Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993 Annual Report and Analysis of Competitive Market Conditions With Respect to Mobile Wireless, Including Commercial Mobile Services	)))))))))	WT Docket No. 11-186 (Terminated)

SIXTEENTH REPORT

Adopted: March 19, 2013 **Released: March 21, 2013**

By the Commission: Chairman Genachowski and Commissioner Clyburn issuing separate statements; Commissioner McDowell concurring and issuing a statement; Commissioner Pai concurring in part, and issuing a statement.

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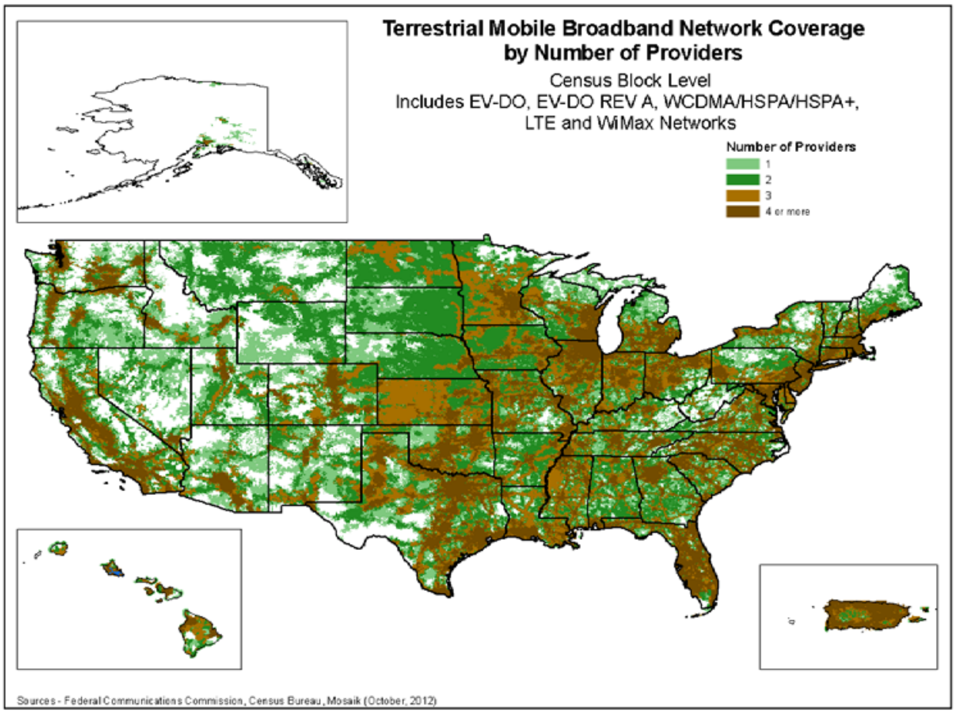
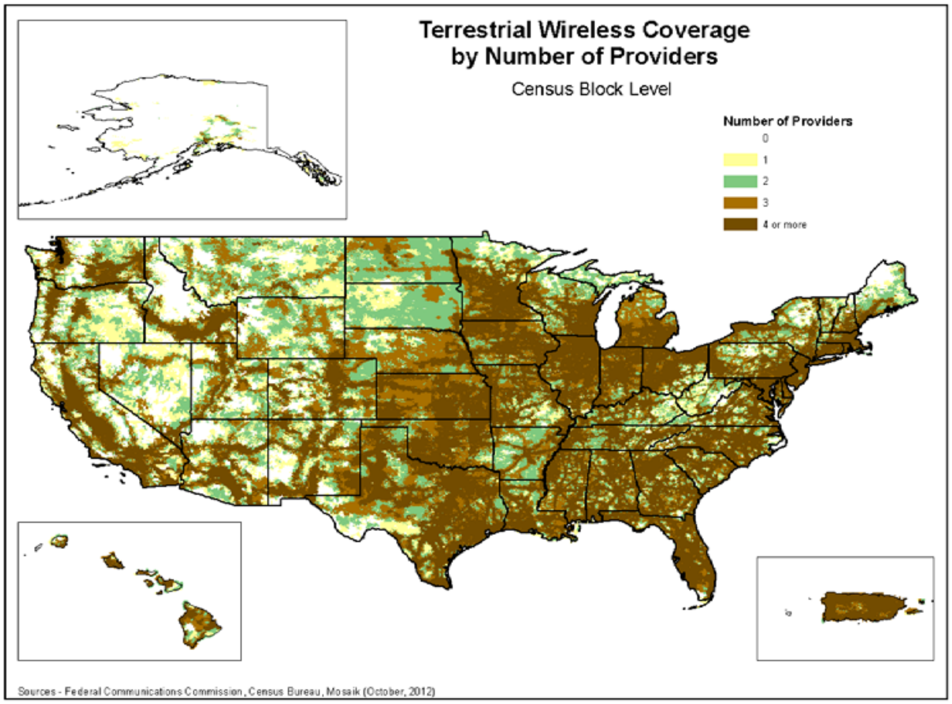


Map 2
Mobile Wireless Network Coverage



I. EXECUTIVE SUMMARY

1. The Federal Communications Commission (Commission) is required to report annually to Congress on the state of competition in the mobile services marketplace, pursuant to section 332(c)(1)(C) of the Communications Act. In June 2011, the Commission released the Fifteenth Report, which provided an analysis of mobile wireless market conditions during 2009 and, to the extent data were available, 2010.[1] This year's sixteenth Mobile Wireless Competition Report (Sixteenth Report or Report) updates the data and analysis presented in the Fifteenth Report, and analyzes mobile wireless service market conditions during 2010 and 2011, as well as during 2012 to the extent data are available.[2] The analysis includes "competitive market conditions with respect to commercial mobile services" as required by the Act.[3] Like the Fifteenth Report, the Sixteenth Report presents a multitude of industry data on various aspects of mobile wireless competition.[4]

2. Consistent with the Commission's first seven Annual Commercial Mobile Radio Service (CMRS) Competition Reports, the *Fourteenth* and *Fifteenth Reports* did not reach an overall conclusion regarding whether or not the CMRS marketplace was effectively competitive, but provided an analysis and description of the CMRS industry's competitive metrics and trends. The *Sixteenth Report* follows the same analytical framework used in the *Fifteenth* and *Fourteenth Reports*, with certain improvements based on responses to those *Reports*. The *Sixteenth Report* also makes no formal finding as to whether there is, or is not, effective competition in the industry. Rather, given the complexity of the various inter-related segments and services within the mobile wireless ecosystem, the *Report* focuses on presenting the best data available on competition throughout this sector of the economy and highlighting several key trends in the mobile wireless industry.

Selected developments and key metrics with respect to the current state of mobile wireless competition, as set forth in the *Report*, are highlighted below:

Network Deployment

Consistent with the previous four *Reports*, the Commission has conducted an analysis of service provider coverage by census block, based on data from Mosaik Solutions, formerly American Roamer,[5] and

[1] Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993, Annual Report and Analysis of Competitive Market Conditions with Respect to Commercial Mobile Services, *Fifteenth Report*, 26 FCC Rcd 9665 (2011) (*Fifteenth Report*).

[2] The *Report* includes network coverage data from Mosaik Solutions (formerly American Roamer) from the third quarter of 2012. In other instances, particularly where year-end metrics are discussed or annual comparisons are made, the *Report* uses year-end 2010 and 2011 data. *See* Section II. Introduction, *infra*, for an additional discussion of data timeframes.

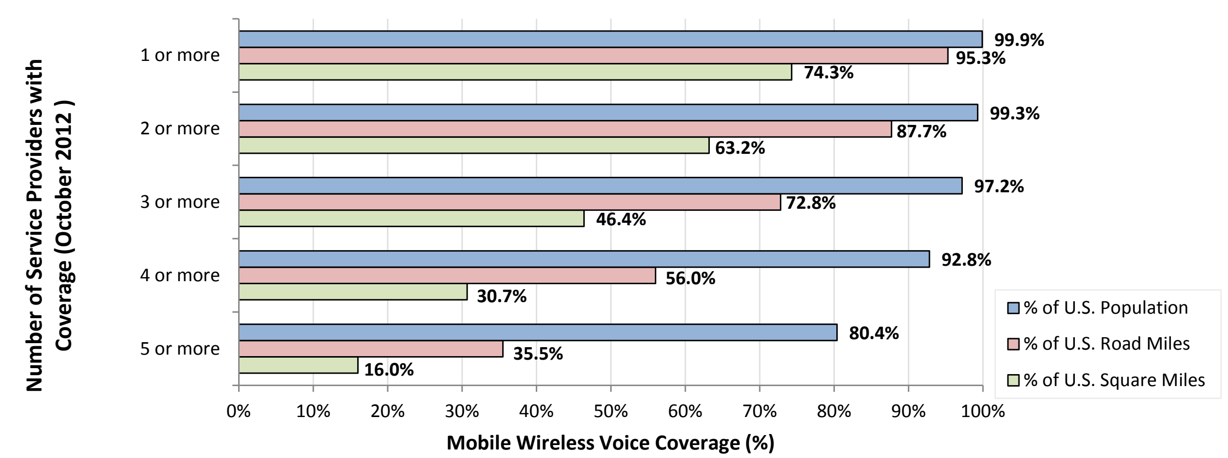
[3] 47 U.S.C. § 332(c)(1)(C). As discussed below, this analysis integrates an analysis of commercial mobile radio services (CMRS) into an analysis of all mobile wireless services, including voice, messaging, and broadband. *See* Section II, Introduction, *infra.*

[4] 47 U.S.C. § 332(c)(1)(C). As with previous *Reports,* this *Report* does not address the merits of any license transfer applications that are currently pending before the Commission or that may be filed in the future, which will be decided based on the record collected in each proceeding. *See, e.g., Fourteenth Report,* 25 FCC Rcd at 11429 n. 14 ("an application for approval of a license transfer, may present facts pointing to narrower or broader markets than any used, suggested, or implied in this *Report*").

[5] This analysis likely overstates the coverage actually experienced by consumers, because Mosaik Solutions, LLC (Mosaik) reports advertised coverage as reported to it by many mobile wireless service providers, each of which uses a different definition or determination of coverage. *2012 Eighth Broadband Progress Report*, FCC 12-119, at ¶ 39-40. We also recognize that an analysis of coverage at the nationwide level provides only a general benchmark. (continued….)

population data from the 2010 Census.[6] While recognizing that this analysis likely overstates the coverage actually experienced by consumers because of limitations of the Mosaik data, we find that this analysis is useful because it provides a general baseline that can be compared over time across network types, technologies, and providers. For the first time, we present estimated coverage in terms of road miles in addition to population and square miles. We also note that these data estimate the number of providers with network coverage in these census blocks, which can often differ from the number of providers actually offering service to consumers who live in these census blocks.

Estimated Mobile Wireless Coverage by Census Block, Oct. 2012[7]



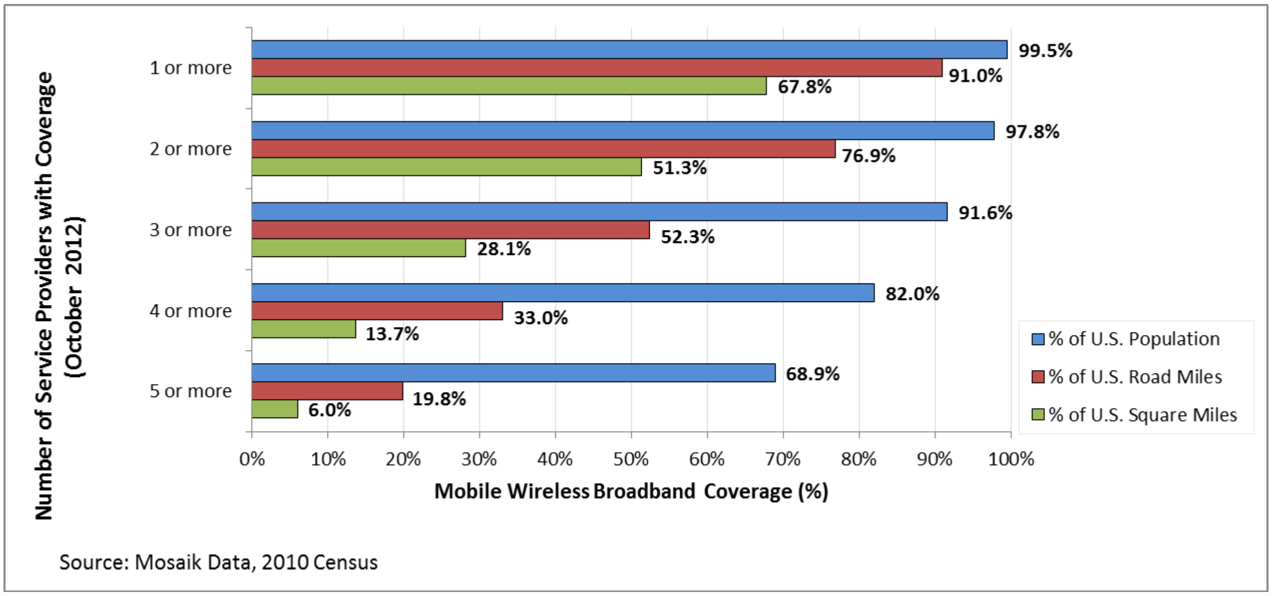
Source: Mosaik Data, Census 2010

(Continued from previous page)
A nationwide average will mask regional disparities in coverage and create an overall picture that does not capture variances across the country.

[6] Unless otherwise noted, population data in the *Report* are taken from U.S. Census Bureau (Census Bureau). For purposes of calculating the extent of service provision based on census blocks, we use 2010 Census population figures because that is the Census Bureau's most recent data about population at the census block level.

[7] The 80.4 percent estimate for '5 or more' providers represents a marked decline from the figure presented in the *Fifteenth Report*, which reported that 89.6 percent of the U.S. population was covered by at least five providers based on the Commission's analysis of July/August 2010 Mosaik data. *See Fifteenth Report*, 26 FCC Rcd at 9705, Table 5. We believe there is an anomaly in the July/August 2010 data that resulted in unusually high estimates of the percentage of the population covered by the networks of at least four, five, and six providers (94.3 percent, 89.6 percent, and 76.4 percent, respectively).

Estimated Mobile Wireless Broadband Coverage by Census Block, Oct. 2012



During the time period covered by this *Report*, the four nationwide facilities-based mobile wireless service providers (Verizon Wireless, AT&T, Sprint Nextel, and T-Mobile), as well as other mobile operators, continued to upgrade and expand their networks with advanced 3G and 4G technologies that allow for faster mobile broadband connection speeds.[8]

3G/4G Deployment Reported by Selected Mobile Wireless Service Providers[9]

Service Provider	HSPA, HSPA+, and EV-DO Deployment	LTE and WiMAX Deployment
Verizon Wireless	As of May 2012, EV-DO Rev. A network covered 290 million POPs.	As of Nov. 2012, LTE network covered more than 250 million POPs. Plans to expand LTE nationwide in 2013 to have LTE coverage similar to its 3G network.
Verizon Wireless – LTE in Rural America Partners		As of March 2013, the program included 20 small, rural providers that have launched or plan to launch LTE to areas covering approximately 2.8 million people across 14 states. By March 2013, 7 of these providers had launched LTE: Bluegrass Cellular (Kentucky), Pioneer Cellular (Oklahoma), Cellcom (Wisconsin), Thumb Cellular (Michigan), Strata Networks (Utah), Chariton Valley

[8] For purposes of this *Report*, the term “broadband” – when referring to mobile broadband networks, coverage, providers, or services – includes the 3G and 4G network technologies: HSPA, EV-DO, LTE, and mobile WiMAX. The Commission may include other combinations of mobile network technologies when referring to “mobile broadband” in other contexts. *See, e.g., Eighth Broadband Progress Report* at Table 15.

[9] *See* Section IV.B.1. Network Coverage and Technology Upgrades, *infra*.

		(Missouri) and Cross Wireless (Oklahoma).
AT&T Wireless	As of mid-year 2012, all of AT&T's network is covered by HSPA+, covering 275 million POPs.	As of Nov. 2012, LTE network covered 150 million POPs. AT&T plans to deploy LTE to 80 percent of the U.S. population, or approximately 250 million POPs, by the end of 2013, and to 300 million by the end of 2014.
Sprint Nextel	As of January 2012, EV-DO Rev. A network covered approximately 274 million POPs.	As of September 2012, LTE service is offered in 19 cities and plans to deploy LTE to 100 additional cities within the next several months and to complete LTE build-out by the end of 2013.
Clearwire		As of June 2012, WiMAX network covered approximately 134 million POPs. Plans to launch LTE in 31 urban markets by June 2013.
T-Mobile	As of September 2012, HSPA+ 21 network covered over 200 million POPs and HSPA+ 42 network covered 184 million POPs.	As of December 2012, plans to deploy its LTE network in the United States to 100 million people by July 2013 and 200 million people by year-end July 2013.
MetroPCS		As of the end of July 2012, LTE network covered all of the major metropolitan areas MetroPCS serves, including Atlanta, Boston, Dallas, Detroit, Jacksonville, Las Vegas, Los Angeles, Miami, New York, Orlando, Philadelphia, Sacramento, San Francisco, and Tampa.
Leap	EV-DO deployed to entire network footprint, which covered approximately 95.3 million POPs at the end of 2011.	As of October 2012, Leap had launched LTE service in Tucson, AZ and Las Vegas, Nevada. Leap expects its LTE network to cover approximately 21 million POPs by the end of 2012. The company plans to deploy LTE to approximately two-thirds of its network footprint over the next two to three years.
US Cellular	EV-DO network covers 98 percent of its customers.	As of June 2012, LTE network covers 30 percent of customers and expects to cover 58 percent by the end of 2012.
C-Spire	EV-DO network covered approximately 4.7 million POPs at the end of 2011.	As of October 2012, C-Spire offered LTE service in 31 cities in Mississippi. C-Spire plans to further expand its LTE network to 6 more cities by the end of 2012.

Subscribers, Connections, and Net Adds

The *Report* uses different data sources to estimate the number of mobile wireless subscribers and connections. One source, Numbering Resource Utilization Forecast (NRUF), tracks the number of phone numbers that have been assigned to mobile wireless devices. When all mobile wireless devices were assigned telephone numbers and subscribers generally carried one mobile device for making voice calls, NRUF provided reasonably accurate measures of subscribership. Now, however, consumers are more likely to use more than one mobile device that have been assigned telephone numbers – particularly non-voice devices, such as Internet access devices (*e.g*., wireless modem cards, netbooks, and mobile Wi-Fi hotspots), e-readers, tablets, and telematics systems. In addition, certain mobile broadband providers do not assign telephone numbers to at least some of the devices on their networks. Therefore, NRUF is becoming increasingly less useful in measuring the number of individual subscribers. Instead, it is providing more of an estimate of the number of mobile wireless connections or connected devices. In addition, it will become a less accurate measure of connected devices to the extent that more devices are sold that do not use telephone numbers.

Based on NRUF data, the number of mobile wireless connections grew four percent from 290.7 million at the end of 2009 to 317.3 million at the end of 2011. CTIA estimates the total number of mobile wireless connections based on its industry survey and found that the number of connections grew 11 percent from 285.6 million at the end of 2009 to 316.0 million at the end of the fourth quarter of 2011. Industry-wide net new mobile wireless subscriber/connection additions (or "net adds") for 2011 totaled 15.5 million, based on NRUF data, and 19.7 million based on CTIA data.

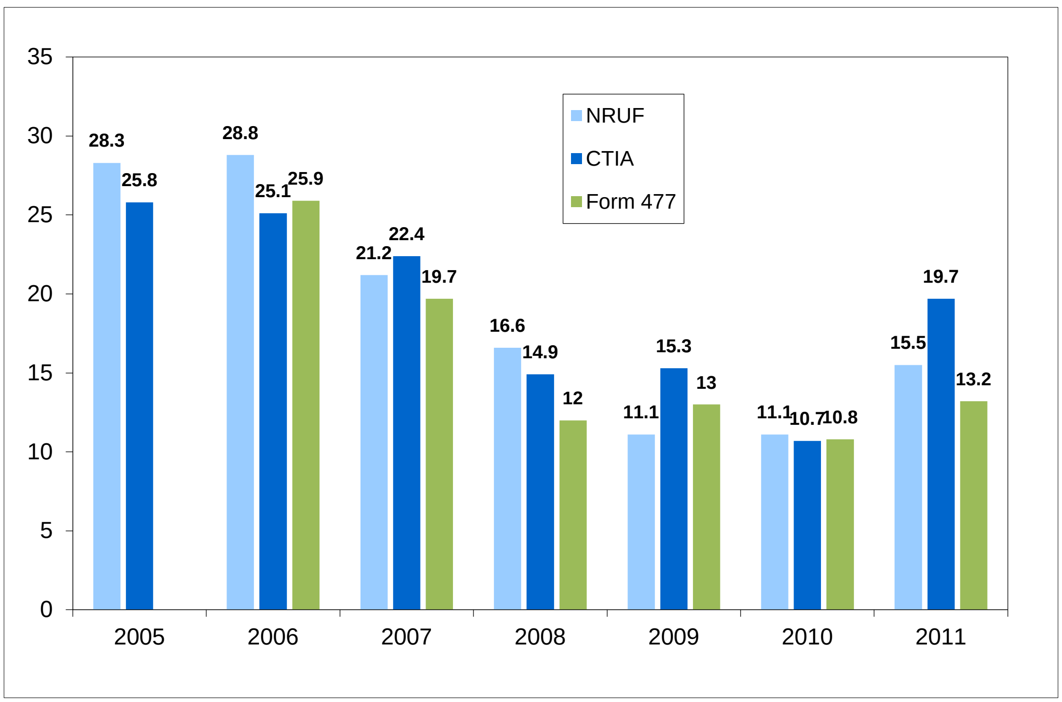
The Commission is also able to estimate the number of mobile voice subscribers and mobile Internet access subscribers using data reported by service providers on Form 477. Based on those data, at the end of 2011 there were 298.3 million subscribers to mobile telephone, or voice, service, up nearly 4.6 percent from 285.1 million at the end of 2010. At the same time, there were 142.1 million subscribers to mobile Internet access services at speeds exceeding 200 kbps in at least one direction, up from the 97.5 million were reported for the end of 2010, and more than double the 56.3 million reported for year-end 2009.[10]

[10] This figure is based on the Commission's Form 477 data, which collects subscribership and other data from providers of Internet access services at speeds exceeding 200 kbps in at least one direction. We believe that only mobile services provided using 3G or 4G mobile network technologies – including HSPA, EV-DO, LTE, and mobile WiMAX – would meet this speed threshold. In the Form 477 data, mobile telephone subscribers and mobile Internet access subscribers are not mutually exclusive.

Estimated Total Mobile Wireless Connections[11]

	NRUF			CTIA
	Connected Devices (millions)	*Increase from previous year (millions)*	*Connections Per 100 People*	*Estimated Connections (millions)*
2001	128.5	n/a	45	128.4
2002	141.8	13.3	49	140.8
2003	160.6	18.8	54	158.7
2004	184.7	24.1	62	182.1
2005	213.0	28.3	71	207.9
2006	241.8	28.8	80	233.0
2007	263.0	21.2	86	255.4
2008	279.6	16.6	91	270.3
2009	290.7	11.1	94	285.6
2010	301.8	11.1	97	296.3
2011	317.3	15.5	102	316.0

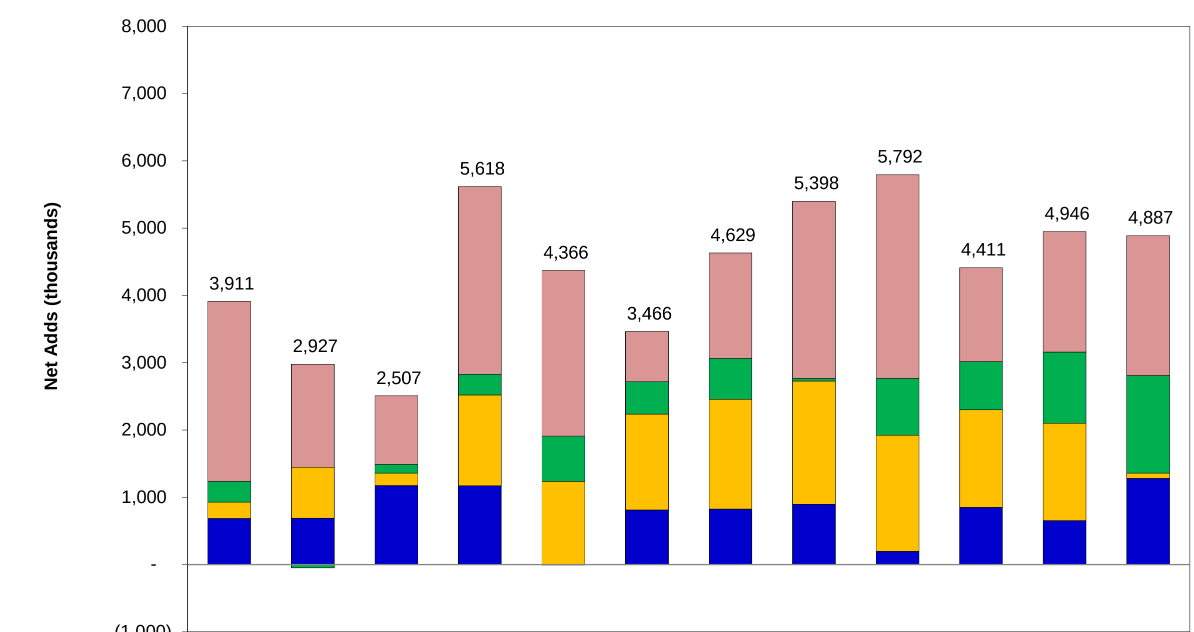
Total Mobile Wireless Connection Annual Net Additions, 2005-2011 (In millions)



[11] Commission estimates based on NRUF data. *CTIA Year-End 2011 Wireless Indices Report*. In the second half of 2012, CTIA revised estimated connections for the years 2009-2011. In describing these revisions, CTIA states in its forthcoming *Wireless Indices Report* “Nor do we make an M2M adjustment for participating companies that do not include their M2M numbers in their reported subscriber counts. Indeed, the mid-year 2012 estimate – and the *revised* subscriber connection figures for five previous periods – reflects the exclusion of some M2M and other units not currently treated as “subscriber connections” which previously *had* been treated as such connections.” *See also* Section V.A.1.Industry Wide Connections, *infra*

Quarterly net adds in 2010 and 2011 varied by service segment, with prepaid continuing to take the largest (but declining) portion, and wholesale and connected device adds seeing significant growth. Net adds among service providers continue to vary, with AT&T and Verizon Wireless continuing to see the largest number of net adds. Sprint Nextel also experienced significant growth, reversing a trend of net losses from previous years. T-Mobile experienced negative net adds in 2011, a year during much of which the unsuccessful applications for the transfer of control of T-Mobile USA to AT&T were pending before the Commission.

Quarterly Net Additions by Service Segment: 2009-2011[12]

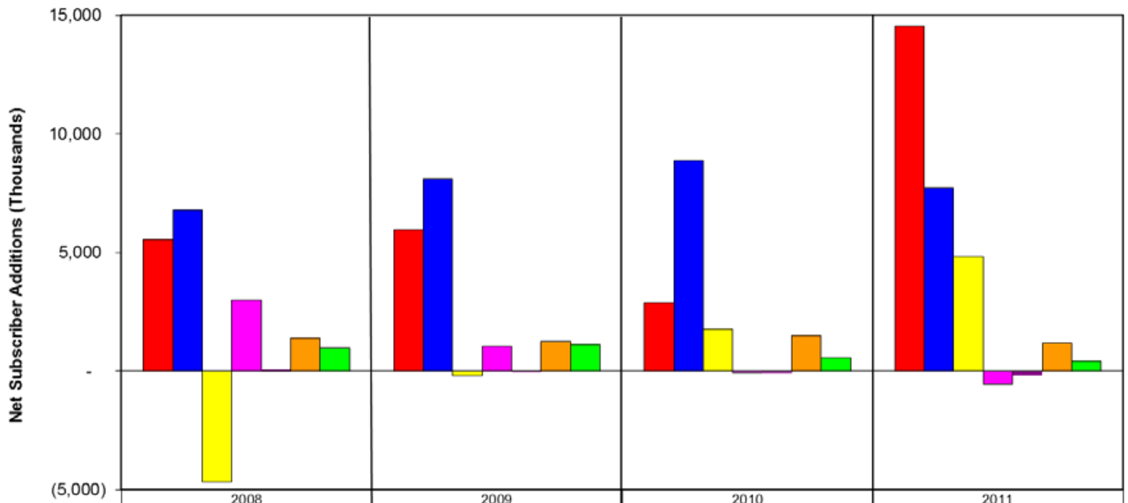


	1Q09	2Q09	3Q09	4Q09	1Q10	2Q10	3Q10	4Q10	1Q11	2Q11	3Q11	4Q11
Total Net Adds	3,911	2,927	2,507	5,618	4,366	3,466	4,629	5,398	5,792	4,411	4,946	4,887
Prepaid	2,675	1,530	1,018	2,792	2,464	749	1,565	2,633	3,025	1,395	1,787	2,078
Wholesale	308	(50)	132	306	671	483	607	39	846	715	1,061	1,451
Connected Devices	244	758	184	1,345	1,237	1,421	1,634	1,831	1,725	1,452	1,446	76
Postpaid	684	689	1,173	1,175	(6)	813	823	895	196	849	652	1,282

Source: UBS Data

[12] *US Wireless 411 4Q11*, at 10. UBS categorizes Tracfone customers as prepaid, not wholesale.

Annual Net Additions by Service Provider, 2008-2011 (In thousands)[13]



	2008	2009	2010	2011
Verizon Wireless	5,558	5,974	2,886	14,532
AT&T	6,785	8,111	8,853	7,711
Sprint Nextel	(4,667)	(205)	1,777	4,811
T-Mobile	2,973	1,032	(56)	(549)
US Cellular	74	(55)	(69)	(181)
MetroPCS	1,404	1,273	1,515	1,192
Leap Wireless	981	1,109	564	416

Source: Company Data, SEC Form 10-K

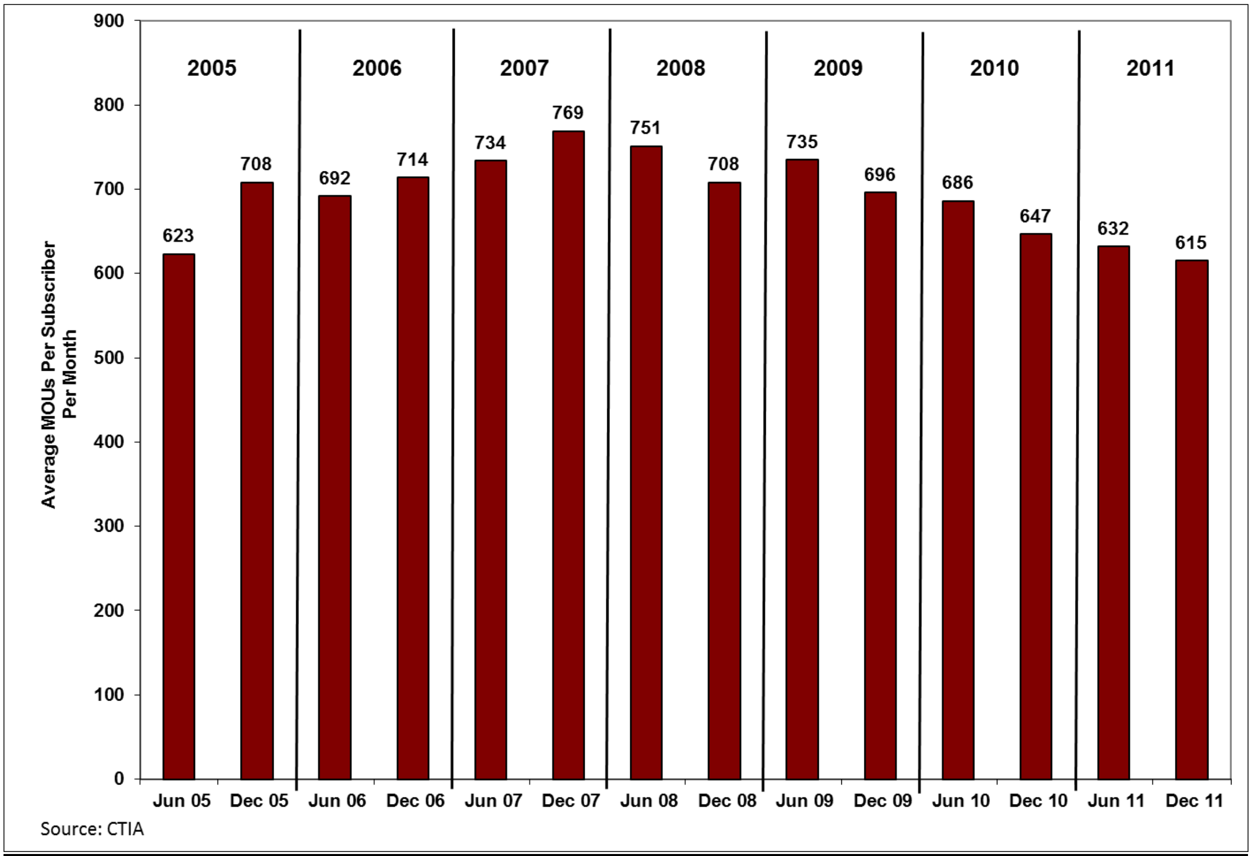
Usage

Trends in mobile wireless services showed continuing evolution from being primarily voice-centric to data-centric during the time frame covered by this *Report*. During this period mobile data traffic grew significantly while average billable minutes of use (MOUs), a measure of monthly mobile voice usage per subscriber, continued to decline. Following significant increases in previous years, growth rates for SMS and Multimedia Messaging Service (MMS) usage per customer were steady or declining, although we note the emergence of data services that provide similar functionality to SMS and MMS. Usage measures for these services are excluded in these numbers but included in the data consumption chart below. The *Report* identifies four trends highlighting the reasons for increased data traffic: (1) the growth in mobile device connections, including multiple connections held by the same subscriber; (2) the growing use of data-only mobile devices, such as laptop cards, e-readers, and tablets; (3) the increased popularity of higher-bandwidth mobile applications; and (4) the deployment of faster networks. It is estimated that U.S. mobile data traffic increased 270 percent from 2010 to 2011, and that it has more than doubled each year for the past four years.[14]

[13] These calculations include wholesale subscribers. *Pro-forma* calculations were made to account for mergers and show only "organic" net adds generated independent of mergers. For instance, Verizon Wireless's reported net additions for 2009, including the subscribers acquired from Alltel, totaled 19,193,000. *See Fifteenth Report*, 26 FCC Rcd at 9775 Chart 18, n. 544.

[14] Cisco Visual Networking Index U.S. Mobile Data Traffic Forecast Update, February 2012.

Average MOUs Per Subscriber Per Month[15]



Average Text and Multimedia Messages Per Subscriber Per Month, CTIA[16]

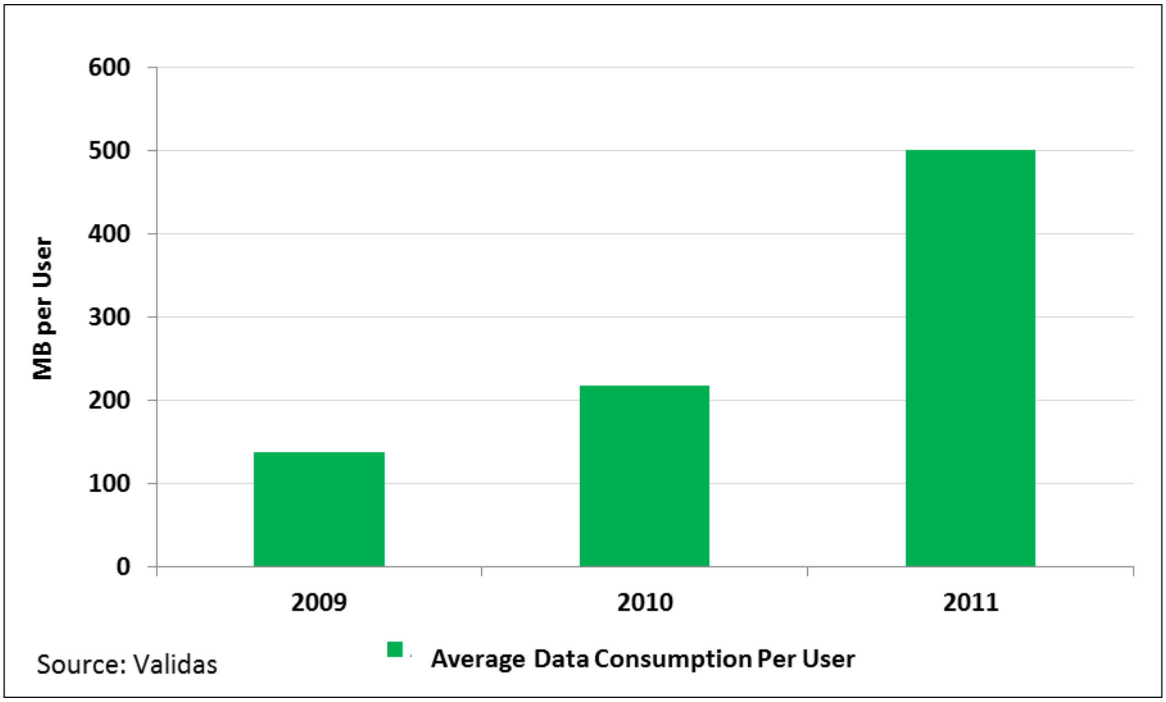
Six-Month Period Ending	Average Text Messages Per User Per Month	Average MMS Messages Per User Per Month
Jun-05	29	0.3
Dec-05	40	0.7
Jun-06	51	0.9
Dec-06	69	1.2
Jun-07	103	1.8
Dec-07	144	2.3
Jun-08	248	3.6
Dec-08	388	5.8
Jun-09	451	6.3
Dec-09	488	14.4

[15] *CTIA Year-End 2011 Wireless Indices Report*, at 215.

[16] *CTIA's Wireless Industry Indices, Year-End 2011 Results*, released May 2012. Calculations derived from data on reported subscribers, six-month text/SMS message volumes, and six-month MMS message volumes. CTIA's reported subscribers which were not revised in the second half of 2012 when CTIA revised estimated subscribers for 2009-2011.

Jun-10	566	18.5
Dec-10	598	13.7
Jun-11	606	15.0
Dec-11	594	12.5

Average Monthly Data Consumption per User: Nationwide Providers, 2009-2011[17]



Price Metrics and Average Revenue Per User (ARPU)

An examination of two key pricing indicators, the Wireless Telephone Services component of the Consumer Price Index[18] and the per-minute price of voice service, shows that mobile wireless prices declined overall in 2010 and 2011. The Wireless Telephone Services CPI declined for two consecutive years, while the per-minute price of voice service remained roughly stable in 2010 and then declined in 2011.

From 2009 to 2010, the annual Wireless Telephone Services CPI decreased by nearly 3 percent while the overall CPI increased by 1.6 percent and the Telephone Services CPI was unchanged. From 2010 to 2011, the annual Wireless Telephone Services CPI decreased by another 3.6 percent, while the overall CPI increased by 3.2 percent and the Telephone Services CPI decreased by 1.1 percent. The Wireless Telephone Services CPI's back-to-back declines in 2010 and 2011 followed an unchanged Wireless Telephone Services CPI in 2009 and a series of much smaller declines in the period from 2002 to 2008.

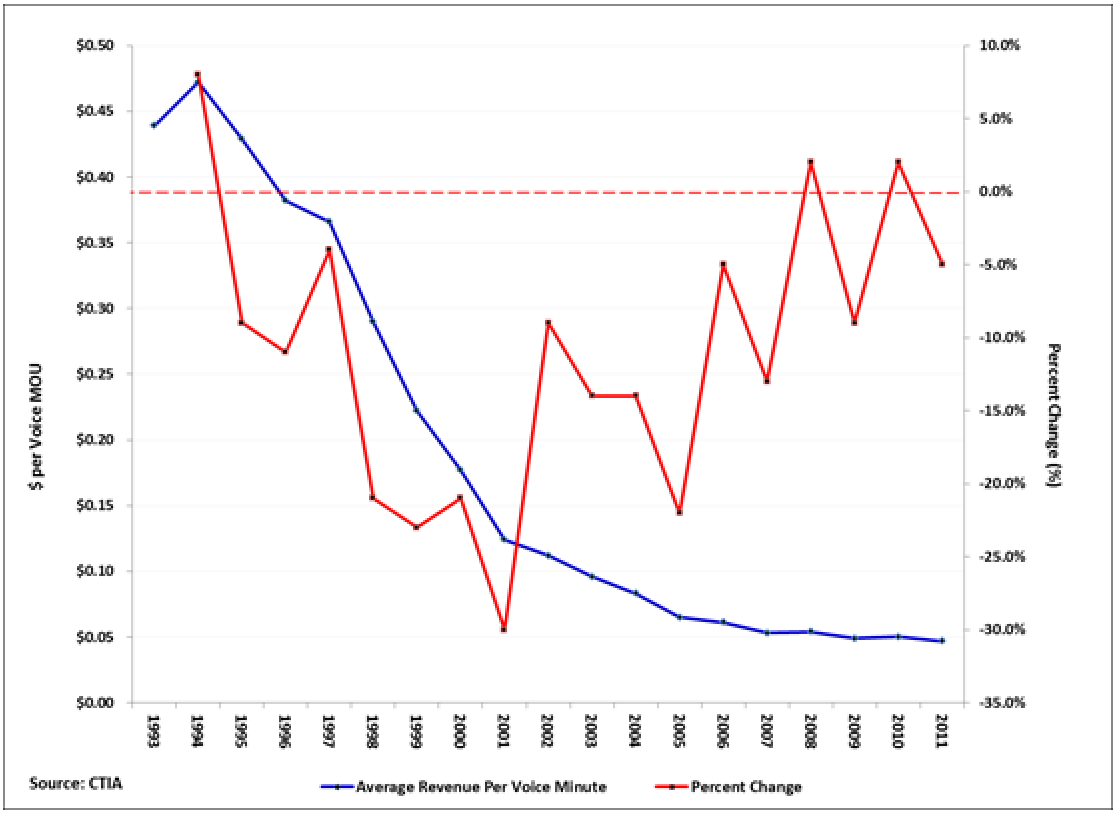
In addition to the Wireless Telephone Services CPI, Voice Revenue per Minute (RPM) offers a proxy for mobile voice prices. Voice RPM has declined over the past 18 years, from more than $0.40 to the current

[17] Validas, 3 Year View of US Wireless Data Consumption: 2009-2011, Prepared for the FCC by Validas. The Validas estimates are averages calculated from data from a sample of approximately 20,000 customer bills obtained from customers of the four nationwide providers.

[18] The wireless telephone services' component of the CPI (Wireless Telephone Services CPI) is published by the U.S. Department of Labor's Bureau of Labor Statistics (BLS) on a national basis.

$0.05, with the rate of decline decreasing as Voice RPM has reached the low single digits. Because CTIA currently aggregates revenue reports for text messaging and data services, it is no longer possible to derive separate estimates for those two services. An estimate based on Nielsen data suggests, however, that the unit price for text messages has continued to fall since 2008. We also note that Recon Analytics estimates that the effective price per megabyte of data declined from $0.47 per megabyte in the third quarter of 2008 to about $0.05 per megabyte in the fourth quarter of 2010, which is roughly an 89 percent decrease.

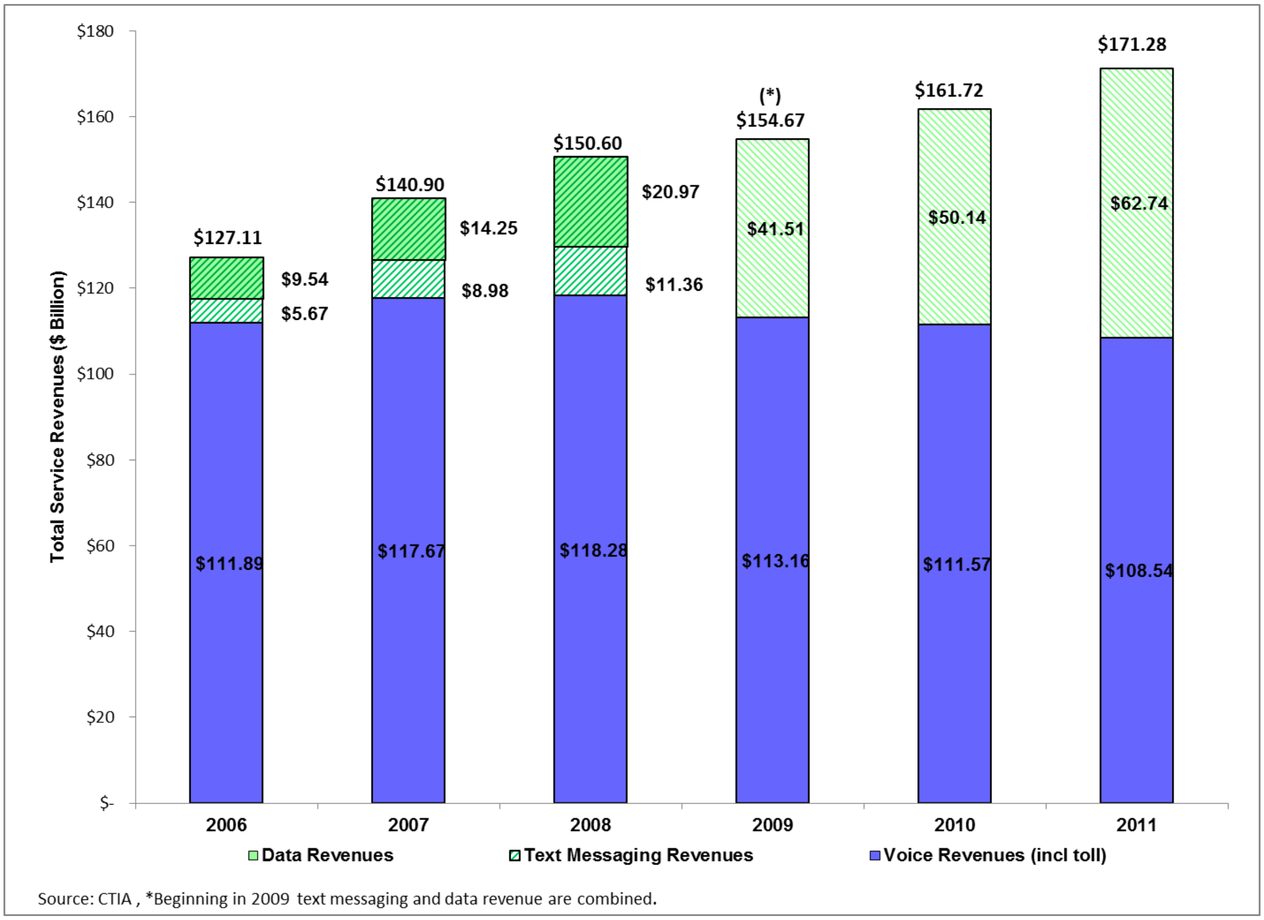
Mobile Wireless Voice Revenue per Minute: 1993-2011



As shown in the following chart, the total revenue generated by the mobile wireless industry continues to be substantial, with approximately $171.28 billion in service revenues in 2011, and has been growing consistently.[19] Annual voice revenues continued the decline first noted in 2009 from approximately $113 billion to $108 billion in 2011. At the same time, data revenue, including text messaging revenue, has continued to see significant growth, going from $42 billion to $63 billion in the same period.

[19] Dollar figures stated in this *Report* have not been adjusted for inflation (*i.e.*, they are nominal dollars) unless stated otherwise.

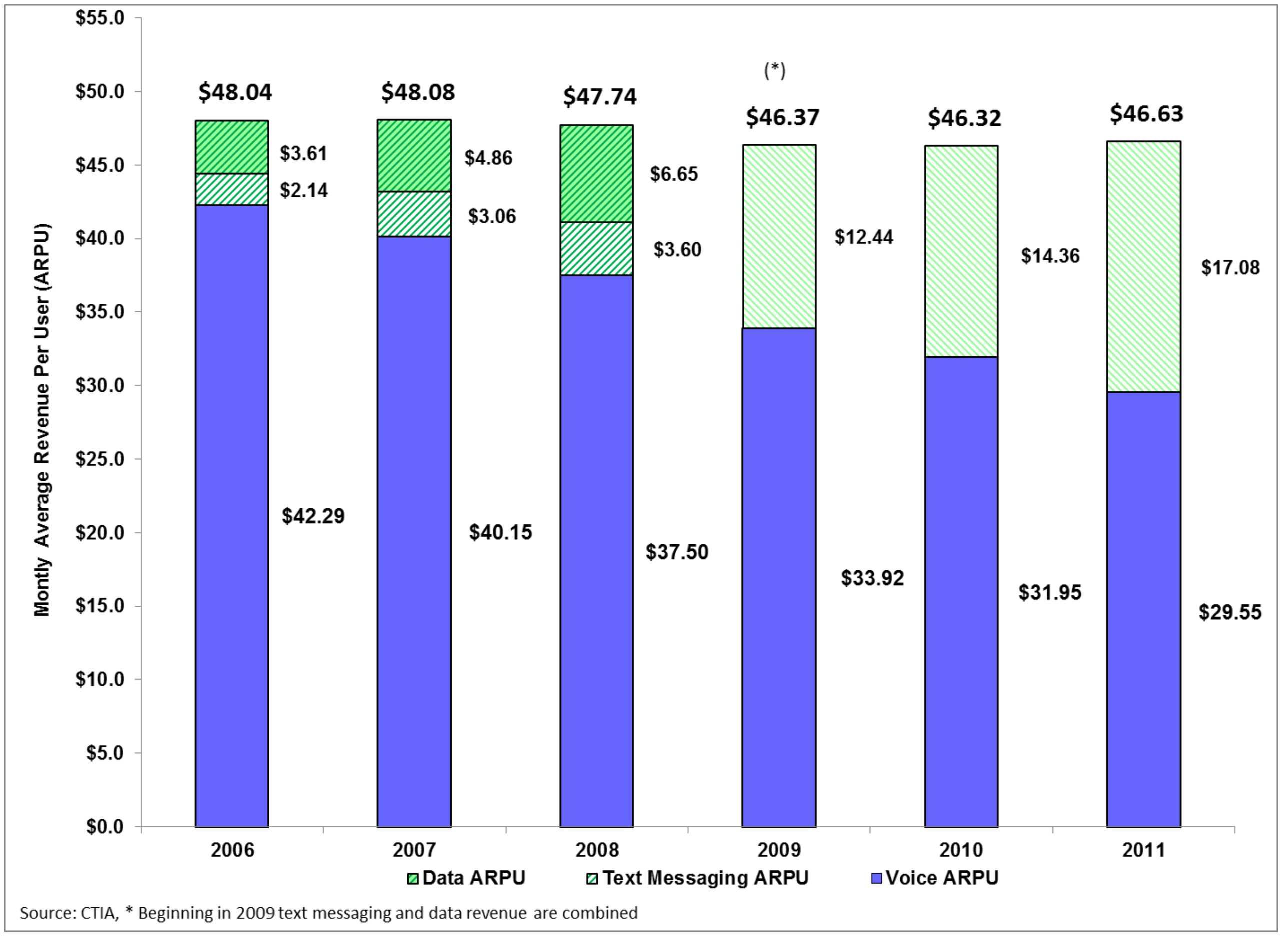
Total Mobile Wireless Industry Revenues [20]



These trends are reflected in the following chart in changes in the Average Revenue per User (ARPU). The chart shows an overall decline, with falling voice ARPU not quite counterbalanced by increases in data revenue.

[20] *CTIA Year-End 2011 Wireless Indices Report.* In 2009, CTIA discontinued the practice of reporting a breakout data series for text messaging service revenues. The estimates of both wireless data revenues and data ARPU therefore include text messaging service revenues as well as other mobile data service revenues.

Monthly ARPU by Type of Service [21]



Spectrum

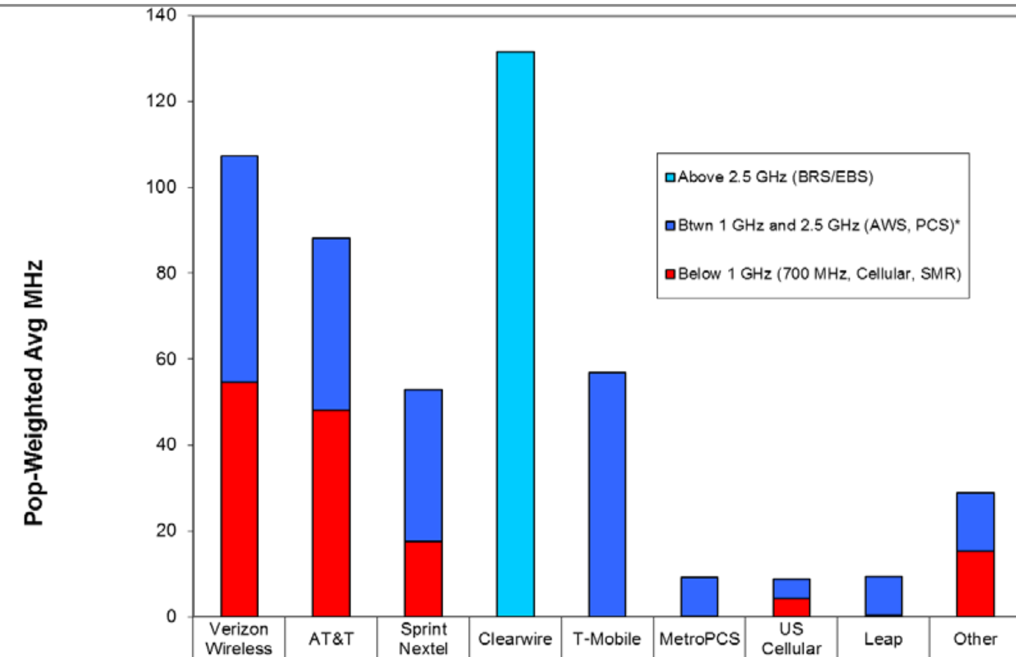
Access to spectrum is perhaps the most important input for the provision of mobile wireless services. Demand for these services has grown steadily and sharply in recent years and projections indicate such growth will continue unabated. In order for service providers to meet the demand, they will need to put new spectrum to use and make more efficient use of existing holdings. Because spectrum bands vary in their propagation characteristics, service providers may make use of different bands depending on the nature of the service, geography, density, or other factors in their network build-out.

As a general matter, a provider is best positioned if it holds complementary spectrum bands. Spectrum below 1 GHz is considered most suitable for establishing base network coverage, especially for wide area and in-building coverage. Higher frequencies often can best enable providers to increase capacity where needed, especially to provide higher data rates, and to fill in gaps in coverage. Spectrum from 1 GHz through 2.7 GHz is currently often used as capacity spectrum. Verizon Wireless and AT&T together hold approximately 90 percent of Cellular spectrum based on megahertz-POPs (MHz-POPs), which was the first band to be licensed for commercial mobile services and has the most extensive network buildout. In

[21] *CTIA Year-End 2011 Wireless Indices Report*; Commission analysis. Total and voice ARPU include roaming and toll revenues. The ARPU calculations are based on CTIA's total estimated subscriber connection numbers, rather than its reported subscriber connection numbers. As discussed above, CTIA discontinued the practice of reporting a breakout data series for text messaging service revenues.

addition, Verizon Wireless holds 45 percent of the MHz-POPs of Cellular and 700 MHz spectrum combined, while AT&T holds approximately 39 percent. No licensee holds more than 25 percent of the combined MHz-POPs in the Broadband PCS (PCS) and Advanced Wireless Services (AWS) spectrum between 1 GHz and 2.5 GHz. T-Mobile holds the greatest amount of those bands. Clearwire, in which Sprint holds a majority interest, has access to the predominant amount of 2.5 GHz spectrum, comprised of the BRS and EBS bands.

Population-Weighted Average Megahertz Under/Over 1 GHz*



	Verizon Wireless	AT&T	Sprint Nextel	Clearwire	T-Mobile	MetroPCS	US Cellular	Leap	Other
Above 2.5 GHz (BRS/EBS)	0.0	0.0	0.0	131.5	0.0	0.0	0.0	0.0	0.0
Btwn 1 GHz and 2.5 GHz (AWS, PCS)*	52.7	40.2	35.5	0.0	56.9	9.0	4.5	9.0	13.6
Below 1 GHz (700 MHz, Cellular, SMR)	54.7	48.0	17.5	0.0	0.0	0.3	4.2	0.4	15.3

Source: FCC staff estimates based on frequencies used for mobile to base transmissions (i.e., uplink)

* Estimates include all transactions consummated as of August 15, 2012, as well as the transactions approved in the *Verizon Wireless-SpectrumCo Order*.

On February 22, 2012, Congress passed the Spectrum Act.[22] Section 6403 of the Spectrum Act requires the Commission to conduct an incentive auction of broadcast television spectrum and sets forth specific requirements for the auction.[23]

The Commission has proposed to make the recovered spectrum available for flexible use in fixed and mobile wireless communications services, including mobile broadband.[24] Repurposing this spectrum will serve to further address the nation's growing demand for wireless broadband services, promote ongoing

[22] 47 U.S.C. § 309(j)(8)(G); Spectrum Act at § 6402.

[23] *See* Spectrum Act at § 6403. Section 6402 of the Spectrum Act, codified at 47 U.S.C. 307(J)(8)(G)(i) authorizes the Commission to conduct incentive auctions in which a licensee may voluntarily relinquish its spectrum usage rights, in order to permit the assignment by auction of new initial licenses subject to flexible-use service rules, in exchange for a portion of the resulting auction.

[24] Innovation in the Broadcast Television Bands: Allocations, Channel Sharing and Improvements to VHF, ET Docket No. 10-235, *Report and Order*, 27 FCC Rcd 4616, 4617 ¶ 1 (2012).

innovation and investment in mobile communications, and help to ensure that the United States keeps pace with the global wireless revolution.[25]

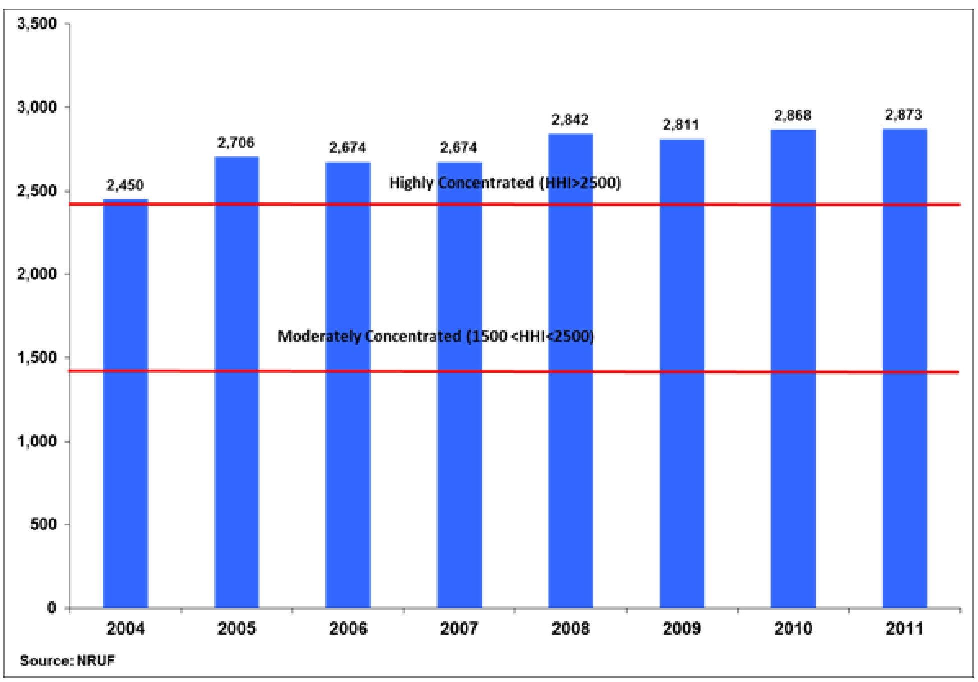
In addition to the incentive auction of broadcast television spectrum, the Commission has taken other measures to enable more efficient use of spectrum, including converting 40 megahertz of spectrum from satellite to terrestrial use, changing technical rules to permit the rollout of LTE in the 800 MHz band and make the WCS band useable for mobile broadband, and pursuing opportunities for innovative use of small cells in the 3.5 GHz band, as well as exploring potential opportunities for sharing with government users in a manner that frees up additional spectrum for commercial use.

Market Concentration

The Herfindahl-Hirschman Index (HHI) employed by the Commission to measure market concentration is the most widely-accepted measure of concentration in competition analysis. The HHI is calculated by summing the squared market shares of all firms in any given market. Antitrust authorities in the United States generally classify markets into three types: Unconcentrated (HHI < 1500), Moderately Concentrated (1500 < HHI < 2500), and Highly Concentrated (HHI > 2500).[26]

In the mobile wireless services industry, the weighted average of HHIs (weighted by population across the 172 Economic Areas in the United States) was 2873 at the end of 2011, essentially unchanged from 2868 at the end of 2010, and an increase from 2811 at the end of 2009. At the end of 2011, the value of the HHI for individual Economic Areas (EAs) ranged from a low of 2008 in EA 108 (covering parts of Wisconsin) to a high of 7178 in EA 146 (covering parts of Montana).

Average HHI Across EAs in 2011



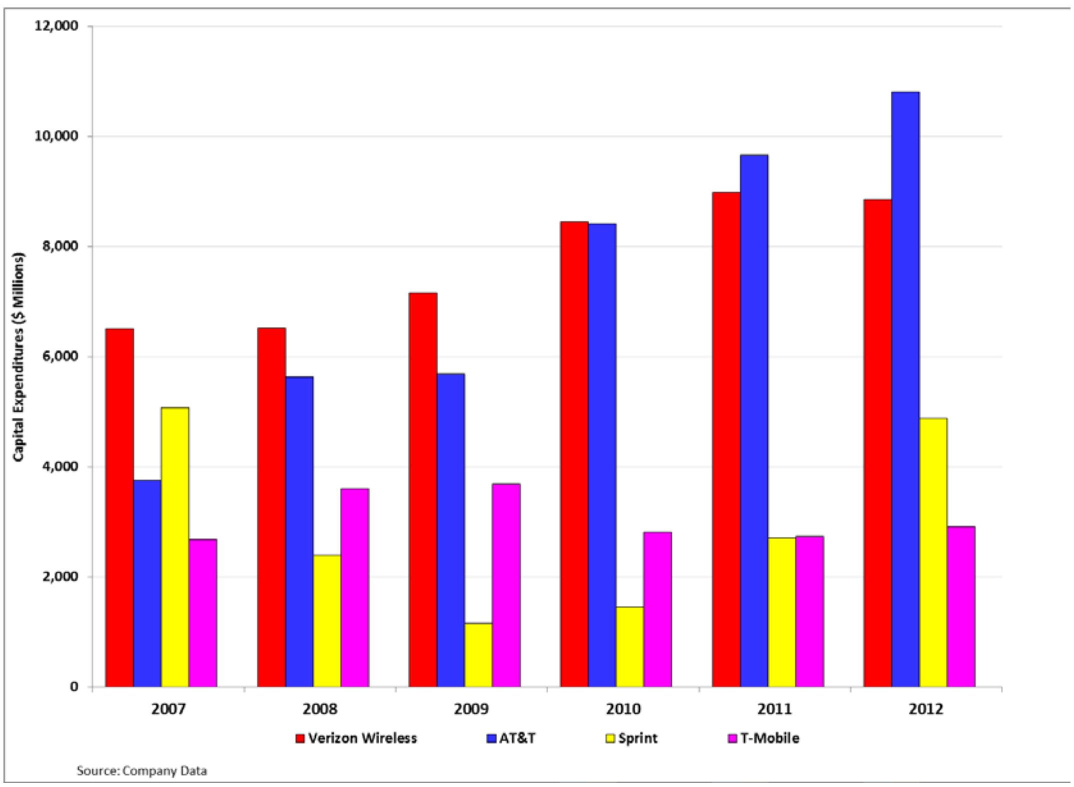
[25] Innovation in the Broadcast Television Bands: Allocations, Channel Sharing and Improvements to VHF, ET Docket No. 10-235, *Report and Order*, 27 FCC Rcd 4616, 4617 ¶ 1 (2012).

[26] *See Horizontal Merger Guidelines*, U.S. Department of Justice and the Federal Trade Commission, http://www.justice.gov/atr/public/guidelines/hmg-2010.pdf .

Investment

CTIA reports that incremental capital investment by wireless operators rose to $24.9 billion in 2010, a 22 percent increase from the $20.4 billion spent in 2009, and then increased another 1.7 percent to $25.3 billion in 2011.[27] The increases in 2010 and 2011 follow a one percent increase in capital investment by mobile wireless service providers in 2009, which followed a trend of declining investment from 2006 through 2008. Estimates by the U.S. Census Bureau likewise show an 11 percent increase in total wireless industry capital expenditures to $23 billion in 2010 following an 18 percent decline to $20.7 billion in 2009.[28] This pattern of a period of declining investment followed by a period of rising investment is consistent with the cyclical nature of technological adoption in the mobile wireless service industry, with the upswing in capital investment since 2009 likely reflecting the transition from third- to fourth-generation wireless network technologies. The following chart presents capital investment by the four current nationwide providers for the past six years.

Capital Expenditures by Service Provider[29]



[27] *CTIA Year-End 2010 Wireless Indices Report*, at 137, 139; *CTIA Year-End 2011 Wireless Indices Report*, at 139, 141. CTIA's figure includes incremental investment in currently operational systems, including expenditures for building operating systems, land and capital leases, and all tangible non-system capital investment, but does not include the cost of spectrum licenses purchased at auctions or other acquisition processes or greenfield builds. *CTIA Year-End 2010 Wireless Indices Report*, at 137-138.

[28] *See* U.S. Census Bureau, Annual Capital Expenditures Survey, http://www.census.gov/econ/aces/index.html, (visited Feb. 9, 2011)

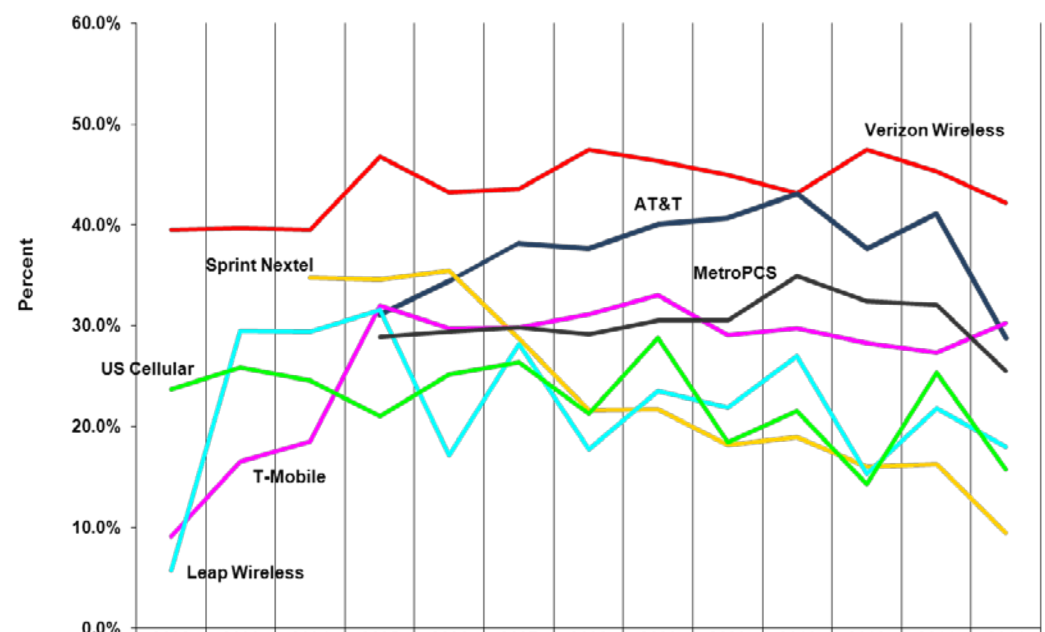
[29] Verizon Communications, Inc., SEC Forms 10-K, filed Feb. 14, 2012, filed Feb. 28, 2011, filed Feb. 26, 2010, and Feb. 24, 2009; AT&T Inc., SEC Forms 10-K, filed Feb. 24, 2012, filed Mar. 1, 2011, filed Feb. 25, 2010, filed Feb. 25, 2009, filed Feb. 27, 2008; Sprint Nextel, SEC Forms 10-K, filed Feb. 27, 2012; filed Feb. 24, 2011; filed Feb. 26, 2010; *US Wireless 411 4Q11*, at 37.

Profitability Metrics

In the absence of the data necessary to estimate economic profits, there are various measures used by industry observers to estimate accounting profits in the wireless industry. One such metric, based on company data reported to the Securities and Exchange Commission, is EBITDA (Earnings before Interest, Taxes, Debt, and Amortization) – which equals accounting profits before deducting interest expenses, corporate income taxes, depreciation, and amortization. In 2011, EBITDA per subscriber ranged from a low of $4.11 (Sprint Nextel) to a high of $19.66 (Verizon Wireless). The EBITDA per subscriber of Sprint Nextel has declined significantly over the past several years. The EBITDA minus CAPEX per subscriber of AT&T and Verizon Wireless have decreased relative to 2009, but are above the levels of Sprint Nextel and T-Mobile.

A second indicator of mobile wireless segment profitability is EBITDA margin, which is EBITDA as a percentage of service revenue. Standardizing EBITDA by service revenues facilitates cross-provider comparisons. The EBITDA margin of a number of the larger mobile providers for the past several years is shown in the following chart:

Reported EBITDA Margins (Selected Providers), 2002-2011[30]



	2002 (Q4)	2003 (Q4)	2004 (Q4)	2005 (Q4)	2006 (Q4)	2007 (Q4)	2008 (Q4)	2009 (Q2)	2009 (Q4)	2010 (Q2)	2010 (Q4)	2011 (Q2)	2011 (Q4)
Verizon Wireless	39.5%	39.7%	39.5%	46.8%	43.2%	43.6%	47.5%	46.3%	45.0%	43.1%	47.5%	45.4%	42.2%
AT&T				31.1%	34.4%	38.2%	37.7%	40.1%	40.7%	43.1%	37.6%	41.1%	28.7%
Sprint Nextel			34.8%	34.6%	35.4%	28.7%	21.6%	21.7%	18.2%	19.0%	16.0%	16.3%	9.5%
T-Mobile	9.1%	16.5%	18.5%	32.0%	29.8%	29.8%	31.1%	33.1%	29.1%	29.7%	28.2%	27.3%	30.2%
Leap Wireless	5.7%	29.5%	29.4%	31.6%	17.1%	28.2%	17.7%	23.5%	21.9%	27.0%	15.3%	21.8%	18.0%
US Cellular	23.7%	25.9%	24.6%	21.0%	25.2%	26.4%	21.3%	28.8%	18.4%	21.5%	14.3%	25.3%	15.7%
MetroPCS				28.9%	29.4%	29.9%	29.2%	30.5%	30.5%	35.0%	32.4%	32.1%	25.5%

Source: UBS

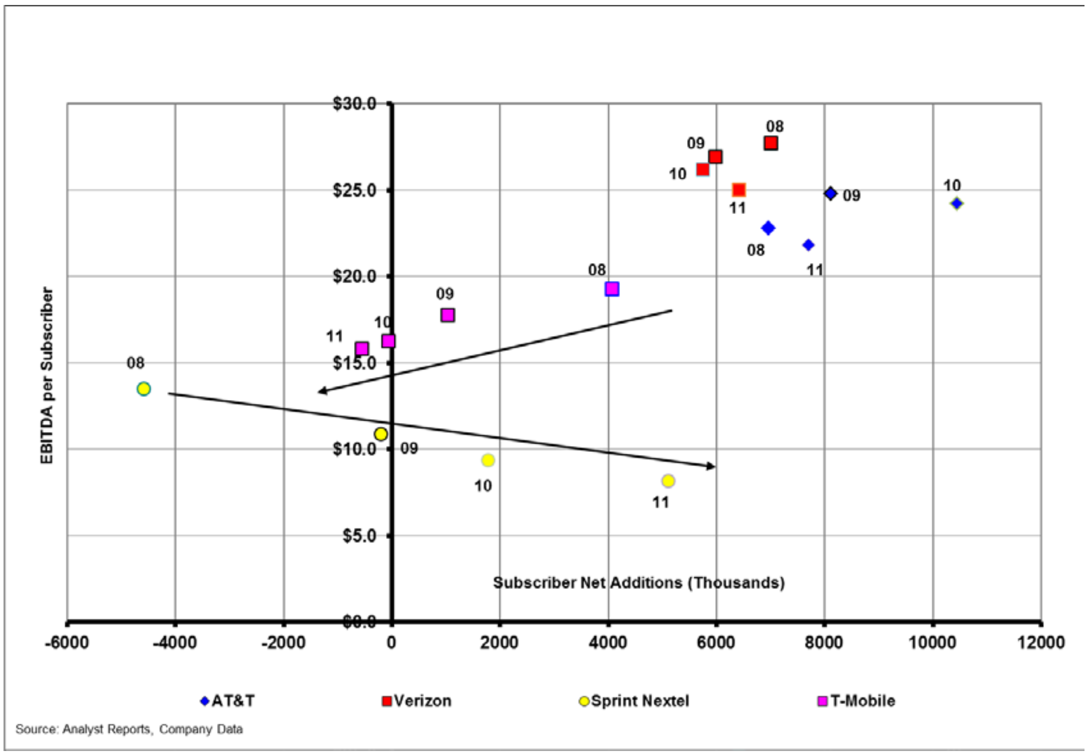
As shown in the chart, among the selected providers, the difference in 2011 between the provider with the highest EBITDA margin (Verizon Wireless) and the provider with the lowest (Sprint Nextel) was 32.7

[30] UBS, *US Wireless 411 Reports*, 2002 – 2011.

percent. Verizon Wireless has remained above 40 percent since 2006. AT&T's EBITDA margin has decreased after 2009, dropping to 28.7 percent in 2011, while T-Mobile's EBITDA margin increased to 30.2 percent in 2011.

The following graph of EBITDA per subscriber versus net adds of the four nationwide service providers shows that the EBITDA per subscriber and net adds of AT&T and Verizon have been stable over the past four years. During the same period, the EBITDA per subscriber and net adds of T-Mobile have been decreasing, and the EBITDA per subscriber of Sprint has been decreasing while its net adds have been increasing.

Subscriber Additions vs. EBITDA Per Subscriber, 2008-2011



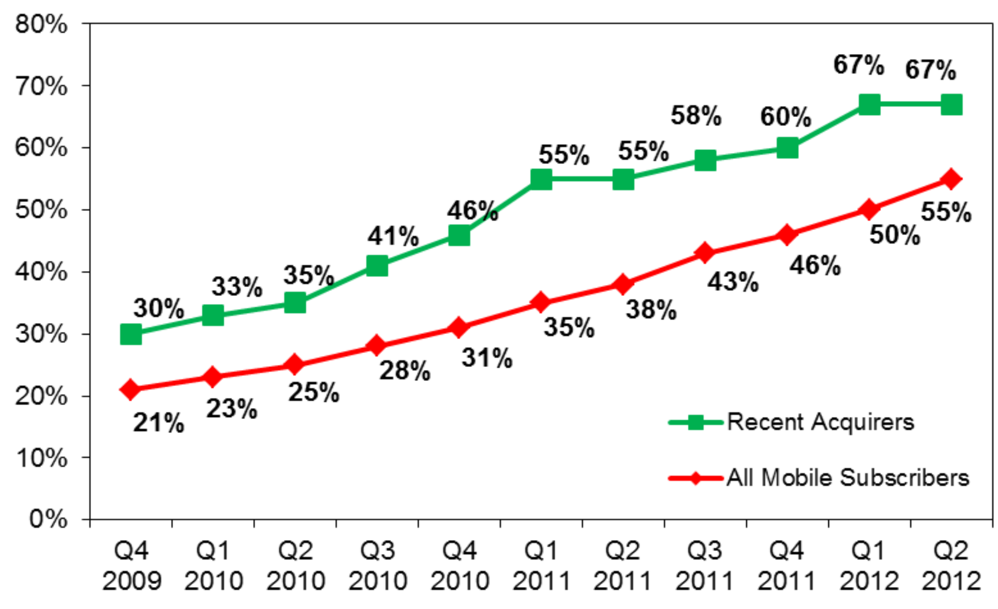
Handsets and Devices

Handsets and devices are a central part of consumers' mobile wireless experience, and a key way by which providers differentiate their offerings. During June 2011, 20 handset manufacturers offered a total of 297 handset models to mobile wireless service providers in the United States. In 2012, smartphone adoption increased, with 55.5 percent of mobile wireless consumers reported to have smartphones as of July 2012, up from 41 percent in July 2011.[31] Popular smartphone operating systems such as the Android and the Apple iOS are available from multiple service providers, permitting consumers to pair their preferred operating systems with different service providers. During 2011, the iPhone exclusive handset arrangement between Apple and AT&T ended, and multiple service providers began offering the iPhone

[31] Nielsenwire, The Nielsen Company, *Young Adults and Teens Lead Growth Among Smartphone Owners*, September 10, 2012. *See also* http://blog.nielsen.com/nielsenwire/online_mobile/young-adults-and-teens-lead-growth-among-smartphone-owners/ (visited Nov.19, 2012).

on their networks.[32] Innovative smartphones are available at a variety of price points and with both post-paid and pre-paid service plans.

Smartphone Penetration Rates in the United States, Q4 2009 – Q2 2012[33]



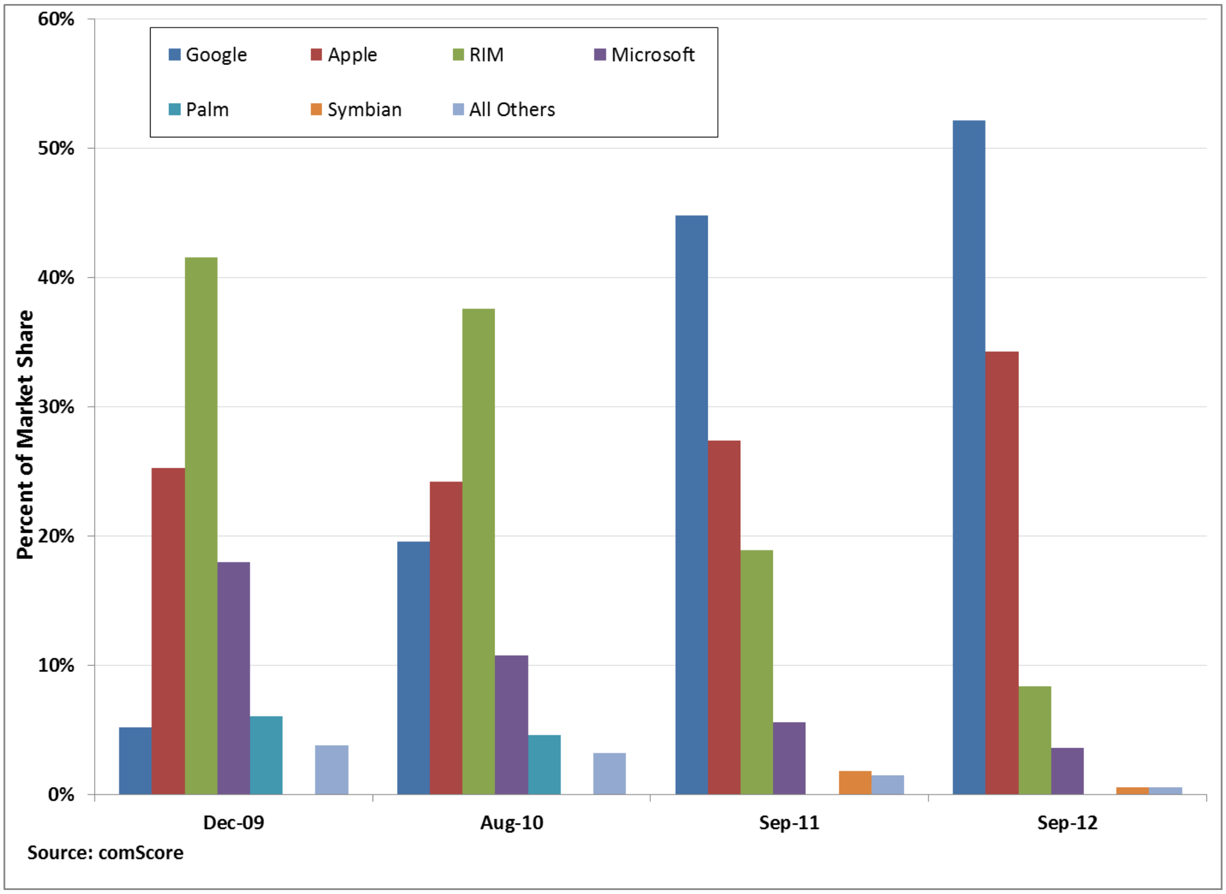
Source: Nielsenwire, The Nielsen Company

Apple's iOS and Google's Android have emerged as the two leading mobile operating systems. According to comScore, Android's share of the smartphone operating system grew from 3 percent in May 2009 to 51 percent in March 2012, while iOS's market share increased from 20 percent to 32 percent over the same period. Over the same period, RIM's market share has declined from the top position to commanding less than ten percent of the market. In September 2011, 98.5 percent of smartphones in use had an operating system from a top-five mobile operating system provider, while the remaining 1.5 percent of smartphones in use had other operating systems.

[32] Prior to 2011, Apple distributed its iPhone through AT&T (and its affiliates) only. An exclusive handset arrangement (EHA) is an arrangement in which a handset manufacturer or vendor agrees to sell a particular handset model to only one wireless service provider, usually for a specified period of time. See *Fifteenth Report*, 26 FCC Rcd at 9857 ¶ 341.

[33] Nielsenwire, The Nielsen Company, *Two Thirds of New Mobile Buyers Now Opting for Smartphones*, July 12, 2012. *See also* http://blog.nielsen.com/nielsenwire/online_mobile/two-thirds-of-new-mobile-buyers-now-opting-for-smartphones/ (visited Nov. 19, 2012).

Smartphone Operating System U.S. Market Share, 2009-2012[34]



Mobile Applications

The number of mobile applications launched and the number of applications downloaded by consumers has grown significantly over the past three years. According to BGR, a leading source for mobile news in the U.S., by the end of 2011 U.S. consumers had access to more than 989,863 applications, a number that has grown to over 1,000,000 by mid-2012.[35] Application stores offer thousands of applications that can be downloaded to mobile devices that have mobile broadband connections. By September 2012, there were more than 700,000 applications available from the Apple App Store for the Apple iOS, a number that nearly doubled in less than a year.[36] The total number of applications downloaded from Apple's App Store grew from 100,000 in 2008 to 25 billion in March 2012. By October 2012, Google Play for the Android operating system offered over 675,000 applications and had more than 25 billion total downloads. The major categories of applications include: web searching, news and information, e-mail and messaging, games, social networking, location-based services, photo sharing, music and video streaming, and VoIP. In addition, thousands of niche applications have been designed for specific uses,

[34] comScore, Press Release, *comScore Reports July 2012 U.S. Mobile Subscriber Market Share*, Sept. 4, 2012. http://www.comscore.com/Insights/Press_Releases/2012/9/comScore_Reports_July_2012_US_Mobile_Subscriber_Market_Share (visited Nov. 19, 2012).

[35] *See Available apps across major mobile platforms approaching million-app milestone*, *available at* http://www.bgr.com/2011/12/05/available-apps-across-major-mobile-platforms-approachmillion-app-milestone/ (visited Nov. 30, 2012).

[36] *See Apple*, http://www.apple.com/iphone/from-the-app-store/ (visited Nov. 30, 2012).

hobbies, interests, and industries by various third-party application developers.

Estimated Number of Applications Available, 2010-2012

Application Store	2010	2011	2012
Apple App Store	250,000	425,000	700,000
Google Play	80,000	200,000	675,000
Blackberry App World	12,000	50,000	70,000
Nokia Ovi Store	13,000	30,000	50,000
Windows Mobile Marketplace	1,350	20,000	30,000

Intermodal Competition

The number of adults who rely exclusively on mobile wireless for voice service has increased significantly in recent years. According to the National Health Interview Survey (NHIS), approximately 32.3 percent of all adults in the U.S. lived in wireless-only households during the second half of 2011.[37] This compares to 27.8 percent of all adults in the second half of 2010 and 22.9 percent in the second half of 2009.[38] The percentage of households that are wireless-only has been steadily increasing as well. As of the second half of 2011, just over one-third, or approximately 34 percent, of all U.S. households were wireless only, up from 29.7 percent in the second of 2010 and 24.5 percent in the second half of 2009.[39]

Approximately half of all adults aged 18-24 and aged 30-34 lived in wireless-only households, while nearly 60 percent of adults aged 25-29 did so.[40] The percentage of adults living in households with only wireless telephones decreased as age increased beyond 35 years.[41] Nevertheless, the percentage of older adults living in wireless-only households has been gradually increasing over time. The percentage of 35- to 44-year-olds that are wireless only rose from 23.9 percent in the second half of 2009 to 36.8 percent in the second half of 2011, while the percentage of 45- to 64-year-olds that are wireless only rose from 14.9 percent to 23.8 percent during the same period.[42]

[37] Stephen J. Blumberg and Julian V. Luke, *Wireless Substitution: Early Release of Estimates from the National health Interview Survey, July- December 2011*, National Center for Health Statistics, Centers for Disease Control, June 2012, *available at* http://www.cdc.gov/nchs/data/nhis/earlyrelease/wireless201206.pdf (visited Nov. 29, 2012).

[38] Stephen J. Blumberg and Julian V. Luke, *Wireless Substitution: Early Release of Estimates from the National health Interview Survey, July- December 2011*, National Center for Health Statistics, Centers for Disease Control, June 2012, *available at* http://www.cdc.gov/nchs/data/nhis/earlyrelease/wireless201206.pdf (visited Nov. 29, 2012).

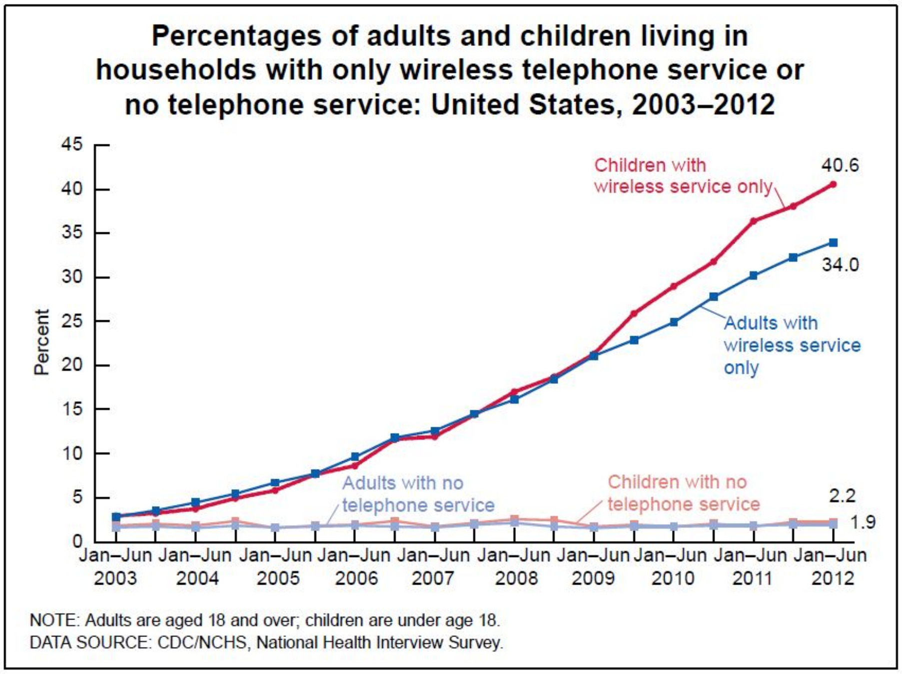
[39] Stephen J. Blumberg and Julian V. Luke, *Wireless Substitution: Early Release of Estimates from the National health Interview Survey, July- December 2011*, National Center for Health Statistics, Centers for Disease Control, June 2012, *available at* http://www.cdc.gov/nchs/data/nhis/earlyrelease/wireless201206.pdf (visited Nov. 29, 2012).

[40] Stephen J. Blumberg and Julian V. Luke, *Wireless Substitution: Early Release of Estimates from the National health Interview Survey, July- December 2011*, National Center for Health Statistics, Centers for Disease Control, June 2012, *available at* http://www.cdc.gov/nchs/data/nhis/earlyrelease/wireless201206.pdf (visited Nov. 29, 2012).

[41] *Id*.

[42] Stephen J. Blumberg and Julian V. Luke, *Wireless Substitution: Early Release of Estimates from the National health Interview Survey, July- December 2011*, National Center for Health Statistics, Centers for Disease Control, June 2012, *available at* http://www.cdc.gov/nchs/data/nhis/earlyrelease/wireless201206.pdf (visited Nov. 29, 2012).

Wireless-Only Households, 2003-2012[43]



Mobile wireless connections represented approximately 62 percent of the 230.4 million data connections with speeds exceeding 200 kbps in the United States in December 2011. In addition, at the end of 2011, there were an estimated 184 million mobile devices in use capable of sending or receiving information at speeds exceeding 200 kbps in at least one direction, up from an estimated 152 million at the end of 2010.

The extent to which wireless broadband services can impose competitive discipline on wireline providers depends on many factors, including technologies, prices, consumer preferences, and the business strategies of providers that offer both wireless and wireline Internet access services.[44] Mobile wireless Internet access service could provide an alternative to wireline service for consumers who are willing to trade speed for mobility, as well as consumers who are relatively indifferent with regard to the attributes, performance, and pricing of mobile and fixed platforms.[45]

Urban-Rural Comparisons

Approximately 59 million people, or 19 percent of the U.S. population, live in rural counties[46]

[43] *Wireless Substitution: Early Release of Estimates From The Data from the National Health Interview Survey, January – June 2012*). Adults and children with "no telephone service" include those in households with neither wireline nor wireless service.

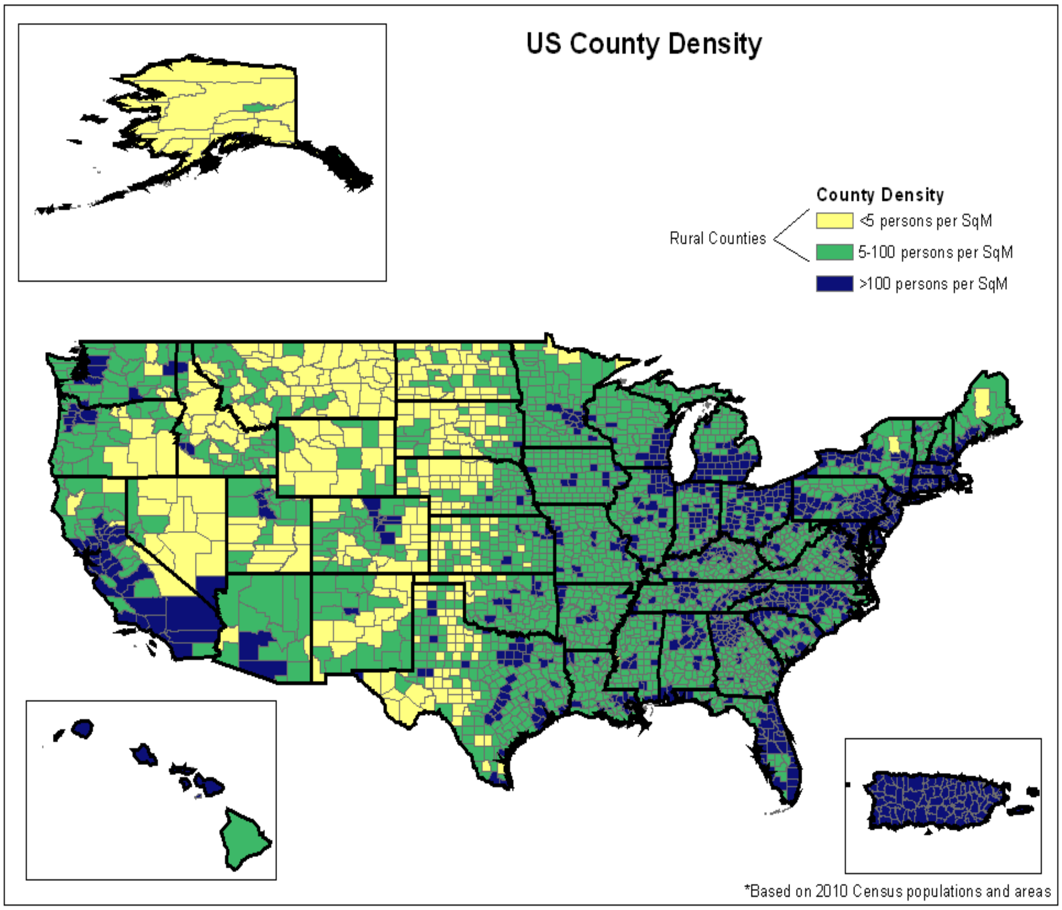
[44] *National Broadband Plan*, at 42; *National Broadband Plan*, at 42-44; U.S. Department of Justice *Ex Parte*, GN Docket No. 09-51 (filed Jan. 4, 2010), at 8, 10, 11.

[45] *National Broadband Plan*, at 43 and 64, note 3; *National Broadband Plan*, at 42-44; U.S. Department of Justice *Ex Parte*, GN Docket No. 09-51 (filed Jan. 4, 2010), *at* 8.

[46] In its 2004 *Report and Order* concerning deployment of wireless services in rural areas, the Commission has adopted a "baseline" definition of rural as a county with a population density of 100 persons or fewer per square mile. *See* Facilitating the Provision of Spectrum-Based Services to Rural Areas and Promoting Opportunities for Rural Telephone Companies To Provide Spectrum-Based Services, *Report and Order*, 19 FCC Rcd. 19078, 19087-88 ¶¶ 11-12 (2004).

comprising 3.1 million square miles, or 86 percent of the geographic area of the United States.[47] In addition, approximately 81 percent of the U.S. population lives on 15 percent of the land, while 19 percent live on the remaining 85 percent of the land.

County Density in the United States[48]



Although mobile voice and mobile broadband network coverage in rural areas has improved since the *Fifteenth Report*, according to data from Mosaik Solutions (formerly American Roamer) more than 400,000 people in rural areas still had no mobile wireless voice coverage as of October 2012, and 1.3 million lacked access to mobile broadband as of October 2012.[49] In addition while 99.3 percent of the rural population is covered by at least one mobile voice provider, and 96.6 percent has coverage by at least two providers as of October 2012, there is a disparity in the percentage of rural and U.S. population covered by more than two mobile voice provider networks. This disparity is even more pronounced when considering mobile broadband provider networks: 97.7 percent of the total U.S. population in non-rural area is covered by three or more mobile broadband providers, compared to only 65.4 percent of the rural population.

[47] Based on 2010 Census data. Includes the population of Puerto Rico.

[48] A larger version of this map may be found in Appendix C.

[49] As mentioned earlier, we recognize that Mosaik data likely overstates the coverage actually experienced by consumers.

In addition, 63.6 percent of rural square miles and 87.3 percent of rural road miles in the U.S. were covered by at least one broadband provider, while 90.9 percent of non-rural square miles and 98.7 percent of non-rural road miles were covered by at least one broadband providers.

For purposes of this *Report*, "mobile broadband" includes coverage and services offered using the following 3G and 4G technologies: EVDO, EVDO Rev A, WCDMA/HSPA, HSPA+, LTE, and mobile WiMAX.[50] As stated earlier, these coverage data may not represent the number of choices actually available to consumers living in particular areas, as service providers provide network coverage in certain areas to serve customers resident elsewhere.

Estimated Mobile Broadband Coverage in Rural and Non-Rural Areas by Census Block, Oct. 2012[51]

	% of U.S. POPs		% of U.S. Square Miles		% of U.S. Road Miles	
Total Number of Providers with Coverage in a Block	**Rural Areas**	**Non-Rural Areas**	**Rural Areas**	**Non-Rural Areas**	**Rural Areas**	**Non-Rural Areas**
1 or more	97.8%	99.9%	63.6%	90.9%	87.3%	98.7%
2 or more	89.9%	99.7%	45.2%	84.4%	67.7%	95.8%
3 or more	65.4%	97.7%	20.6%	69.4%	35.7%	86.6%
4 or more	37.4%	92.4%	7.1%	49.7%	14.2%	71.8%
5 or more	15.8%	81.3%	1.7%	29.8%	4.0%	52.4%

As part of the *USF/ICC Transformation Order* adopted in October 2011, the Commission created Mobility Fund Phase I, a universal service support mechanism dedicated to the deployment of mobile broadband networks.[52] Mobility Fund Phase I will accelerate new mobile infrastructure deployment by awarding up to $300 million in one-time support to recipients that commit to provide 3G or better mobile voice and broadband services in census blocks that currently lack such services.[53] Phase I of the Mobility Fund used a reverse auction, which took place on September 27, 2012 to assign $300 million in support to 33 winning bidders, which will be obligated to provide services covering up to approximately 83,500 road miles.[54] In Phase II of the Mobility Fund, the Commission will provide up to $500 million per year in

[50] The Commission may include other combinations of mobile network technologies when referring to "mobile broadband" in other contexts. *See, e.g.*, *Eighth Broadband Progress Report* at Table 15.

[51] Commission estimates based on census block analysis of Mosaik CoverageRight coverage maps, October 2012. Population data are from the 2010 Census, and include the United States (50 states plus the District of Columbia) and Puerto Rico. Square miles include the United States and Puerto Rico. There are approximately 11 million census blocks and a population of 312 million people.

[52] *Connect America Fund; A National Broadband Plan for Our Future; Establishing Just and Reasonable Rates for Local Exchange Carriers; High-Cost Universal Service Support; Developing an Unified Intercarrier Compensation Regime; Federal-State Joint Board on Universal Service; Lifeline and Link-Up; Universal Service Reform—Mobility Fund*, WC Docket Nos. 10-90, 07-135, 05-337, 03-109, GN Docket No. 09-51, CC Docket Nos. 01-92, 96-45, WT Docket No. 10-208, Report and Order and Further Notice of Proposed Rulemaking, 26 FCC Rcd 17663 (2011) (*USF/ICC Transformation Order*), *available at* http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-11-161A1_Rcd.pdf, *pets. for review pending sub nom. In re* FCC 11-161, No. 11-9900 (10th Cir. filed Dec. 8, 2011); Order on Reconsideration, 26 FCC Rcd 17633 (2011); Second Order on Reconsideration, 27 FCC Rcd 4648 (2012); Third Order on Reconsideration, 27 FCC Rcd 5622 (2012).

[53] "Mobility Fund Phase I Auction Scheduled for September 27, 2012, Notice and Filing Requirements and Other Procedures for Auction 901," *Public Notice*, AU Docket No. 12-25, DA 12-641 (WTB rel. May 2, 2012).

ongoing support to expand deployment and sustain mobile voice and broadband services in areas in which such service would be unavailable absent USF support.[55]

International Comparisons

As in past years the Commission reviewed data from a variety of international markets to identify trends, and compare market structure and performance in the US with selected European and Asian countries with similar income levels. This comparison shows the following: First, market structure is converging to three or four national competitors per market in most countries. Second, the calling party pays system used in most other countries tends to result in lower average voice usage (MOUs) and higher revenue per minute of voice service than the receiving party pays system used in the United States.[56] Third, international differences in regulatory policy and business environment have produced a wide variety of successful models for the mobile sector, with no one model dominating on all dimensions of market performance.

Mobile Market Performance in Selected Countries, Global Wireless Matrix, 2011[57]

Country	Penetration (% of Pops)	Prepaid (% of Subs)	MOUs	RPM ($) Voice Only	ARPU ($)	Data (% of ARPU)
Receiving Party Pays						
USA	106	29	945	0.033	50.88	39.9
Canada	77	19	372	0.091	56.32	34.7
Singapore	148	48	352	0.064	36.85	39.1
Calling Party Pays						
UK	123	50	192	0.083	27.07	37.0
Germany	139	56	130	0.092	19.81	40.4
Italy	152	86	162	0.093	23.30	31.9
Sweden	146	31	242	0.085	32.05	31.8
France	99	30	235	0.101	35.23	28.0
Finland	171	13	205	0.093	26.65	30.1
Japan	99	1	134	0.205	59.70	56.5
South Korea	107	0	303	0.069	30.81	32.3
Australia	132	39	268	0.106	47.97	44.4

(Continued from previous page)
[54] "Mobility Fund Phase I Auction Closes, Winning Bidders Announced For Auction 901." *Public Notice*, DA 12-1566 (WTB rel. Oct. 3, 2012). For further information on the Mobility Fund Phase I auction, *see* Auction 901, Mobility Fund Phase I, *available at* http://wireless.fcc.gov/auctions/default.htm?job=auction_summary&id=901 (visited Nov. 30, 2012). In the USF/ICC Transformation Order, the Commission also designated an additional $50 million in Phase I of the Mobility Fund for one-time support targeted exclusively for mobile service on Tribal lands, which is to be awarded by auction in 2013. *See USF/ICC Transformation Order*, 26 FCC Rcd at 17819-20, ¶ 481.

[55] *USF/ICC Transformation Order*, 26 FCC Rcd at 17824, ¶¶ 493-494.

[56] *See* Implementation of Section 6002(B) of the Omnibus Budget Reconciliation Act of 1993, Annual Report and Analysis of Competitive Market Conditions with Respect to Commercial Mobile Services, *Thirteenth Report*, 24 FCC Rcd 6185, 6290 ¶ 223 (*Thirteenth Report*).

[57] *Global Wireless Matrix 4Q11.*

II. INTRODUCTION

3. In 1993, Congress created the statutory classification of "commercial mobile services" to promote the consistent regulation of mobile radio services that are similar in nature.[58] Commission regulations refer to these services as the Commercial Mobile Radio Services, or "CMRS."[59] At the same time, Congress established the promotion of competition as a fundamental goal for CMRS policy formation and regulation. To measure progress toward this goal, Congress required the Commission to submit annual reports that analyze competitive conditions in the industry.[60]

4. Congress called on the Commission to report on "competitive market conditions with respect to commercial mobile services."[61] In particular, the statute requiring the annual report on CMRS competition states:

> The Commission shall review competitive market conditions with respect to commercial mobile services and shall include in its annual report an analysis of those conditions. Such analysis shall include an identification of the number of competitors in various commercial mobile services, an analysis of whether or not there is effective competition, an analysis of whether any of such competitors have a dominant share of the market for such services, and a statement of whether additional providers or classes of providers in those services would be likely to enhance competition.[62]

Beginning with the *Fourteenth Report*, the Commission, while complying with Congress's mandate to assess competitive market conditions, has undertaken a more expansive and detailed analysis of the entire mobile wireless industry to better represent fundamental shifts in the mobile marketplace.[63] To reflect this broader focus, the Commission changed the name of the *Report* from the "Annual CMRS Competition Report" to the current "Annual Mobile Wireless Competition Report." As in the past, this *Report* bases its analysis on a consumer-oriented view of mobile services by focusing on specific product categories, regardless of their regulatory classification, and integrates an analysis of CMRS into an analysis of all mobile wireless services, such as voice, messaging, and broadband. In some cases, this includes an analysis of offerings outside the umbrella of services that have been specifically classified as

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[58] Omnibus Budget Reconciliation Act of 1993, Pub. L. No. 103-66, Title VI, § 6002(b), amending the Communications Act of 1934 and codified at 47 U.S.C. § 332(c).

[59] *See* 47 C.F.R. § 20.9(a); Implementation of Sections 3(n) and 332 of the Communications Act, *Second Report and Order*, 9 FCC Rcd 1411, 1413 (1994). CMRS includes a large number of terrestrial services and also some mobile satellite services.

[60] 47 U.S.C. § 332(c)(1)(C).

[61] 47 U.S.C. § 332(c)(1)(C). As noted in previous *Reports*, any individual proceeding in which the Commission defines relevant product and geographic markets, such as an application for approval of a license transfer, may present facts pointing to narrower or broader markets than any used, suggested, or implied in this *Report*. *See, e.g.*, Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993, Annual Report and Analysis of Competitive Market Conditions with Respect to Commercial Mobile Services, *Twelfth Report*, 23 FCC Rcd 2241, 2250 ¶ 3 n. 5 (2008) (*Twelfth Report*).

[62] 47 U.S.C. § 332 (c)(1)(C).

[63] 47 U.S.C. § 332(c)(1)(C). As noted in previous *Reports*, any individual proceeding in which the Commission defines relevant product and geographic markets, such as an application for approval of a license transfer, may present facts pointing to narrower or broader markets than any used, suggested, or implied in this *Report*. *See, e.g.*, Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993, Annual Report and Analysis of Competitive Market Conditions with Respect to Commercial Mobile Services, *Fourteenth Report*, 25 FCC Rcd 11407(2010) (*Fourteenth Report).*

CMRS.[64] For example, many providers of CMRS offer mobile broadband Internet access service, which has not been classified as "CMRS."[65] Such services often jointly use the same spectrum and network facilities, and many mobile service providers have integrated the marketing of some of these services, offering some of them in bundles. Consumers are increasingly substituting among voice, messaging, and some data services, and, in particular, are willing to move from voice to messaging or data services for an increasing portion of their communication needs. Because consumers view these other services as interchangeable with or substitutes for certain CMRS services, service providers compete for these customers using CMRS services as well as non-CMRS services. As a result, the Commission has indicated that it is important to consider such substitute services in analyzing the competitive landscape for these services and thus considers the mobile wireless industry, rather than just the provision of CMRS services.[66]

5. In addition, as the mobile wireless services industry has transitioned from one centered on interconnected mobile voice communications to one that produces an array of voice, messaging, and data services, the number of related mobile wireless industry segments involved in bringing these information products to mobile consumers has grown and evolved. These interrelated market segments form the mobile wireless ecosystem, which includes the various parts of the supply and production network that bring thousands of mobile wireless products to Americans every day. Each of the segments in the mobile wireless ecosystem has the potential to affect competition by providers and consumer demand for mobile wireless services. As the ecosystem has evolved, so have the Commission's *Competition Reports*.[67] This *Report* analyzes competition across the entire mobile wireless ecosystem, including the "upstream" and "downstream" market segments, such as spectrum, infrastructure, devices, and applications. As discussed in detail below, this *Report's* detailed assessment of competitive market conditions required by statute considers developments across the entire mobile wireless ecosystem.

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[64] Note that the regulatory classification of a particular wireless service offered by a CMRS carrier is determined on a case-by-case basis. *See* Amendment of the Commission's Rules to Permit Flexible Service Offerings in the Commercial Mobile Radio Service, WT Docket No. 96-6, *Second Report and Order and Order on Reconsideration*, 15 FCC Rcd 14680, 14683, ¶ 7, 14687, ¶ 15 (2000). *See* IP-Enabled Services, WC Docket No. 04-36, *Notice of Proposed Rulemaking*, 19 FCC Rcd 4863 (2004); "Wireless Telecommunications Bureau Seeks Comment on Petition for Declaratory Ruling That Text Messages and Short Codes Are Title II Services or Are Title I Services Subject to Section 202 Non-Discrimination Rules," *Public Notice*, 23 FCC Rcd 262 (WTB 2008).

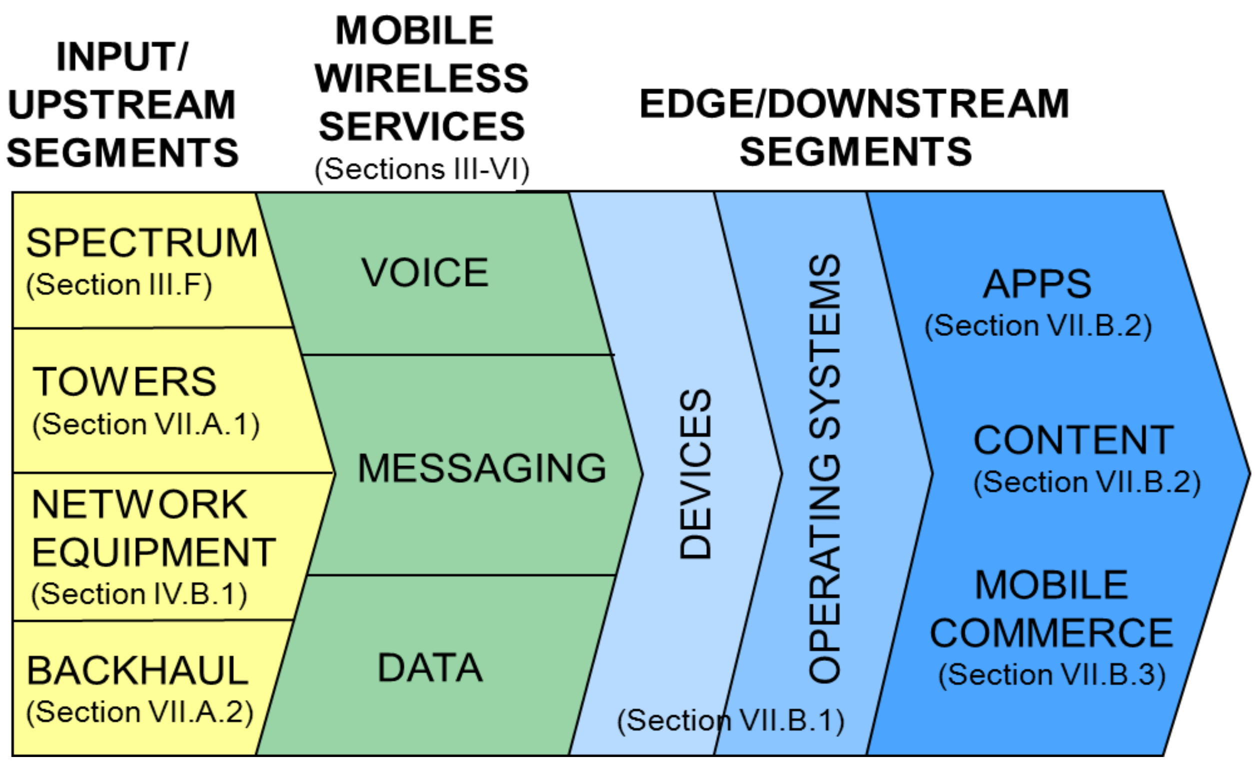
[65] In 2007, the Commission classified wireless broadband Internet access service as an information service under the Communications Act and also found that mobile wireless broadband Internet access service was not a "commercial mobile service" as defined in the Act. Appropriate Regulatory Treatment for Broadband Access to the Internet over Wireless Networks, WT Docket No. 07-53, *Declaratory Ruling*, 22 FCC Rcd 5901 (2007).

[66] As the Commission has concluded, paraphrasing the Department of Justice/Federal Trade Commission guidelines on merger review, "When one product is a reasonable substitute for the other in the eyes of consumers, it is to be included in the relevant product market even though the products themselves are not identical." Application of Echostar Communications Corporation, General Motors Corporation, and Hughes Electronics Corporation (Transferors) and Echostar Communications Corporation (Transferee), *Hearing Designation Order*, 17 FCC Rcd 20559, 20606 ¶ 106 (2002).

[67] *See* Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993, Annual Report and Analysis of Competitive Market Conditions with Respect to Commercial Mobile Services, *First Report*, 10 FCC Rcd 8844 (1995); *Second Report*, 12 FCC Rcd 11266 (1997); *Third Report*, 13 FCC Rcd 19746 (1998); *Fourth Report*, 14 FCC Rcd 10145 (1999); *Fifth Report*, 15 FCC Rcd 17660 (2000); *Sixth Report*, 16 FCC Rcd 13350 (2001); *Seventh Report*, 17 FCC Rcd 12985 (2002); *Eighth Report*, 18 FCC Rcd 14783 (2003); *Ninth Report*, 19 FCC Rcd 20597 (2004); *Tenth Report*, 20 FCC Rcd 15908 (2005); *Eleventh Report*, 21 FCC Rcd 10947 (2006); *Twelfth Report*, 23 FCC Rcd 2241; *Thirteenth Report*, 24 FCC Rcd 6185 (2009) (*Thirteenth Report*); *Fourteenth Report*, 25 FCC Rcd 11407 (2010) (*Fourteenth Report*); *Fifteenth Report*, 26 FCC Rcd 9664 (2011) (*Fifteenth Report*). The reports can also be found on the Commission's website, *available at* http://wireless.fcc.gov/index.htm?job=cmrs_reports. (visited Nov. 19, 2012).

6. Figure 1 below provides an overview of the mobile wireless ecosystem and the corresponding sections of the *Sixteenth Report* in which each of the ecosystem segments is discussed. The input segments are divided into spectrum, towers, network equipment, and backhaul facilities.[68] These segments can affect entry, competition, output, or prices in the provision of mobile wireless services. Following these inputs, the transmission of mobile wireless services includes voice services, messaging services,[69] and data services (including broadband). The downstream segments include mobile devices, device operating systems, and mobile applications, content, and mobile commerce.[70] Mobile devices, the endpoints of mobile networks, connect consumers to the network. They can include traditional voice-centric handsets, devices that offer both voice and data services, as well as devices that provide data but not circuit-switched voice service, such as modem cards for portable computers and e-readers. Riding on the networks of the mobile wireless ecosystem are the information products that are consumed directly by subscribers – mobile applications, content (*e.g.*, video and music files, web sites, photos, and documents), and mobile commerce (*e.g.*, electronic shopping and financial transactions using a mobile device). The importance of the downstream segments to consumers' mobile wireless experience is increasing with the deployment of mobile broadband networks that support Internet-based applications.

Figure 1
Mobile Wireless Ecosystem



7. In this *Report*, the discussion of the middle part of the mobile wireless ecosystem –

[68] Spectrum, towers, network equipment, and backhaul facilities can be viewed as input or upstream markets because of their input relation to mobile wireless networks.

[69] Messaging includes text and multimedia (photo and video) message services, also referred to as SMS (Short Message Service) and MMS (multimedia messaging services), respectively.

[70] Mobile devices, device operating systems, and mobile applications, content, and mobile commerce can be viewed as edge or downstream markets because they are products that utilize mobile wireless services.

mobile wireless services – includes a detailed analysis of mobile wireless service market conditions in the CMRS marketplace, as required by Section 332(c) of the Act. As discussed above, the statute requires an identification of the number of competing providers of the various commercial mobile services, an analysis of whether there is effective competition, an analysis of whether any of the competitors has a dominant share of the market for the services, and a statement of whether additional providers or classes of providers in the services would be likely to enhance competition. Therefore, this *Report's* competitive analysis of mobile wireless services considers data that provide information on whether any wireless service provider is exercising undue market power – the ability to profitably charge prices above cost for a sustained period of time due to a lack of competitive constraints.[71] This analysis has been organized into four distinct categories: an overview of the mobile wireless services industry, provider conduct, market performance and outcomes, and consumer behavior.

8. First, within the overview of the mobile wireless services industry, we analyze the number of competitors and calculate measures of concentration. Markets with few providers or high concentration measures raise concerns that firms may be able to exercise market power, *i.e.,* without competitors or potential entry, there may not be sufficient constraints to prevent the exercise of market power. At year-end 2011, the four nationwide service providers accounted for just over 90 percent of the nation's mobile wireless subscribers (including wholesale connections and machine-to-machine connections), with AT&T and Verizon Wireless together accounting for 64 percent. The *Report* also examines the entry and exit of wireless service providers in the mobile wireless services market. Entry and exit conditions may affect the number of competitors that can enter and compete in the market, and, as discussed above, this in turn may influence whether any firm can exercise undue market power. The Commission closely reviews mergers, a type of exit. A merger can potentially form a stronger provider that restrains competitors from engaging in anticompetitive behavior, or may increase the likelihood that the merged firm may itself, or in coordination with other firms, obtain or maintain market power.[72] Last, spectrum conditions and spectrum policy are discussed as an extension of entry conditions. Spectrum is a critical input to mobile wireless services that affects entry conditions and overall industry capacity, and its availability is influenced by regulatory policy and market conditions.

9. Second, in our analysis of provider conduct, we describe significant changes in providers' prices and service offerings that may affect a consumer's choice of a provider or may lead other providers to competitively respond by changing their own prices and service offerings. We discuss product differentiation, network investment and technology upgrades, advertising and marketing, and innovation because many non-price choices by providers determine the qualities and characteristics of their wireless services. Such non-price rivalry can significantly influence a customer's choice of a provider and impose significant competitive constraints, especially in high technology industries that experience rapid innovation.

10. Third, the section on market performance and outcomes evaluates evidence from essential metrics for evaluating market competition and consumer welfare in the mobile wireless industry: quantities consumed, total and new connections, prices, and qualities of different services. This section focuses on the benefits to consumers of competition among rivals – lower prices, more connections and usage, and better quality services – while the other sections examine the various input, strategic, technological, and informational factors that determine such market outcomes. As a result, market performance metrics provide more direct evidence of competitive outcomes and the strength of competitive rivalry than intermediate factors, such as concentration measures.[73] Analysis of data relating

[71] *See* Dennis W. Carlton and Jeffrey M. Perloff, *Modern Industrial Organization* (4th ed.), Addison, Wesley, Longman, Inc., 2005, at 8, 249-251 (*Modern Industrial Organization*).

[72] *See* Section III.D.3.b, Exit, *infra*, for further discussion of the potential competitive benefits and harms of mergers.

[73] *See* Ernest Gellhorn, *Antitrust Law and Economics* (4th ed.), West Publishing, 1994, at 117 (stating "[m]arket shares are not synonymous with market power; they should mark the beginning for careful analysis, not the end of (continued….)

to prices and quantities of services consumed can reveal whether there are any upward trends or movements in prices, or observable restrictions on the quantities of services produced, that may indicate that the market is lacking competition or that there is collusive behavior among providers.[74] Analyses of data on the qualities of different services are particularly useful in high technology industries that experience rapid innovation to gauge whether the quality of service received for a given price is increasing or stagnating over time.

11. Fourth, the *Report* examines consumer behavior. The willingness and ability of consumers to switch mobile wireless service providers in response to changes in the prices, service offerings, and qualities of service offerings is one indicator of the level of competition in the industry. The more informed consumers are about mobile wireless services, and the more easily a consumer can switch service providers in response to a change in price or non-price factors, the more providers must take efforts to improve their services or lower their prices in order to retain their customers and attract new customers. This section analyzes consumer decisional factors in choosing a service provider, consumer access to information concerning mobile wireless services, and consumer satisfaction with mobile wireless service providers.

12. In addition to analyzing competition within the mobile wireless services sector, the *Report* analyzes competition in other market segments that constitute the mobile wireless ecosystem and their relationships with the mobile wireless industry. The main non-spectrum input segments of the mobile wireless services market – infrastructure and backhaul – are analyzed in Section VII.A, and the mobile wireless handset/device sector, mobile applications, and mobile commerce are analyzed in Section VII.B. Intermodal Services are discussed in Section VIII. Differences across geographic markets, including urban-rural comparisons and international comparisons, are addressed in Sections IX and X. The Appendices discuss spectrum available for mobile wireless services (Appendix A) and present tables and maps (Appendices B and C).

13. This *Report* complies with the statutory requirements for analyzing competitive market conditions with respect to commercial mobile services by employing an analysis founded upon an expanded view of the mobile wireless services marketplace and an examination of competition across the entire mobile wireless ecosystem. We analyze the extent of, and trends over time in, competitive rivalry present in the mobile wireless industry and the benefits received by consumers. This competitive analysis also tries to identify areas where competition is strong, as well as areas that could benefit from increased competition.

14. Given the *Report's* expansive view of mobile wireless services and its examination of competition across the entire mobile wireless ecosystem, we find that the mobile wireless ecosystem is sufficiently complex and multi-faceted that it would not be meaningful to try to make a single, all-inclusive finding regarding effective competition that adequately encompasses the level of competition in the various interrelated segments, types of services, and vast geographic areas of the mobile wireless industry.

15. We note as well that there is no definition of "effective competition" widely accepted by economists or competition policy authorities such as the U.S. Department of Justice (DOJ).[75] Rather, the DOJ's position on competition policy is in agreement with the approach taken in this *Report*.[76] The DOJ

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it."). *See also* Michael Whinston, "Antitrust Policy toward Horizontal Mergers," in *Handbook of Industrial Organization, Vol. 3*, ed. Mark Armstrong and Robert Porter (Elsevier, 2007), at 2411-2414; Massimo Motta, *Competition Policy: Theory and Practice*, Cambridge University Press, 2004, at 117 (*Competition Policy*).

[74] See, e.g. Jonathan Baker and Timothy Bresnahan, *Economic Evidence in Antitrust: Defining Markets and Measuring Market Power*, in Handbook of Antitrust Economics, edited by Paolo Buccirossi, at 8-16.

[75] *See Ex Parte* Submission of the United States Department of Justice, GN Docket No. 09-51 at 11 (filed Jan. 4, 2010).

[76] *See id*.

states, "[t]he operative question in competition policy is whether there are policy levers that can be used to produce superior outcomes, not whether the market resembles the textbook model of perfect competition."[77] We take an approach consistent with the Commission's first seven Annual CMRS Competition Reports, which did not reach an overall conclusion regarding whether or not the CMRS marketplace was effectively competitive, but provided an analysis and description of the CMRS industry's competitive metrics and trends.[78] This *Report*, like the previous two *Reports*, adopts an approach similar to the earlier reports, but undertakes an expanded and more detailed competitive analysis of the entire mobile wireless ecosystem. We provide an analysis of whether or not there is effective mobile wireless competition, but refrain from providing any single conclusion because such an assessment would be incomplete and possibly misleading in light of the variations and complexities we observe.

16. The Commission is continuously seeking to improve its analysis of mobile wireless competition. In November 2011, the Commission's Wireless Telecommunications Bureau (Bureau) sought comment on the data and analytical framework used for its analysis in this *Sixteenth Report*.[79] In March 2012, the Bureau sought updated, year-end 2011 data for its analysis.[80]

17. *Data Timeframes*. The *Sixteenth Report* focuses on conditions prevailing in the mobile wireless industry during 2010, 2011, and 2012. In cases where our analysis relies on annual year-end metrics – such as with subscriber/connection levels or pricing levels– we use, and have included in the *Report*, year-end 2011 data. The *Report's* analysis of network coverage and the number of providers is based on data provided by Mosaik Solutions, formerly American Roamer, in October 2012. Many sections of the *Report* also discuss major industry developments, where relevant, that have occurred during 2012.

18. *Dollar Amounts*. Dollar figures stated in this *Report* have not been adjusted for inflation (*i.e.*, they are nominal dollars) unless stated otherwise.

III. OVERVIEW OF THE MOBILE WIRELESS SERVICES INDUSTRY

A. Introduction to Mobile Wireless Services

19. The *Sixteenth Report* provides an analysis of competition in the mobile wireless services industry. Providers of mobile wireless services offer an array of mobile voice and data services, including interconnected mobile voice services, text and multimedia messaging, and mobile broadband Internet access services. Mobile wireless services also include machine-to-machine connections for fleet management systems, smart grid devices, vehicle tracking, home security systems, and other telematics services. The *Report* considers information and data on all mobile wireless services as well as on individual services and segments where appropriate and when the data are available.

20. In its competitive analysis, the *Report* considers, for the reasons described below, all mobile wireless services. First, the bundling of some mobile wireless services in the same service plan and the prevalence of devices that support multiple services shift the focus of competition and consumer choice from individual services to bundles of services. Many handsets, especially smartphones, can send

[77] *See id*.

[78] This is in contrast to the *Eighth* through the *Thirteenth Reports,* which included a specific finding that there was effective competition in the CMRS market without defining the term "effective competition." *See, e.g., Thirteenth Report,* 24 FCC Rcd 6185.

[79] "Wireless Telecommunications Bureau Seeks Comment on the State of Mobile Wireless Competition," WT Docket No. 11-186, *Public Notice*, 26 FCC Rcd 15595 (WTB 2011). A list of comments and reply comments is included as Appendix E.

[80] "Wireless Telecommunications Bureau Seeks Updated, Year-end 2011 Data for its Sixteenth Report on Mobile Wireless Competition," WT Docket No. 11-186, *Public Notice,* 27 FCC Rcd 2570 (WTB 2012).

and receive both mobile voice and data communications. Service providers offer bundles of services in the same service plan to meet the voice and data communication needs of customers.[81] Although mobile data services are not offered in conjunction with mobile voice service for some devices, mobile wireless customers who use smartphones typically purchase data services as either an add-on to voice services or as part of a bundled voice and data plan. Many mobile wireless service providers offer data-only services that are not bundled in a service plan with a mobile voice service, *i.e.* are not packaged with a voice plan through a handset – for example, mobile wireless Internet access for tablets, portable computers, and e-readers.

21. Second, the availability of certain data employed in this *Report* reflects the entire mobile wireless services industry and not the individual segments. For example, the NRUF data provide an estimate of all mobile wireless devices in use that have a telephone number assigned to them, but do not distinguish by the type of device used.[82] This includes traditional mobile handsets used primarily or exclusively for voice calls, smartphones that are used for both voice and data services, some devices used exclusively for data services,[83] and some machine-to-machine services. In addition, data on service provider network coverage is organized by the type of network technology, and some services may be available on different network technologies.

22. *Geographic Areas*. Defining the appropriate geographic area for mobile wireless services has a useful role to play in assessing the level of competition.[84] When undertaking a competitive analysis, one of the basic economic principles for defining the scope of the relevant geographic area is to include all of the competing service providers in the geographic area from which various consumers may choose similar substitutes. Many consumers shop for competitive mobile wireless alternatives in the areas where they live, work, and travel.

23. Defining the appropriate geographic area for mobile wireless services is complex. Relevant factors to be considered include: (1) the variety of geographic schemes used to license different spectrum bands; (2) the wide variation in service providers' geographic license areas and coverage footprints; (3) the difficulty of collecting accurate information on the geographic area(s) covered by each mobile operator's network; (4) a consumer's willingness and ability to purchase services in one or more geographic areas; and (5) the extent to which providers offer different terms or service quality in different locations.

24. We estimate overall network coverage and the number of providers with coverage in an area using census blocks, and we provide concentration measures and regional penetration rates at the level of Economic Areas (EAs).[85] We recognize that such geographic areas may be broader or narrower than the relevant geographic markets employed in other analyses conducted by the Commission. For instance, the Commission has historically used narrower geographic areas to calculate HHIs when it has evaluated the competitive consequences of certain transactions. We use EAs in this *Report* to maintain continuity with past *Reports* and to ensure that we do not compromise the confidential information found

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[81] Service bundles primarily include mobile voice, text, and data services, but many machine-to-machine services (also called connected devices) are not bundled with other services and may not even be marketed together with mobile services for handsets. Some examples of machine-to-machine services are fleet management, home security management, and smart grid devices.

[82] *See* Section V.A, Numbers of Mobile Wireless Connections and Customers, *infra*.

[83] Even though data-only devices – such as wireless modem cards and e-readers – are not used to make circuit-switched voice calls, they are often assigned telephone numbers because that is the method wireless service providers use to establish accounts and provide access to their networks.

[84] *See* United States Department of Justice and the Federal Trade Commission, Horizontal Merger Guidelines, issued Aug. 19, 2010 at 7-8, 13-15.

[85] EAs are geographic units defined by the U.S. Department of Commerce that define geographic economic markets using data on commuting patterns.

in the NRUF data.[86] We analyze both the local markets in which consumers purchase mobile wireless services and aspects of competition that occur at the national level. For instance, defining local geographic markets for retail wireless services does not preclude us from analyzing variables, such as prices and service plan offerings, that may not vary for some providers across the various geographic markets they serve.[87]

B. Overview of Service Providers

1. Facilities-Based Providers

25. Facilities-based mobile wireless service providers offer mobile voice, messaging, and/or data services using their own network facilities.[88] Most facilities-based providers currently offer circuit-switched mobile voice services that are interconnected with the public switched telephone network (PSTN).[89] Some data and messaging services offered by facilities-based providers rely only on IP-based, packet-switched networks, while other services may continue to connect to the PSTN. Many facilities-based providers have deployed, or are currently deploying, Internet Protocol (IP)-based networks.

26. *Nationwide Service Providers*. As of year-end 2011, there were four facilities-based mobile wireless service providers in the United States that industry observers typically describe as "nationwide": AT&T, Sprint Nextel,[90] T-Mobile,[91] and Verizon Wireless.[92] In 2011, AT&T applied to acquire T-Mobile, a transaction which would have reduced the number of nationwide service providers to three. After careful evaluation, both the DOJ and Commission staff found that the proposed acquisition was likely to lead to a substantial lessening of competition in the market[93] and the parties abandoned the

[86] *See* Section III.D.2, Herfindahl-Hirschman Index, *infra.*

[87] *See AT&T and Qualcomm Order*, 26 FCC Rcd 17589. Tables 2 and 3 below indicate that most providers' voice networks cover more people than their broadband networks, implying that there is likely some variation in services and plan offerings across the geographic areas that providers serve. *See* Section IV.A, Price Rivalry: Developments in Mobile Service Pricing Plans, which generally treats pricing plans at the national level.

[88] Fixed wireless services, such as those offered by Stelera Wireless, are currently not included in our analysis of mobile wireless services.

[89] Certain mobile wireless service providers, such as Clearwire Corporation (Clearwire), offer mobile broadband data services but do not offer circuit-switched mobile voice services. *See* Clearwire Corporation, SEC Form 10-K for the fiscal year ended December 31, 2011 at 7. Clearwire also offers fixed wireless VoIP services, *Id*.

[90] Sprint Nextel was created by the merger of Sprint Corp. and Nextel Communications, Inc. See Tenth Report, 20 FCC Rcd at 15931 ¶ 60. According to Clearwire SEC filings, Sprint holds the largest interest in Clearwire with an effective voting interest of approximately 48.6% and an economic interest in Clearwire of approximately 51.5% as of December 31, 2011. On November 15, 2012, SoftBank Corp. and Sprint Nextel filedan application with the Commission seeking consent for SoftBank to acquire approximately 70 percent of Sprint Nextel. The Commission is currently reviewing this proposed transaction. See Softbank And Sprint Seek Fcc Consent To The Transfer Of Control Of Various Licenses, Leases, And Authorizations From Sprint To Softbank, And To The Grant Of A Declaratory Ruling Under Section 310(B)(4) Of The Communications Act. Public Notice, IB Docket No. 12-343, DA 12-1924 (rel. Nov. 30, 2012).

[91] T-Mobile USA is a wholly-owned subsidiary of Deutsche Telekom AG (Deutsche Telekom).

[92] Verizon Wireless is a joint venture of Verizon Communications, Inc. (Verizon) and Vodafone Group PLC (Vodafone). Verizon owns 55 percent of Verizon Wireless, and Vodafone owns 45 percent. *See* Verizon Communications, Inc., SEC Form 10-K, filed Feb. 24, 2012, at 2.

[93] *See* Complaint, *United States of America v. AT&T, Inc.,* 11-cv-1560 (D.D.C.Aug. 31, 2011); Application of AT&T and Deutsche Telekom AG for Consent to Assign or Transfer Control of Licenses and Authorizations, WT Docket No. 11-65, Order, 26 FCC Rcd 16184 (2012).

(continued….)

transaction.[94] Although these four providers do not have networks that cover the entire land area or population of the United States, they do cover a significant portion of both, and will be referred to as the nationwide providers throughout this *Report*.[95] These four nationwide service providers each have mobile wireless networks that cover in excess of 91 percent of the U.S. population in large proportions of the western, mid-western, and eastern United States.[96] A map of the combined coverage areas of these four facilities-based nationwide providers can be found in Appendix D.

27. *Multi-Regional and Multi-Metro Service Providers*. Other facilities-based providers offer mobile wireless services on a multi-regional or multi-metro basis. Three such providers – Clearwire, Leap Wireless International, Inc. (Leap) and MetroPCS Communications Inc. (MetroPCS) – provide service in multiple large and medium-sized metropolitan areas across the nation.[97] Leap states "Our Cricket service offerings provide customers with unlimited nationwide wireless services for a flat rate without requiring a fixed term contract or a credit check."[98] MetroPCS states that it provides mobile wireless services in "selected major metropolitan areas in the United States."[99] United States Cellular Corporation (U.S. Cellular) is a large regional provider that serves regions in the western, mid-western, and eastern United States.[100] U.S. Cellular states, "Since 1985, when it began providing wireless telecommunications service in Knoxville, Tennessee and Tulsa, Oklahoma, U.S. Cellular has expanded its wireless networks and customer service operations to cover five geographic market areas in portions of 26 states, which collectively represent a total population of 46.9 million as of December 31, 2011."[101] Multi-metro and multi-regional service providers typically rely on roaming agreements with nationwide facilities-based providers to provide service to their customers in areas not covered by their networks.

28. *Regional and Local Service Providers*. There are dozens of small facilities-based providers throughout the continental United States, Alaska, and Hawaii that typically provide service in a single geographical area, many of them rural areas. Based on Mosaik data, we estimate that there were approximately 95 smaller, facilities-based providers in the continental United States, Alaska, and Hawaii

(Continued from previous page)

[94] In December 2011, AT&T formally ended its bid to acquire T-Mobile USA. See Letter, filed by AT&T Inc., Re: Applications of AT&T Inc. & Deutsche Telekom AG for Consent to Assign or Transfer Control of Licenses & Authorizations, filed Dec. 23, 2011, WT Docket No. 11-65, (2011).

[95] Throughout this *Report*, we attribute Clearwire to Sprint Nextel when discussing spectrum holdings and network coverage. When analyzing concentration and performance metrics, the two firms are treated as separate entities because the NRUF data used for the concentration analysis do not include Clearwire, and Sprint Nextel does not consolidate Clearwire in its SEC filings and financial/operational data.

[96] Thus, a nationwide network covers a sufficiently large percentage of the population such that it would be inappropriate to categorize it as a regional network. These nationwide providers have spectrum holdings in different bands, including cellular, SMR, PCS, AWS-1, 700 MHz, and 2.5 GHz (both BRS licenses and EBS spectrum leases). Their respective holdings are discussed in more detail, *See* Section III.F, Spectrum and Mobile Wireless Services, *infra*. *See* Appendix A, *infra*.

[97] Leap states "The combined network footprint in our operating markets covered approximately 95.3 million POPs as of December 31, 2011." *See* SEC, Leap Wireless Form 10-K for the fiscal year ended December 31, 2011, at 4. Section III.E, Entry and Exit Conditions, *infra*. See SEC, MetroPCS Form 10-K for the fiscal year ended December 31, 2011, at 6 (stating, "We currently provide our wireless broadband mobile services primarily in selected major metropolitan areas in the United States, including the Atlanta, Boston, Dallas/Fort Worth, Detroit, Las Vegas, Los Angeles, Miami, New York, Orlando/Jacksonville, Philadelphia, Sacramento, San Francisco, and Tampa/Sarasota metropolitan areas.").

[98] Leap Wireless, SEC Form 10-K for the fiscal year ended December 31, 2011 at 4.

[99] MetroPCS Communications Inc., SEC Form 10-K for the fiscal year ended December 31, 2011, at 6.

[100] United States Cellular Corp., SEC Form 10-K for the fiscal year ended December 31, 2011, at 1.

[101] United States Cellular, SEC Form 10-K for the fiscal year ended December 31, 2011at 1.

as of October 2012. For example, Cincinnati Bell Wireless, one of the larger of these providers, provides service in the areas surrounding Cincinnati, Ohio. C Spire Wireless (formerly Cellular South) provides service in Mississippi, as well as Memphis and parts of Alabama and Louisiana. Regional and local service providers include publicly-traded companies, privately-owned companies, and cooperatives.

2. Resale and MVNO Providers

29. Resellers and mobile virtual network operators (MVNOs) generally do not own any network facilities but instead purchase mobile wireless services wholesale from facilities-based providers and resell the services to consumers.[102] MVNOs may target their service and product offerings at specific demographic, lifestyle, and market niches, including consumers who are low income, are relatively price sensitive, do not want to commit to multi-year subscription contracts, have low usage needs, or do not want to buy a bundle that contains unwanted data services. For instance, TracFone, the largest MVNO, states "Our formula for success is simple — exclusive focus on "No-Contract" cell phones and service."[103]

30. Some facilities-based providers buy capacity wholesale and engage in resale to complement their own service offerings. A facilities-based provider that also resells services may be motivated by the desire to expand its geographic coverage outside of its network coverage area or to add service offerings that are not available on its own network by reselling the services of another provider. As of August 2010, Leap (Cricket) entered into a wholesale agreement with Sprint Nextel that allows Cricket to offer some products and services on Sprint Nextel's EV-DO network throughout the United States.[104] Cricket states that "this agreement will allow us to offer enhanced products and services and to strengthen and expand our distribution."[105] Another hybrid reseller and facilities-based model is the one employed by Sprint Nextel that supplies EV-DO mobile wireless voice and data services using its own networks and resells WiMAX services purchased wholesale from its business partner Clearwire.[106] Selling capacity on a wholesale basis factors significantly into Clearwire's business model.[107]

31. The development of a partnership between an MVNO and a facilities-based provider may be more likely to occur when the MVNO has better access to some market segments than the host facilities-based provider, possibly due to its brand reputation, distribution network, marketing strategies,

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[102] According to one service provider, "MVNOs execute a contract with [the facilities-based provider] to buy wireless service from [the facilities-based provider] to resell under their own brand to customers and perform all marketing, billing, collections and customer service for the customers they activate. MVNOs establish and maintain the relationship with its customers. MVNOs own the relationship with their customers and establish their own calling plans and pricing." *See* Verizon Wireless, *Authorized Retailers and MVNOs*, http://www.verizonwireless.com/b2c/aboutUs/reseller/authorizedAgentIndex.jsp (visited Nov. 18, 2012).

[103] *See* TracFone, http://www.tracfone.com/facelift/tour.jsp#a_about (visited April 30, 2012).

[104] Leap Wireless, Press Release, *Cricket Introduces its Cricket Products Into Kmart Locations Nationwide*, June 11, 2012 *available at* http://leapwireless.mediaroom.com/press-releases (visited Nov. 18, 2012). Fiercewireless, Leap: We won't make $75M payment to Sprint for 2012 network access, Aug. 6, 2012, *available at* fiercewireless.com.

[105] *See* Leap Wireless, SEC Form 10-K for the fiscal year ended December 31, 2011, filed Feb. 21, 2012, at 21.

[106] *See* Clearwire, SEC Form 10-K for the fiscal year ended December 31, 2011, filed Feb. 16, 2012, at 2, 6.

[107] *See* Clearwire, SEC Form 10-K, filed Feb. 16, 2012, at 3 (stating "Over the long term, we will need to greatly expand our revenue base by increasing sales to our existing wholesale partners, primarily Sprint, and by adding additional wholesale partners."). Over 85% of Clearwire's connections at the end of 2011 were wholesale connections. See SEC, Clearwire Form 10-K, For the fiscal year ended December 31, 2011, at 3 (stating "We believe that, as the demand for mobile broadband services continues its rapid growth, Sprint and other service providers will find it difficult, if not impossible, to satisfy their customers' demands with their existing spectrum holdings. By deploying LTE, we believe that we will be able to take advantage of our leading spectrum position to offer offload data capacity to Sprint and other existing and future mobile broadband service providers for resale to their customers on a cost effective basis.")

or business model.[108] MVNOs often increase the range of services offered by the host facilities-based provider by targeting certain market segments, including segments previously not served by the hosting facilities-based provider.[109] Hence, the relationship between an MVNO and its hosting facilities-based provider is a mutually beneficial strategic partnership.[110]

32. Comprehensive data on MVNO subscribers are generally not reported by either MVNOs or facilities-based providers that host MVNOs. Estimates of the number of MVNOs operating in the United States vary considerably. Many MVNOs are privately-held companies that do not publicly report financial or subscriber data. It is a standard practice of many facilities-based providers to include the subscribers of providers reselling their services in their own subscriber counts.[111] Similarly, CTIA and many industry analyst reports include MVNO subscribers with the subscribers of the host facilities-based providers. [112] Some facilities-based providers report wholesale connections in combination with other connections, such as (data centric) connected device connections (e.g. Sprint), and others report them separately (e.g. AT&T and T-Mobile).[113] No provider disaggregates wholesale connections to the level of the individual MVNOs hosted on their networks. For instance, in its 2011 annual report, AT&T reported MVNO subscribers as its own subscribers and did not attribute them to its MVNO relationships.[114] For the above reasons, the reported data on MVNOs are generally inadequate for identifying the host

[108] *See* P. Kalmus and L. Wiethaus, *On the Competitive Effects of Mobile Virtual Network Operators,* Telecommunications Policy, Vol. 34, 2010 at 263, 266, 268.

[109] *See* P. Kalmus and L. Wiethaus, *On the Competitive Effects of Mobile Virtual Network Operators,* Telecommunications Policy, Vol. 34, 2010, at 268 (*On the Competitive Effects of Mobile Virtual Network Operators). See* A. Banerjee and C. Dippon, *Voluntary Relationships Among Mobile Network Operators and Mobile Virtual Network Operators: An Economic Explanation*, Information Economics and Policy, Vol. 21, 2009, at 72 (*Voluntary Relationships Among Mobile Network Operators and Mobile Virtual Network Operators: An Economic Explanation*).

[110] *See*, The Yankee Group, Jason Armitage, *Yankee Group's 2011 Predictions: 4G Fuels the Decade of Disruption*, at 7 (stating, "Like a small bird on an elephant's back, if an MVNO can establish a symbiotic relationship with its host and provide some direct commercial benefits, it can flourish.") *See Voluntary Relationships Among Mobile Network Operators and Mobile Virtual Network Operators: An Economic Explanation*, at 75, 76, 82. *See On the Competitive Effects of Mobile Virtual Network Operators*, at 263, 268.

[111] *See* SEC, *AT&T Inc. 2011 Annual Report*, filed Feb. 24, 2012. *See* T-Mobile USA, *T-Mobile USA Reports Fourth Quarter 2011 Operating Results*, at 2, 12. In their SEC forms, Sprint Nextel and Clearwire both count some Sprint Nextel 4G customers as subscribers (those on dual mode 3G/4G devices) since Sprint Nextel and Clearwire are separately providing the 3G and 4G services, respectively, to these customers. *See* Sprint Nextel, SEC Form 10-K, filed Feb. 27, 2012, at 2-3, 38. *See* Clearwire, SEC Form 10-K for the fiscal year ended December 31, 2011, filed Feb. 16, 2012, at 2, 6.

[112] CTIA, *CTIA's Wireless Industry Indices, Semi-Annual Data Survey Results: A Comprehensive Report from CTIA Analyzing the U.S. Wireless Industry, Year-end 2011 Results*, released May 2012, at 11 (stating "Companies that hold licenses but have not yet begun to offer commercial services, and companies that provide service only on a resale basis (*i.e*., that are not facilities-based) are not included in the general pool of companies surveyed for the bulk of this report. Nonetheless, subscribers to such resellers or MVNOs are accounted for in the results reported by the facilities-based companies that support the reseller/MVNO offerings."). UBS Investment Research, *US Wireless411,Version 43.0*, March 7, 2012, at 14. Bank of America Merrill Lynch, Global Wireless Matrix 4Q11, released Dec. 21, 2011 at 3.

[113] Because a (data centric) connected device could be a retail connection or a wholesale connection, the reporting conventions of some providers for such connected devices lack consistency. Additionally, because some connected devices (such as those reported by AT&T: eReaders, home security monitoring, fleet management systems, and smart grid devices) differ significantly from standard handsets and smartphones, some providers choose to categorize connected devices separately from their consumer connections.

[114] *See* SEC, EX-13 AT&T Inc. 2011 Annual Report, filed Feb. 24, 2012. See SEC, EX-13 Portions of Verizon's Annual Report to Shareholders, filed Feb. 24, 2012.

facilities-based providers of all the MVNOs and the customer figures of the MVNOs.

33. Some nationwide providers and Clearwire reported their wholesale connections for year-end 2011 (Table 1). In addition, according to Commission Form 477 data, an estimated ten percent of all mobile wireless connections were reseller connections in December 2011 and the figure was nine percent in December 2010[115]

Table 1
Estimated Wholesale Connections, Year-end 2011 (In thousands)[116]

Service Provider	Number of Wholesale Connections
AT&T	13,644
Clearwire[117]	9,123
Sprint[118]	7,218
T-Mobile	3,569

34. In 2011, the largest MVNO was TracFone Wireless (TracFone), which had more than 19 million subscribers in the United States at year's end, giving it a subscriber base in the United States that is larger than every facilities-based provider other than the four nationwide providers.[119] TracFone is owned by América Móvil, S.A.B. de C.V. [120] a telecommunications service provider in Latin America and

[115] FCC, Industry Analysis and Technology Division, *Local Telephone Competition: Status as of December 31, 2010*, October 2011.

[116] Reported by the providers to the SEC, 2011 Form 10-K filings. Verizon Wireless did not disaggregate connections for wholesale and connected devices in 2011, and stopped reporting wholesale connections in 2012. *See* SEC, Verizon, 2011 Form 10-K Exhibit 13 (stating "Total connections represent the total of our retail customers and wholesale and other connections. Wholesale and other connections include customers from our reseller channel as well as connections from non-traditional wireless-enabled devices, such as those used to support vehicle tracking, telematics services and machine-to-machine connections.").

[117] Clearwire states that "Sprint accounts for substantially all of our wholesale sales to date." See SEC, Clearwire Form-10K for the fiscal year ended 2011, at 50, 52. RCR Wireless reports that Clearwire's other wholesale agreements include Prepayd Wireless, FreedomPop, and NetZero. See RCR Wireless, *Prepayd enters white-hot prepaid space with WiMAX data*, *available a*t http://www.rcrwireless.com/article/20120502/carriers/prepayd-enters-white-hot-prepaid-space-with-wimax-data/ (visited May 2, 2012).

[118] Some of the Sprint wholesale connections are at Sprint affiliates. Sprint states that "Wholesale and affiliate subscribers represent customers that are served on our networks through companies that resell our wireless services to their subscribers, customers residing in affiliate territories and connected devices that utilize our network." and "End of period connected devices are included in total retail postpaid or wholesale and affiliates end of period subscriber totals for all periods presented." Regarding its wholesale subscribers, Sprint states "Subscribers through some of our MVNO relationships have inactivity either in voice usage or primarily as a result of the nature of the device, where activity only occurs when data retrieval is initiated by the end-user and may occur infrequently. Although we continue to provide these customers access to our network through our MVNO relationships, approximately 1.7 million subscribers through these MVNO relationships have been inactive for at least six months, with no associated revenue as of December 31, 2011." SEC, Sprint Form 10-K filing for the fiscal year ended December 31, 2011.

[119] América Móvil, S.A.B. De C.V., SEC Form 6-K, filed Feb. 3, 2010, at 4. TracFone prepaid service is marketed and sold under the "TracFone," "Net10" and "SafeLink" wireless brands and is the largest operator in the U.S. prepaid cellular market, SEC Form 20-F, at 57.

[120] TracFone, *About Us*, http://www.tracfone.com/about.jsp?nextPage=about.jsp&task=about, (visited Nov. 4, 2010).

Puerto Rico, and offers mobile wireless services through agreements with various service providers in the United States, including AT&T, T-Mobile, Sprint-Nextel, and Verizon Wireless.[121] Tracfone targets the prepaid customer segment as well as low-usage customers whom other prepaid service providers are reluctant to target because the ARPU they generate is so low.[122]

35. MVNOs engage in some price rivalry and some forms of non-price rivalry. The strategic partnerships between MVNOs and facilities-based providers increase competition and consumer welfare by providing service to various market segments using the capacity of the hosting facilities-based provider and the marketing strategy and distribution network of the MVNO.[123] Some facilities-based providers, especially those that specialize in pre-paid plans, state that they compete with MVNOs, including TracFone.[124] Furthermore, TracFone makes wholesale agreements with multiple nationwide providers, which may increase the competition between nationwide providers for TracFone's wholesale customers.[125]

36. Unlike facilities-based providers, MVNOs do not engage in the full range of non-price rivalry such as creating capacity through network investments, network upgrades, or network coverage. As discussed above, many nationwide providers, in their public financial reports, attribute MVNO subscribers to themselves. Industry analyst reports state that service providers use strategic partnerships with TracFone, for example, to compete with each other for customers.[126] Hence, while MVNOs compete for retail customers with some facilities-based providers, facilities-based providers compete with each other for wholesale customers. Following widespread industry practices, the Commission generally attributes the subscribers of MVNOs to their host facilities-based providers, including when it calculates market concentration metrics.[127]

3. Narrowband Data Providers

37. Narrowband data and paging services comprise a specialized market segment of the mobile wireless industry. These services include two-way messaging, as well as machine-to-machine and other telemetry communications, and are consumed primarily by businesses, government users, and other institutions. According to Commission licensing databases, there is approximately seven megahertz of

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[121] See FierceWireless, *Straight Talk MVNO TracFone Adds 515K Subs in Q3*, Oct. 31, 2011. *See* Phil Cusick, *et al*., *Prepaid Wireless Services, Just Who is TracFone Anyway?*, Macquarie Research, June 10, 2009, at 1 (*Macquarie - Just Who is TracFone Anyway?). See also* http://www.straighttalk.com/ (visited Sep. 28, 2010). *See also* América Móvil, S.A.B. De C.V., SEC Form 20-F, filed May 25, 2010, at 57.

[122] Phil Cusick *et al*., *Slumdog Millionaires*, Macquarie Capital, Equity Research, May 1, 2009, at 4, 24. *See also* Footnote 845.

[123] *See* The Yankee Group, Jason Armitage, *Yankee Group's 2011 Predictions: 4G Fuels the Decade of Disruption*, at 7 (stating, "[I]t's critical the MVNO does not compete to any meaningful degree with the host.")

[124] SEC, Form 10-K, Leap Wireless, For the Fiscal Year Ended December 31, 2011, at 9. SEC, Form 10-K, MetroPCS, For the Fiscal Year Ended December 31, 2011, at 11.

[125] AT&T argues that competition among nationwide providers at the wholesale level to sell to TracFone results in lower wholesale and retail prices; i.e. TracFone exerts competitive pressure on its hosting nationwide providers. AT&T comments at 17. However, s*ee, also*, *On the Competitive Effects of Mobile Virtual Network Operators* (stating, "It is found that MNOs host MVNOs if and only if the latter do not exert a competitive constraint on MNOs' retail businesses. Thus, absent access regulation, MVNO entry may happen but is unlikely to reduce consumer prices").

[126] *Macquarie - Just Who is TracFone Anyway?* (stating that Verizon is "teaming up" with TracFone because "…Verizon is specifically targeting the ~8 million prepaid customers who are now on AT&T's network…"). *See also TracFone's Prepaid Offer Raises Price War Fears*, Morgan Stanley Research, Telecom Services, June 4, 2009 (Stating that Verizon has formed a partnership with TracFone because "they want to use TracFone to get more of the prepaid market").

[127] *See* Section III.D.2. Herfndahl-Hirschman Index, *infra*.

spectrum allocated to narrowband and paging services, and there are hundreds of licensees for these services. Licensees include citizens, firms, and local and state governments. For instance, USA Mobility provides paging and two-way messaging products to the business, government, and health care sectors.[128] USA Mobility states that, due to competition from mobile wireless service providers (using Cellular and Broadband PCS spectrum), they expect demand for their messaging services to continue to decline.[129] Another narrowband provider, Space Data Corp., provides commercial telemetry services across the south-central United States to energy, utility, and transportation companies.[130] SkyTel offers machine-to-machine services including tracking services, automated reading of utility meters, power grid communication services, wireless security services, and point of sale communication services.[131]

4. Mobile Satellite Service Providers

38. Mobile Satellite Services (MSS) providers offer satellite-based communications to mobile devices. Traditionally, MSS has involved voice and narrowband data services. MSS services are generally targeted at users requiring service in remote areas, in disaster response situations, or other places where terrestrial mobile wireless network access may be limited.[132] Examples of MSS customers include the oil industry, maritime users, public safety agencies, and other government/military operations.[133]

39. In the *Fifteenth Report*, we noted that the mobile satellite service industry has been undergoing major technological and structural changes, shifting consumer demand and industry growth to broadband services.[134] In this regard, certain of the MSS licensees also have sought to augment their satellite services with terrestrial mobile services pursuant to Ancillary Terrestrial Component (ATC) authority. However, the path toward deployment of ATC services has been a slow process, and no such services are offered at this time.[135] In addition, as of November 2012, there remains little commercial use

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[128] *See* USA Mobility, *Wireless Messaging – Products and Services*, http://www.usamobility.com/products/messaging/ (visited May. 4, 2012); *Tenth Report*, 20 FCC Rcd at 15923 ¶ 33.

[129] USA Mobility Inc., SEC Form 10-K, filed Feb. 23, 2012, at 4.

[130] Space Data Corp., *Overview of SkySite Network*, http://www.spacedata.net/commercial_coverage.html (visited May 4, 2012) and http://www.spacedata.net/company.html (visited May 4, 2012); *Tenth Report*, 20 FCC Rcd at 15923 ¶ 34.

[131] *See* SkyTel, *Powering Innovations using SkyTel's Network-on-Demand Communications Platform*, http://www.skytel.com/index.html (visited Apr. 26, 2012).

[132] *See Thirteenth Report*, 24 FCC Rcd at 6301 ¶ 247.

[133] AT&T has teamed up with TerreStar Networks to offer the first cellular/satellite smartphone, the Genus, which can operate on AT&T's terrestrial network or TerreStar's satellite network. *See TerreStar Genus Dual-Mode Cellular/Satellite Smartphone Now Available from AT&T*, Press Release, AT&T, Sept. 21, 2010, *available at* http://www.att.com/gen/press-room?pid=18505&cdvn=news&newsarticleid=31218&mapcode=enterprise (visited May 4, 2012). As of September 2010, the Genus is available for enterprise, government, and small business customers.

[134] *See Fifteenth Report*, 26 FCC Rcd at 9702 ¶ 39.

[135] Initially, four MSS providers, SkyTerra (later LightSquared), Globalstar, DBSD and TerreStar (now Dish Network), were granted ATC authority by the Commission. In 2010, Globalstar's ATC authority was suspended for failure to come into compliance with the ATC "gating criteria." LightSquared also is not deploying terrestrial services at this time, and on February 15, 2012, the International Bureau proposed to modify LightSquared's satellite license "to suspend indefinitely LightSquared's underlying ATC authorization." *See* International Bureau Invites Comment on NTIA Letter Reqarding LightSquared Conditional Waiver, IB Docket No. 11-109, *Public Notice*, 27 FCC Rcd 1596 (IB 2012). In March 2012, Dish Network consummated its transactions to acquire DBSD and Terrestar, neither of which had offered any ATC services. *See* Fixed and Mobile Services in the Mobile Satellite Service Bands at 1525-1559 MHz and 1626.5-1660.5 MHz, 1610-1626.5 MHz and 2483.5-2500 MHz, and 2000-2020 MHz and 2180-2200 MHz, ET Docket No. 10-142, *Report and Order*, 26 FCC Rcd 5710 ¶ 5 (2011) (*MSS*

(continued….)

of the 2 GHz band spectrum for MSS service.[136] In the *AWS-4 NPRM*, the Commission proposed eliminating the ATC rules for the 2 GHz band.[137] In December of 2012, the Commission eliminated the ATC rules for the 2 GHz band, granted terrestrial authority to the existing MSS licensee, and established terrestrial service, technical, and licensing rules that generally follow the Commission's Part 27 flexible use rules, modified as necessary to account for issues unique to the AWS-4 band.[138]

40. In response to the increasing demand for additional spectrum for wireless broadband services, the National Broadband Plan recommended that the Commission "accelerate terrestrial deployment in 90 megahertz" of spectrum allocated to MSS spectrum and proposed different approaches to expanding terrestrial services in different MSS bands.[139] For the 2 GHz MSS band, for example, the Plan recommended that the "FCC should add a primary 'mobile' (terrestrial) allocation to the S-Band, consistent with the international table of allocation, which will provide the option of flexibility to licensees to provide stand-alone terrestrial services using the spectrum."[140]

41. In the *AWS-4 NPRM*, the Commission proposed to free up 40 megahertz of 2 GHz MSS spectrum for mobile broadband service by removing regulatory barriers and providing for flexible use of MSS spectrum, thus carrying out the National Broadband Plan's recommendation that the Commission enable the provision of stand-alone terrestrial services in this spectrum. In December 2012, the Commission adopted the *AWS-4 Report and Order,* which provides for flexible use of this spectrum to encourage innovation and investment in mobile broadband, and to provide a stable regulatory environment in which broadband deployment could develop.[141] Due to the unique characteristics of each band, the Commission intends to address its ATC rules for Big LEO and L-band MSS separately.[142]

C. Mobile Wireless Network Coverage

42. *Network Coverage*. Our analysis of mobile wireless network coverage in this section is based on U.S. census blocks[143] overlaid on provider coverage maps provided to the Commission through

(Continued from previous page)
Report and Order); *see also* Service Rules for Advanced Wireless Services in the 2000-2020 MHz and 2180-2200 MHz Bands, *Notice of Proposed Rule Making and Notice of Inquiry*, 27 FCC Rcd 3561, 3563-4 ¶ 5-9 (2012)(*AWS-4 NPRM and NOI*).

[136] Service Rules for Advanced Wireless Services in the 2000-2020 MHz and 2180-2200 MHz Bands, *Notice of Proposed Rule Making and Notice of Inquiry*, 27 FCC Rcd 3564 ¶ 8 (2012)(*AWS-4 NPRM and NOI*).

[137] *AWS-4 NPRM* at ¶ 136.

[138] *See* Service Rules for Advanced Wireless Services in the 2000-2020 MHz and 2180-2200 MHz Bands, WT Docket No. 12-70, Fixed and Mobile Services in the Mobile Satellite Service Bands at 1525-1559 MHz and 1626.5-1660.5 MHz, 1610-1626.5 MHz and 2483.5-2500 MHz, and 2000-2020 MHz and 2180-2200 MHz, ET Docket No. 10-142, Service Rules for Advanced Wireless Services in the 1915-1920 MHz, 1995-2000 MHz, 2020-2025 MHz and 2175-2180 MHz Bands, WT Docket No. 04-356, *Report and Order and Order of Proposed Modification*, FCC 12-151 (rel. Dec. 17, 2012) *(AWS-4 Report and Order).*

[139] *National Broadband Plan*, Recommendation 5.8.4 at 87-88.; Three MSS frequency bands are currently available to support terrestrial mobile broadband service: the 2 GHz band (S-band) from 2000-2020 MHz and 2180-2200 MHz, the Big LEO Band from 1610-1626.5 MHz and 2483.5-2500 MHz, and the L-band from 1525-1559 MHz and 1626.5-1660.5 MHz. *See* Appendix A, Fixed and Mobile Services in the Mobile Satellite Service Bands at 1525-1559 MHz and 1626.5-1660.5 MHz, 1610-1626.5 MHz and 2483.5-2500 MHz, and 2000-2020 MHz and 2180-2200 MHz, ET Docket No. 10-142, *Report and Order*, 26 FCC Rcd 5710 (2011) (MSS *Report and Order).*

[140] *National Broadband Plan*, Recommendation 5.8.4, at 87-88.

[141] See *AWS-4 Report and Order*.

[142] *See* Service Rules for Advanced Wireless Services in the 2000-2020 MHz and 2180-2200 MHz Bands, *Notice of Proposed Rule Making and Notice of Inquiry*, 27 FCC Rcd 3563 ¶ 1 (2012)(*AWS-4 NPRM and NOI*).

[143] A census block is the smallest geographic unit for which the Census Bureau tabulates decennial census data. *See* U.S. Census Bureau, *2010 Census Summary File 1 – 2010 Census of Population and Housing, Technical*
(continued….)

a contract with Mosaik Solutions (formerly American Roamer), an independent consulting firm[144] that tracks coverage footprints of mobile voice and mobile data networks.[145] If the center point, or centroid, of a census block is within the coverage boundary of a map provided by Mosaik, then we consider the census block to be "covered" by that provider and/or technology. We then aggregate the population and land area of the covered census blocks. While recognizing that this analysis likely overstates the coverage experienced by consumers because of limitations in Mosaik data, we find that this analysis is useful because it provides a general baseline that can be compared over time across network technologies, and providers. We present our analysis in terms of coverage by population, square miles, and road miles.

43. We first present network coverage in terms of population covered by the mobile wireless networks of the top facilities-based providers. Table 2 provides information on mobile wireless voice network coverage, and Table 3 provides information on mobile wireless broadband network coverage for the top facilities-based providers. The term population coverage by a mobile wireless provider means only that a mobile wireless network has been deployed in areas where the Census Bureau records indicate that people reside. A provider's having network coverage in an area does not mean that a provider actually offers its service to residents in all of that area.

Table 2
Estimated Mobile Wireless Network Coverage, Selected Facilities-Based Providers: *Voice Networks*, 2009-2012 (Covered POPs, in millions) [146]

Service Provider	Oct. 2009	Oct. 2010	Apr. 2011	Jan. 2012	Oct. 2012
AT&T	262.8	281.9	306.3	306.6	307.2
Verizon Wireless	270.5	284.9	299.5	299.5	300.0
Sprint Nextel	258.0	263.2	292.1	291.2	290.3

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Documentation, Mar. 2010, at 2-1, *available at* http://www.census.gov/prod/cen2010/doc/sf1.pdf#page=504. Census blocks in cities often correspond to individual city blocks bounded by streets. Blocks in suburban or rural areas "may be large, irregular, and bounded by a variety of features, such as roads, streams, and transmission lines. In remote areas, census blocks may encompass hundreds of square miles." *Id.* at A-10. While the past several Reports relied on 2000 Census population data at the census block level, this Report uses 2010 Census population data. The 2010 Census identified over 11 million blocks covering the entire United States and its territories. U.S. Census Bureau, *Question & Answer Center*, http://www.census.gov/ (visited Oct. 2, 2010). The mean size of a census block is 0.0460 square miles, and its median size is 0.016 square miles with a range of 0.0000001 to 8,081 square miles; its mean population is 34.3 people, while its median population is 8.0 people, with a range of 0 to 23,373 people.

[144] Mosaik provides data to the FCC under contract on facilities-based providers in the form of coverage boundary maps based on the coverage boundaries provided to them by mobile wireless network operators. Mosaik began as American Roamer in 1985 as the original vendor of custom printed roaming guides for Cellular carriers, but has since evolved into a provider of data and mapping for the mobile wireless industry. *See Fifteenth Report*, 26 FCC Rcd at 9703 ¶ 41 n. 106; Mosaik, About Us, http://www.mosaik.com/about-us/ (visited Apr. 27, 2012).

[145] This analysis likely overstates the coverage actually experienced by consumers, because Mosaik reports advertised coverage as reported to it by many wireless service providers, each of which uses a different definition or determination of coverage. The data does not expressly account for factors such as signal strength, bit rate, or in-building coverage, and may convey a false sense of consistency across geographic areas and service providers but nonetheless are useful for benchmarking mobile network deployment across the United States, especially over time. National Broadband Plan, at 39 (Chapter 4). We also recognize that an analysis of coverage at the nationwide level provides only a general benchmark. A nationwide average will mask regional disparities in coverage and create an overall picture that does not capture variances across the country.

[146]The estimates in this Table are based on our census block analysis of Mosaik CoverageRight coverage maps using the April 2011, January 2012, and October 2012 data. The population data are from the 2010 Census. Estimates for 2009 and 2010 are obtained from the *Fifteenth Report*. *Fifteenth Report*, 25 FCC Rcd at 9702 ¶ 45.

T-Mobile	246.2	249.5	282.5	284.8	281.4
MetroPCS	84.6	92.1	105.0	105.4	108.1
Leap	80.5	82.7	94.0	93.4	94.2
US Cellular	41.7	41.5	44.2	44.0	44.0

Table 3
Estimated Mobile Wireless Network Coverage, Selected Facilities-Based Providers*: Broadband Networks*, 2009-2012 (Covered POPs, in millions)[147]

Service Provider	Nov. 2009	Aug. 2010	Apr. 2011	Jan. 2012	Oct. 2012
Verizon Wireless	266.7	270.0	298.0	299.2	300.4
AT&T	212.3	228.6	276.1	289.9	296.7
Sprint Nextel	226.9	239.4	276.4	273.7	275.1
T-Mobile	133.9	183.8	214.7	227.6	235.4
MetroPCS	-	-	62.2	72.4	108.3
Clearwire	-	-	108.9	105.1	105.3
Leap	79.2	81.5	92.6	92.3	93.4
US Cellular	26.6	30.0	40.7	41.1	43.2

44. We next estimate the percentage of the U.S. population, land area, and road miles covered by a certain number of facilities-based mobile wireless service providers based on the Mosaik data (Tables 4-5).[148] Map 3 below depicts an estimate of the areas of the United States covered by a certain number of facilities-based providers. More detailed regional maps, as well as an enlarged version of Map 3 below, are available in Appendix C. As stated above, these estimates of coverage represent deployment of mobile wireless networks and do not indicate the extent to which providers actually offer service to residents in the covered areas.

[147] For purposes of this, and earlier, *Mobile Wireless Competition Reports*, we include coverage by WCDMA/HSPA, HSPA+, EV-DO, WiMAX, and LTE networks within our estimate of mobile broadband network coverage. Commission estimates based on census block analysis of Mosaik CoverageRight coverage maps, April 2011, January 2012, and October 2012. Population data are from the 2010 Census. Estimates for 2009 and 2010 are obtained from the *Fifteenth Report*. *Fifteenth Report*, 25 FCC Rcd at 9702 ¶ 45. The recent *Broadband Progress Report* did not include WCDMA/HSPA or EV-DO networks in its definition of mobile broadband networks. *2012 Eighth Broadband Progress Report*, WN Docket No. 11-121 (rel. Aug. 21, 2012) ¶ 40.

[148] Our analysis of road miles includes the following road miles categories from census: Primary Road (S1100), Secondary Road (S1200), Local Neighborhood Road, Rural Road, City Street (S1400), Vehicular Trail [4WD] (S1500), Service Drive usually along a limited access highway (S1640), and Private Road for service vehicles (S1740) as defined in MAF/TIGER Feature Class Code (MTFCC) Definitions, pages F-186 and F-187 at http://www.census.gov/geo/www/tiger/tgrshp2010/documentation.html (last visited Sep 26, 2012). In calculating the number of road miles associated with each census block, we also used two tables ("Faces" and "Edges"), published by the US Census Bureau as part of the TIGER database. A description of these relationship tables can be found at http://www.census.gov/geo/www/tiger/rel_file_desc.pdf. The datasets themselves are available in the FACES and EDGES directories at ftp://ftp2.census.gov/geo/tiger/TIGER2010/ (visited Nov. 19, 2012).

Map 3: Coverage by Mobile Wireless Competitors

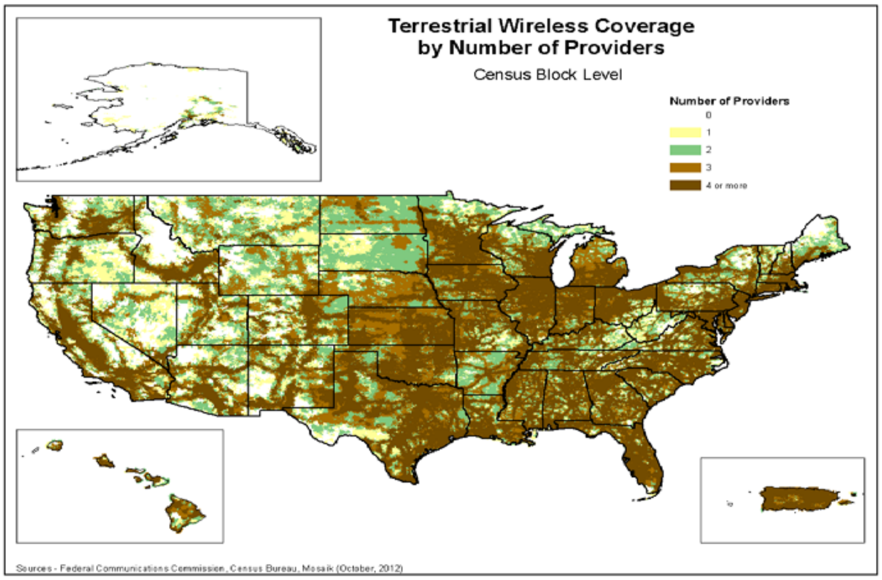

Table 4
Estimated Mobile Wireless Coverage by Census Block, Jan. 2012[149]

Number of Providers with Coverage in a Block	Number of Blocks (Thousands)	POPs Contained in Those Blocks (Thousands)	% of Total US POPs	Square Miles Contained in Those Blocks (Thousands)	% of Total US Square Miles	Road Miles Contained in Those Blocks (Thousands)	% of Total US Road Miles
US Total	11,155	312,471	100.0%	3,802	100.0%	6,821	100.0%
1 or more	10,927	312,010	99.9%	2,821	74.2%	6,498	95.3%
2 or more	10,554	310,306	99.3%	2,393	62.9%	5,977	87.6%
3 or more	9,629	303,843	97.2%	1,756	46.2%	4,949	72.6%
4 or more	8,315	290,478	93.0%	1,165	30.7%	3,814	55.9%
5 or more	6,054	248,820	79.6%	596	15.7%	2,380	34.9%

[149] Includes Federal lands. Commission estimates based on census block analysis of Mosaik CoverageRight coverage maps, January 2012. Population data are from the 2010 Census, and include the United States (50 states plus the District of Columbia) and Puerto Rico. Square miles include the United States and Puerto Rico. Our analysis of road miles includes the following road miles categories from census: Primary Road (S1100), Secondary Road (S1200), Local Neighborhood Road, Rural Road, City Street (S1400), Vehicular Trail [4WD] (S1500), Service Drive usually along a limited access highway (S1640), and Private Road for service vehicles (S1740) as defined in MAF/TIGER Feature Class Code (MTFCC) Definitions, pages F-186 and F-187 at http://www.census.gov/geo/www/tiger/tgrshp2010/documentation.html (last visited Sep 26, 2012). In calculating the number of road miles associated with each census block, we also used two tables ("Faces" and "Edges"), published by the US Census Bureau as part of the TIGER database. A description of these relationship tables can be found at http://www.census.gov/geo/www/tiger/rel_file_desc.pdf. The datasets themselves are available in the FACES and EDGES directories at ftp://ftp2.census.gov/geo/tiger/TIGER2010/ (visited Nov. 19, 2012).

Table 5
Estimated Mobile Wireless Coverage by Census Block, Oct. 2012[150]

Number of Providers with Coverage in a Block	Number of Blocks (Thousands)	POPs Contained in Those Blocks (Thousands)	% of Total US POPs	Square Miles Contained in Those Blocks (Thousands)	% of Total US Square Miles	Road Miles Contained in Those Blocks (Thousands)	% of Total US Road Miles
US Total	11,155	312,471	100.0%	3,802	100.0%	6,821	100.0%
1 or more	10,932	312,044	99.9%	2,824	74.3%	6,499	95.3%
2 or more	10,560	310,291	99.3%	2,402	63.2%	5,985	87.7%
3 or more	9,626	303,678	97.2%	1,764	46.4%	4,963	72.8%
4 or more	8,281	290,114	92.8%	1,167	30.7%	3,817	56.0%
5 or more	6,097	251,071	80.4%	607	16.0%	2,421	35.5%

45. Table 5 shows that as of October 2012, approximately 312 million people, or 99.9 percent of the total U.S. population, were covered by at least one facilities-based provider offering mobile voice and/or data service. Equivalently, approximately 427 thousand people, or 0.1 percent of the U.S. population, lived in areas with no mobile wireless coverage. Looking at areas with multiple providers, the October 2012 data show that approximately 97 percent of the U.S. population is covered by the networks of at least three mobile voice providers, close to 93 percent is covered by the networks of at least four mobile voice providers, and about 80 percent is covered by five. We believe there is an anomaly with the July/August 2010 data presented in the *Fifteenth Report* that resulted in unusually high estimates of the percentage of the population covered by the networks of at least four, five, and six providers (94 percent, 90 percent, and 76 percent, respectively).[151]

46. Tables 4 and 5 also show the approximate percentage of the U.S. land area and road miles covered by a certain number mobile wireless providers. These tables may overstate coverage to the extent that a provider's reported coverage is greater than its actual coverage. Additionally, coverage does not quantify network quality variables such as signal strength, bit rate, and in-building coverage. While we estimate that over 90 percent of the U.S. population lives in census blocks with coverage by at least 4 mobile voice providers, these census blocks account for only 30 percent of the total land area of the United States and 55 percent of road miles. Furthermore, while we estimate that only 0.1 percent of the U.S. population lives in areas with no mobile wireless coverage, these areas cover more than a quarter of the U.S. land area and approximately 5 percent of U.S. road miles.

47. The percentage of land area covered increases however, when federally-owned or administered lands area is excluded from the analysis due to the vast quantities of sparsely-populated Federal lands in the United States (Table 6, Table 7).[152]

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[150] Includes Federal lands. Commission estimates based on census block analysis of Mosaik CoverageRight coverage maps, October 2012. Population data are from the 2010 Census, and include the United States and Puerto Rico. Square miles include the United States and Puerto Rico.

[151] *See Fifteenth Report*, 26 FCC Rcd at 9705 Table 5. The 80.4 percent estimate for '5 or more' providers as of October 2012 represents a marked decline from the figure presented in the *Fifteenth Report*, which reported that 89.6 percent of the U.S. population was covered by at least five providers based on the Commission's analysis of July/August 2010 Mosaik data. The estimates in this *Report* are more consistent with the Commission's estimates based on the October/November 2009 data presented in the *Fourteenth Report*, which showed that approximately 91 percent of the U.S. population was covered by at least four providers' networks, 74 percent by five, and 25 percent, by six. *See Fourteenth Report*, 25 FCC Rcd at 11447 Table 4.

[152] Federally-owned lands constitute nearly 30 percent of the approximately 3.6 million square mile land area of the United States. *See Fifteenth Report*, 26 FCC Rcd at 9705 ¶ 43. A map showing the extent of Federal lands, with (continued….)

Table 6
Estimated Mobile Wireless Coverage by Census Block, *Excluding Federal Land*, Jan. 2012[153]

Number of Providers with Coverage in a Block	Number of Blocks (Thousands)	POPs Contained in Those Blocks (Thousands)	% of Total US POPs	Square Miles Contained in Those Blocks (Thousands)	% of Total US Square Miles	Road Miles Contained in Those Blocks (Thousands)	% of Total US Road Miles
US Total	10,449	307,209	100.0%	2,431	100.0%	5,893	100.0%
1 or more	9,865	306,863	99.9%	2,183	89.8%	5,751	97.6%
2 or more	9,615	305,402	99.4%	1,956	80.5%	5,426	92.1%
3 or more	8,862	299,415	97.5%	1,501	61.7%	4,607	78.2%
4 or more	7,727	286,659	93.3%	1,029	42.3%	3,616	61.4%
5 or more	5,696	246,015	80.1%	542	22.3%	2,293	38.9%

(Continued from previous page)
American Indian Reservations and Alaska Native Village Statistical Areas, can be found in Appendix C. The Commission has recognized, "[i]n many locations, covering certain government land may be impractical, because these lands are subject to restrictions that prevent a licensee from providing service or make provision of service extremely difficult. We also note that government lands often include only very small portions of the population in a license area." Service Rules for the 698-746, 747-762 and 777-792 MHz Bands; Revision of the Commission's Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems; Section 68.4(a) of the Commission's Rules Governing Hearing Aid-Compatible Telephones; Biennial Regulatory Review – Amendment of Parts 1, 22, 24, 27, and 90 to Streamline and Harmonize Various Rules Affecting Wireless Radio Services; Former Nextel Communications, Inc. Upper 700 MHz Guard Band Licenses and Revisions to Part 27 of the Commission's Rules; Implementing a Nationwide, Broadband, Interoperable Public Safety Network in the 700 MHz Band; and Development of Operational, Technical and Spectrum Requirements for Meeting Federal, State and Local Public Safety Communications Requirements Through the Year 2010, *Second Report and Order,* 22 FCC Rcd 15289, 15350 ¶ 160 (2007).

[153] Commission estimates based on Mosaik, Jan. 2012. Population and land area are based on census blocks. POPs are from the 2010 Census, and square miles include the United States and Puerto Rico. Excludes Federal lands. In this analysis, Federal lands consist of lands owned or administered by the Federal Government, including the Bureau of Land Management, the Bureau of Reclamation, the United States Department of Agriculture Forest Service, the Department of Defense, the United States Fish and Wildlife Service, the National Park Service, the Tennessee Valley Authority, and other agencies. Only areas of one square mile (640 acres) or more are included. Indian lands are not included in Federal lands. *See* United States Department of the Interior, *Federal Lands of the United States*, http://www.nationalatlas.gov/mld/fedlanp.html (visited Sep. 18, 2012). Our analysis of road miles includes the following road miles categories from census: Primary Road (S1100), Secondary Road (S1200), Local Neighborhood Road, Rural Road, City Street (S1400), Vehicular Trail [4WD] (S1500), Service Drive usually along a limited access highway (S1640), and Private Road for service vehicles (S1740) as defined in MAF/TIGER Feature Class Code (MTFCC) Definitions, pages F-186 and F-187 *available at* http://www.census.gov/geo/www/tiger/tgrshp2010/documentation.html (last visited Sep 26, 2012). In calculating the number of road miles associated with each census block, we also used two tables ("Faces" and "Edges"), published by the US Census Bureau as part of the TIGER database. A description of these relationship tables can be found at http://www.census.gov/geo/www/tiger/rel_file_desc.pdf. The datasets themselves are available in the FACES and EDGES directories at ftp://ftp2.census.gov/geo/tiger/TIGER2010/. (visited Nov. 19, 2012).

Table 7
Estimated Mobile Wireless Coverage by Census Block, *Excluding Federal Land*, Oct 2012[154]

Number of Providers with Coverage in a Block	Number of Blocks (thousands)	POPs Contained in Those Blocks (Thousands)	% of Total US POPs	Square Miles Contained in Those Blocks (Thousands)	% of Total US Square Miles	Road Miles Contained in Those Blocks (Thousands)	% of Total US Road Miles
US Total	10,449	307,209	100.0%	2,431	100.0%	5,893	100.0%
1 or more	9,871	306,901	99.9%	2,185	89.9%	5,756	97.7%
2 or more	9,622	305,393	99.4%	1,964	80.8%	5,434	92.2%
3 or more	8,868	299,261	97.4%	1,511	62.2%	4,622	78.4%
4 or more	7,708	286,289	93.2%	1,035	42.6%	3,619	61.4%
5 or more	5,747	248,242	80.8%	555	22.8%	2,331	39.6%

48. *Mobile Broadband Coverage*. Tables 8 and 9 below show the estimated mobile broadband coverage as of January 2012 and October 2012. For purposes of this Report, "mobile broadband" includes coverage and services offered using the following 3G and 4G technologies: EVDO, EVDO Rev A, WCDMA/HSPA, HSPA+, LTE, and mobile WiMAX. Mobile broadband network deployment by multiple providers has continued and, as of October 2012, approximately 311 million people, or 99.5 percent of the U.S. population, lived in areas with coverage by at least one mobile broadband provider, up from approximately 98.5 percent in August 2010. We estimate that the percentage of the population covered by at least three mobile broadband providers increased from 82 percent in August 2010 to 87 percent in April 2011 to nearly 92 percent in October 2012. Finally, in October 2012, 82 percent of the U.S. population lived in areas with coverage by at least four mobile broadband providers, up from 68 percent in August 2010.

Table 8
Estimated Mobile Wireless Broadband Coverage by Census Block, Jan. 2012[155]

Number of Providers with Coverage in a Block	Number of Blocks (Thousands)	POPs Contained in Those Blocks (Thousands)	% of Total US POPs	Square Miles Contained in Those Blocks (Thousands)	% of Total US Square Miles	Road Miles Contained in Those Blocks (Thousands)	% of Total US Road Miles
1 or more	10,620	310,519	99.4%	2,517	66.2%	6,115	89.6%
2 or more	9,570	302,620	96.8%	1,786	47.0%	4,954	72.6%

[154] Commission estimates based on Mosaik, Oct. 2012. Population and land area are based on census blocks. POPs are from the 2010 Census, and square miles include the United States and Puerto Rico. Excludes Federal lands.

[155] Includes Federal lands. Commission estimates based on census block analysis of Mosaik CoverageRight coverage maps, Jan. 2012. The estimates include coverage by all EVDO, EVDO Rev. A, HSPA/UMTS/WCDMA, HSPA+, LTE, and mobile WiMAX networks. Population data are from the 2010 Census, and square miles include the United States and Puerto Rico. The Commission may include other combinations of mobile network technologies when referring to "mobile broadband" in other contexts. *See, e.g., Eighth Broadband Progress Report* at Table 15. Our analysis of road miles includes the following road miles categories from census: Primary Road (S1100), Secondary Road (S1200), Local Neighborhood Road, Rural Road, City Street (S1400), Vehicular Trail [4WD] (S1500), Service Drive usually along a limited access highway (S1640), and Private Road for service vehicles (S1740) as defined in MAF/TIGER Feature Class Code (MTFCC) Definitions, pages F-186 and F-187 at http://www.census.gov/geo/www/tiger/tgrshp2010/documentation.html (last visited Sep 26, 2012). In calculating the number of road miles associated with each census block, we also used two tables ("Faces" and "Edges"), published by the US Census Bureau as part of the TIGER database. A description of these relationship tables can be found at http://www.census.gov/geo/www/tiger/rel_file_desc.pdf. The datasets themselves are available in the FACES and EDGES directories at ftp://ftp2.census.gov/geo/tiger/TIGER2010/ (visited Nov. 19, 2012).

3 or more	7,459	280,104	89.6%	895	23.6%	3,186	46.7%
4 or more	5,444	246,180	78.8%	395	10.4%	1,920	28.1%
5 or more	3,095	165,191	52.9%	139	3.7%	1,009	14.8%

Table 9
Estimated Mobile Wireless Broadband Coverage by Census Block, Oct. 2012[156]

Number of Providers with Coverage in a Block	Number of Blocks (Thousands)	POPs Contained in Those Blocks (Thousands)	% of Total US POPs	Square Miles Contained in Those Blocks (Thousands)	% of Total US Square Miles	Road Miles Contained in Those Blocks (Thousands)	% of Total US Road Miles
1 or more	10,708	311,025	99.5%	2,577	67.8%	6,209	91.0%
2 or more	9,889	305,590	97.8%	1,950	51.3%	5,245	76.9%
3 or more	7,954	286,121	91.6%	1,070	28.1%	3,570	52.3%
4 or more	5,977	256,191	82.0%	521	13.7%	2,252	33.0%
5 or more	4,222	215,375	68.9%	228	6.0%	1,353	19.8%

49. *Areas with Service Offered.* We have also estimated – using a different set of data that indicates where providers have customers instead of where they have network coverage – the number of people living in Cellular Market Areas with a certain number of mobile wireless providers offering service in that CMA.[157] These estimates are likely to overestimate the number of facilities-based providers available for selection by any individual customer living in that CMA. Because many CMAs are made up of several counties and because a facilities-based service provider may offer service in only part of a CMA,[158] many consumers, especially in rural areas, likely have fewer service provider choices where they live or work than the total number of providers offering service somewhere in their CMA. As one example, Map 4 below shows coverage in a rural CMA in eastern Oregon. Because mobile providers generally screen the eligibility of potential customers by zip code, a more accurate estimation of the competitive choices available to individual consumers would be based on zip codes. Another depiction of the choices effectively available to a consumer would be based on an assessment of a service provider's retail presence in an area.

[156] Includes Federal lands. Commission estimates based on census block analysis of Mosaik CoverageRight coverage maps, Oct. 2012. The estimates include coverage by all EVDO, EVDO Rev. A, HSPA/UMTS/WCDMA, HSPA+, LTE, and mobile WiMAX networks. Population data are from the 2010 Census, and square miles include the United States and Puerto Rico.

[157] In recent transactions orders, the Commission has primarily used CMAs as the local geographic markets in which to analyze the potential competitive harms arising from the spectrum concentration as a result of the transaction, but it has also found it appropriate to analyze the potential national competitive impacts of transactions. *See* Application of AT&T Inc. and Qualcomm Incorporated for Consent to Assign Licenses and Authorizations, WT Docket No. 11-18, *Order*, 26 FCC Rcd 17589, 17591 ¶ 34 (2011) (*AT&T-Qualcomm Order*); Applications of Cellco Partnership d/b/a Verizon Wireless and SpectrumCo LLC and Cox TMI, LLC For Consent To Assign AWS-1 Licenses, WT Docket No. 12-4, Applications of Verizon Wireless and Leap for Consent To Exchange Lower 700 MHz, AWS-1, and PCS Licenses, ULS File Nos. 0004942973, 0004942992, 0004952444, 0004949596, and 0004949598, Applications of T-Mobile License LLC and Cellco Partnership d/b/a Verizon Wireless for Consent to Assign Licenses, WT Docket 12-175, FCC 12-95 (rel. Aug. 23, 2012) (*Verizon Wireless-SpectrumCo Order*); Applications of AT&T Inc. and Centennial Communications Corp. for Consent to Transfer Control of Licenses, Authorizations, and Spectrum Leasing Arrangements, WT Docket No. 08-246, *Memorandum Opinion and Order*, 24 FCC Rcd 13915 (2009) (*AT&T-Centennial Order*); *See also* Section II, Introduction, *supra*.

[158] *See Fifteenth Report*, 26 FCC Rcd at 9707 ¶ 47.

50. We estimate the number of providers serving at least portions of each of the 716 CMA in the U.S. (excluding territories). In this *Report*, we consider a provider to be a competitor if it has market share above a particular threshold, and have made estimates based on two alternative thresholds. Specifically, to estimate the number of providers serving a CMA, we include a provider if it has a greater than two percent market share (alternatively, a five percent market share, which provides greater assurance of a meaningful choice for consumers) of mobile wireless connections based on NRUF data within the CMA.[159] As shown in Table 10, using a two percent market share threshold shows that in all but one of the 716 CMAs that make up the United States (excluding territories), there are at least two mobile wireless service providers offering service in at least a portion of that CMA. With this threshold, approximately 93 percent of such CMAs have three or more providers offering service, and approximately 72 percent have four or more providers. Also as shown in Table 10, using a five percent market share threshold shows that in all but two of the 716 CMAs that make up the United States (excluding territories), there are at least two mobile wireless service providers offering service in at least a portion of that CMA. Approximately 83 percent of such CMAs have three or more providers offering service, and approximately 53 percent have four or more providers.

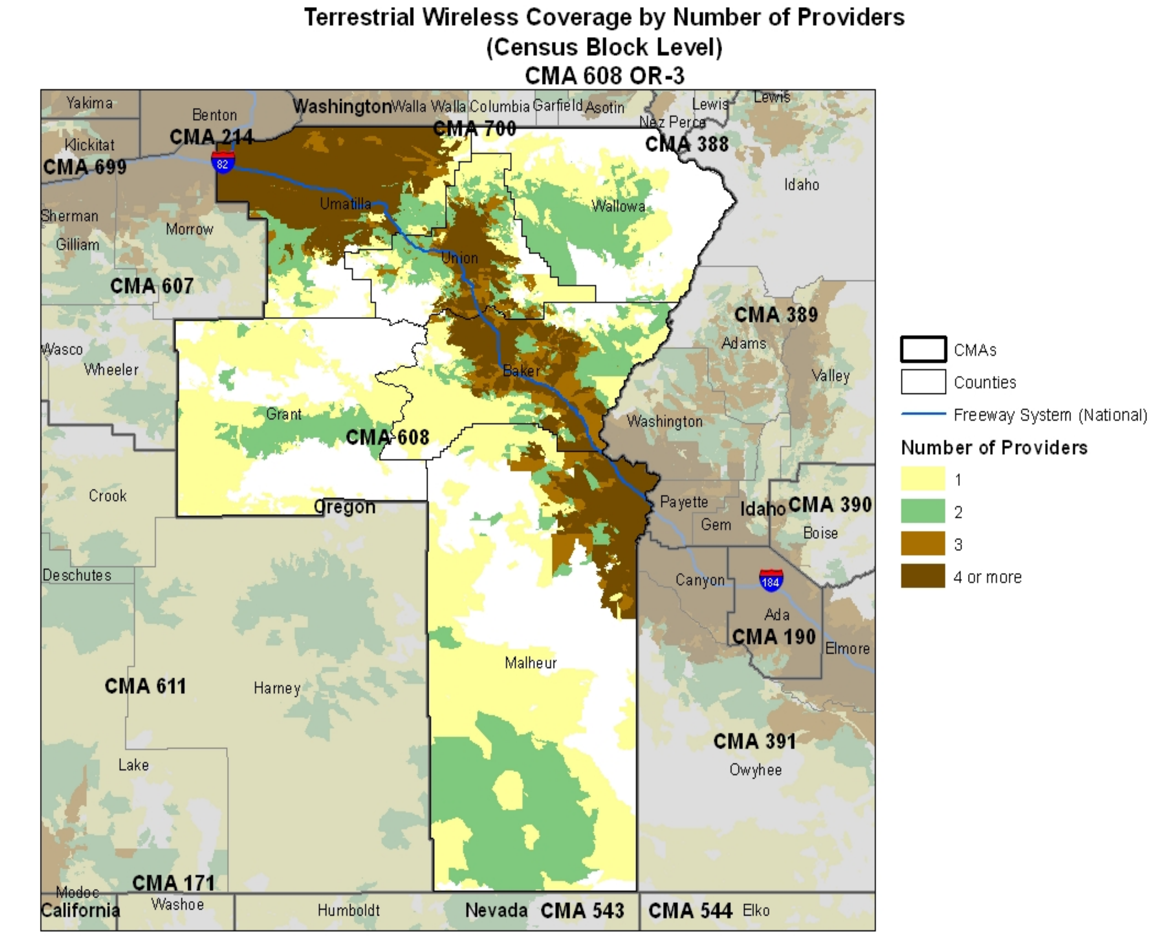
Table 10
Estimated Mobile Wireless Providers Offering Service by CMA, Excluding Territories, December 2011[160]

	Two Percent Market Share Threshold		**Five Percent Market Share Threshold**	
Number of Providers Offering Service Anywhere in a CMA	**Number of CMAs**	**Total CMAs (Percent)**	**Number of CMAs**	**Total CMAs (Percent)**
Total for U.S., excluding territories	*716*	*100%*	*716*	*100%*
1 provider	1	0.1%	2	0.3%
2 providers	51	7.1%	120	16.8%
3 providers	152	21.2%	213	29.7%
4 providers	210	29.3%	246	34.4%
5 or more providers	302	42.2%	135	18.9%

[159] Because NRUF includes data on the number of telephone numbers that have been assigned to end-user devices by mobile wireless providers, this analysis does not include providers whose data-only devices are not assigned a mobile telephone number. *See also* Section V.A, Numbers of Mobile Wireless Connections and Customers, *infra*.

[160] Commission analysis based on December 2011 NRUF data.

Map 4
Service Provider Coverage in an Illustrative Rural CMA, Jan. 2012



Source: Federal Communications Commission, Census Bureau, and Mosaik Solutions (CoverageRight January 2012)

D. Horizontal Concentration

51. The level of market concentration can be measured by the number of competitors, shares of subscribers or sales, or the distribution of competitors' respective shares of subscribers or sales. Market concentration measures that are derived from market shares can indicate when a small number of competitors each possess a relatively large share of subscribers or sales. High market concentration levels in a given market may raise some concern that the market is not competitive. However, an analysis of other factors, such as prices, entry conditions, and non-price rivalry, may nonetheless find that a market with high concentration levels is competitive. Data on the number of competitors were reported in the previous section (Mobile Wireless Network Coverage), market share data and the Herfindahl-Hirschman Index (HHI) are discussed below.

1. Market Shares

52. Service provider service revenues and market shares by service revenues are shown in Table 11 and Table 12. Table 12 provides market share estimates of the seven largest facilities-based service providers, showing that the four nationwide service providers accounted for about 92 percent of the nation's mobile wireless service revenue in the first half of 2012. The service revenues of Verizon Wireless and AT&T accounted for about 67 percent of total service revenue.

Table 11
Facilities–Based Mobile Wireless Service Providers by Service Revenues, Publicly-Traded Companies, Reported by Provider, 2008-2012[161]
(In millions of dollars)

	2008	2009	2010	2011	2012 Q1-Q2
Verizon Wireless	42,602	52,046	55,629	59,157	31,186
AT&T	44,249	48,563	53,510	56,726	29,331
Sprint Nextel	28,435	25,832	25,894	27,390	14,302
T-Mobile	19,242	18,926	18,733	18,481	8,825
MetroPCS	2,437	3,130	3,690	4,428	2,318
US Cellular	3,428	3,430	3,534	3,782	2,054
Leap Wireless	1,782	2,242	2,483	2,829	1,525
Clearwire	213	252	505	1,208	640
Atlantic Tele-Network	105	147	453	572	283
Ntelos	392	400	383	396	222
Cincinnati Bell Wireless	291	284	269	252	117

Table 12
Estimated Facilities-Based Service Provider Share of Service Revenues, 2008-2012 (Percent)[162]

	2008	2009	2010	2011	2012 Q1-Q2
Verizon Wireless	27.8	33.4	33.7	33.8	34.3
AT&T	28.9	31.2	32.4	32.4	32.3
Sprint Nextel	18.6	16.6	15.7	15.6	15.8
T-Mobile	12.6	12.1	11.3	10.5	9.7
MetroPCS	1.6	2.0	2.2	2.5	2.6
US Cellular	2.2	2.2	2.1	2.2	2.3
Leap Wireless	1.2	1.4	1.5	1.6	1.7
Other	7.2	1.1	1.0	1.4	1.4

[161] Service revenues are reported publicly by most publicly-traded service providers in SEC 10-K filings. Atlantic Tele-Network service revenues for 2010 and 2011 are for U.S wireless operations. Atlantic Tele-Network, SEC Form 10-K, filed March 15, 2012. Atlantic Tele-Network service revenues for 2008 and 2009 are for U.S and Caribbean wireless operations. Atlantic Tele-Network, SEC Form 10-K, filed March 16, 2010.

[162] "Other" is the sum of service revenues from Clearwire, Cincinnati Bell Wireless, Ntelos, Atlantic Tele-Network, Rural Cellular, Alltel, and Centennial. Hence, "Other" excludes service revenues of all non-publicly traded facilities-based companies, the largest being C-Spire. The relatively large 7.2 percent "Other" for 2008 in largely accounted for by Alltel. To the extent that not all service revenues are accounted for in "Other", the shares attributed to some of the listed service providers may be overstated in this estimation method. Deriving "Other" using UBS estimates of total service revenue yields similar estimates.

53. Reported total connections for the top service providers are shown in Table 13.[163] Service providers do not follow the same reporting conventions for their connections. Some providers, such as AT&T, Sprint, and T-Mobile, reported all the connections served by their networks, including retail and wholesale connections, and connected devices. Verizon Wireless, which recently revised its reported connections for 2009, 2010, and 2011, now includes only its retail connections.[164] Industry analysts often calculate market shares by reported total connections,[165] a method which attributes all industry connections to facilities-based providers. However, if Verizon does not report all of its connections then its market share would be underestimated with this method.

Table 13
Top-12 Facilities–Based Mobile Wireless Service Providers Reported Connections, Year-end 2008-2012 Q2 (In thousands) [166]

Service Provider	2008	2009	2010	2011	2012 Q2
AT&T	77,009	85,120	95,536	103,247	105,206
Verizon Wireless	72,056	85,445	87,535	92,167	94,154
Sprint Nextel[167]	48,338	48,133	49,910	55,021	56,386
T-Mobile	32,758	33,790	33,734	33,185	33,168
Clearwire[168]	475	688	4,345	10,415	10,957
MetroPCS	5,367	6,640	8,155	9,347	9,292
Leap	3,845	4,954	5,518	5,934	5,903
US Cellular	6,196	6,141	6,072	5,891	5,799
C Spire Wireless[169]	≈800	≈800	NA	≈1,000	≈1,000
Atlantic Tele-Network	NA	NA	718	582	584
Cincinnati Bell Wireless	551	533	509	459	430
NTELOS	435	439	438	415	425

[163] Verizon Wireless acquired Alltel in Jan. 2009 (the 5th largest firm in 2008, with an estimated 13.2 million subscribers). AT&T acquired Centennial in Nov. 2009 (the 9th largest firm in 2008 with an estimated 1.1 million subscribers).

[164] In its 2012 Q2 10Q, Verizon Wireless stated "Retail (non-wholesale) customers are customers directly served and managed by Verizon Wireless that use its branded services." See Verizon Wireless, SEC Form 10Q for the quarter ended June 30, 2012, filed July 30, 2012. Verizon last reported the wholesale connections of Verizon Wireless in 2011 when it reported approximately 15.6 million wholesale and other connections. Verizon, SEC Form 10-K for the fiscal year ended December 31, 2011, Exhibit 13.

[165] Well-known industry analyst reports attribute all connections to facilities-based providers. *See, e.g.*, Bank of America Merrill Lynch, 3Q12 US Wireless Matrix: Verizon sweeps the quarter, Nov. 15, 2012; UBS Investment Research, US Wireless 411: Version 44.0, Aug. 14, 2012.

[166] Sources include publicly-available company documents such as annual reports and SEC filings. Verizon revised its reported subscribers for 2009, 2010 and 2011and now only reports retail connections. Claro, a facilities-based provider that serves Puerto Rico, has substantial connections. Currently, América Móvil reports Claro mobile wireless connections for its entire Caribbean service area and does not break out Puerto Rico. *See also* Claro, http://www.telefonicapr.com/ (reporting total subscribers for combined wireless and wireline operations.).

[167] Sprint customers include customers on Sprint's iDEN and CDMA networks.

[168] Clearwire customers include 9,123,000 wholesale connections, most of which are also Sprint retail connections Some Sprint data plans include coverage on both Sprint's CDMA network and Clearwire's WiMAX network. Clearwire customers include a small, unknown number of customers on Clearwire's legacy fixed wireless network.

[169] *See* C Spire Wireless, http://www.cspire.com/company_info/about/more_info.jsp, visited Nov. 21, 2012 (stating, "The company has nearly 1 million subscribers and continues to experience strong, steady growth.").

2. Herfindahl-Hirschman Index

54. The Commission employs the Herfindahl-Hirschman Index (HHI), the most widely-accepted measure of concentration in competition analysis. In particular, it allows a comparison of different distributions of providers' shares of subscribers. The range of the HHI is from zero to 10,000, with 10,000 representing a monopoly, the highest possible level of industry concentration. Fewer providers or a higher inequality in providers' shares of subscribers result in higher HHI values.[170] As a benchmark for comparison, the value of the HHI for a hypothetical market in which there are four facilities-based providers with equal shares of subscribers is 2500. If there are three facilities-based providers with equal shares of subscribers, the value would increase to 3333.[171] Antitrust authorities in the United States generally classify markets into three types: Unconcentrated (HHI < 1500), Moderately Concentrated (1500 < HHI < 2500), and Highly Concentrated (HHI > 2500).[172]

55. *HHI Methodology*. As in previous *Reports*, we calculate the HHI in each EA using the shares of mobile wireless connections held by facilities-based mobile wireless providers, deriving providers' shares of connections from their respective number of connections.[173] Hence, we use a facilities-based provider's number of connected devices as a proxy for the provider's actual output (*i.e.,* minutes of use, MBs, etc.). The number of mobile wireless connections for each provider is determined based on the Commission's year-end 2011 NRUF data, which track phone number usage information for the United States.[174]

56. Certain limitations of the NRUF data may affect the accuracy of the HHI estimates.[175]

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[170] The HHI is calculated by summing the squares of all provider subscriber shares in the EA. Thus, if a single firm supplies the market, the HHI = 10,000 (100 x 100). If there are ten providers, each with ten percent of the market, the value of HHI would be 1,000 [$(10)^2$ x 10]. As the structure of a market becomes progressively more atomistic, the value of HHI approaches 0. For a given number of firms, the value of the HHI increases as the inequality in subscriber shares increases. For example, if four carriers are identified as participants in the relevant markets and each carrier accounts for 25 percent of total sales, the value of HHI would be 2500 [$(25)^2$ x 4]. If there are still only four carriers but the top carrier has a 40 percent subscriber share while each of the remaining three carriers has 20 percent, the value of HHI increases from 2500 to 2800 [$(40)^2 + ((20)^2$ x 3)].

[171] The antitrust authorities (Department of Justice and the Federal Trade Commission) as well as the Commission use HHIs in their competitive review of mergers. On August 19, 2010, the DOJ and FTC issued new merger guidelines whereby the proposed transaction would come under scrutiny if the HHI is currently above 2500, and the merger would lead the HHI to increase by 100 – 200 points, *Horizontal Merger Guidelines*, U.S. Department of Justice and the Federal Trade Commission, http://www.justice.gov/atr/public/guidelines/hmg-2010.pdf (visited Dec 13, 2012). In reviewing mobile wireless applications the Commission has also applied an HHI screen. The Commission's HHI screen flags markets for further competitive review if the HHI is 2800 with a change from the pre to the post transaction HHI of 100 or greater or a change of 250 or greater regardless of the initial HHI. *See* Applications of AT&T Wireless Services, Inc., Transferor, and Cingular Wireless Corp., Transferee, *Memorandum Opinion and Order*, 19 FCC Rcd 21522 (2004); Applications of AT&T Inc. and Cellco Partnership d/b/a Verizon Wireless for Consent to Assign or Transfer Control of Licenses and Authorizations and Modify a Spectrum Leasing Arrangement, WT Docket No. 09-104, *Memorandum Opinion and Order*, 25 FCC Rcd 8704 (2010).

[172] *See Horizontal Merger Guidelines*, United States Department of Justice and the Federal Trade Commission, http://www.justice.gov/atr/public/guidelines/hmg-2010.pdf (visited Dec. 12, 2012).

[173] *See* Section III.A, Introduction, *supra*. As discussed in Section V.A, Numbers of Mobile Wireless Connections , *infra*, the NRUF data used to calculate the HHIs provide an estimate of the number of mobile wireless connections or connected devices, rather than an estimate of the number of individual subscribers.

[174] The methodology used to compile NRUF data is described in Section V.A, Numbers of Mobile Wireless Connections , *infra*. Clearwire reported that it had 1,292,000 retail customers and 9,123,000 wholesale customers at the end of 2011. Clearwire states that "Sprint accounts for substantially all of our wholesale sales to date." See SEC, Clearwire Form-10K for the fiscal year ended 2011, at 50, 52.

[175] *See* Section V.A, Numbers of Mobile Wireless Connections , *infra*.

First, not all providers assign telephone numbers to the mobile devices on their networks. Thus, the NRUF data do not include connections of Clearwire (which does not assign telephone numbers to its devices) that are not also Sprint connections, and Clearwire is not counted as a separate provider in the *Report's* HHI calculations.[176] Second, some data-only mobile devices are assigned telephone numbers by some providers, but some providers do not assign telephone numbers to many of these data-only devices. The inconsistent application of telephone numbers by different providers to the same or similar data-only devices may decrease a provider's number of connections (in the NRUF data) relative to the provider's publicly-reported number of connections. This may cause variation across providers' market shares that would not be present if a consistent accounting of devices were available at the sub-national level.

57. Wholesale customers are included with the customers of their hosting facilities-based providers, except for the wholesale customers of Clearwire, virtually all of whom are already included in Sprint's connections.[177] Therefore, market shares of MVNOs are not quantified separately in the *Report's* concentration metrics.[178] Leading industry analyst reports on the mobile wireless industry also include wholesale subscribers with retail subscribers when they calculate market concentration metrics.[179]

58. A national weighted average HHI across EAs is obtained by averaging the HHIs of all 172 EAs, with more (less) importance attached to EAs that have a higher (lower) population.[180] Although we calculate the HHI on an EA geographical market for this *Report*, as shown in Table 14 and Chart 1, we do not conclude that EAs are the appropriate geographic market for other purposes.[181] The value of the HHI depends on the assumed geographical market. Basing the HHI on broader (narrower) geographic markets will generally result in lower (higher) HHI values. Calculating the HHI at the level of a CMA, for example, which is the geographic market typically used in the Commission's review of transfers and assignments of mobile wireless licenses, would generally result in an average market HHI that is higher than one based on EAs. Calculating the HHI based on a single nationwide geographical market would result in a national HHI that is lower than for a national weighted average HHI across EAs, because the total number of providers in the entire United States far exceeds the number of providers that compete in any single local area. Applying the HHI to a single nationwide geographical market would assume that every American is able to choose from more than one hundred facilities-based providers.[182]

59. *Current HHI Values*. As shown in Table 14 and Chart 1, the weighted average of the

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[176] Based on publicly available information about Clearwire's customers, *see* Section III.D.2 *supra*, its exclusion is not likely to have a material effect on the HHI estimates.

[177] *See* Table 1, n.122. *See* Section III.D.1. Market Shares, *supra*, for a discussion of how service providers do not follow the same reporting conventions for wholesale connections.

[178] See Section III.B.2, Resale and MVNO Providers, *supra,* for a discussion of the degree to which the competitiveness of the mobile wireless market is increased by the presence of resellers and MVNOs relative to a market scenario in which they are absent.

[179] *See, e.g.*, Glen Campbell, *Get Ready for the Wireless Revenue Bounce*, Bank of America, Global Wireless Matrix 4Q09, Dec. 13, 2009, at 10, 198 (*Bank of America Global Wireless Matrix 4Q09*); John C. Hodulik, *et al*., *US Wireless 411, Version 43.0,* UBS, UBS Investment Research, Mar. 7, 2012 at 18 (*US Wireless 411 4Q11*).

[180] Letting P_i be the population in the *i*th EA, P be the total population in all 172 EAs, and H_i be the HHI in the *i*th EA, then the population weighted HHI is given by $(P_1 H_1 + P_2 H_2 + \ldots P_{172} H_{172})/P$.

[181] Although the Commission typically uses 734 CMAs and 354 Component Economic Areas (CEAs) to calculate the HHI screen in evaluating mobile wireless transactions, we use 172 EAs to calculate HHIs in this *Report*. We use EAs in this *Report* to maintain continuity with past *Reports* and to avoid compromising the confidential information found in the NRUF data.

[182] As discussed in Section II.A, the consumer searches for a mobile wireless provider in the local area where he lives, works, and travels. In 2009, for example, MetroPCS's and Leap Wireless's networks had very little overlapping coverage, and MetroPCS and Leap Wireless were not competitors in the same geographic areas. *See* ¶ 22, *infra*.

HHIs (weighted by EA population) was 2873 at the end of 2011, up from 2868 at the end of 2010, an increase of approximately 0.2 percent.[183] From 2003 (the first year the Commission calculated HHIs using this methodology) to year-end 2011, the average HHI has increased from 2151 to 2873, an increase of 722 points. For 2011, the value of the HHI for individual EAs ranges from a low of 2008 in EA 108 (covering parts of Wisconsin) to a high of 7178 in EA 146 (covering parts of Montana).

Table 14
Mobile Wireless Market Concentration: Herfindahl-Hirschman Index, 2006-2011[184]

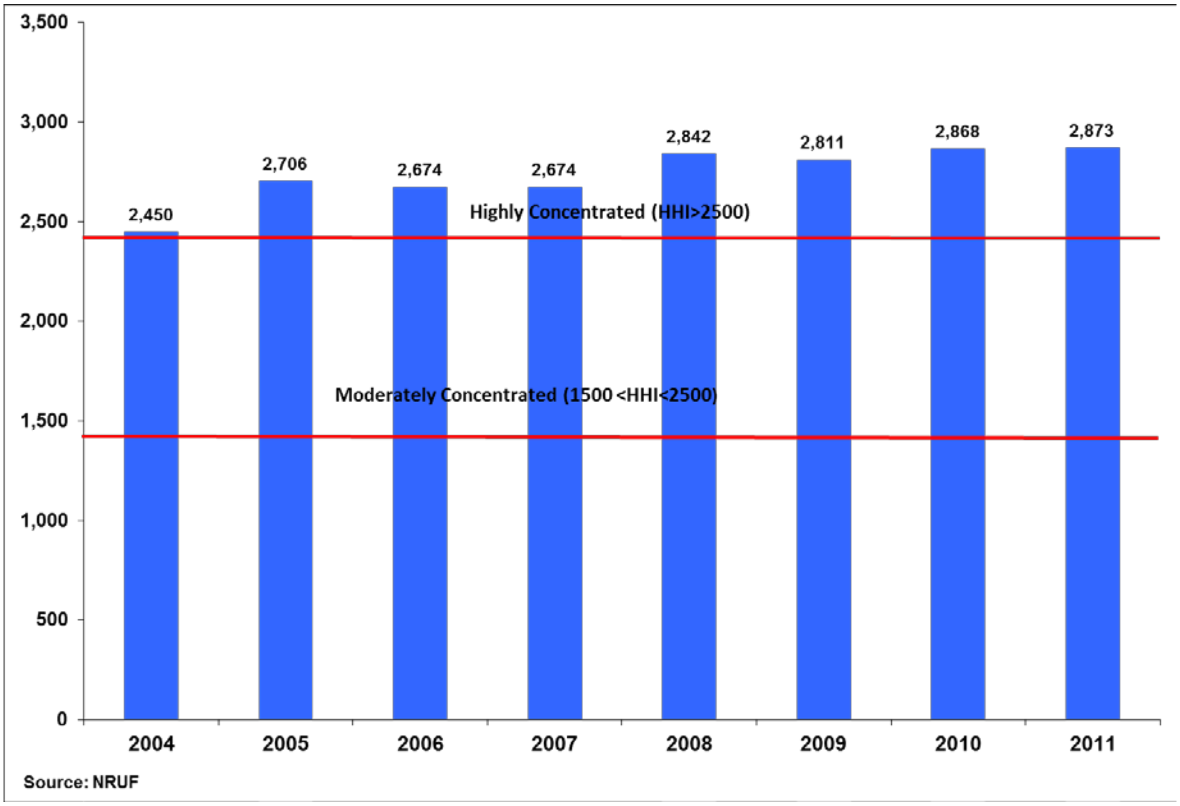
Year	2006	2007	2008[185]	2009	2010	2011
Average	2,674	2,674	2,842	2,811	2,868	2,873
High	6,551	6,272	6,801	6,572	6,512	7,178
Low	1,609	1,795	2,123	1,903	1,878	2,008

[183] *See* Appendix B, Table B-3, *infra*, for EA subscribership levels, penetration rates, and population densities.

[184] Population-weighted average of 172 EAs based on Commission estimates using year-end NRUF data and Census Bureau 2010 population data. The HHI calculated with a simple average across EAs (not weighted by population) is 3435 in 2010 and 3458 in 2011.

[185] In the *Fourteenth Report*, the weighted average HHI for 2008 was reported as 2848, with a maximum of 8263. When calculating these HHIs, the Verizon/Alltel divestitures were accounted for as follows: those Alltel subscribers that were not to be divested were allocated to Verizon Wireless, and divestiture markets were not allocated to Verizon Wireless but were accounted for as an independent business entity. During 2008, Verizon Wireless also acquired Rural Cellular (August 2008). The 2008 HHI has been recalculated to account for the divestiture markets from the Verizon Wireless/Rural Cellular acquisition. We adopted the same methodology, whereby the divestiture markets were not allocated to Verizon Wireless, but instead were treated as an independent entity. This recalculation reduced the weighted average 2008 HHI by six points. In addition, the maximum HHI was revised down from 8263 (EA 4 – Burlington VT-NY, a divestiture marketfrom the Rural Cellular acquisition) to 6801 (EA 142 which covers parts of Nebraska and Wyoming).

Chart 1
Average HHI Across EAs, 2004-2011 (In thousands)[186]



60. HHI values tend to vary with the population density of different markets. Specifically, market concentration in EAs tends to increase as the EA population declines. Chart 2 below shows the relationship between EA population densities and HHI values, and indicates that the most concentrated EAs tend to be in rural areas, while major metropolitan areas lie within the least concentrated EAs. Chart 3 below shows that the median HHI value of EAs that lie within population density bands decreases as the population density increases, where the nationwide median value of the HHI by EA is 3230. This observed decrease in the median value in more highly-populated areas likely reflects greater demand and greater cost efficiencies (per-user mobile wireless network deployment costs tend to decrease with increases in the population density) in more densely-populated areas.[187] Apart from differences in population, EAs also vary significantly with regard to other determinants of market demand and facilities-based provider costs, such as per-capita income, the age distribution of the population, and the size and composition of the business sector.[188] Some of the economic determinants of industry concentration are discussed further in Section III.E, Entry and Exit Conditions.

[186] Chart 1 is based on the data shown in Table 14. According to the U.S. antitrust authorities (DOJ and FTC), markets are generally classified into three types: Unconcentrated (HHI < 1500), Moderately Concentrated (1500 < HHI < 2500), and Highly Concentrated (HHI > 2500). *See Horizontal Merger Guidelines*, U. S. Department of Justice and the Federal Trade Commission, http://www.justice.gov/atr/public/guidelines/hmg-2010.pdf.

[187] *See also* M. Kende and M. Starling, White Paper for Mobile Future, *Rural Mobile Services Deployment in the US: the Challenges in an International Context*, May 2012.

[188] The Commission conducted a regression analysis of data at the EA level in September 2008, which indicates that concentration in the mobile wireless market (measured by the HHI) tends to decline with increases in market size, population density, per capita income, and percentage of the population living in urban areas.

Chart 2
Plot of 2011 EA HHI Values on EA Population Densities, 2011[189]

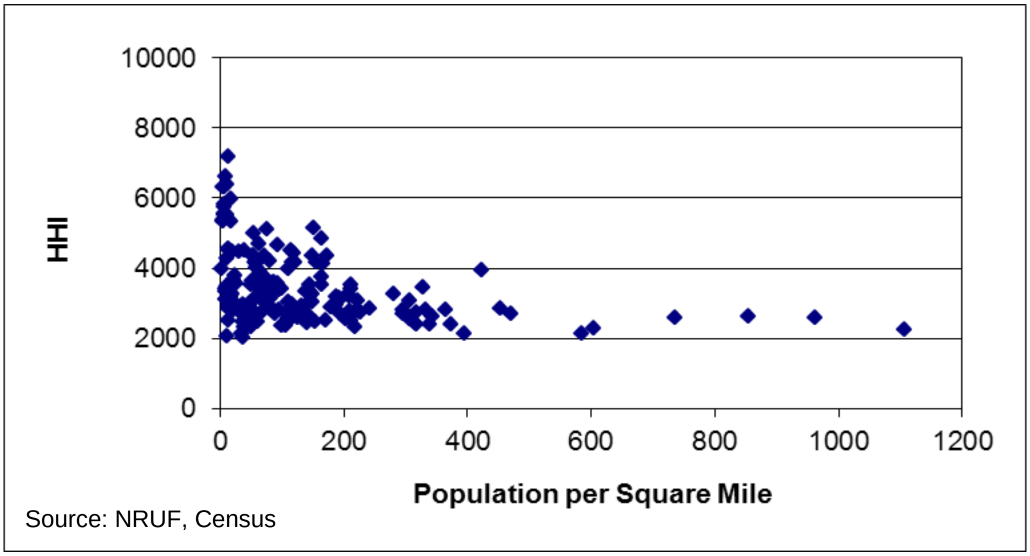
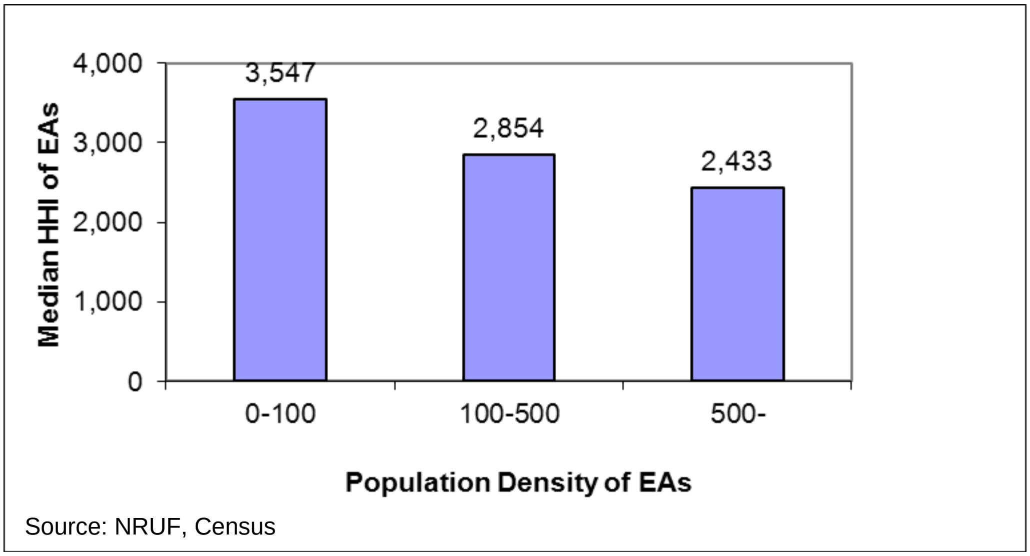


Chart 3
Median HHI of EAs in Population Density Bands, 2011



61. *Relation Between HHI and Competition*. High market concentration is not synonymous with a non-competitive market or with market power – the ability to charge prices above the competitive level for a sustained period of time.[190] High market concentration may indicate that a firm or firms potentially may be able to exercise market power, but market concentration measures alone are

[189] Population density is measured as Population/Square Mile (2010 Census). The highest population density, 1107, occurs in EA 34 (Tampa-St. Petersburg-Clearwater, FL), and the lowest population density, 1, occurs in EA 171 (Anchorage, AK). Water area is excluded in the calculation of the areas of EAs.

[190] *See* Jonathan B. Baker and Timothy Bresnahan, "Economic Evidence in Antitrust: Defining Markets and Measuring Market Power" in *Handbook of Antitrust Economics*, ed. Paolo Buccirossi (Cambridge: MIT Press, 2008), 15. *See also See* Ernest Gellhorn, *Antitrust Law and Economics* (4th ed.), West Publishing, 1994, at 117 (stating "Market shares…should mark the beginning for careful analysis, not the end of it"). *See also* Department of Justice, *Horizontal Merger Guidelines*, Section 5.3, 2010 ("*Horizontal Merger Guidelines*").

insufficient to draw such a conclusion.[191] Therefore, this *Report* analyzes other indicators and measures of competition in the mobile wireless services market. These include mainly price and non-price rivalry by competitors and price and output data.[192]

3. Recent Entry and Exit

62. Entry and exit of service providers can lead to significant changes in market concentration. When a service provider exits the market through a merger or acquisition, subscribers of the exiting service provider may be acquired by the purchasing provider unless divestitures occurred. Entry normally proceeds through several stages that require a significant period of time to complete, including raising financial capital, acquisition of spectrum rights,[193] deployment of the mobile wireless network, and a product launch stage during which a customer base is gained. Estimating the date of potential entry is one factor in a comprehensive entry analysis that predicts how soon there will be new rivals who are in a position to place competitive constraints on existing competitors.[194] Below we summarize recent entry commitments that are large enough to be consistent with entry that could introduce new competitive constraints at a regional or national level. We also summarize recent exit of service providers and selected applications to the Commission for the acquisition of other service providers. Recent acquisitions that are mainly spectrum-only transactions are discussed in section 108.

a. Entry

63. *SoftBank*. On November 15, 2012, SoftBank Corp. and Sprint Nextel filed an application with the Commission seeking consent for SoftBank to acquire approximately 70 percent of Sprint Nextel and invest over $20 billion in Sprint.[195] The Applicants state that the proposed transaction will benefit consumers by promoting greater wireless competition and broadband innovation and deployment. The Applicants seek Commission consent to the transfer of control of various wireless licenses and leases, domestic section 214 authority, international section 214 authorizations, earth station authorizations, interests in submarine cable licenses, and cable television relay service station licenses held by Sprint and its subsidiaries, and by Clearwire, to SoftBank. The Commission is currently reviewing this proposed transaction.[196]

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[191] See, e.g., *Horizontal Merger Guidelines,* Section 5.3 (stating, "By contrast, even a highly concentrated market can be very competitive if market shares fluctuate substantially over short periods of time in response to changes in competitive offerings.")

[192] The *Report* does not provide an estimate of market power for the mobile wireless industry, *i.e.*, a numerical estimate of price mark-up over cost, due to the complexities of estimating market power in an industry with high fixed costs that are recovered gradually over time, difficulties with analyzing pricing plans for bundles of services, and the difficulties in obtaining accurate and suitable cost data. The *Report* does discuss mobile wireless services price and price margins. *See* Section IV.A, Price Rivalry: Developments in Mobile Service Pricing Plans, *infra.*

[193] We note that acquisition of spectrum, in itself, is not necessarily a good predictor of timely entry into a market. For a discussion of the discrepancy between the spectrum license coverage of some facilities-based providers and their network coverage, *see* Section VII.A.1, Infrastructure Facilities, *infra*.

[194] Malcolm B. Coate, *Theory Meets Practice: Barriers to Entry in Merger Analysis*, Review of Law and Economics, vol. 4, Feb. 2008, at 190, 206. Data and information about the stages a firm has completed in the entry process can provide valuable information for estimating the timeframe during which entry will be completed. Analysis of when entry will occur can be likened to a "pipeline" that is marked by increasing financial commitments and the completion of the various stages.

[195] *See* Applications of Sprint Nextel Corporation, Transferor, and SoftBank Corp., and Starburst II, Inc., Transferees, for Consent to Transfer of Control of Licenses and Authorizations, Public Interest Statement, IB Docket No. 12-343.

[196] *See* "Softbank and Sprint Seek FCC Consent to the Transfer Of Control of Various Licenses, Leases, and Authorizations From Sprint to Softbank, and to the Grant of a Declaratory Ruling Under Section 310(B)(4) of the Communications Act." IB Docket No. 12-343, Public Notice, DA 12-1924 (rel. Nov. 30, 2012).

64. SoftBank is a publicly traded holding company organized and existing under the laws of Japan. SoftBank and its subsidiaries are engaged in various information technology and Internet-related businesses in Japan, including mobile communications, broadband infrastructure, fixed-line telecommunications, e-commerce, and web portals. SoftBank also invests in Internet-based companies throughout the world.[197] At present, SoftBank does not offer wireless services in the U.S.

65. *Atlantic Tele-Network (ATN)*. ATN acquired 26 of the divestiture markets from the Verizon- Alltel transaction, which was consummated in April 2010. Through this acquisition, ATN became a new retail entrant that replaced certain existing Alltel operators that the Commission required be divested by Verizon. ATN offers wireless voice and data services to retail customers under the 'Alltel' name in rural markets located principally in the Southeast and Midwest. Through another affiliate, Commnet, ATN continues to offer wholesale wireless voice and data roaming services to national, regional and local wireless carriers in rural markets located principally in the Southwest and Midwest U.S. As of December 31, 2011, ATN had approximately 582,000 wireless subscribers with a network footprint covering approximately 4.5 million POPs, making it the tenth largest facilities-based provider in terms of connections.[198]

66. *Entry of Existing Service Providers Into New Geographic Markets*. The entry of existing facilities-based providers into new geographic markets is an important form of entry when competition is evaluated at a sub-national or regional market level.[199] The metrics presented above on the estimated population covered by the networks of the major providers and the estimated percentage of the population covered by a certain number of providers can indicate network expansion by providers into new geographic markets.[200] The year-to-year change in the population covered by a provider's network can estimate the degree to which a provider increased its population coverage by entering new geographic markets. We note, however, that an increase in population coverage can also be partly attributed to an increase in population in already-served markets. In addition, Section IV.B.1.a, Service Provider Technology Deployments, discusses provider upgrades of network technologies to newer, faster, and more spectrally-efficient technologies.[201] Investment in new network technologies and network coverage are forms of non-price rivalry in which providers design product offerings and choose quality characteristics to compete with each other for customers.

b. Exit

67. Exit of service providers – whether through mergers, acquisitions, or discontinuance – affects the number of competitors in the mobile wireless market and potentially exerts both negative and positive effects on competitive performance and consumer welfare, depending on details of the pre- and post-exit competitors in the market.[202] The main potential negative effects of the exit of a competitor is that with fewer competitors remaining in the market, there is an increased possibility of higher prices and

[197] *See* "Softbank and Sprint Seek FCC Consent to the Transfer Of Control of Various Licenses, Leases, and Authorizations From Sprint to Softbank, and to the Grant of a Declaratory Ruling Under Section 310(B)(4) of the Communications Act." IB Docket No. 12-343, Public Notice, DA 12-1924 (rel. Nov. 30, 2012).

[198] *See* Atlantic Tele-Network, SEC Form 10-K, filed March 15, 2012, at 4.

[199] For example, the *Twelfth Report* discusses how, following the acquisition of new spectrum holdings in 2006, T-Mobile, Leap, and MetroPCS entered new markets. *See Twelfth Report*, 23 FCC Rcd at 2265 ¶ 75. *See also* Cellular South, *About Us*, https://www.cellularsouth.com/aboutus/index.html (visited Jan. 4, 2010) (stating that, since 2006, Cellular South has significantly increased the size of its regional coverage).

[200] *See* Section III.B.1, Facilities-Based Providers, Tables 1-2; Section III.C, Mobile Wireless Network Coverage, Tables 6-7, *supra*; Appendix C, Maps.

[201] *See* Section IV.B.1, Network Coverage and Technology Upgrades, *infra.*

[202] Spectrum transfers (*i.e.*, the assignment of licenses from one firm to another) are discussed further in Section VII.A.1, Non-Spectrum Input Segments, *infra*.

sometimes reduced quality of service or a slower rate of innovation. The main potential positive effects of the exit of a competitor occur in the context of a merger or acquisition that creates a stronger post-merger entity due to cost efficiencies or greater network coverage.[203]

68. *Mergers and Acquisitions*. Since mergers and acquisitions can simultaneously exhibit both these positive and negative effects, merger analysis typically involves a detailed analysis to evaluate the magnitude of the opposing effects and determine whether, on balance, the effects of the merger are positive or negative. If the cost savings generated by consolidation endow the merged provider with the ability to compete more effectively, consolidation could result in lower prices and new and innovative services for consumers.[204] However, if the consolidation substantially decreases competition, there may be reduced competitive pressure on the firm, potentially leading to higher consumer prices and/or lower incentive to improve its consumer services.[205] Service providers in non-overlapping geographic markets are not considered competitors for present purposes.

69. Facilities-based providers have expanded their network coverage and capacity through mergers and acquisitions, as well as through increased investment and expansion of their existing assets. Over the years, the four current nationwide facilities-based providers have all employed mergers or acquisitions as a growth strategy to realize nationwide networks.[206] A summary of significant mergers or acquisitions since 2005 involving a nationwide facilities-based provider and the exit of another facilities-based provider appears in Table 15 below.[207] This table indicates the extent to which each of the four nationwide facilities-based providers has used mergers or acquisitions to expand coverage since 2005. In many instances, the entities that were combined had not previously competed in the same geographic market. As a result, these transactions resulted in the expansion of the coverage of the newly combined entity. In markets where the entities were significant competitors, the Commission may have required divestitures in specified markets as conditions of the transaction in order to prevent competitive harm.[208] Below we summarize these transactions and report on the status of divestitures that were required in some recent transactions.[209]

Table 15
Selected Mergers and Acquisitions, 2005-2010

Year of Commission Approval	Merger or Acquisition
2005	Sprint/Nextel Alltel/Western Wireless
2006	Altell/Midwest
2007	AT&T/Dobson
2008	AT&T/Aloha T-Mobile/Suncom

[203] *See Competition Policy*, at 238. *See also* Daniel Birke and G. M. Peter Swann, *Network Effects and the Choice of Mobile Phone Operator*, Journal of Evolutionary Economics, 2006, 16: 65 – 84.

[204] *See* Baker, J. B., *Developments in Antitrust Economics*, Journal of Economic Perspectives, 1999, 13: 1, 182.

[205] *See Economics of Regulation and Antitrust*, at 126.

[206] *See* Section III.B.1, Facilities-Based Providers, *supra*, for a discussion of the term "nationwide."

[207] The Commission must consent to the transfer of control or assignment of all non pro-forma spectrum licenses used to provide wireless telecommunications services. 47 C.F.R. § 1.948.

[208] *See, e.g., AT&T-Centennial Order*, 24 FCC Rcd 13915.

[209] In addition, in December 2010, AT&T announced its intention to acquire Qualcomm's licenses in the Lower 700 MHz band, which cover more than 300 million people, for $1.925 billion. Specifically, the Commission approved the assignment of 11 licenses in the D and E Block of the Lower 700 MHz band from Qualcomm to AT&T, subject to certain conditions. Application of AT&T Inc. and Qualcomm Incorporated for Consent to Assign Licenses and Authorizations, WT Docket No. 11-18, *Order*, 26 FCC Rcd 17589, 17591 ¶ 5 (2011) (*AT&T-Qualcomm Order*).

	Verizon Wireless/Rural Cellular Verizon Wireless/Alltel Sprint Nextel/Clearwire
2009	AT&T/Centennial
2010	AT&T/Verizon Wireless-Alltel ATN/Verizon Wireless-Alltel

70. *AT&T's Applications for Transfer of Control of T-Mobile USA.* On March 20, 2011, AT&T announced an agreement with Deutsche Telekom (DT) for AT&T to acquire all of the stock of T-Mobile USA for $39 billion. On April 21, 2011, AT&T and DT filed a series of applications seeking the Commission's consent to the transfer of control of the licenses and authorizations held by T-Mobile USA and its wholly-owned and controlled subsidiaries from DT to AT&T. On November 29, 2011, the Wireless Telecommunications Bureau granted the Applicants' request to withdraw the applications and the Commission released a Staff Report on the applications stating that the proposed acquisition raised serious competitive concerns.[210] On December 19, 2011, DT announced that AT&T and DT had terminated the agreement they announced on March 20, 2011. As a result of a break-up provision in the terminated agreement between AT&T and DT, AT&T transferred $3 billion to DT and assigned 20 AWS-1 licenses in full and partitioned portions of 27 AWS-1 licenses to T-Mobile.[211]

71. *Cox Communications*. Cox Communications (Cox) invested more than $500 million in spectrum in the AWS-1 and 700 MHz bands and the development of infrastructure in 2006 and 2008.[212] In 2009, Huawei Technologies announced that it had signed a contract with Cox to supply CDMA 1x and EV-DO network infrastructure and equipment for a Cox mobile wireless network,[213] and Cox began market testing its mobile wireless service.[214] However, in May 2011, Cox announced that it would abandon its plans to build its own wireless network,[215] and on November 15, 2011 Cox announced that it would discontinue selling Cox Wireless, its wireless phone service, effective November 16, 2011.[216] Cox

[210] Applications of AT&T Inc. and Deutsche Telekom AG for Consent to Assign or Transfer Control of Licenses and Authorizations, WT Docket No. 11-65, *Staff Analysis and Findings*, at http://hraunfoss.fcc.gov/edocs_public/attachmatch/DA-11-1955A2.pdf.

[211] Applications of T-Mobile License LLC, AT&T Mobility Spectrum LLC and New Cingular Wireless PCS, LLC For Consent to Assign AWS-1 Licenses, WT Docket No. 12-21, *Order*, 27 FCC Rcd 4124 (2012).

[212] *Cox to Launch Next Generation Bundle with Wireless in 2009*, Press Release, Cox, Oct. 27, 2008. Cox holds the spectrum through the SpectrumCo LLC joint venture, the entity that purchased the AWS spectrum at the Commission's 2006 AWS-1 Auction and originally included three other cable operators. The other operators subsequently left the SpectrumCo venture, and Cox is the only remaining member. Marguerite Reardon, *Cox Wireless Coming in March*, CNET News, Jan. 14, 2010, *available at* http://news.cnet.com/8301-30686_3-10434831-266.html.(visited Dec 12, 2012).

[213] *See Huawei to Provide CDMA Technology for Cox Communications' Wireless Network*, Press Release, Huawei Technologies, Apr. 1, 2009. *See also* Amol Sharma and Sarah Silver, *Huawei Tries to Crack U.S. Market*, Wall Street Journal, Mar. 26, 2009, at B2.

[214] *See* Cox Enterprises, *2009 Annual Report*, http://www.coxenterprises.com/media/35045/cox_09_annual.pdf (visited Oct. 21, 2010). Cox also announced that it conducted LTE trials in Phoenix and San Diego in 2010. *Cox Successfully Demonstrates the Delivery of Voice Calling, High Definition Video Via 4G Wireless Technology*, Press Release, Cox, Jan. 25, 2010, *available at* http://coxenterprises.mediaroom.com/index.php?s=43&item=841 (visited Nov. 30, 2012).

[215] *See* Ed Hansberry, *Cox Abandons 3G Network*, InformationWeek, May 25, 2011, at http://www.informationweek.com/news/mobility/3G/229625643; Alex Sherman, *Cox Communications Stops Building 3G Network, Will Use Sprint's*, Bloomberg, May 24, 2011, at http://www.bloomberg.com/news/2011-05-24/cox-communications-stops-building-3g-network-will-use-sprint-s.html (visited Nov. 30, 2012).

[216] Cox Communications, Press Release, *Cox Communications to Discontinue Cox Wireless Service, Effective March 30, 2012*, November 15, 2011.

stated it would continue providing service for its wireless customers through March 30, 2012.[217] Verizon Wireless and Cox TMI Wireless, LLC filed an application on December 21, 2011 to assign 30 20-megahertz AWS-1 licenses from Cox to Verizon Wireless, which was granted subject to conditions on August 21, 2012.[218]

72. *MetroPCS*. On October 18, 2012, Deutsche Telekom AG, T-Mobile USA, Inc., and MetroPCS filed applications seeking Commission consent to the transfer of control of PCS and AWS-1 licenses and leases, and authorizations, as well as one lower 700 MHz license, held by MetroPCS and by T-Mobile to a newly formed entity that would combine T-Mobile and MetroPCS. The Applicants stated that the proposed transaction would result in Deutsche Telekom and existing MetroPCS shareholders ultimately holding 74 percent and 26 percent ownership interests, respectively, in a newly formed entity that would continue to offer both MetroPCS brand and T-Mobile USA brand services.[219] On March 12, 2013, the Wireless Telecommunications Bureau and the International Bureau jointly approved the proposed transaction.[220]

E. Entry and Exit Conditions

73. Entry and exit conditions are important in helping to understand the degree to which incumbent firms may or may not possess market power, *i.e.* the ability to set prices above marginal cost without attracting entry. Entry and exit occurs in the context of underlying regulatory and market conditions that directly influence the total number of firms that can compete successfully in a market. Such conditions are relevant for determining if actual entry or exit will occur, and *when* actual entry or exit will occur – both of which are important for evaluating how the market structure will evolve in the future. Service provider entry and exit decisions are primarily determined by regulatory entry and exit conditions, the costs of entry, and expected post-entry market profitability.[221]

74. We distinguish between regulatory and non-regulatory entry and exit conditions in order to consider the effects of the Commission's spectrum and infrastructure policies from basic market conditions. Regulatory entry conditions primarily affect access to the inputs necessary to offer mobile wireless services.[222] They include spectrum policy, which affects the spectrum capacity available for mobile wireless services, and tower-siting regulations, which affect whether and how quickly mobile wireless networks can be deployed or expanded. They also include Federal policies for the funding of network deployment and operations, such as the Mobility Fund programs of the Connect America

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[217] Cox Communications, Press Release, *Cox Communications to Discontinue Cox Wireless Service, Effective March 30, 2012*, November 15, 2011.

[218] Application of Cellco Partnership d/b/a Verizon Wireless and Cox TMI Wireless, LLC for Consent to Assign Licenses, File No. 0004996680 (filed Dec. 21, 2011).

[219] *See* FCC, Office of General Counsel, Transaction Team, *T-Mobile/MetroPCS*, WT Docket No. 12-301, http://transition.fcc.gov/transaction/tmobile-metropcs.html (visited Mar. 13, 2013).

[220] *See generally* Applications of Deutsche Telekom AG, T-Mobile USA, Inc. and MetroPCS Communications, Inc. for Consent to Transfer of Control of Licenses and Authorizations, WT Docket No. 12-301, *Memorandum Opinion and Order*, DA 13-384 (WTB and IB rel. Mar. 12, 2013).

[221] High economic profits encourage entry into the market, low economic profits discourage entry, and prolonged negative economic profits induce exit from the market. *See Intermediate Microeconomics*, at 394-395, 503; *Modern Industrial Organization*, at 61, 76. *See also Competition After Unbundling*, at 334.

[222] Regulatory delay can, in turn, lead to entry delay. One example of a regulatory delay would be the clearing of a spectrum band. Economists argue that some operating licenses and other legal restrictions that serve to limit access to the market are barriers to entry, *i.e.*, they create positive economic profits for incumbents which are not bid away by new entry. *See* Jean Tirole, *The Theory of Industrial Organization*, MIT Press, 1988, at 305. *See also* Hal R. Varian, *Intermediate Microeconomics: A Modern Approach*, W. W. Norton and Company, 1999, at 395 (*Intermediate Microeconomics*).

Fund.[223] Non-regulatory or market conditions that influence entry and exit can be summarized by expected post-entry profitability and its associated risk factors, which in turn have several main market determinants that are discussed below.[224] Major costs that may determine the number of providers that can operate in the market or may deter entry include efficiencies of size and scale, permanent asymmetries across service providers' costs, and capital cost requirements.

1. Regulatory Entry and Exit Conditions

75. *Spectrum.* Spectrum bandwidth is a necessary input to the supply of mobile wireless services. If a potential entrant were to attempt to enter the mobile wireless services market, obtaining access to spectrum is crucial. The effective supply of spectrum capacity that is available for mobile wireless service depends on several aspects of spectrum policy, including allocation and licensing policies, as well as interference and technical rules. First, increasing the total supply of spectrum bandwidth that the Commission allocates and licenses to mobile wireless service providers can increase network capacity and reduce the degree of frequency reuse required to achieve a given capacity.[225] Second, interference and technical rules can affect both spectrum access and spectrum efficiency, and, hence, overall network capacity.[226] Therefore, spectrum policies affect the ability of potential entrants to access spectrum and to build out or expand capacity.[227]

76. *Tower and Antenna Siting.* State and local zoning rules for erecting wireless towers or attaching equipment to pre-existing towers and other structures (*e.g.*, rooftops, water tanks, power lines, and utility poles) can affect the deployment of mobile wireless networks. In particular, delays in zoning approvals can lengthen the process of cell site acquisition and deployment, thereby increasing costs for new or existing providers to enter into new markets. The Commission reported that in 2009, of 3,300 pending zoning applications for wireless facilities, over 760 (nearly one quarter) had been pending for more than a year and 180 had been pending for more than three years.[228] In November 2009, the Commission issued a *Declaratory Ruling* that sets time frames for state and local zoning authorities to act on a zoning application – 90 days for collocations and 150 days for all other towers.[229] If a zoning authority does not act within the appropriate time period, and the parties have not agreed to extend the review period, the applicant can file for relief in federal court.[230] Furthermore, the *Declaratory Ruling* reduced regulatory barriers to entry by finding that it is a violation of the Communications Act for a state

[223] *See* Connect America Fund, *Report and Order and Further Notice of Proposed Rulemaking*, released November 11, 2011.

[224] *See Modern Industrial Organization* at 12, 61-62. *See also The Theory of Industrial Organization*, at 34; George S. Ford, *et al*., *Competition After Unbundling: Entry, Industry Structure, and Convergence*, Federal Communications Law Journal, 2007, 59: 2, at 342 (*Competition After Unbundling)*.

[225] *See* Rappaport, T. S., *Wireless Communications: Principles and Practice* (2^{nd} ed.), Prentice Hall, 2002, at 58.

[226] *See* FCC, Spectrum Policy Task Force, Report of the Spectrum Efficiency Working Group, 2002, at 16, (*Spectrum Policy Task Force Report*). A discussion of the Commission's flexible licensing policies and their effects on network deployment can be found in Section IV.B.1, Network Coverage and Technology Upgrades, *infra.*

[227] Further discussion and data on the market for spectrum, recent spectrum auctions, upcoming spectrum auctions, and spectrum policy can be found in Section III.F, Spectrum for Mobile Wireless Services, *infra* and Appendix A, *infra.*

[228] Petition for Declaratory Ruling to Clarify Provisions of Section 332(c)(7)(B) to Ensure Timely Siting Review and to Preempt Under Section 253 State and Local Ordinances that Classify All Wireless Siting Proposals as Requiring a Variance, WT Docket No. 08-165, *Declaratory Ruling*, 24 FCC Rcd 13994, 14005 ¶ 33 (2009), *pet. for recon. denied*, 25 FCC Rcd 11157 (2010), *pet. for review denied sub nom. City of Arlington, Texas v. FCC*, 668 F.3d 229 (5^{th} Cir. 2012); *cert granted* 133 S.Ct. 524 (Oct 5, 2012), oral argument Jan 16, 2013.

[229] *Id*. at 13995 ¶ 4.

[230] *Id*. at 13995 ¶ 4, 14013 ¶ 49.

or local government to deny a wireless service facility-siting application because service is available from another provider.[231] In addition, on February 22, 2012, President Obama signed into law the Middle Class Tax Relief and Job Creation Act of 2012 (Tax Relief Act).[232] Section 6409 of the Tax Relief Act provides that a state or local government may not deny, and shall approve, any request for collocation, removal, or replacement of equipment on a wireless tower or base station that does not substantially change the physical dimensions of the tower or base station.[233] Section 6409 also includes provisions to facilitate access to Federal buildings and other property for wireless facilities.[234] On June 14, 2012, President Obama released an Executive Order to facilitate broadband deployment on Federal buildings, lands, and rights-of-way.[235]

77. In a 2011 *Report and Order and Order on Reconsideration* (Pole Attachment Order), the Commission revised its pole attachment rules to improve the efficiency and reduce the costs of deploying telecommunications networks.[236] In particular, the Pole Attachment Order adopted rule changes to help facilitate deployment on utility poles of Distributed Antenna Systems (DAS) and small cell solutions that are especially useful for providing wireless broadband service.

2. Non-Regulatory Entry and Exit Conditions

78. Non-regulatory entry and exit conditions are market conditions that directly affect a firm's ability to enter into or exit from a market. The major sources of market-determined entry costs that affect the propensity to enter include: (1) the cost of acquiring spectrum licenses or spectrum leases; (2) network coverage costs such as site acquisition and preparation costs, site construction and leasing costs, network equipment costs, backhaul transport costs[237] and other potential interconnection and roaming costs; (3) the costs of offering customers a portfolio of attractive wireless devices; and (4) the costs of marketing and distributing wireless services and devices. On the demand side, population, population density, income, other socioeconomic variables, and macroeconomic conditions affect the service revenue projections of potential entrants. The market-determined entry conditions factor into an entrant's expected post-entry market profitability. Expected post-entry market profitability also depends on market growth projections, market supply and capacity projections, and the intensity of inter-firm rivalry, including the level of price competition and the extent of product differentiation.[238]

79. Market-determined entry conditions, like regulatory entry conditions, can affect both *if* entry will occur and *when* entry will occur. Entry costs, on a per subscriber basis, are significant in the mobile wireless industry, although they are generally lower than in the wireline industry.[239] A high level

[231] *Id.* at 13995-96 ¶ 5.

[232] Middle Class Tax Relief and Job Creation Act of 2012, P.L. 112-96.

[233] *Id.* § 6409(a).

[234] *Id.* § 6409(b), (c).

[235] Accelerating Broadband Infrastructure Deployment, Executive Order 13616, 77 Fed. Reg. 36903 (June 16, 2012).

[236] *See* Implementation of Section 224 of the Act – A National Broadband Plan for Our Future, *Report and Order and Order on Reconsideration*, WC Docket No. 07-245, FCC 11-50, released April 7, 2011.

[237] The backhaul transport link generally refers to the communications link between the cell site radio equipment and the core network.

[238] *See Competition After Unbundling*, at 344. *See also* Andreu Mas-Colell, *et al*., *Microeconomic Theory*, Oxford University Press, 1995, at 383-384, 423. *See also* Park, E and Taylor, R., "Barriers to Entry Analysis of Broadband Multiple Platforms: Comparing the U.S. and South Korea," Paper presented at the Telecommunications Policy Research Conference, 2006.

[239] *See, e.g., Ex Parte* Submission of the United States Department of Justice, GN Docket No. 09-51 (Economic Issues in Broadband Competition, A National Broadband Plan for our Future), at 14; and Jonathan E. Nuechterlein and Philip J. Weiser, *Digital Crossroads, American Telecommunications Policy in the Internet Age*, MIT Press, 2005, at 274.

of network deployment costs (a type of fixed cost [240] of building network capacity) in relation to the number of customers may limit the number of firms that can enter and survive in a market.[241] For example, areas with a low population density tend to have fewer facilities-based competitors (and higher concentration) than areas that have a high population density.[242] For an entrant to survive in the market, the market must be large enough, and profits high enough, for a potential entrant to recoup its network deployment costs over time from service revenues. Costs that delay entry, sometimes referred to as "adjustment costs," are relevant for estimating exactly when entry will occur. [243] One role of competition policy is to estimate how the timing of entry depends on various costs and to determine whether there are any relevant regulatory policy tools that can reduce entry delay.[244] Below, we briefly discuss the major costs of setting up a network and gaining a customer base.

80. *Spectrum*. A potential facilities-based entrant to a wireless service market can obtain spectrum in several ways including purchasing licenses at Commission auctions, purchasing licenses in the secondary market, and leasing spectrum in the secondary market.[245] For instance, in two major spectrum auctions in 2006 and 2008, the average price ranged from $0.53/MHz-POP for the AWS-1 (Advanced Wireless Service) band (1700/2100 MHz band) in Auction 66 to $1.28/MHz-POP for the 700 MHz band in Auction 73.[246] At these prices, aggregating a significant regional spectrum footprint would involve an outlay of hundreds of millions of dollars and a national footprint would require billions of dollars. Additional information about spectrum can be found in Section III.F.

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[240] The fixed costs to produce a range of output are costs that are generally incurred independently of the quantity of output produced within the range. They can be financed in many ways, including over time. *See Intermediate Microeconomics*, at 353.

[241] *See* W. Kip Viscusi, *et al*., *Economics of Regulation and Antitrust* (3rd ed.), MIT Press, 2000, at 150. *See also Competition Policy*, at 51, 76. *See also* Sutton, J., *Sunk Costs and Market Structure*, 1991, MIT Press. *See also Competition After Unbundling*, at 332, 337. For the use of fixed costs to estimate market concentration, *see, e.g., Modern Industrial Organization*, at 41; *Economics of Regulation and Antitrust*, at 150. For the relevance of the size of sunk costs to predict market concentration, *see Competition Policy*, at 76-79; *Competition After Unbundling*, at 337; and Dennis W. Carlton, *Why Barriers to Entry are Barriers to Understanding*, American Economic Review, 2004, 94: 2, at 467. *See also* Written Statement of George S. Ford, Ph.D., Chief Economist, Phoenix Center for Advanced Legal & Economic Public Studies, Before the House of Representatives, Committee on Energy and Commerce, Subcommittee Telecommunications and the Internet, Hearing on "An Examination of Competition in the Wireless Industry," May 7, 2009, at 5, (estimating that three to five nationwide carriers will be able to provide mobile services, including mobile broadband).

[242] *See* Section III.D, Horizontal Concentration, *supra*.

[243] *See* Dennis W. Carlton, *Why Barriers to Entry are Barriers to Understanding*, American Economic Review, 2004, 94: 2, at 468-469. *See also* R. Preston McAfee, *et al*., *What Is a Barrier to Entry?*, American Economic Review, 2004, 94: 2, at 463 (*What is a Barrier to Entry?*).

[244] *See, e.g.*, Dennis W. Carlton, *Why Barriers to Entry are Barriers to Understanding*, American Economic Review, 2004, 94: 2, at 469; Malcolm B. Coate, *Theory Meets Practice: Barriers to Entry in Merger Analysis*, Review of Law and Economics, vol. 4, Feb. 2008, at 190; *What is a Barrier to Entry?*, at 463-465. The difference between an adjustment cost and a barrier to entry (*i.e*. a permanent asymmetry in firms' costs) may, in practice, be a matter of degree, depending on the length of the delay caused by the adjustment cost. *See What is a Barrier to Entry?* at 464 (arguing that economies of scale are not barriers to entry), and 465 (arguing that sunk costs cause firms to delay entry because of their option value).

[245] Spectrum Bridge, Inc. provides an online marketplace for spectrum exchange. Spectrum Bridge Inc.'s online market exchange, SpecEx, can be accessed at http://www.specex.com/Default.aspx (visited Aug. 16, 2012). Its list of available spectrum can be accessed at http://spectrumbridge.com/ProductsServices/specex/VerticalCarriers.aspx (visited Nov. 30, 2012).

[246] This was calculated by dividing the total net auction revenue by spectrum bandwidth and population in the year 2000.

81. *Network Coverage*. To create a customer base, a new facilities-based entrant must provide network coverage that is sufficient to attract new customers, including enticing customers to switch from their existing service providers.[247] Major network deployment costs include cell site acquisition, preparation, engineering, and construction. Network cost studies analyze cost scenarios under diverse sets of assumptions. One network cost study estimates that the total capital cost of deploying a single cell site, on average, can be upwards of $200,000.[248] Regional wireless providers typically have hundreds or thousands of sites and national providers have tens of thousands of sites. A new entrant would therefore need to invest tens or hundreds of millions of dollars in capital expense for a regional network (depending on the size of the regions) and billions of dollars for a national network. We note that roaming on competitors' networks can offer entrants access to greater network coverage while they are deploying their own networks. Service providers, including new entrants to a mobile wireless market that typically deploy their planned networks gradually, may seek access to networks besides their own in order to achieve a competitive level of coverage while their network is being built out. Roaming can increase network coverage by allowing the entrant's customers to have network coverage when they travel outside of the range of the entrant's own network.[249]

82. Entrants often use backhaul provided by other firms, especially if construction of separate backhaul facilities is not cost-justified given the size of the market. Backhaul can be a significant cost for new entrants. Estimates of average monthly costs range from hundreds of dollars (for a T1 line) to $6,000.[250] The costs can vary widely by market and provider, and may affect the ability of entrants to compete successfully. Overall cell site and backhaul costs also depend on the spectrum held by new entrants.[251] For instance, a new entrant with more spectrum bandwidth would be able to reduce its cell site and backhaul costs by deploying fewer cell sites and potentially fewer backhaul transmission lines for a given traffic volume. Additionally, a new entrant utilizing spectrum only in higher frequency bands may need to deploy more infrastructure, including cell sites to cover the same land area and therefore incur higher cell site costs, compared to providers using lower band spectrum. Additional discussions on cell site deployment and backhaul facilities can be found in Section VII.A.

83. *Handsets and Devices.* Mobile handsets and devices are the end points of mobile wireless networks that connect consumers to the networks. They directly affect the quality of a consumer's mobile wireless experience and can factor into a consumer's choice of a wireless provider. Depending on the market strategy of the entrant, its portfolio of handsets and devices may be a significant non-price factor affecting its ability to compete for customers. Although handset manufacturers sell many handset models to any service provider with a compatible network, some handsets and devices may be subject to exclusivity arrangements that restrict their distribution to a single service provider in the United States or they may be designed to function only in spectrum bands held by particular providers.[252]

84. *Marketing and Distribution.* The ability of a potential entrant to compete for customers is also influenced by its expenditures on marketing and the development of its Internet and non-Internet sales and distribution networks. Marketing expenditures help to distribute product information and

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[247] A scale effect can occur when positive network externalities increase with the size of the network, a relationship known as "network effects." *See Competition Policy*, at 82 (stating that greater network coverage, by increasing the pool of network users, increases the quality of the service, and, hence, the benefits consumers derive from the good).

[248] *See* Comments of Mobile Satellite Ventures Subsidiary LLC, WT Docket No. 06-150, Service Rules for the 698-746, 747-762 and 777-792 MHz Bands (filed June 20, 2008), at 49 (*MSV 700 MHz Comments*).

[249] *See* Section V.E.3, Intercarrier Roaming Rates and Revenue, *infra,* for an additional discussion of roaming.

[250] *See* Fourteenth Report, 25 FCC Rcd at 11459 ¶ 64.

[251] *See* Section VII.A.1, Infrastructure Facilities, *infra.*

[252] *See* Sections IV.B.3, Differentiation in Mobile Wireless Handsets/Devices and Applications, *infra*; Section VII.B.1, Mobile Wireless Handsets/Devices and Operating Systems, *infra*.

promote brand recognition. Marketing expenditures are a significant factor of non-price competition in the mobile wireless industry.[253] The size of a provider's sales and distribution networks is one measure of the provider's penetration of the market. An entrant that has an existing customer base for other telecommunication services may expect to have lower expenditures on marketing, sales, and distribution than an entrant that does not have a customer base in potentially complementary telecommunications services that can be marketed in bundles. Marketing and advertising expenditures by mobile wireless service providers are discussed below.[254]

F. Spectrum for Mobile Wireless Services

85. As discussed above, spectrum is a key input for the provision of mobile wireless services, and spectrum policy affects if and when existing providers and potential entrants will be able to build out networks or expand capacity. Because spectrum plays such a significant role in the mobile wireless industry, and because the Commission has primary responsibility for overseeing spectrum availability, allocation, and holdings, this section will highlight the role of spectrum as an entry condition. Other inputs in the mobile wireless industry, including infrastructure and backhaul, are discussed in Section VII below. First, we briefly describe the Commission's allocation and licensing of commercial wireless spectrum that is used for the provision of mobile voice and data services. We then provide an overview of the overall spectrum holdings among different providers. We also discuss the relative advantages of spectrum in different frequency bands for providing broadband service.

1. Availability of Mobile Wireless Services Spectrum

86. Ensuring that sufficient spectrum is available for incumbent licensees, as well as for potential entrants, is critical to promoting competition, investment, and innovation. Incumbent licensees may need additional spectrum to increase their coverage or capacity as they grow their subscriber bases and meet increasing demand, while new entrants need access to spectrum to enter the market and compete with established licensees. A number of commenters discuss their concerns with a lack of spectrum for mobile use, and comment that competition and innovation in the mobile market requires spectrum.[255] Through the years, the Commission has increased the amount of spectrum available for the provision of mobile wireless services. This spectrum has been made available in different frequency bands, in different bandwidths and licensing areas.

87. As noted in the *National Broadband Plan*, making sufficient spectrum available to meet growing spectrum needs is integral to enabling network expansion and technology upgrades by providers.[256] In the absence of sufficient spectrum, network providers must turn to costly alternatives, such as cell splitting, often with diminishing returns.[257] Accordingly, the *National Broadband Plan* recommended that the Commission make 500 megahertz of spectrum newly available for broadband use within ten years, of which 300 megahertz between 225 MHz and 3.7 GHz should be made newly

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[253] *See Barriers to Understanding*, at 467 (Advertising, like investments that raise product quality, is as common a competitive behavior in high-technology industries as price competition is in industries that are characterized by less product innovation). *See also Modern Industrial Organization*, at 80 (If an incumbent has never had any rivals [*i.e.* it is a monopolist] then asymmetries in advertising costs between the incumbent and entrant can constitute a barrier to entry, because the monopolist has never had to bear these costs). However, the wireless telephony/broadband market is not a monopoly, and incumbent providers incur significant advertising costs as a component of their rivalry.

[254] *See* Section IV.B.4, Advertising Marketing, Sales Expenditures, and Retailing, *infra*.

[255] *See* Counsel Tree Comments at 1; CTIA Comments at 66; TechAmerica Comments at 3; WCAI Reply at 4.

[256] *National Broadband Plan*, at 77.

[257] *National Broadband Plan*, at 77.

available for mobile use within five years.[258] Furthermore, on June 28, 2010, the President issued an Executive Memorandum calling for 500 megahertz of new spectrum to be made available for wireless broadband use in the next ten years.[259] Moreover, the wireless industry is undergoing a transformation from an industry providing predominantly voice services to one that is increasingly focused on providing data services, particularly mobile broadband services. Rapid adoption of smartphones and tablet computers, wide-spread use of mobile applications, and deployment of high-speed 3G and 4G technologies are driving more intensive use of mobile networks. In 2012, a single smartphone could generate as much traffic as 50 basic-feature phones, while a tablet could generate as much traffic as 120 basic-feature phones and a single laptop as much traffic as 368 basic-feature phones.[260] The adoption of smartphones alone increased at a 50 percent annual growth rate in 2011, from 27 percent of U.S. mobile subscribers in December 2010 to nearly 42 percent in December 2011.[261] In addition, global mobile data traffic is anticipated to grow thirteen-fold between 2012 and 2017.[262] A study by the Council of Economic Advisors (CEA) found that "the spectrum currently allocated to wireless is not sufficient to handle the projected growth in demand, even with technological improvements allowing for more efficient use of existing spectrum and significant investment in new facilities."[263]

88. In 2010, the Department of Commerce's National Telecommunications and Information Administration (NTIA) released two complementary reports describing efforts to make additional spectrum available for mobile and fixed broadband commercial use: a Ten-Year Plan and Timetable,[264] as well as a Fast Track Evaluation report identifying 115 megahertz of spectrum to be made available

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[258] *National Broadband Plan*, at 75-76. The *National Broadband Plan* contemplates that the 300-megahertz spectrum goal can be met by making the following spectrum available: 20 megahertz of WCS spectrum; 60 megahertz of AWS 2/3 spectrum; the 10 megahertz 700 MHz D Block; 90 megahertz of MSS spectrum; and 120 megahertz of spectrum to be reallocated from the broadcast television bands. *See id.* at 84, Exhibit 5-E.

[259] Memorandum for the Heads of Executive Departments and Agencies, *Unleashing the Wireless Broadband Revolution*, (Presidential Memorandum), rel. June 28, 2010, 75 Fed. Reg. 38387, *available at* http://www.whitehouse.gov/the-press-office/presidential-memorandum-unleashing-wireless-broadband-revolution (visited June 4, 2012). This was further expanded on in the next State of the Union address. *See* "President Obama Details Plan to Win the Future through Expanded Wireless Access," *available at* http://www.whitehouse.gov/the-press-office/2011/02/10/president-obama-details-plan-win-future-through-expanded-wireless-access (visited June 4, 2012).

[260] *See* Cisco White Paper, *Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update*, 2012-2017, at 9, February 6, 2013, *available at* http://www.cisco.com/en/US/solutions/collateral/ns341/ns525/ns537/ns705/ns827/white_paper_c11-520862.pdf .

[261] comScore 2012, *Mobile Future in Focus* (2012), *available at* http://www.comscore.com/Press_Events/Presentations_Whitepapers/2012/2012_Mobile_Future_in_Focus (last visited Oct. 23, 2012). For consumers ages 25-34, eight of ten recent new phone purchases were smartphones. *See* Survey: New U.S. Smartphone Growth by Age and Income, NIELSENWIRE, Feb. 20, 2012, *available at* http://blog.nielsen.com/nielsenwire/online_mobile/survey-new-u-s-smartphone-growth-by-age-and-income/ (last visited Oct. 23, 2012).

[262]*See* Cisco White Paper, *Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update*, 2012-2017, Executive Summary, February 6, 2013, *available at* http://www.cisco.com/en/US/solutions/collateral/ns341/ns525/ns537/ns705/ns827/white_paper_c11-520862.pdf.

[263] Council of Economic Advisors, *The Economic Benefits of New Spectrum for Wireless Broadband at 1* (Feb. 2012), *available at* http://www.whitehouse.gov/sites/default/files/cea_spectrum_report_2-21-2012.pdf (last visited Oct. 23, 2012).

[264] *See* U.S. Department of Commerce, *Plan and Timetable to Make Available 500 Megahertz of Spectrum for Wireless Broadband*, Oct. 2010, *available at* http://www.ntia.doc.gov/reports/2010/TenYearPlan_11152010.pdf (visited Nov. 30, 2012) (*Plan and Timetable to Make Available 500 Megahertz of Spectrum for Wireless Broadband*).

within five years.[265] The Ten-Year Plan and Timetable, developed in collaboration with the Commission and other Federal agencies, identifies over 2,200 megahertz of Federal and non-Federal spectrum that will be evaluated for potential opportunities for wireless broadband use.[266] It also describes the process for evaluating these candidate bands and the steps necessary to make the selected spectrum available for wireless broadband services.[267] In its Fast Track Evaluation report, NTIA examines four spectrum bands for potential reallocation within five years – 1675-1710 MHz, 1755-1780 MHz, 3500-3650 MHz, and 4200-4220/4380-4400 MHz – and recommends that various portions of these bands totaling 115 megahertz be made available for wireless broadband use within five years, contingent upon the allocation of resources for necessary reallocation activities.[268] In a subsequent report released in March 2012, NTIA finds that 95 megahertz of spectrum at 1755-1850 MHz can be repurposed for wireless broadband use, and discusses the importance of spectrum sharing, and suggests that spectrum repurposing rely on a combination of relocating federal users and sharing spectrum between federal agencies and commercial users.[269] The Commerce Spectrum Management Advisory Committee (CSMAC) advises the NTIA on spectrum policy issues and includes spectrum policy experts from within and outside the Federal government. In May 2012, CSMAC was directed to create five working groups to consider ways to facilitate the implementation of commercial wireless broadband in the 1695-1710 MHz and 1755-1850 MHz band and to "enable the NTIA and the FCC to formulate the service rules for the band, including terms of spectrum sharing and required protections."[270] Work in these CSMAC working groups is currently on-going, and it is anticipated that the working groups provide reports to the CSMAC by early 2013.[271]

89. Recent legislation has provisions that will make additional spectrum available for commercial mobile broadband services. On February 22, 2012, President Obama signed the Middle Class Tax Relief and Job Creation Act of 2012 (Spectrum Act) into law. The Spectrum Act addresses public

[265] *See* U.S. Department of Commerce, *An Assessment of the Near-Term Viability of Accommodating Wireless Broadband Systems in the 1675-1710 MHz, 1755-1780 MHz, 3500-3650 MHz, and 4200-4220, 4380-4400 MHz Bands*, Oct. 2010, *available at* http://www.ntia.doc.gov/reports/2010/FastTrackEvaluation_11152010.pdf (visited Nov. 30, 2012).

[266] *See Plan and Timetable to Make Available 500 Megahertz of Spectrum for Wireless Broadband*. Of the 2,200 megahertz of candidate spectrum that the Ten-Year Plan and Timetable identify, 28 percent is allocated exclusively for Federal use at present, 35 percent is allocated exclusively for commercial use, and 37 percent is shared by Federal and commercial users. The 2,200 megahertz includes 280 megahertz of commercial spectrum that the Commission recommended in the *National Broadband Plan* to be made available for mobile broadband use within five years.

[267] *See Plan and Timetable to Make Available 500 Megahertz of Spectrum for Wireless Broadband*.

[268] *See* U.S. Department of Commerce, *An Assessment of the Near-Term Viability of Accommodating Wireless Broadband Systems in the 1675-1710 MHz, 1755-1780 MHz, 3500-3650 MHz, and 4200-4220, 4380-4400 MHz Bands*, Oct. 2010, *available at* http://www.ntia.doc.gov/reports/2010/FastTrackEvaluation_11152010.pdf (visited Nov. 30, 2012).

[269] U.S. Department of Commerce, *An Assessment of the Viability of Accommodating Wireless Broadband in the 1755 – 1850 MHz Band*, March 2012, *available at* http://www.ntia.doc.gov/report/2012/assessment-viability-accommodating-wireless-broadband-1755-1850-mhz-band (visited Nov. 30, 2012) In its Report, NTIA also finds that a number of issues will need to be resolved, including the allocation by NTIA and the Commission of comparable spectrum to accommodate federal operations, consideration of incumbent operations in such comparable spectrum, and the need for any repurposing to promote economic values without loss of critical federal capabilities.

[270] *See* Framework for Work within CSMAC at 1, http://www.ntia.doc.gov/files/ntia/meetings/framework_for_work_within_csmac_20120525.pdf. (visited Dec 12, 2012).

[271] *See id*.

safety communications and electromagnetic spectrum auctions,[272] and grants the Commission the authority to conduct incentive auctions.[273] Section 6403 of the Spectrum Act requires the Commission to conduct a one-time incentive auction of broadcast television spectrum, and sets forth specific requirements for the auction.[274] Section 6403(a)(1) directs the Commission to conduct a "reverse auction" to determine the amount of compensation that each broadcast television licensee would accept for voluntarily relinquishing some or all of its spectrum usage rights for assignment through a system of competitive bidding.[275] The Spectrum Act also indicates that the Commission may "make such reassignments of television channels as the Commission considers appropriate," and "reallocate such portions of such spectrum as the Commission determines are available for reallocation."[276] The Commission has proposed to make the recovered spectrum available for flexible use in fixed and mobile wireless communications services, including mobile broadband.[277] The Commission has stated that repurposing this spectrum will serve to further address this nation's growing demand for wireless broadband services, promote ongoing innovation and investment in mobile communications, and help to ensure that the United States keeps pace with the global wireless revolution.[278] In addition to the provisions on incentive auctions and broadcast television spectrum, the Spectrum Act also requires the Commission to allocate certain spectrum for commercial use and to assign new initial licenses for its use subject to flexible use service rules within three years of enactment.[279] The Spectrum Act takes other steps, including requiring the reallocation of the Upper 700 MHz D block for use by public safety.[280] The Spectrum Act also requires the reallocation of the spectrum in the 470-512 MHz band that is currently used by public safety and requires the Commission to begin a system of competitive bidding to grant new initial licenses for the use of the spectrum.[281]

90. On July 20, 2012, the President's Council of Advisors on Science and Technology (PCAST) released a report [282] recommending that the U.S. government share underutilized spectrum to the maximum extent consistent with the Federal mission, and identify 1,000 MHz of Federal spectrum in which to implement shared-use spectrum pilot projects.[283] The PCAST report also recommended

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[272] *See* Middle Class Tax Relief and Job Creation Act of 2012, Pub. L. No. 112-96, §§ 6001-6703, 125 Stat. 156 (2012) (Spectrum Act).

[273] 47 U.S.C. § 309(j)(8)(G); Spectrum Act at § 6402.

[274] *See* Spectrum Act at § 6403. Section 6402 of the Spectrum Act, codified at 47 U.S.C. 307(J)(8)(G)(i) authorizes the Commission to conduct incentive auctions in which a licensee may voluntarily relinquish its spectrum usage rights in order to permit the assignment by auction of new initial licenses subject to flexible-use service rules, in exchange for a portion of the resulting auction proceeds.

[275] *See* Spectrum Act at § 6403(a)(1).

[276] *See* Spectrum Act at § 6403(b)(1).

[277] *See* Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions, GN Docket No. 12-268, *Notice of Proposed Rulemaking*, FCC 12-118, (adopted Sept. 28, 2012) (*Incentive Auctions NPRM*).

[278] *Id*.

[279] *See* Spectrum Act at § 6401(b). These are the frequencies between 1915-1920 MHz, 1995-2000 MHz, and 2155-2180 MHz. Also included in this requirement is 15 megahertz of spectrum identified by NTIA between 1675-1710 MHz, and 15 megahertz of contiguous spectrum to be identified by the Commission. *Id*.

[280] *See* Spectrum Act at § 6101(a).

[281] *Id.* at § 6103(a). The Commission must reallocate this spectrum within 9 years of enactment and relocate users within 2 years after spectrum is competitively bid. *Id.* at § 6103(a), (c).

[282] Executive Office of the President, *Realizing the Full Potential of Government-Held Spectrum to Spur Economic Growth*, (July 20, 2012) (PCAST Report), *available at* http://www.whitehouse.gov/administration/eop/ostp/pcast/docsreports (visited Oct. 16, 2012).

[283] *See* PCAST Report, at 1.

modifying FCC rules to allow "general authorized access" devices to operate in the 3550-3650 MHz (radar) band and another to be determined by NTIA and the FCC.[284]

91. Wireless operators today primarily use licenses that fall in frequencies between 698 MHz and 2.7 GHz for the provision of mobile voice and broadband services. Among the bands used, or with the potential to be used, are Cellular (in the 850 MHz band), SMR (in the 800/900 MHz band), broadband PCS (in the 1.9 GHz band), BRS and EBS in the 2.5 GHz band, AWS in the 1.7/2.1 GHz band (and potentially other bands), the 700 MHz band, and WCS in the 2.3 GHz band. By examining the history of the available frequency bands and associated service rules, it is possible to trace the growth of the mobile wireless industry and the introduction of new competition in the mobile wireless marketplace.[285]

a. Frequency Bands

92. *Cellular.* The Commission began licensing Cellular spectrum in 1982, eventually making a total of 50 megahertz available. The band was divided into two blocks, licensed by Cellular Market Area (CMA). At the time of initial licensing, one of the two Cellular channel blocks in each market was awarded to a local incumbent wireline carrier, while the other block was awarded to another entity in order to promote competition.[286] The Commission completed licensing the majority of Cellular operators in 1991. Cellular licensees provided the first widely-used mobile services,[287] and providers have since been using Cellular spectrum to deploy mobile voice and broadband services using technologies on the CDMA and GSM migration paths.

93. *SMR*. The Commission established SMR in 1979 to provide for land mobile communications on a commercial basis.[288] While it initially licensed SMR spectrum in non-contiguous bands, on a site-by-site basis, the Commission has since licensed additional SMR spectrum on an EA basis through the auction process. [289] Although the primary use for SMR traditionally was dispatch services,[290] providers such as Nextel acquired significant amounts of SMR spectrum and were successful in launching mobile voice services in the 800 and 900 MHz bands in the 1990s, competing with licensees using Cellular spectrum in the provision of mobile voice services.[291] As discussed in previous reports, for

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[284] *See* PCAST Report, at 82.

[285] A more detailed description of spectrum available for mobile wireless service is provided in Appendix A. Also, *see* Section III.B.3 Narrowband Data Providers, *supra*; *Narrowband Personal Communications Service*, FCC Encyclopedia, http://www.fcc.gov/encyclopedia/narrowband-personal-communications-service-pcs (visited September 19, 2012). There are other bands that can be used to provide CMRS, including 1670-1675 MHz and 901-902 MHz (narrowband PCS). Appendix A also includes a discussion of the 3650-3700 MHz band, which can be used to provide wireless broadband service (although not fully mobile service).

[286] Inquiry Into the Use of the Bands 825-845 MHz and 870-890 MHz for Cellular Communications Systems; and Amendment of Parts 2 and 22 of the Commission's Rules Relative to Cellular Communications Systems, CC Docket No. 79-318, *Report and Order*, 86 FCC 2d 469, 488-92 ¶¶ 38-43 (1981).

[287] *See Third Report*, 13 FCC Rcd at 19749, 19779, pp. 3, 29.

[288] *See* Federal Communications Commission Wireless Telecommunications Bureau Staff Paper, *Private Land Mobile Radio Services: Background*, December 18, 1996 at D-6, available at *http://wireless.fcc.gov/index.htm?job=reports*.

[289] The "900 MHz" SMR band refers to spectrum allocated in the 896-901 and 935-940 MHz bands; the "800 MHz" band refers to spectrum allocated in the 806-824 and 851-869 MHz bands. *See* 47 C.F.R. § 90.603; 47 C.F.R. § 90.7 (defining "specialized mobile radio system"); *see also* Auctions 16, 34, 36 and 43 in FCC Auctions Home, *Auctions*, http://wireless.fcc.gov/auctions/default.htm?job=auctions_home (visited Aug. 23, 2012).

[290] Dispatch services allow two-way, real-time, voice communications between fixed units and mobile units (*e.g.*, between a taxicab dispatch office and a taxi) or between two or more mobile units (*e.g.*, between a car and a truck). See *Fifth Report*, 15 FCC Rcd at 17727-28, for a detailed discussion.

[291] Nextel and Sprint combined their spectrum holdings in a merger completed in 2005, becoming Sprint Nextel Corporation. *See* http://www.sprint.com/companyinfo/history/ (visited Oct. 27, 2010).

many years, SMR providers offered mobile wireless services using iDEN-based technologies.[292] However, Sprint, the largest SMR licensee, has announced that it is in the process of repurposing its 800 MHz SMR spectrum for CDMA-based technology and that it will shut down its iDEN network as early as June 30, 2013.[293] In May of 2012 the Commission adopted a Report and Order that amends its rules to allow geographically-based SMR licensees to operate across contiguous channels without rigid channel spacing requirement or bandwidth limitation.[294] This change enables SMR licensees to fully and more efficiently utilize their licensed spectrum and transition their networks from legacy 2G technologies to 3G as well as other advanced technologies such as LTE.[295]

94. *Broadband PCS.* Between 1995 and 1999, the Commission auctioned 120 megahertz of Broadband PCS spectrum, using different bandwidths and licensing areas, in the 1850-1910 MHz and 1930-1990 MHz bands.[296] Licensees of this newly-available spectrum deployed digital technologies that were more efficient and offered improved service quality over the existing analog technologies deployed in the Cellular bands at the time. These deployments by new entrants facilitated the growth and development of a more competitive mobile wireless marketplace. By 1998, 87 percent of the U.S. population (by Basic Trading Area) was covered by three or more mobile wireless providers, and 54 percent by five or more providers.[297] During this time period, the Broadband PCS band was the primary spectrum available to new entrants that could provide competition to the cellular incumbents. With that increased competition came increased innovation: broadband PCS service providers offered new pricing plans, introduced smaller handsets with increased functionality, and facilitated mass market acceptance of mobile wireless service. Cumulative investment in the industry more than tripled from $19 billion to over $70 billion from 1994 to 2000,[298] and the number of cell sites more than quadrupled, from 18,000 to over 80,000.[299] Subsequently, the Commission assigned an additional 10 megahertz at 1910-1915 MHz and 1990-1995 MHz to Sprint as part of the 800 MHz Band Reconfiguration agreement.[300]

95. *BRS and EBS.* In 2004, the Commission adopted revisions to the rules and band plan governing the BRS and EBS spectrum in the 2.5 GHz band that better facilitated the use of this spectrum – 73.5 megahertz of BRS and 112.5 megahertz of EBS – for mobile and fixed broadband services.[301]

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[292] *See Ninth Report*, 19 FCC Rcd at 20597 ¶ 78.

[293] *See* Section IV.B.1 Network Coverage and Technology Upgrades, *infra*; *Sprint to Cease Service on its iDEN Network as Early as June 30, 2013*, News Release, Sprint Newsroom, May 29, 2012, *available at* http://newsroom.sprint.com/article_display.cfm?article_id=2296&ECID=vanity:nextelnetwork (visited Sep. 17, 2012).

[294] *See* Improving Spectrum Efficiency Through Flexible Channel Spacing and Bandwidth Utilization for Economic Area-based 800 MHz Specialized Mobile Radio Licensees, WT Docket No. 12-64 *Report and* Order, 12 FCC Rcd.1225. FCC 12-55**,** Rel. May 24, 2012 (WTB).

[295] *Id*. at ¶ 5.

[296] *See* Auctions 4, 5, 10, 11, 22, 35, 58, 71 and 78 in FCC Auctions Home, *Auctions*, http://wireless.fcc.gov/auctions/default.htm?job=auctions_home (visited Aug. 23, 2012).

[297] *See Third Report*, 13 FCC Rcd at 19768, Table 3A.

[298] *CTIA Year-End 2008 Wireless Indices Report*, at 126.

[299] *CTIA Year-End 2008 Wireless Indices Report*, at 150.

[300] *See* Improving Public Safety Communications in the 800 MHz Band, *Report and Order, Fifth Report and Order, Fourth Memorandum Opinion and Order,* 19 FCC Rcd 14969, 15083 (2004).

[301] These totals for BRS and EBS spectrum do not include the 8 megahertz in the J and K guard bands. On October 30, 2009, the Commission completed Auction 86, which offered 78 BRS licenses: 75 licenses covering various Basic Trading Areas (BTAs), including one partial BTA, and 3 licenses covering BRS service areas in the Gulf of Mexico. The Commission completed the auction. *See* "Auction of Broadband Radio Service Licenses Closes; Winning Bidders Announced for Auction 86," *Public Notice*, 24 FCC Rcd 13572 (2009).

Since then, BRS and EBS licensees have been transitioning to the revised band plan, a process that is nearly complete. In 2008, Clearwire began deploying mobile broadband services using this spectrum in various markets across the country.[302] Clearwire currently operates a mobile WiMAX network and plans to overlay certain of its WiMAX sites with TDD LTE technology by June 2013.[303] Several smaller providers, including Xanadoo and Digital Bridge, are, like Clearwire, deploying WiMAX in their 2.5 GHz spectrum holdings.[304]

96. *AWS-1*. In 2006, the Commission auctioned a total of 90 megahertz of AWS-1 spectrum in the 1.7 and 2.1 GHz bands.[305] Since 2008, several licensees have deployed mobile wireless services using AWS spectrum and 3G/4G technologies in markets across the country.[306] T-Mobile has been using its AWS spectrum to offer WCDMA/HSPA+ technologies since 2008 and, in 2012, announced plans to launch an LTE network in 2013 using AWS licenses acquired from AT&T earlier this year.[307] MetroPCS and Leap have launched LTE networks using their AWS licenses in September 2010 and December 2011, respectively.[308] In addition, AT&T launched its LTE network in September 2011, and has stated that it is using both AWS and 700 MHz spectrum for its LTE deployment.[309] AT&T plans to deploy LTE to 80 percent of the U.S. population by the end of 2013.[310] In 2012, Verizon Wireless completed the acquisition of a significant amount of AWS spectrum from Leap, SpectrumCo, and Cox.[311] Verizon Wireless plans to use this spectrum to expand and enhance its existing LTE network, and committed to covering at least 30 percent of the total population in the Economic Areas in which it is acquiring AWS by August 2015 and at least 70 percent by August 2019.[312] T-Mobile acquired significant amounts of AWS spectrum during 2012 in two significant transactions: from AT&T as part of the implementation of the break-up provisions of the AT&T/Deutsche Telekom deal and from Verizon Wireless.

97. *700 MHz*. The auctions of 700 MHz spectrum between 2002 and 2008, combined with the completion of the Digital Television transition in June 2009, made 70 megahertz of spectrum in the 700 MHz Band available for commercial mobile and fixed services, including 58 megahertz of paired spectrum.[313] Certain providers have begun rolling out LTE networks using 700 MHz Band spectrum.

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[302] *See* Section IV.B.1, Network Coverage and Technology Upgrades, *infra.*

[303] *See* Section IV.B.1, Network Coverage and Technology Upgrades, *infra*.

[304] Digital Bridge Communications, *About DBC: Bringing Broadband to Underserved or Rural Communities Nationwide*, http://www.digitalbridgecommunications.com/AboutDBC/tabid/84/Default.aspx (visited Aug. 20, 2012); Xanadoo Company, *About Xanadoo*, http://www.xanadoo.com/about.html (visited Aug. 20, 2012).

[305] *See* Appendix A for a band plan diagram of the AWS bands. Only the AWS-1 spectrum has been auctioned and licensed.

[306] *See* Section IV.B.1, Network Coverage and Technology Upgrades, *infra*.

[307] *See* Section IV.B.1, Network Coverage and Technology Upgrades, *infra*.

[308] *See* Section IV.B.1, Network Coverage and Technology Upgrades, *infra*.

[309] *See* Section IV.B.1, Network Coverage and Technology Upgrades, *infra; Fifteenth Report*, 26 FCC Rcd at 9737 ¶ 110.

[310] *See* Section IV.B.1, Network Coverage and Technology Upgrades, *infra*.

[311] Applications of Cellco Partnership d/b/a Verizon Wireless and SpectrumCo LLC and Cox TMI, LLC For Consent To Assign AWS-1 Licenses, WT Docket No. 12-4, Applications of Verizon Wireless and Leap for Consent To Exchange Lower 700 MHz, AWS-1, and PCS Licenses, ULS File Nos. 0004942973, 0004942992, 0004952444, 0004949596, and 0004949598, Applications of T-Mobile License LLC and Cellco Partnership d/b/a Verizon Wireless for Consent to Assign Licenses, WT Docket 12-175, FCC 12-95 (2012) (*Verizon Wireless-SpectrumCo Order*).

[312] *See Verizon Wireless-SpectrumCo Order*, FCC 12-95, at ¶ 121.

[313] Portions of the Lower 700 MHz band were auctioned in Auctions 44, 49, 60 and 73. *See* Auctions 44, 49, 60 and 73 in FCC Auctions Home, *Auctions*, http://wireless.fcc.gov/auctions/default.htm?job=auctions_home (visited Aug. 23, 2012). Auction 92 in 2011offered licenses that were previously offered but remained unsold or were (continued….)

Verizon Wireless first launched LTE services using its 700 MHz Upper C Block licenses in December 2010 and is leasing portions of this spectrum to wireless service providers in rural areas where it does not intend to build out.[314] AT&T launched its LTE network in September 2011 and has stated that it is using both 700 MHz and AWS spectrum for its LTE deployment.[315] AT&T also has announced plans to use the unpaired 700 MHz Lower D and E block licenses it acquired from Qualcomm in December 2011 as early as 2014 as a supplemental downlink for mobile broadband services.[316] In March 2012, US Cellular launched LTE service using 700 MHz spectrum and plans to expand LTE service to cover approximately 25 million people by year end 2012 and approximately two-thirds of its footprint by 2014.[317] On September 7, 2012, the Public Safety and Homeland Security Bureau (PSHSB) implemented the directives of the Spectrum Act by reallocating the Upper 700 MHz D Block for public safety services, and adopting rules to license the D Block and the existing public safety broadband spectrum in the 700 MHz Band to FirstNet, an independent authority within NTIA, in order to establish "a nationwide, interoperable public safety broadband network."[318]

98. *Wireless Communications Service (WCS).* In May 2010, the Commission adopted final rules for WCS that modified the technical parameters governing the operation of WCS mobile and portable devices in 25 megahertz of spectrum in the 2.3 GHz band.[319] The revised rules were intended to enable WCS licensees to offer mobile broadband services, while limiting the potential for harmful interference to incumbent Satellite Digital Audio Radio Service licensees operating in adjacent bands.[320] In 2012 the Commission issued an Order on Reconsideration that adopted flexible technical and operating rules to enable LTE mobile broadband deployment in 20 megahertz of long-dormant WCS spectrum. In addition, it made an additional 10 megahertz of spectrum available for fixed broadband, with possible future downlink use of the spectrum to serve mobile broadband devices (for a total of 30 megahertz potentially available for mobile broadband). It also provides greater certainty to Sirius XM by requiring WCS licensees to work cooperatively if WCS base or fixed stations cause harmful interference (*i.e.*,

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licenses on which a winning bidder defaulted. *See* Auction of 700 MHz Band Licenses Scheduled for July 19, 2011, Notice and Filing Requirements, Minimum Opening Bids, Upfront Payments, and Other Procedures for Auction 92, *Public Notice*, 26 FCC Rcd 3342 (2011). The Digital Television transition ensured that the 700 MHz spectrum was cleared of broadcast use, and thus made available for commercial mobile services, no later than June 12, 2009. In addition to the 80 megahertz of spectrum included in Table 16, 4 megahertz of 700 MHz spectrum serve as Guard Bands. The *Spectrum Act* requires the reallocation of the Upper 700 MHz D block (10 megahertz) for use by public safety. *See Spectrum Act* at § 6101(a).

[314] *See* Section IV.B.1, Network Coverage and Technology Upgrades, *infra.*

[315] *See* Section IV.B.1, Network Coverage and Technology Upgrades, *infra; Fifteenth Report*, 26 FCC Rcd at 9824 ¶ 274.

[316] Application of AT&T Inc and Qualcomm Incorporated for Consent to Assign Licenses and Authorizations, WT Docket No. 11-18, *Order*, 26 FCC Rcd 17589, 17625 ¶ 89 (2011) (*AT&T-Qualcomm Order*).

[317] *See* Section IV.B.1, Network Coverage and Technology Upgrades, *supra*; Stephen Lawson, *U.S. Cellular Throws Its 4G LTE Hat in the Ring*, ComputerWorld, Mar. 22, 2012, at http://www.computerworld.com/s/article/9225498/U.S._Cellular_throws_its_4G_LTE_hat_in_the_ring. (visited Nov. 19, 2012).

[318] Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993, PS Docket No. 12-94, DA 12-1462, Report and Order (PSHSB, adopted September 7, 2012).

[319] *See* Amendment of Part 27 of the Commission's Rules to Govern the Operation of Wireless Communications Services in the 2.3 GHz Band, WT Docket No. 07-293, *Report and Order*, 25 FCC Rcd 11710 (2010). The WCS band has a total of 30 MHz spectrum at 2305-2320 MHz and 2345-2360 MHz. *Id.* However, WCS mobile and portable devices are not permitted to operate in the 2.5-megahertz portions of the WCS C and D blocks closest to the SDARS band (*i.e.*, 2317.5-2320 and 2345-2347.5 MHz). *Id.*

[320] *See* Amendment of Part 27 of the Commission's Rules to Govern the Operation of Wireless Communications Services in the 2.3 GHz Band, WT Docket No. 07-293, *Report and Order*, 25 FCC Rcd 11710 (2010).

muting) to SDARS receivers on roadways, resolving longstanding interference concerns between the WCS and SDARS.[321]

99. *AWS-4.* In March 2012, the Commission proposed service and licensing rules for the provision of terrestrial mobile broadband service in the 40 megahertz of spectrum in the 2000-2020 MHz and 2180-2200 MHz bands, currently assigned to the Mobile Satellite Service and known as "AWS-4."[322] As described in more detail below, in December of 2012, the Commission adopted service and licensing rules that generally follow the Commission's Part 27 flexible use rules, modified as necessary to account for issues unique to the AWS-4 band.[323] This action carries out a recommendation in the *National Broadband Plan* that the Commission enable the provision of stand-alone terrestrial services in this spectrum.[324]

100. *Other Spectrum Bands.* Other spectrum bands that may later be used for the provision of mobile voice or broadband services include spectrum in the 1.4 GHz band (1392-1395 MHz and 1432-1435 MHz), and the 1670-1675 MHz band as well as certain MSS spectrum bands. As noted previously, the Spectrum Act requires that the Administration, within three years, begin the process of withdrawing or modifying the assignment to Federal stations of 15 megahertz between 1675 and 1710 MHz identified for reallocation from Federal use to non-Federal use. In addition, the Spectrum Act requires the Commission to allocate this spectrum for commercial use and assign new initial licenses within three years of enactment (February 2015), along with 1915-1920 MHz, 1995-2000 MHz, 2155-2180 MHz, and an additional 15 megahertz of continuous spectrum that it must identify. The Commission has taken several steps to accelerate terrestrial broadband deployment in MSS bands For example, in April 2011, the Commission adopted a Report and Order applying certain spectrum leasing policies to MSS/ATC leasing arrangements and adding co-primary mobile and fixed allocations in the 2 GHz MSS band. As discussed above, on March 21, 2012, the Commission proposed rules for AWS-4 to enable the provision of terrestrial mobile broadband service in the 2 GHz band at 2000-2020 MHz and 2180-2200 MHz. The *AWS-4 NPRM* also proposed eliminating the ATC rules for the 2 GHz band.[325] In December of 2012, the Commission eliminated the ATC rules for the 2 GHz band, granted terrestrial authority to the existing MSS licensee, and established terrestrial service, technical, and licensing rules that generally follow the Commission's Part 27 flexible use rules, modified as necessary to account for issues unique to the AWS-4 band.[326] Further, on December 12, 2012, the Commission adopted a Notice of Proposed Rulemaking

[321] *See* Amendment of Part 27 of the Commission's Rules to Govern the Operation of Wireless Communications Services in the 2.3 GHz Band, WT Docket No. 07-293, Establishment of Rules and Policies for the Digital Audio Radio Satellite Service in the 2310-2360 MHz Frequency Band, IB Docket No. 95-91*Order on Reconsideration,* 12FCC Rcd. 5754 (2012).

[322] Service Rules for Advanced Wireless Services in the 2000-2020 MHz and 2180-2200 MHz Bands, WT Docket No. 12-70, Fixed and Mobile Services in the Mobile Satellite Service Bands at 1525-1559 MHz and 1626.5-1660.5 MHz, 1610-1626.5 MHz and 2483.5-2500 MHz, and 2000-2020 MHz and 2180-2200 MHz, ET Docket No. 10-142, Service Rules for Advanced Wireless Services in the 1915-1920 MHz, 1995-2000 MHz, 2020-2025 MHz and 2175-2180 MHz Bands, WT Docket No. 04-356, *Notice of Proposed Rulemaking and Notice of Inquiry*, 27 FCC Rcd 3561 (2012) (*AWS-4 NPRM*).

[323] *See* Service Rules for Advanced Wireless Services in the 2000-2020 MHz and 2180-2200 MHz Bands, WT Docket No. 12-70, Fixed and Mobile Services in the Mobile Satellite Service Bands at 1525-1559 MHz and 1626.5-1660.5 MHz, 1610-1626.5 MHz and 2483.5-2500 MHz, and 2000-2020 MHz and 2180-2200 MHz, ET Docket No. 10-142, Service Rules for Advanced Wireless Services in the 1915-1920 MHz, 1995-2000 MHz, 2020-2025 MHz and 2175-2180 MHz Bands, WT Docket No. 04-356, *Report and Order and Order of Proposed Modification,* FCC 12-151 (rel. Dec. 17, 2012) *(AWS-4 NPRM).*

[324] *See National Broadband Plan,* Recommendation 5.8.4 at 87-88.

[325] *AWS-4 NPRM* at ¶ 136.

[326] *See* Service Rules for Advanced Wireless Services in the 2000-2020 MHz and 2180-2200 MHz Bands, WT Docket No. 12-70, Fixed and Mobile Services in the Mobile Satellite Service Bands at 1525-1559 MHz and 1626.5-
(continued….)

that seeks comment on creating a new Citizens Broadband Service, which would make 100 megahertz of spectrum available for mobile broadband service in the 3550-3650 MHz Band according to rules that would leverage the benefits of small cell technologies to facilitate spectrum sharing with incumbent federal and commercial users. And, as recommended in the PCAST Report, the Commission proposes to use a spectrum access system to manage shared access to the band and protect incumbent users. In addition, as discussed in the Fifteenth Report, LightSquared had planned to use MSS/ATC authority associated with its L-band MSS licenses to offer terrestrial LTE service and satellite connectivity on a wholesale basis to other wireless providers. However, on February 15, 2012, the Commission's International Bureau proposed to vacate the conditional waiver previously granted to LightSquared and to modify LightSquared's satellite license "to suspend indefinitely LightSquared's underlying ATC authorization" out of concerns that its network would interfere with GPS services. More recently, LightSquared has requested that the Commission take additional actions that would allow LightSquared to proceed with revised plans to provide terrestrially-based services using L-band spectrum.[327]

b. Facilitating Access to Spectrum Among Multiple Providers

101. In addition to increasing the availability of commercial mobile wireless spectrum, the Commission has had different policies related to the service and technical rules, licensing and assignment, and aggregation of spectrum, all of which have affected market entry. We discuss here several prominent Commission policies that have affected spectrum holdings over the past two decades.

102. *Flexible Use Policies.* Initially, the Commission's rules restricted the use of Cellular spectrum to analog service. More recently, the Commission has adopted a general policy of providing licensees with significant flexibility to decide which services to offer and what technologies to deploy on spectrum used for the provision of mobile wireless services. For example, licensees have the flexibility to deploy next-generation wireless technologies that allow them to offer high-speed mobile data services using their existing spectrum.[328]

103. *Mobile Spectrum Holdings.* The Commission has adopted different policies through the years with regard to policies regarding mobile spectrum holdings. As mentioned above, when first licensing 50 megahertz of Cellular spectrum, the Commission required that two different Cellular licensees serve each local market in order to promote competition between mobile telephony providers. In 1994, as the Commission prepared to make an additional 120 megahertz of spectrum available through broadband PCS auctions, it adopted a CMRS spectrum cap.[329] Under these CMRS spectrum limits, which were modified in 1999, no entity could control more than 45 megahertz out of 180 megahertz of

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1660.5 MHz, 1610-1626.5 MHz and 2483.5-2500 MHz, and 2000-2020 MHz and 2180-2200 MHz, ET Docket No. 10-142, Service Rules for Advanced Wireless Services in the 1915-1920 MHz, 1995-2000 MHz, 2020-2025 MHz and 2175-2180 MHz Bands, WT Docket No. 04-356, *Report and Order and Order of Proposed Modification*, FCC 12-151 (rel. Dec. 17, 2012)*(AWS-4 NPRM).*

[327] *See* Modification Application of LightSquared Subsidiary LLC, IBFS File Nos. SAT-MOD-20120928-00160, -00161, SES-MOD-20121001-00872 (filed Sept. 28, 2012 and Oct. 1, 2012 with identical narrative text).

[328] For licensees of PCS, *see* 47 C.F.R § 24.3.

[329] Implementation of Sections 3(n) and 332 of the Communications Act, *Third Report and Order*, 9 FCC Rcd 7988, 7999, 8100-8110 ¶¶ 16, 238-265 (1994) (*CMRS Third Report and Order*). In adopting spectrum aggregation limits, the Commission was "recognizing the possibility that mobile service licensees might exert undue market power or inhibit market entry by other service providers if permitted to aggregate large amounts of spectrum." *Id.* at 8100 ¶ 239. It stated that if firms were to aggregate sufficient amounts of spectrum, it is possible that they could unilaterally or in combination exclude efficient competitors, reduce the quality of service available to the public, and increase prices to the detriment of consumers. *Id.* at 8104 ¶ 248. *See also* Amendment of the Commission's Rules Regarding Installment Payment Financing for Personal Communication Services (PCS) Licensees, WT Docket No. 97-82, *Sixth Report and Order and Order on Reconsideration*, 15 FCC Rcd. 16266, 16275 ¶ 15 (2000) (adopting auction eligibility restrictions to set aside some PCS licenses for small businesses to ensure that these businesses are provided with opportunities to enter the marketplace).

Cellular, SMR, and broadband PCS spectrum in any given cellular market.[330] In 2003, the Commission moved from a spectrum cap to a case-by-case market review of proposed merger transactions to review potential competitive effects on the marketplace, as well as the acquisition of business units.[331] In 2012, the Commission released a notice of proposed rulemaking to review its policies governing mobile spectrum holdings.[332] The Commission seeks comment on a number of options for evaluating the competitive effects of spectrum holdings, including retaining the current case-by-case approach, adopting bright-line limits, or adopting a hybrid approach that would combine some elements of a bright-line limit with a case-by-case analysis.[333]

104. *Spectrum Screen.* Beginning in 2004, the Commission has used a two-part screen to help identify markets where the acquisition of spectrum provides particular reason for further competitive analysis.[334]The first part of the screen considers changes in market concentration as a result of the transaction and is based on the size of the post-transaction Herfindahl-Hirschman Index (HHI) and the change in the HHI.[335] The second part examines the amount of spectrum that is suitable and available on a market-by-market basis for the provision of mobile telephony/broadband service.[336] For those markets highlighted by one or both steps in the analysis, the Commission routinely conducts detailed, market-by-market reviews to determine whether the transaction would result in an increased likelihood or ability in those markets for the combined entity to behave in an anticompetitive manner. The case-by-case analysis considers variables that are important in predicting the incentives and ability of service providers to successfully reduce competition on price or non-price terms, and transaction-specific public interest

[330] *CMRS Third Report and Order*, 9 FCC Rcd at 8105-8110 ¶¶ 252-265. *See also* 1998 Biennial Regulatory Review, Spectrum Aggregation Limits for Wireless Telecommunications Carriers, WT Docket No. 98-205, *Report and Order*, 15 FCC Rcd 9219, 9254-57 ¶¶ 80-84 (2000). The CMRS spectrum cap only covered services that had spectrum of 5 megahertz or more (thus excluding narrowband CMRS) in order to ensure that providers using the spectrum could compete with one another. *CMRS Third Report and Order*, 9 FCC Rcd at 8105 ¶ 252. The *CMRS Third Report and Order* calculated that PCS, Cellular, and SMR account for approximately 189 megahertz, which included 120 megahertz of broadband PCS spectrum, 50 megahertz of Cellular spectrum, and 19 megahertz of SMR spectrum. 9 FCC Rcd at 8108 ¶ 258. However, under the CMRS spectrum cap rules, no more than 10 megahertz of SMR spectrum could be attributed to any one licensee, making 180 megahertz the total pool of spectrum for the CMRS spectrum cap. *See* 47 C.F.R. § 20.6(b); 2000 Biennial Regulatory Review Spectrum Aggregation Limits for Commercial Mobile Radio Services, *Notice of Proposed Rulemaking*, 16 FCC Rcd 2763, 2764 ¶ 2 (2001); *CMRS Third Report and Order*, 9 FCC Rcd at 8113-14 ¶ 275. In 1999, the Commission raised the CMRS spectrum cap to 55 megahertz in rural market areas (RSAs). Biennial Regulatory Review, Spectrum Aggregation Limits for Wireless Telecommunications Carriers, *Report and Order*, 15 FCC Rcd 9219, 9256-57 (1999).

[331] *Verizon Wireless- SpectrumCo Order*, FCC 12-95, at ¶ 48; *AT&T-Qualcomm Order*, 26 FCC Rcd at 17602 ¶ 31; Applications of AT&T Inc. and Centennial Communications Corp. For Consent to Transfer Control of Licenses, Authorizations, and Spectrum Leasing Arrangements, WT Docket No. 08-246, *Memorandum Opinion and Order*, 24 FCC Rcd 13915, 13938 ¶ 50 (2009)(*AT&T-Centennial Order*); s*ee also* 2000 Biennial Regulatory Review – Spectrum Aggregation Limits for Commercial Mobile Radio Services, WT Docket No. 01-14, *Report and Order*, 16 FCC Rcd 22668, 22693-94 ¶ 50 (2001) (*Second Biennial Review Order*) (stating that case-by-case review gives the Commission flexibility to reach the appropriate decision in each case on the basis of the particular circumstances of that case.

[332] Policies Regarding Mobile Spectrum Holdings, WT Docket No. 12-269, *Notice of Proposed Rulemaking*, FCC 12-119 ¶ 8 (rel. Sept. 28, 2012) (*Mobile Spectrum Holdings NPRM*).

[333] *See Mobile Spectrum Holdings NPRM*, FCC 12-119, at ¶¶ 17-22 (rel. Sept. 28, 2012).

[334] *See, e.g., Verizon Wireless-SpectrumCo Order*, FCC 12-95, at ¶ 48; *AT&T-Qualcomm Order*, 26 FCC Rcd at 17602 ¶ 31; Applications of AT&T Wireless Services, Inc. and Cingular Wireless Corporation For Consent to Transfer Control of Licenses and Authorizations, WT Docket No. 04-70, *Memorandum Opinion and Order*, 19 FCC Rcd 21522, 21552 ¶ 58 (2004) (*Cingular-AT&T Wireless Order*).

[335] *See* Section III.D.2, Hefindahl-Hirschman Index, *supra*.

[336] *See, e.g., Verizon Wireless-SpectrumCo Order*, FCC 12-95, at ¶ 59.

benefits that may mitigate or outweigh any harms arising from the transaction.[337]

105. In 2008, the Commission recognized the evolving nature of mobile services marketplace and therefore expanded the product market to include mobile broadband services.[338] The Commission has determined suitability by whether the spectrum is capable of supporting mobile service given its physical properties and the state of equipment technology, whether the spectrum is licensed with a mobile allocation and corresponding service rules, and whether the spectrum is committed to another use that effectively precludes its uses for the relevant mobile services.[339] With respect to availability, the Commission has considered particular spectrum to be a relevant input if it is fairly certain that it will meet the criteria for suitable spectrum in the near term.[340] The Commission has balanced a number of factors in its market-by-market analysis, considering the totality of the circumstances in each market.[341] The Commission also has considered whether harms in numerous local markets may result in nationwide harms.[342] Since 2004, the Commission has periodically modified its spectrum screen to include additional spectrum – including 700 MHz,[343] AWS-1,[344] BRS,[345] and WCS[346] spectrum– as those bands have been made available for commercial use.[347] The Commission has determined that cellular, PCS,[348] SMR, and 700 MHz band spectrum, as well as AWS-1, WCS, and BRS spectrum, where available, meet the definition.[349] In the recent *Mobile Spectrum Holdings NPRM*, the Commission notes that in several recent transactions, some parties have suggested modifying the spectrum screen to include additional spectrum bands, such as the BRS spectrum not currently included in the screen, EBS, and MSS. In the NPRM, the

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[337] *See Verizon Wireless-Alltel Order*, 23 FCC Rcd at 17460 ¶ 26; *Mobile Spectrum Holdings NPRM,* FCC 12-119.

[338] *See Verizon Wireless-Alltel Order*, 23 FCC Rcd at 17469-70 ¶¶ 45-47.

[339] *See AT&T-Qualcomm Order*, 26 FCC Rcd at 17605-06 ¶ 38; *See, e.g., AT&T-Verizon Wireless Order*, 25 FCC Rcd at 8723-24 ¶ 39; *AT&T-Cingular Order*, 19 FCC Rcd at 21560-61 ¶ 81.

[340] *See AT&T-Qualcomm Order*, 26 FCC Rcd at 17605-06 ¶ 38; *AT&T-Verizon Wireless Order*, 25 FCC Rcd at 8723-24 ¶ 39; *AT&T-Centennial Order*, 24 FCC Rcd at 13935 ¶ 43.

[341] *See, e.g., Verizon Wireless-Alltel Order*, 23 FCC Rcd at 17487-88 ¶ 91.

[342] *See Verizon Wireless-SpectrumCo Order*, FCC 12-95, at ¶ 76.

[343]*See* Applications of AT&T Inc. and Dobson Communications Corporation, WT Docket No. 07-153,*Memorandum Opinion and Order*, 22 FCC Rcd 20295, 20307-08 ¶ 17 (2007)(*AT&T-Dobson Order*).

[344] *See Sprint Nextel Corp. and Clearwire Corp.* Applications for Consent to Transfer Control of Licenses, Leases, and Authorizations, WT Docket No. 08-94, *Memorandum Opinion and Order*, 23 FCC Rcd 17570, 17599 ¶ 72 (2008) (*Sprint Nextel-Clearwire Order*).

[345] Most BRS spectrum is considered available in those markets where the transition of BRS spectrum to the new band plan has been completed. *Sprint Nextel-Clearwire Order*, 23 FCC Rcd at 17598-99 ¶ 70. EBS spectrum, which is licensed to educational institutions and can be leased to commercial operators, is not included in the Commission's spectrum screen when evaluating proposed transactions.

[346] *See* Applications of AT&T Mobility Spectrum LLC, New Cingular Wireless PCS, LLC, Comcast Corporation, Horizon Wi-Com, LLC, NextWave Wireless, Inc., and San Diego Gas & Electric Company, WT Docket No. 12-240, *Memorandum Opinion and Order* (rel. Dec. 18, 2012).

[347] As discussed above, in reviewing proposed merger transactions that involve spectrum aggregation, the Commission examines market participants' holdings of suitable spectrum to ensure that there is sufficient spectrum available to competitors.

[348] The PCS spectrum includes the 10 megahertz of spectrum obtained by Sprint Nextel as part of the 800 megahertz rebanding order. *See Verizon Wireless- SpectrumCo Order*, FCC 12-95, at ¶ 63 n.151.

[349] *See Verizon Wireless- SpectrumCo Order*, FCC 12-95, at ¶ 59; *Sprint Nextel-Clearwire Order*, 23 FCC Rcd at 17591-92 ¶ 53.

Commission seeks comment on whether to modify the screen to include additional bands.[350]

106. The spectrum screen identifies markets for particular focus in its case-by-case analysis to determine the likelihood that the transfer of spectrum may increase competitors' costs to increase capacity or foreclose competitors or potential entrants from expanding capacity, deploying next-generation services, or entering the market.[351] The Commission can condition approval of a transaction on the divestiture of licenses in markets where necessary to find an application serves the public interest.[352] The Commission is not, however, limited in its consideration of potential competitive harms in proposed transactions solely to markets identified by the spectrum screen.[353]

Table 16
Spectrum Attributable in the Spectrum Screen

Spectrum Band	Megahertz
Cellular	50
SMR*	26.5
Broadband PCS**	130
700 MHz***	80
AWS-1****	90
BRS*****	55.5
WCS	20

* Including 19 megahertz of SMR spectrum and 7.5 megahertz of spectrum that is available for SMR as well as other services.[354]
** Includes 10 megahertz of 1910-15/1990-95 MHz spectrum held by Sprint as a result of the 800 MHz Band Reconfiguration.[355]
***Includes 10 megahertz of Upper 700 MHz D Block spectrum.[356]
**** AWS-1 is not attributable in markets where Federal Government users have not been relocated.
***** BRS is not attributable in markets where previous BRS licensees have not been transitioned.[357]

107. In both the 2011 *AT&T-Qualcomm Order* and in the 2012 *Verizon Wireless- SpectrumCo*

[350] *Mobile Spectrum Holdings NPRM*, FCC 12-119, at ¶ 28.

[351] *See Verizon Wireless- SpectrumCo Order*, FCC 12-95, at ¶ 72.

[352] *See, e.g., AT&T-Cingular Order*, 19 FCC Rcd at 21577 ¶140, 21620-21 ¶ 255.

[353] *See Verizon Wireless- SpectrumCo Order*, FCC 12-95, at ¶ 48; *Mobile Spectrum Holdings NPRM*, FCC 12-119, at ¶ 8.

[354] *See* Appendix A, *infra*. The Commission has recently indicated that, as the provision of mobile broadband services becomes increasingly central to wireless transactions it may be appropriate to reduce the amount of suitable SMR spectrum from 26.5 megahertz to 14 megahertz to reflect the portion of SMR spectrum through which mobile broadband service can be provided. *See AT&T-Qualcomm Order*, 26 FCC Rcd at 17607 ¶ 42. The Commission is seeking comment on how much SMR spectrum is suitable and available in the near term for mobile broadband services. *Spectrum Holdings NPRM*, FCC 12-119, at ¶ 29.

[355] *See Verizon Wireless-SpectrumCo Order*, FCC 12-95, at ¶ 63 n. 151.

[356] The Upper 700 MHz D Block is to be reallocated for public safety service rather than commercial service. The Commission is seeking comment on whether this spectrum should remain relevant to its mobile spectrum holdings analysis, Mobile Spectrum Holdings NPRM, FCC 12-119, at ¶ 29.

[357] 55.5 megahertz out of a total 74 megahertz of BRS is attributable where transitioned. *See Sprint/Clearwire Order*, 23 FCC Rcd at 17598-99 ¶ 70. To date, the Commission has declined to include in its analysis several other spectrum bands—including EBS, MSS/ATC, AWS-2/3, WCS, 3650-3700 MHz, and 2155-2175 MHz. *See AT&T-Qualcomm Order*, 26 FCC Rcd at 17606 ¶ 39; *see also Verizon Wireless- SpectrumCo Order*, FCC 12-95, at ¶ 63.

Order, the Commission declined to make any changes to the current spectrum screen.[358] However, in the *Verizon Wireless-Spectrum Co Order*, the Commission stated it would initiate a proceeding to review its policies governing mobile wireless spectrum holdings to ensure that they fulfill statutory objectives, given changes in technology, spectrum availability, and the marketplace.[359] On September 28, 2012, the Commission released the *Mobile Spectrum Holdings NPRM* to review its policies to ensure that its rules "are clear and predictable and promote the competition needed to ensure a vibrant, world-leading, increasingly mobile economy driven by innovation."[360] As noted above, one of the issues the Commission addresses is whether and how to modify the current spectrum screen.[361]

108. *Secondary Market Transactions and Spectrum Leasing.* The Commission also has adopted secondary market policies to facilitate spectrum access. Subject to the Commission's approval, which includes review of spectrum aggregation for potential competitive harm, licensees may buy and sell licenses, in whole or in part (through partitioning and/or disaggregation), on the secondary market. As part of its secondary market policies, the Commission also permits mobile wireless licensees to lease all or a portion of their spectrum usage rights for any length of time within the license term, and over any geographic area encompassed by the license.[362] The Commission's secondary market policies allow existing licensees to obtain additional spectrum capacity and expand their coverage areas to better meet the needs of their customers, while also providing new entrants with additional opportunities to access the spectrum so that they can compete. The *National Broadband Plan* recommended that the Commission spur further development and deployment of opportunistic uses across more radio spectrum. Consistent with that recommendation, in November 2010 the Commission released a Notice of Inquiry seeking comment on the variety of ways in which dynamic spectrum access radios and techniques can promote more intensive and efficient use of the radio spectrum, and the potential of these technological innovations to enable more effective management of spectrum through use of secondary market arrangements. Geo-location databases with policy information, and the use of small cell technologies have the potential to enable efficient spectrum sharing in both the existing commercial bands, as well as those bands designated for federal and non-federal use such as the 3.5 GHz and 1755 MHz bands.

109. The Commission's spectrum leasing policies provide for two types of spectrum leasing agreements: spectrum manager leases[363] and *de facto* transfer leases.[364] Such leasing agreements can provide parties with the opportunity to negotiate voluntary, market-driven leasing arrangements that enable other providers or new entrants to provide facilities-based services to the public or other end-

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[358] *AT&T-Qualcomm Order*, 26 FCC Rcd at 17607 ¶ 42 (the Commission approved the assignment of 11 licenses in the D and E Block of the Lower 700 MHz band from Qualcomm to AT&T); *Verizon Wireless- SpectrumCo Order*, FCC 12-95, at ¶ 63 (the Commission approved the assignment and/or exchange of a significant portion of AWS-1 spectrum to Verizon Wireless from Cox, Leap, Comcast, Time Warner Cable, and Bright House Networks).

[359] *See Verizon Wireless- SpectrumCo Order*, FCC 12-95, at ¶ 63.

[360] *Mobile Spectrum Holdings NPRM*, FCC 12-119, at ¶ 1.

[361] *Mobile Spectrum Holdings NPRM*, FCC 12-119, at ¶ 34.

[362] *Ninth Report*, 19 FCC Rcd at 20631 ¶ 84.

[363] Spectrum manager leases require the licensee to retain both *de jure* control and *de facto* control over the spectrum that it leases, however, it does not require prior Commission approval. These leases may be implemented once the parties submit notifications satisfying the applicable requirements. *See* Promoting Efficient Use of Spectrum Through Elimination of Barriers to the Development of Secondary Markets, WT Docket No. 00-230, *Report and Order and Further Notice of Proposed Rulemaking*, 18 FCC Rcd 20604, 20657 ¶ 119 (2003) ("*Secondary Markets Report and Order*").

[364] Under *de facto* transfer leases, the licensee retains *de jure* control of the license while transferring *de facto* control and associated rights of the leased spectrum to the spectrum lessee. The parties must file an application for a *de facto* transfer lease and obtain prior Commission approval before commencing operations.

users.[365] Leasing provides lessees the flexibility to lease a small or large quantity of spectrum for short or longer time periods depending on their business needs. [366] The Commission applies its general competition policies to spectrum leasing arrangements, with spectrum being attributed, with limited exceptions, to both lessee and lessor.

110. Spectrum leasing has been used frequently in a number of the Commission's spectrum bands, such as paging or narrowband PCS, where there are licensees and third parties making businesses out of leasing spectrum. Spectrum leasing arrangements in the spectrum bands that are the focus of this *Report*, however, have been employed more sparingly. For instance, parties have at times entered into short-term spectrum manager lease arrangements involving spectrum that is also the subject of an application to assign the underlying spectrum licenses. Such arrangements enable the lessee to gain interim access to the spectrum during the pendency, and subject to approval, of the underlying assignment application.[367] Spectrum manager leasing arrangements in these spectrum bands also have provided licensees the flexibility to provide contractually for certain post-transaction obligations. For instance, such arrangements have been used by sellers of spectrum to continue to provide roaming services on a transitional basis post-transaction before buyers use the spectrum to launch new services.[368] Spectrum manager leasing arrangements also have been relied upon to facilitate transition of customers by means of a temporary leaseback of spectrum once it has been transferred to a new entity to ensure that the original licensee can move existing customers using that spectrum to replacement spectrum in a non-disruptive fashion. This use can often occur where two existing licensees are swapping spectrum within the same geographic market.[369] Short-term *de facto* transfer leases also have been used for post-transaction customer transition purposes, as, for example in the recent transaction between T-Mobile License LLC and Cellco Partnership d/b/a Verizon Wireless involving AWS-1 licenses.[370]

2. Current Spectrum Transactions

111. Since the *Fifteenth Report*, there have been developments regarding several major proposed transactions filed with the Commission that involved the transfer of spectrum licenses only, rather than network assets or customers, from one mobile wireless licensee to another. Such transactions primarily involved an assignment of spectrum either to or from AT&T or Verizon Wireless. The first of the spectrum-only transactions involving AT&T involved the Commission's approval in late 2011 of the assignment of 11 licenses in the D and E Block of the Lower 700 MHz band from Qualcomm to AT&T,

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[365] *See Secondary Markets Use Report and Order*, 18 FCC Rcd at 20625-26 ¶ 44. Spectrum lessees leasing CMRS spectrum must disclose to the Commission whether they hold direct or indirect interests (of 10 percent or more) in any entity that already has access to 10 megahertz or more of CMRS spectrum (through a license or lease) in the same geographic area. We also require leasing parties to indicate whether the lease arrangement reduces the number of CMRS competitors in the market. Such disclosure requirements help to ensure market transparency, and also help the Commission to distinguish those leases that may warrant further inquiry to assess whether there is a competitive impact from the likely vast majority of leases that will have no competitive impact and require no further inquiry. *See Secondary Markets Report and Order*, 18 FCC Rcd at 20659 ¶ 123.

[366] *See Secondary Markets Report and Order*, 18 FCC Rcd at 20625-26 ¶ 44.

[367] *See, e.g.*, FCC Application or Notification for Spectrum Leasing Arrangement, FCC Form 608, Cellco Partnership, Licensee, Cricket Communications, Inc., Lessee, ULS File No. 0005070267 (filed Feb. 10, 2012); FCC Application or Notification for Spectrum Leasing Arrangement, FCC Form 608, Cricket License Company, LLC, Licensee, Cellco Partnership, Lessee, ULS File No. 0005085825 (filed Feb. 21, 2012).

[368] *See, e.g.*, FCC Application or Notification for Spectrum Leasing Arrangement, FCC Form 608, Wireless Co, L.P., Licensee, New Cingular Wireless PCS, LLC, Lessee, ULS File No. 0005182011 (filed Apr. 27, 2012); FCC Application or Notification for Spectrum Leasing Arrangement, FCC Form 608, Wireless Co, L.P., Licensee, New Cingular Wireless PCS, LLC, Lessee, ULS File No. 0005182023 (filed Apr. 27, 2012).

[369] *See* FCC Encyclopedia, http://www.fcc.gov/encyclopedia/spectrum-leasing. (visited Nov. 30, 2012).

[370] *See* ULS File No. 0004993617.

subject to certain conditions.[371] In addition, in April 2012, the Commission consented to the transfer of 13 AWS-1 licenses in 20 full and partitioned portions of 27 AWS-1 licenses from AT&T to T-Mobile.[372] This transaction was the result of a break-up provision between AT&T and Deutsche Telekom for the proposed, but ultimately withdrawn, application for the sale of T-Mobile to AT&T.[373] T-Mobile acquired 10-20 megahertz of spectrum in 128 CMAs covering 121 million people (or approximately 39 percent of the U.S. population).[374] In August 2012, AT&T was a party to separate applications seeking Commission consent to assign 51 WCS licenses and 12 AWS-1 licenses from Comcast, Horizon, and Nextwave to AT&T. On August 31, 2012, the Commission consolidated the review of these AT&T applications.[375] On September 14, 2012, an additional application was filed to assign two WCS licenses from San Diego Gas & Electric to AT&T, which was also consolidated. The Commission approved the acquisition of all these respective licenses on December 18, 2012.[376]

112. The spectrum-only transactions involving Verizon Wireless included a series of interrelated assignments and exchanges with Leap Wireless, SpectrumCo, Cox, and T-Mobile. In November 2011, Verizon Wireless and Leap filed applications seeking Commission consent to assign certain 700 MHz, AWS, and PCS licenses between the two applicants. Specifically, the parties sought to assign, from Verizon Wireless to Leap, the 700 MHz Lower Band A Block license for the Chicago BEA, and to assign, from Leap to Verizon Wireless, 23 PCS and 13 AWS-1 licenses in full; disaggregated portions of one PCS license and one AWS-1 license; and partitioned portions of five AWS-1 licenses.[377] Shortly thereafter, in early 2012, Verizon Wireless, SpectrumCo, and Cox Wireless filed two separate applications seeking Commission consent to assign 122 AWS-1 licenses to Verizon Wireless from SpectrumCo, and 30 AWS-1 licenses to Verizon Wireless from Cox.[378] In June 2012, Verizon Wireless and T-Mobile filed applications for the assignment and exchange of a number of full and partial AWS-1

[371] *See AT&T-Qualcomm Order*, 26 FCC Rcd at 17591 ¶ 5.

[372] Applications of T-Mobile License LLC, AT&T Mobility Spectrum LLC and New Cingular Wireless PCS, LLC for Consent To Assign AWS-1 Licenses, WT Docket No. 12-21, *Order*, 27 FCC Rcd 4124 (WTB 2012) (*T-Mobile-AT&T Order*).

[373] *See T-Mobile-AT&T Order*, 27 FCC Rcd at 4125 ¶ 3; Applications of AT&T Inc. and Deutsche Telekom AG For Consent To Assign or Transfer Control of Licenses and Authorizations, WT Docket No. 11-65, *Order*, 26 FCC Rcd 16184 (WTB 2011); *AT&T Ends Bid to Add Network Capacity through T-Mobile USA Purchase*, Press Release, AT&T, Dec. 19, 2011, *available at* http://www.att.com/gen/press-room?pid=22146&cdvn=news&newsarticleid=33560. (visited Nov. 19, 2012).

[374] ULS File Nos. 0005005682, 0005005685, 0005005687 and 0005016840.

[375] AT&T Seeks FCC Consent to the Assignment and Transfer of Control of WCS and AWS-1 Licenses, WT Docket No. 12-240, *Public Notice*, DA 12-1341 (WTB 2012). As part of its application, AT&T and Nextwave also have applied for the transfer of control of certain NextWave subsidiaries to AT&T. AT&T has also proposed to acquire WCS spectrum from San Diego Gas & Electric Company in CMA 18 (San Diego, California), review of which has been consolidated with the other pending WCS applications. Public Notice Consolidating Review of Additional Application, WT Docket No. 12-240, *Public Notice*, DA 12-1513 (WTB 2012).

[376] *See* Applications of AT&T Mobility Spectrum LLC, New Cingular Wireless PCS, LLC, Comcast Corporation, Horizon Wi-Com, LLC, NextWave Wireless, Inc., and San Diego Gas & Electric Company, WT Docket No. 12-240, *Memorandum Opinion and Order* (rel. Dec. 18, 2012).

[377] Verizon Wireless and Leap Wireless Seek FCC Consent to the Exchange of Lower 700 MHz Band A Block, AWS-1, and Personal Communications Service Licenses," ULS File Nos. 0004942973, 0004942992, 0004952444, 0004949596, 0004949598, Revised Pleading Cycle Established, *Public Notice*, 27 FCC Rcd 367 (WTB 2012). Verizon Wireless acquired two of the partitioned AWS-1 licenses from Savary Island and the remaining licenses from Cricket License Company.

[378] CellCo Partnership d/b/a Verizon Wireless, SpectrumCo, LLC, and Cox TMI Wireless, LLC Seek FCC Consent to the Assignment of AWS-1 Licenses, ULS File Nos. 0004993617 and 0004996680, Pleading Cycle Established, *Public Notice*, 27 FCC Rcd 360 (WTB 2012).

licenses, including 47 licenses that Verizon Wireless had proposed to acquire from SpectrumCo, Cox, and Leap Wireless.[379] On August 3, 2012, the Commission consolidated the review of these Verizon Wireless applications[380] and on August 24, 2012 the Commission consented to the various assignments of spectrum subject to certain conditions.[381]

113. In addition to larger spectrum-only transactions, there have been several smaller transactions in which larger providers have acquired spectrum licenses in a small number of CMAs from small or regional licensees. Many of these transactions also included assignments of spectrum to AT&T and Verizon Wireless. From the end of 2010 through December 2012, the Commission consented to close to 60 applications filed by AT&T in which it sought to acquire PCS, AWS, Cellular, and 700 MHz licenses. Between November 2010 and mid-June 2011, AT&T filed applications associated with nine separate transactions through which it acquired 700 MHz licenses from small or regional licensees.[382] For example, in May 2011, AT&T filed an application to acquire a 700 MHz B Block license from Maxima in two counties and one CMA in Louisiana.[383] Also, in June 2011, AT&T filed an application to acquire 12 megahertz of 700 MHz spectrum from Kennebec in two counties and one CMA in Iowa and Nebraska.[384] In 2012, AT&T filed numerous additional applications to acquire 700 MHz spectrum, among these, an application for consent to the assignment of eight Lower 700 MHz B Block licenses from Cox.[385]

114. During 2011 and 2012, the Commission consented to approximately 30 applications filed by Verizon Wireless seeking to acquire PCS, AWS and Cellular spectrum from small or regional licensees. For example, in February 2011, Verizon Wireless filed an application to acquire a 10 megahertz PCS F Block license from 3 Rivers Telephone Cooperative, Inc. covering 5 counties and 3 CMAs in Montana.[386] The following February, Verizon Wireless filed an application to acquire a 20 megahertz AWS B Block license from 3 Rivers in 14 counties in 6 Montana CMAs.[387] In addition, nationwide service providers filed applications to transfer spectrum licenses among those providers: for

[379] CellCo Partnership d/b/a Verizon Wireless, and T-Mobile License LLC Seek FCC Consent to the Assignment of Advanced Wireless Service Licenses, WT Docket No. 12-175, Public Notice, 27 FCC Rcd 7169 (WTB 2012).

[380] Wireless Telecommunications Bureau Consolidates Review of Verizon Wireless–SpectrumCo–Cox, Verizon Wireless–Leap Wireless, and T-Mobile–Verizon Wireless Transactions, WT Docket Nos. 12-4 and 12-175, ULS File Nos. 0004942973, etc., *Public Notice*, DA 12-1266 (rel. Aug. 3, 2012).

[381] *See Verizon Wireless-SpectrumCo Order*, FCC 12-95, at ¶ 6.

[382] *See* ULS File Nos. 0004681773 and 0004681771, consummated Feb. 22, 2012; ULS File Nos. 0004544863 and 0004544869; ULS File No. 0004621016, consummated Mar. 7, 2012; ULS File No. 0004643747, consummated Mar. 9, 2012; ULS File No. 0004635440, consummated Mar. 13, 2012; ULS File No. 0004777216, consummated Mar. 29, 2012; ULS File No. 0004448347, consummated Mar. 30, 2012.

[383] *See* ULS File No. 0004699707, consummated Mar. 21, 2012. *See also*, "AT&T Mobility Spectrum LLC and Maxima International, LLC Seek FCC Consent to the Assignment of One Lower 700 MHZ Band B Block License," *Public Notice*, 26 FCC Rcd 7847 (WTB 2011).

[384] *See* ULS File No. 0004774053, consummated Feb. 8, 2012. *See also*, "Wireless Telecommunications Bureau, Assignment of License Authorization Applications, Transfer of Control of Licensee Applications, and De Facto Transfer Lease Applications, and Designated Entity Reportable Eligibility Event Applications Accepted for Filing," *Public Notice* (*WTB Accepted for Filing PN*), rel. Aug. 10, 2011.

[385] AT&T Mobility Spectrum LLC and Cox TMI Wireless, LLC Seek FCC Consent to the Assignment of Eight Lower 700 MHz Band B Block Licenses, ULS File No. 0005155794, Pleading Cycle Established, *Public Notice*, 27 FCC Rcd 5213 (WTB 2012). *See also* for additional 700 MHz applications filed by AT&T, ULS File No. 0005150801, consummated July, 24, 2012; ULS File No. 0005231760; ULS File No. 0005262760; ULS File No. 0005286787; ULS File No. 0005295055; ULS File No. 0005296026; ULS File No. 0005304258; ULS File No. 0005293645; ULS File No. 0005323094.

[386] *See* ULS File No. 0004608390, consummated June 20, 2011. *WTB Accepted for Filing PN*, rel. Mar. 16, 2011.

[387] *See* ULS File No. 0005046789, consummated July 11, 2011. *WTB Accepted for Filing PN*, rel. Mar. 7, 2012.

instance, AT&T and Verizon Wireless transferred Cellular spectrum licenses between the two companies, Verizon Wireless and Sprint transferred PCS spectrum licenses.[388]

115. In addition to the two largest service providers, T-Mobile as well as certain small or regional providers also filed applications with other parties to assign or transfer spectrum. T-Mobile filed a number of applications to acquire or exchange AWS or PCS spectrum. For instance, in June 2012, T-Mobile acquired 20 megahertz of AWS spectrum from Cleveland Unlimited in 10 counties and 3 CMAs in Ohio.[389] The regional carrier US Cellular participated in a large number of transactions during 2011 and 2012 compared to most other regional providers, mainly to acquire 700 MHz licenses**.** These included an April 2012 application for 12 megahertz of lower 700 MHz A Block spectrum from Cox in 30 CMAs throughout five Midwestern states.[390]

3. Analysis of Spectrum Holdings Overall

116. Because access to spectrum is necessary for the provision of mobile wireless service, the different spectrum holdings of providers potentially affect their ability to compete effectively. These spectrum holdings include licenses obtained when the spectrum was first licensed for mobile services, such as through the original Cellular assignments or through the auction process (*e.g.*, PCS, AWS, or 700 MHz spectrum), as well as spectrum obtained through various secondary market transactions. The following Tables and Charts update the information included in past Reports.[391]

117. Verizon Wireless and AT&T each hold significant amounts of 700 MHz, Cellular, broadband PCS, and AWS spectrum. Sprint has substantial holdings of PCS licenses, as well as the SMR spectrum acquired through its merger with Nextel in 2005. T-Mobile's spectrum holdings are in both the PCS and AWS bands.[392] Uniquely, the spectrum holdings of Clearwire, which is affiliated with Sprint,[393] fall in the 2.5 GHz band – where it holds the predominant share of BRS spectrum, and has access to much of the EBS spectrum through spectrum leasing arrangements.[394] Regional provider US

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[388] *See WTB Accepted for Filing PN*, rel. Oct. 26, 2011 (AT&T/Verizon Wireless Swap Applications); *WTB Accepted for Filing PN*, rel. Nov. 23, 2011(Verizon Wireless/Sprint).

[389] *See* ULS File No. 000 5271445. *WTB Accepted for Filing PN*, rel. Mar. Jul. 18, 2012.

[390] *See* United States Cellular Corporation and Cox TMI Wireless, LLC seek FCC consent to the Assignment of Four Lower 700 MHz Band A Block Licenses, ULS File No 000 5167598, Pleading Cycle Established, Public Notice, 27 FCC Rcd 526 (WTB 2012).

[391] *See infra* Tables 17-18 and Charts 4-5 The data in these tables and charts generally reflect major transactions consummated through August 2012. As in past *Reports*, the data in these tables include EBS leases, and do not include MSS or WCS spectrum holdings. *See, e.g.*, *Fifteenth Report*, 26 FCC Rcd at 9822 ¶ 269 – 9825 ¶ 276 & Table 26. As discussed above, the Commission is considering which spectrum bands should be considered in its mobile spectrum holdings policy. *See Mobile Spectrum Holdings NPRM*, FCC 12-119, at ¶ 26.

[392] However, SunCom Wireless License Company, LLC, a wholly owned subsidiary of T-Mobile, holds one Cellular license for CMA 629-South Carolina 5-Georgetown (call sign KNKN557).

[393] *See* Section III.B.1, Facilities-Based Providers, *supra*. Sprint holds a 48.6 percent interest in Clearwire. *See* Clearwire Corporation SEC Form 10-K Filed February 16, 2012 *at* 4. On Nov. 15, 2012, Sprint sought approval to increase its stake in Clearwire from approximately 48% to over 50% through its acquisition of Eagle River's stake in Clearwire. This *pro forma* application was consented to on Dec. 6 and Dec. 7, 2012. In addition, on Nov. 11th, 2012, SoftBank filed a series of applications seeking Commission approval to its proposed acquisition of Sprint Nextel. Further, on Dec. 17, 2012, Sprint and Clearwire announced that Sprint would acquire the remaining stock of Clearwire that it did not already own, and on Dec. 20, 2012, SoftBank and Sprint filed an amendment to supplement their previously filed applications.

[394] As noted above, while EBS licensees may lease excess capacity to commercial operators, various elements of the EBS licensing regime complicate the use of EBS spectrum for commercial purposes. *See,* III.F. 3 Analysis of Spectrum Holdings Overall, ¶ 112, *supra*.

Cellular holds Cellular, 700 MHz, PCS, and AWS licenses, while MetroPCS and Leap chiefly hold PCS and AWS spectrum. Finally, as the charts below reveal, smaller providers also hold Cellular, 700 MHz, SMR, PCS, AWS, and BRS licenses, primarily in the less populated parts of the United States.

118. Five providers together – Verizon Wireless, AT&T, T-Mobile, as well as Sprint and Clearwire – hold close to 80 percent of all spectrum, measured on a MHz-POPs basis, that is potentially usable for the provision of mobile wireless services.[395] Table 18 shows megahertz holdings for each provider, weighted by population. Finally, Chart 4 is a graph of providers' spectrum holdings by frequency band, measured on a MHz-POPs basis.

Table 17
Percentage Spectrum Holdings, Measured on a MHz-POPs Basis by Provider, by Frequency Band[396]

Licensee	700 MHz	Cellular (850 MHz)	SMR (800/900 MHz)	PCS (1.9 GHz)	AWS (1.7/2.1 GHz)	BRS (2.5 GHz)	EBS Leases (2.5 GHz)
Verizon Wireless	42.0%	48.1%	0.0%	15.7%	35.5%	0.0%	0.0%
AT&T	35.9%	43.6%	0.0%	26.4%	6.2%	0.0%	0.0%
Sprint Nextel	0.0%	0.0%	97.2%	27.1%	0.0%	0.0%	0.0%
Clearwire	0.0%	0.0%	0.0%	0.0%	0.0%	85.4%	61.1%
T-Mobile	0.0%	0.1%	0.0%	19.6%	34.6%	0.0%	0.0%
MetroPCS	0.5%	0.0%	0.0%	2.6%	6.1%	0.0%	0.0%
US Cellular	2.9%	4.2%	0.0%	2.1%	2.0%	0.0%	0.0%
Leap	0.6%	0.0%	0.0%	2.3%	6.6%	0.0%	0.0%
Other[397]	18.1%	4.1%	2.8%	4.2%	9.0%	14.6%	38.9%

* Estimates in Table 17 include all transactions consummated as of August 15, 2012, as well as the transactions approved in the *Verizon Wireless-SpectrumCo Order*. Estimates do not include WCS spectrum that was added in the spectrum screen in December 2012.

[395] *See* Table 17, *supra*; Table 18, *infra*.

[396] Spectrum tables include 18 megahertz of BRS and 112.5 megahertz of EBS not currently attributable in the spectrum screen. As noted above, while EBS licensees may lease excess capacity to commercial operators, various elements of the EBS licensing regime complicate the use of EBS spectrum for commercial purposes. SunCom Wireless License Company, LLC, a wholly owned subsidiary of T-Mobile, holds one Cellular license.

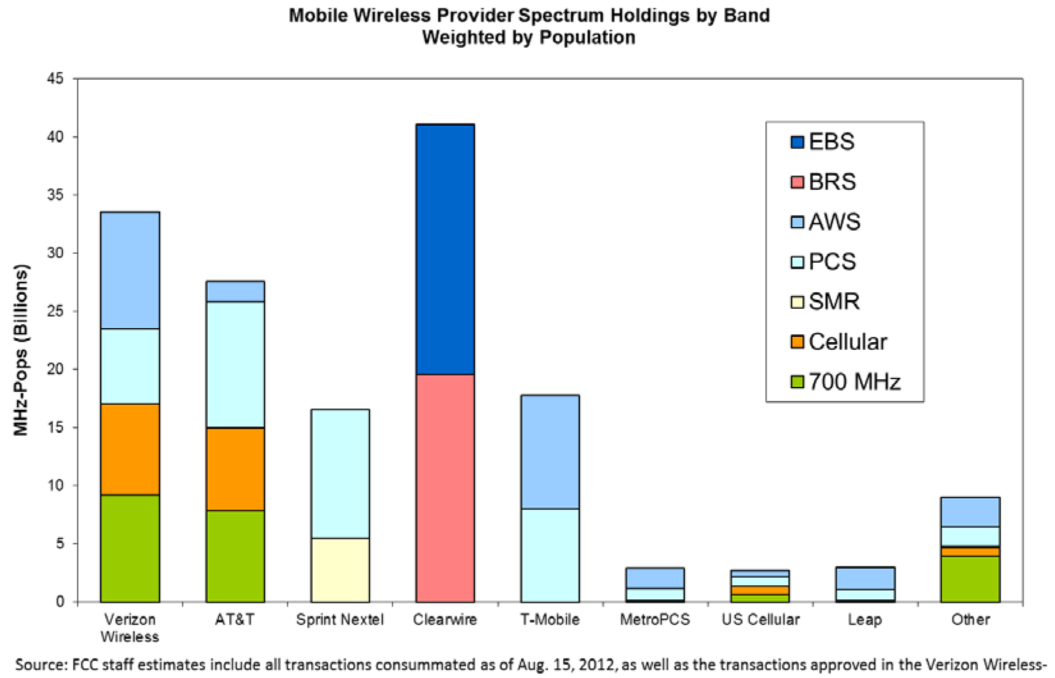
[397] Total EBS spectrum includes 112.5 megahertz of spectrum, and "Other" EBS spectrum represents spectrum held by all other providers (including educational institutions and providers such as Digital Bridge) and EBS white space. Total BRS spectrum includes 73.5 megahertz of spectrum and "Other" BRS spectrum represents spectrum held by all other providers (such as Digital Bridge) and BRS white space. In the context of transactions, with respect to both BRS and EBS spectrum, the Commission counts only 55 megahertz of BRS spectrum as suitable and available for mobile telephony/broadband services. *See* Sprint Nextel Corporation and Clearwire Corporation, WT Docket No. 08-94, Memorandum Opinion and Order, 23 FCC Rcd 17570 (2008).

Table 18
Population-Weighted Average Megahertz Holdings by Provider, by Frequency Band[398]

Licensee	700 MHz	Cellular (850 MHz)	SMR (800/900 MHz)	PCS (1.9 GHz)	AWS (1.7/2.1 GHz)	BRS (2.5 GHz)	EBS Leases (2.5 GHz)
Verizon Wireless	29.4	25.2	0.0	20.6	32.1	0.0	0.0
AT&T	25.2	22.9	0.0	34.6	5.6	0.0	0.0
Sprint Nextel	0.0	0.0	17.5	35.5	0.0	0.0	0.0
Clearwire	0.0	0.0	0.0	0.0	0.0	62.8	68.7
T-Mobile	0.0	0.0	0.0	25.7	31.3	0.0	0.0
MetroPCS	0.3	0.0	0.0	3.4	5.5	0.0	0.0
US Cellular	2.1	2.2	0.0	2.7	1.8	0.0	0.0
Leap	0.4	0.0	0.0	3.0	6.0	0.0	0.0
Other	12.7	2.1	0.5	5.4	8.2	10.7	43.8

* Estimates in Table 18 do not include the WCS spectrum that was added to the spectrum screen in December 2012, 5.4 billion MHz-Pops of which is held by AT&T.

Chart 4
Mobile Wireless Provider Spectrum Holdings by Band, Weighted by Population[399]



Source: FCC staff estimates include all transactions consummated as of Aug. 15, 2012, as well as the transactions approved in the Verizon Wireless-SpectrumCo Order.

398 Weighted average megahertz is the sum of the provider's MHz-POPs, divided by the U.S. population (2010 Census).

399 Estimates do not include the WCS spectrum that was added to the spectrum screen in December 2012, 5.4 billion MHz-Pops of which is held by AT&T.

4. Analysis of Spectrum Characteristics

119. In addition to considering the quantity of spectrum to which providers have access, we also consider the characteristics of particular spectrum that is available for licensing and assignment. As discussed below, spectrum bands vary in their propagation characteristics, and service providers may make use of different bands depending on the nature of the service, geography, density, or other factors in their network build-out. Spectrum below 1 GHz is considered most suitable for establishing base network coverage, especially for rural area and in-building coverage, whereas higher frequencies, which are typically available in wider bandwidths, often can best enable providers to increase capacity where needed, especially to provide higher data rates. In particular, providers that obtain coverage by deploying services in below-1-GHz spectrum often use spectrum from 1 GHz through 2.7 GHz for additional capacity, whereas operators who only have access to high frequency spectrum use it for both coverage and capacity. Thus, as a general matter, a provider is best positioned if it holds complementary spectrum bands, *i.e.*, both higher and lower frequency bands. In this sense, to a certain degree, higher-frequency spectrum may be made more valuable by being combined with lower-frequency spectrum, and vice versa. We discuss below the technical differences between spectrum at lower and higher frequencies as well as the spectrum holdings of mobile wireless providers in both lower and higher frequency bands.

120. In the United States, there are frequency bands suitable for mobile broadband services at very different frequencies: the 700 MHz, SMR, and Cellular bands fall below 1 GHz,[400] while the AWS, PCS, BRS, and EBS bands – which run from 1.7 to 2.5 GHz – are above 1 GHz. The different characteristics of these respective bands affect how providers use them to deliver mobile services to consumers. Two licensees may hold equal quantities of bandwidth but nevertheless hold very different spectrum assets. Some commenters note that access to spectrum is important to competition.[401] In addition, several parties have commented on the importance of access to spectrum below 1 GHz.[402]

121. As noted above, it is well established that lower frequency bands possess certain more favorable spectrum propagation characteristics than spectrum in higher bands that make them particularly suitable for establishing baseline, or foundational, network coverage.[403] In particular, "low-band" spectrum can provide superior coverage both over larger geographic areas, through adverse climates and terrain, and inside buildings and vehicles.[404]

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[400] In addition to the spectrum bands below 1 GHz authorized for licensed use, the Commission has recently taken steps to free up vacant spectrum between TV channels – called "white spaces" – for unlicensed use. *See* Unlicensed Operation in the TV Broadcast Bands, ET Docket No. 04-186, Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Band, ET Docket No. 02-380, *Second Memorandum Opinion and Order*, 25 FCC Rcd 18661 (2010) (*TVWS Second MO&O*).

[401] *See* MetroPCS Comments at 35; Leap Reply Comments at 2; Council Tree Comments at 1.

[402] *See* Letter from Steven K. Berry, President & CEO, Rural Carriers Association—The Competitive Carriers Association, to Marlene H. Dortch, Secretary, FCC, WT Docket No. 11-186 (filed May 24, 2012) (*T-Mobile May 24, 2012 Ex Parte Letter*) at 9 (citing *AT&T-Qualcomm Order* at ¶ 49; T-Mobile Comments at 5 (citing to November 11 Public Notice in WT Docket No. 11-186, *AT&T-Qualcomm Order* at ¶ 49, and *Fifteenth Report* 26 FCC Rcd at 9833-34 ¶ 292). Other commenters question the differentiation of spectrum above and below 1 GHz. *See* Verizon Comments at 125-26; Telecommunications Industry Association Comments at 24; AT&T Reply Comments at 17-18.

[403] *See, e.g.*, *700 MHz Band Second R&O*, 22 FCC Rcd at 15349 ¶ 158, 15354-55 ¶ 176, 15400-01 ¶ 304 (recognizing the excellent propagation characteristics of 700 MHz band spectrum); *White Spaces Report and Order*, 23 FCC Rcd at 16807, 16820-21 ¶ 32 (stating that propagation characteristics of the TV bands enable service at greater ranges than in the 2.4 GHz band).

[404] *See Fifteenth Report,* 26 FCC Rcd at 9833-34 ¶ 292. In addition, in the *ATT-Qualcomm Order*, the Commission in recognizing the different frequency band characteristics, stated that "[t]he more favorable propagation characteristics of lower frequency spectrum (*i.e.*, spectrum below 1 GHz) allow for better coverage across larger (continued….)

122. With respect to wide area coverage, the Commission has noted, in particular with respect to 700 MHz band spectrum, that lower frequency spectrum has "excellent propagation" characteristics that, in contrast to higher frequency bands such as PCS and AWS spectrum, "make it ideal for delivering advanced wireless services to rural areas."[405] In addition, certain providers have noted the advantages of lower frequency spectrum for coverage in rural areas.[406] Low-band spectrum can provide the same geographic coverage, at a lower cost, than higher-frequency bands, such as the 1.9 GHz PCS band, the 1.7/2.1 GHz AWS band, and the 2.5 GHz band.[407] In order to provide equivalent service coverage, a licensee that exclusively or primarily holds spectrum in a higher frequency range generally must construct more cell sites (at additional cost) than a licensee with primary holdings at a lower frequency. For example, T-Mobile has estimated that build out of 700 MHz spectrum would require approximately 25 to 30 percent of the sites needed to build out a comparable geographic area using AWS-1 spectrum.[408] The National Institute of Standards and Technology (NIST) developed a propagation model comparing the 700 MHz, 1.9 GHz, and 2.4 GHz spectrum bands.[409] Similarly, an analysis using the Okumura-Hata model shows that rural, suburban, and urban cell sizes at 700 MHz are more than three times larger than cells in the PCS band.[410]

123. With respect to critical in-building coverage issues, wireless providers such as Verizon Wireless and AT&T have recognized the relative advantages of deploying lower frequency spectrum in urban areas due to its superior in-building coverage characteristics.[411] For instance, to improve its

(Continued from previous page)
geographic areas and inside buildings," when compared with spectrum above 1 GHz. *AT&T-Qualcomm Order*, 26 FCC Rcd at 17610 ¶ 49.

[405] *700 MHz Second R&O*, 22 FCC Rcd at 15349 ¶ 158. *See also, AT&T-Qualcomm Order,* 26 FCC Rcd at 17610-11 ¶ 49 (discussing proceedings in which the Commission noted the value of lower frequency spectrum making it ideal for services to rural areas); *TVWS Second MO&O,* 25 FCC Rcd at 18662 ¶ 1 (the Commission noted that this particular spectrum has excellent propagation characteristics that allow signals to reach farther and penetrate walls and other structures).

[406] *See AT&T-Qualcomm Order,* 26 FCC Rcd at 17610-11 ¶ 49 (discussing AT&T's statement in its bid to acquire T-Mobile that T-Mobile customer access to spectrum below 1 GHz would enable extended rural coverage); *Fifteenth Report,* 26 FCC Rcd at 9833 n.843.

[407] *See* Section III.E, Entry and Exit Conditions, *supra* (a new entrant *utilizing spectrum only in higher frequency bands may need to deploy more infrastructure, including cell sites, to cover the same land area and therefore incur higher cell site costs, compared to providers using lower band spectrum.* One network cost study estimates that the total capital cost of deploying a single cell site, on average, can be upwards of $200,000; *See* Peter Cramton, *700 MHz Device Flexibility Promotes Competition,* Aug. 9, 2010, at 2, *available at* http://www.cramton.umd.edu/papers2010-2014/cramton-700-mhz-device-flexibility-promotes-competition.pdf (visited Nov. 30, 2012), ("The 700 MHz and Cellular bands allow a region to be covered with many fewer cell sites and thus at much lower cost.") (visited Aug. 30, 2012); GSM World, *Impact of Spectrum Allocation*, http://www.gsmworld.com/our-work/public-policy/spectrum/digital-dividend/impact_of_spectrum_allocation.htm (visited Feb. 23, 2011) ("Operators need fewer cells at lower frequencies; 3G at 700 MHz needs about 30 percent of cells to offer the same coverage as 3G at 2100 MHz"); Morgan Stanley Mobile Internet Report, at 313-314 (lower spectrum allocations, such as 700 MHz spectrum, help lower capital expenditures by broadening reach).

[408] T-Mobile Comments, GN Docket No. 09-51 *et al.,* NBP PN #26, at 11 (filed Dec. 22, 2009).

[409] *See* NIST, *700 MHz Band Channel Propagation Model*, http://www.nist.gov/itl/antd/emntg/700mhz.cfm (visited Aug. 29, 2012) (NIST model concludes that because of the favorable propagation characteristics of the 700 MHz spectrum, providers need less infrastructure at the lower frequency compared to the higher frequencies to cover the same geographic area). *See also Fifteenth Report,* 26 FCC Rcd at 9834-35 ¶ 293.

[410] Okumura-Hata is a widely used RF propagation. *See* John S. Seybold, *Introduction to RF Propagation*, Wiley-Interscience, 2005.

[411] *See, e.g.,* Dan Mead, President and Chief Executive Officer, Verizon Wireless, News Conference at 2011 Consumer Electronics Show (Jan. 6, 2011), *available at* http://client.uvault.com/2491/010611/news/vod/start.php# (stating that 700 MHz spectrum is "the best spectrum for in-building coverage"); John Stankey, President and CEO, (continued….)

network performance in large cities due to subscribers' increasing usage of smartphones, AT&T put 3G traffic on its 850 MHz Cellular spectrum, which provided comparatively better in-building coverage.[412] Verizon Wireless has estimated that spectrum in the 700 MHz and Cellular bands can provide in-building penetration approximately two to three times farther than that of spectrum in the PCS, AWS, and BRS bands.[413]

124. In its consideration of mobile wireless mergers and transactions, both the Commission and the DOJ have both noted the differences between the use of lower and higher frequency bands.[414] In 2011, in its review of the competitive effects of the AT&T-Qualcomm transaction, the Commission found that the proposed transaction raised some competitive concerns because post-transaction, AT&T would hold a significant proportion of the available spectrum suitable for the provision of mobile voice or broadband services, particularly below-1 GHz spectrum with "technical attributes important for other competitors to meaningfully expand their provision of mobile broadband services or for new entrants to have a potentially significant impact on competition."[415] Furthermore, some regulators in other countries have recognized the distinctive characteristics between lower and higher frequency bands. As lower frequency spectrum has become available for mobile services, countries such as Germany and the United Kingdom have adopted policies intended to promote wireless competition, innovation, and investments, as well as broadband deployment in rural areas.[416]

(Continued from previous page)
AT&T Operations, Inc., Jan. 28, 2010 (Q4 2010 Earnings Call) (noting that 850 MHz Cellular spectrum is "very high quality with terrific propagation characteristics. …As customers make the shift to more data-intensive devices, we think this is important for the perceived quality of their overall experience").

[412] AT&T, *What the 850 MHz Spectrum Can Do for You, available at* http://www.att.com/gen/press-room?pid=6209&cat=66&u=982 (AT&T videoblog discussing AT&T's use of an 850 MHz overlay in New York City to provide enhanced in-building coverage over 1900 MHz frequencies).

[413] *See* Barclays Capital, Lowell McAdam, President and CEO of Verizon Wireless, May 26, 2010, at slide 8, *available at* http://www22.verizon.com/idc/groups/public/documents/adacct/event_965_precol.pdf (visited Nov. 30, 2012). (showing the relative distances of building penetration for 700 MHz LTE, 800 MHz Cellular, 1900 MHz PCS, 2100 MHz AWS, and 2500 MHz BRS, when broadcast power is the same across the frequencies, and advocating the benefits of below-1-GHz spectrum as "foundational spectrum" for a network). According to Verizon Wireless, "[e]ach frequency has a different rate of energy decay, with higher frequencies decaying faster." *Id.* Full transcript and presentation audio *available at* http://www22.verizon.com/investor/barclays_capital_global_wireless_and_wireline_conf.htm (visited Nov. 30, 2012).

[414] *See Fifteenth Report,* 26 FCC Rcd at 9834 n.845.

[415] *AT&T-Qualcomm Order*, 26 FCC Rcd at 17611 ¶ 51. The Commission concluded that potential harm arising out of the transaction could be mitigated with certain technical conditions, including a requirement for AT&T to use the spectrum acquired from Qualcomm only for downlink transmissions, to operate under the reduced power and antenna height limits applicable to Lower 700 MHz A and B Block licensees, and to take certain steps to mitigate possible interference the uplink operations of licensees operating in the Lower 700 MHz A, B, and C Blocks. *Id*. at 17616-17 ¶¶ 62-67.

[416] *See Fifteenth Report,* 26 FCC Rcd at 9834 n.846. *See Mobile Spectrum Holdings NPRM*, FCC 12-119, at ¶ 36 n. 106 (stating some countries conducting or planning auctions of spectrum reclaimed as part of the transition from analog to digital television have adopted various measures that recognize the differences between lower-frequency and higher-frequency spectrum in the context of spectrum aggregation limits. *See, e.g.,* Federal Network Agency, Decisions of the President's Chamber of the Federal Network Agency for Electricity, Gas, Telecommunications, Post and Railway of 12 October 2009 on Combining the Award of Spectrum in the Bands 790 to 862 MHz, 1710 to 1725 MHz and 1805 to 1820 MHz with Proceedings to Award Spectrum in the Bands 1.8 GHz, 2 GHz and 2.6 GHz for Wireless Access for the Provision of Telecommunications Services, at 6 (2009), *available at* http://www.bundesnetzagentur.de/cae/servlet/contentblob/138364/publicationFile/3682/DecisionPresidentChamberTenor_ID17495pdf.pdf (visited Nov. 30, 2012) (adopting limits on sub-1GHz spectrum in Germany's 4G auction) (last visited Aug. 7, 2012); Office of Communications (Ofcom), *Statement on Assessment of Future Mobile Competition and Award of 800 MHz and 2.6 GHz,* at Executive Summary, page 3, (2012), *available at*
(continued….)

125. A comparison of spectrum prices in the AWS and 700 MHz spectrum auctions (Auctions 66 and 73, respectively) suggests that providers may have placed a higher value on 700 MHz spectrum, at least in part, because of its relative advantages for coverage and in-building penetration. Although a number of factors in addition to frequency can affect the prices in a particular auction, including factors unrelated to technical characteristics of the spectrum, both auctions involved large quantities of paired spectrum with similar service rules in a relatively close timeframe, eliminating at least some of the other factors that could reduce the significance of the comparison. In the 2008 auction of 700 MHz spectrum, the average price for the 700 MHz spectrum was $1.28 per MHz-pop, which was more than twice the average price of $0.54 per MHz-pop for AWS spectrum auctioned in 2006.[417]

126. Although higher-frequency spectrum does not provide the same level of coverage or in-building penetration as lower-frequency spectrum, in some instances, higher-frequency spectrum may be just as effective, or more effective, for providing significant capacity, or increasing capacity, within smaller geographic areas.[418] For instance, AT&T has noted that it cannot be assumed that lower frequency bands will require fewer cells or be more economical to deploy because other factors also affect propagation – including the presence of large buildings in urban areas or other physical impediments.[419] In addition, capacity enhancement technologies such as multiple-input and multiple-output (MIMO) may perform better at higher frequencies.[420] We also note that while spectral efficiency is the same for all spectrum bands when using a given technology (and bandwidth),[421] there currently is significantly more spectrum above 1 GHz that is potentially available for use (as shown by Table 16 above), and, in many parts of these higher bands, spectrum is licensed in larger contiguous blocks. Larger blocks can enable operators to deploy wider channels and simplify device design. Thus, higher-frequency spectrum can be ideally suited for providing high capacity where it is needed, such as in high-traffic urban areas.[422]

127. In general, as noted above, because the properties of lower and higher frequency spectrum are complementary, both types of spectrum may be helpful for the development of an effective nationwide competitor that can address both coverage and capacity needs.[423] As some observers have noted, a combination of sub-1 GHz and higher frequency spectrum may be optimal.[424] For example, low frequency spectrum can be deployed ubiquitously with relatively few cell sites, providing a base layer of

(Continued from previous page)
http://stakeholders.ofcom.org.uk/binaries/consultations/award-800mhz/statement/Statement-summary.pdf (visited Nov. 30, 2012) (adopting limits on sub-1 GHz spectrum in United Kingdom's upcoming 4G auction) (visited Aug. 7, 2012).

[417] *See generally* FCC, *Auction 66 – Advanced Wireless Services*, http://wireless.fcc.gov/auctions/default.htm?job=auction_summary&id=66 (visited Nov. 30, 2012); FCC *Auction 73 – 700 MHz Band*, http://wireless.fcc.gov/auctions/default.htm?job=auction_summary&id=73 (visited Nov. 30, 2012).

[418] *See Fifteenth Report*, 26 FCC Rcd at 9836-37 ¶ 296.

[419] AT&T Comments, Docket No. 09-66, at 81-83, stating that "in areas that are capacity limited, there is likely to be no difference in the number of cells required at 700 MHz vs. 2.5 GHz."

[420] *See Fifteenth Report*, 26 FCC Rcd at 9836-37 ¶ 296.

[421] *See Fifteenth Report*, 26 FCC Rcd at 9836-37 ¶ 296.

[422] *See Fifteenth Report*, 26 FCC Rcd at 9836-37 ¶ 296.

[423] *See AT&T-Qualcomm Order*, 26 FCC Rcd at 17609-11 ¶ 49, n.140.

[424] *See Fifteenth Report*, 26 FCC Rcd at 9837 ¶ 297. *See also T-Mobile Dec. 2, 2010 Ex Parte Letter* at 1-3, Attachment at 10-11 (stating that a mixture of low (below 1 GHz) and upper band spectrum is "important to building competitive high speed mobile broadband networks"); Alan Hadden, *Mobile Broadband — Where The Next Generation Leads Us*, Global Mobile Suppliers Association, Dec. 2009, *available at* http://www.gsacom.com/downloads/pdf/GSA_IEEE_articles1209.php4. (visited Nov. 26, 2012)

coverage that extends to wide areas and complemented with a capacity layer using high frequency spectrum.[425] Given these different spectrum characteristics, a licensee's particular mix of spectrum holdings may affect its ability to provide efficient mobile wireless services.

a. Analysis of Spectrum Holdings Below 1 GHz

128. Three nationwide providers – Verizon Wireless, AT&T, and Sprint – hold licenses for spectrum below 1 GHz, as do regional providers, such as US Cellular and C Spire, and several smaller companies, many of which have holdings in more rural areas of the country. T-Mobile, the fourth nationwide provider, holds one Cellular license in South Carolina.[426]

129. Of the sub-1 GHz spectrum, Verizon Wireless and AT&T each hold a significant amount of the available Cellular and 700 MHz spectrum. Specifically, when measured on a licensed MHz-POP basis, Verizon Wireless holds 48.1 percent of the Cellular spectrum and 42 percent of the 700 MHz spectrum, while AT&T holds 43.6 percent of the Cellular spectrum and 35.9 percent of the 700 MHz band spectrum. Adding these two bands together, Verizon Wireless holds approximately 45 percent of the licensed MHz-POPs of the combined Cellular and 700 MHz band spectrum, while AT&T holds approximately 39 percent. US Cellular holds approximately 3 percent of these bands. Several other, smaller providers' combined holdings total approximately four percent of the Cellular and 18 percent of the 700 MHz spectrum. Sprint Nextel holds approximately 97 percent of the SMR spectrum.

b. Analysis of Spectrum Holdings Above 1 GHz

130. All four nationwide providers hold spectrum above 1 GHz. Verizon Wireless, AT&T, and T-Mobile each hold a substantial number of PCS and AWS licenses, while Sprint holds significant amounts of PCS spectrum. In the PCS and AWS spectrum bands, no licensee holds more than 26 percent of the combined MHz-POPs for those two bands, with T-Mobile holding the most. Of the PCS and AWS spectrum held by nationwide providers, again based on MHz-POPs: Verizon Wireless holds approximately 15.7 percent of the PCS and 35.5 percent of the AWS spectrum; AT&T holds around 26.4 percent of the PCS and 6.2 percent of the AWS spectrum; Sprint holds approximately 27.1 percent of the PCS and none of the AWS; and T-Mobile holds approximately 19.5 percent of the PCS and approximately 34.6 percent of the AWS. US Cellular, MetroPCS, and Leap each hold some PCS and AWS spectrum, with MetroPCS and Leap holding a somewhat higher percentage, relative to their PCS holdings, of the AWS spectrum. Other, smaller providers hold 4.2 percent of the PCS spectrum and 9 percent of the AWS spectrum. Finally, as noted above, Clearwire, in which Sprint holds a significant ownership interest, holds a predominant amount of 2.5 GHz spectrum, comprised of the BRS and EBS bands, which is the highest frequency band potentially usable for the provision of mobile broadband service.[427]

[425] *See Fifteenth Report*, 26 FCC Rcd at 9837 ¶ 297**.** *See also* Alan Hadden, *Mobile Broadband — Where The Next Generation Leads Us*, Global Mobile Suppliers Association, Dec. 2009, *available at* http://www.gsacom.com/downloads/pdf/GSA_IEEE_articles1209.php4 (visited Nov. 26, 2012) ("A combination of higher spectrum (*e.g.*, 1.8 GHz, 2.1 GHz, 2.6 GHz) for the capacity layer, and sub-1 GHz spectrum for improved coverage in rural areas and for urban in-building, is considered optimal.").

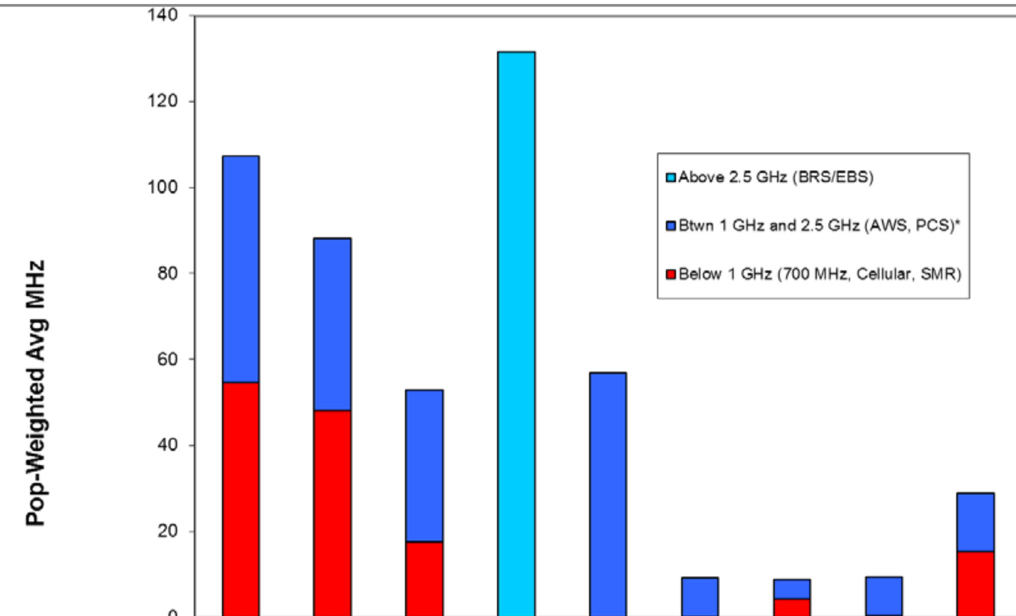
[426] SunCom Wireless License Company, LLC, a wholly owned subsidiary of T-Mobile, holds a Cellular license for CMA629-South Carolina 5-Georgetown (call sign KNKN557).

[427] On October 18, 2012, Sprint Nextel announced that it would increase its stake in Clearwire from approximately 48% to over 50% through its acquisition of Eagle River's stake in Clearwire http://www.sec.gov/Archives/edgar/data/101830/000119312512426578/d424777dex9929.htm (visited Nov. 30, 2012); http://www.sec.gov/Archives/edgar/data/101830/000119312512426578/d424777dsc13da.htm (visited Oct. 25, 2012). We note that since the *Sprint Nextel-Clearwire Order*, the Commission has attributed Clearwire to Sprint Nextel because Sprint Nextel owns more than a 10 percent equity interest in Clearwire. *See e.g.* Sprint Nextel Corporation and Clearwire Corporation, Applications for Consent to Transfer Control of Licenses, Leases, and Authorizations, WT Docket No. 08-94, *Memorandum Opinion and Order*, 23 FCC Rcd 17570 (2008) (continued….)

c. Distribution of Holdings Below and Above 1 GHz

131. The following chart shows the spectrum holdings of nationwide wireless providers by frequency. It provides a side-by-side comparison of each licensee's holdings – in terms of total population-weighted average megahertz – under 1 GHz, between 1 and 2 GHz, and above 2.5 GHz.[428]

Chart 5
Population-Weighted Average Megahertz Under/Over 1 GHz*



	Verizon Wireless	AT&T	Sprint Nextel	Clearwire	T-Mobile	MetroPCS	US Cellular	Leap	Other
Above 2.5 GHz (BRS/EBS)	0.0	0.0	0.0	131.5	0.0	0.0	0.0	0.0	0.0
Btwn 1 GHz and 2.5 GHz (AWS, PCS)*	52.7	40.2	35.5	0.0	56.9	9.0	4.5	9.0	13.6
Below 1 GHz (700 MHz, Cellular, SMR)	54.7	48.0	17.5	0.0	0.0	0.3	4.2	0.4	15.3

Source: FCC staff estimates based on frequencies used for mobile to base transmissions (i.e., uplink)

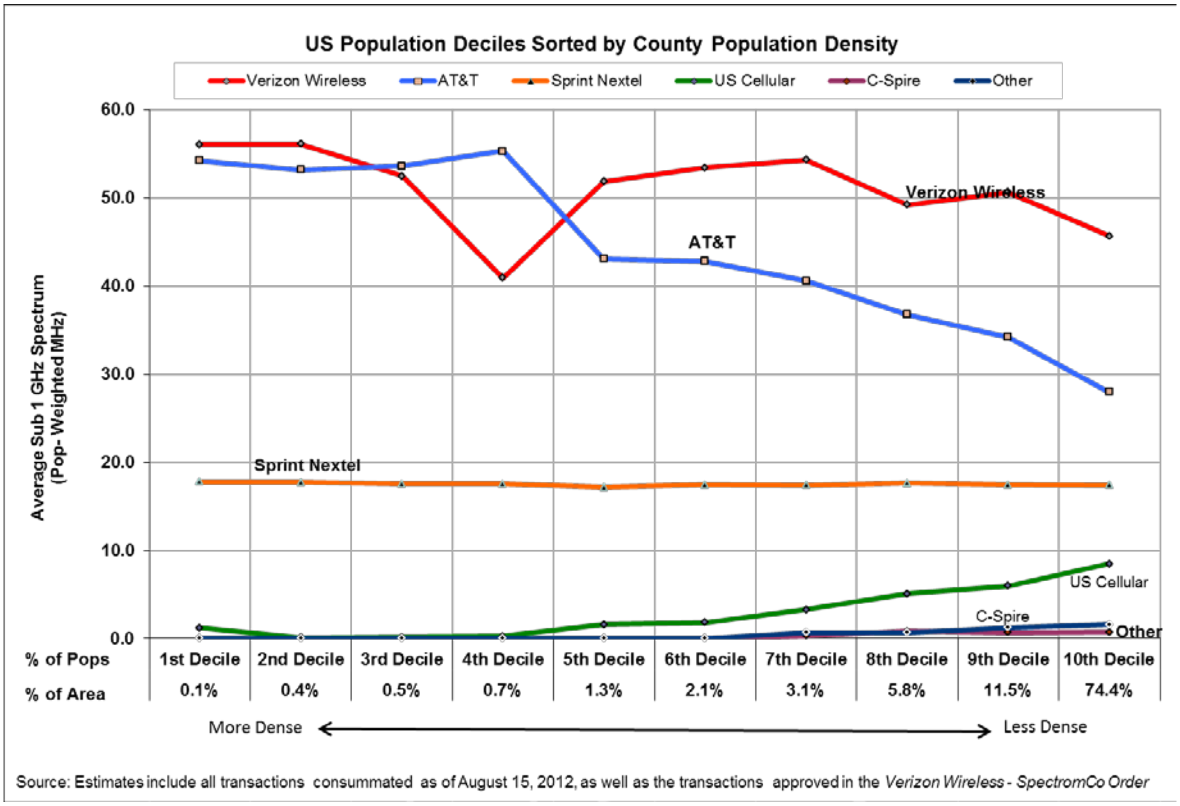
d. Distribution of Holdings by Population Density

132. The following Chart shows how spectrum is nationally distributed by population density. Generally, as the population density decreases, the under-1 GHz spectrum holdings of the large providers decrease, and those of regional and smaller companies increase.

(Continued from previous page)
(*Sprint Nextel-Clearwire Order*).

[428] Estimates do not include the WCS spectrum that was added to the spectrum screen in December 2012, 5.4 billion MHz-Pops of which is held by AT&T.

Chart 6
Average Under-1 GHz Spectrum by Population Density Deciles



5. Competitive Effects of Spectrum Holdings

133. The Commission's competition policies with respect to spectrum holdings have been developed with the goal of preserving competitive opportunities in the mobile wireless marketplace while retaining incentives for efficiency and innovation. Its policies have evolved over the years as more and more spectrum has been made available for mobile services. These policies have also changed as the marketplace changes and technology evolves.

134. The CMRS marketplace in 1995, when the *First Report* was issued, was very different from today's mobile wireless marketplace. Until 2007, the Commission's competition policies concerning the spectrum input market for mobile services focused on spectrum associated with three frequency bands – Cellular, SMR, and broadband PCS. These were the specific frequency bands that, until that time, the Commission had determined to be spectrum "suitable" for the provision of mobile services in the relevant product market, which the Commission had defined as the product market for "mobile telephony" services.[429] For purposes of its competitive analysis, the Commission has evaluated whether particular spectrum bands are "suitable" for mobile wireless services by determining whether the spectrum is capable of supporting mobile services given its physical properties and the state of the equipment technology, whether the spectrum is licensed with a mobile allocation and corresponding service rules, and whether the spectrum is committed to another use that effectively precludes its uses for mobile telephony.[430] Since the Commission first began applying a "spectrum screen" as part of its competitive analysis, it has determined that additional spectrum should be part of its spectrum input analysis – including 700 MHz,[431] AWS, and BRS spectrum[432] – and periodically has modified the

[429] *See AT&T-Dobson Order*, 22 FCC Rcd at 20311-12 ¶¶ 26-27.

[430] *See AT&T-Dobson Order*, 22 FCC Rcd at 20311 ¶ 26.

[431] *AT&T-Dobson Order*, 22 FCC Rcd at 20313-14 ¶ 31.

spectrum screen as more spectrum has become available.[433] The Commission also has recognized that the mobile services marketplace – including the product market – has evolved. In 2008, the Commission revised its competition policies, no longer limiting its competitive analysis to examination of the mobile telephony product market. Given the increasing prevalence of mobile broadband services, the Commission began examining a combined product market for both mobile telephony services and mobile broadband services.[434] Finally, we note that the Commission recently initiated a *Mobile Spectrum Holdings* rulemaking proceeding, in which it has sought comment on the factors it should use to determine whether particular spectrum bands are suitable and available for purposes of evaluating spectrum concentration, as well as which specific spectrum bands should be included in the analysis.[435]

135. As discussed above, spectrum resources in different frequency bands have distinguishing features that can make some frequency bands more valuable or better suited for particular purposes. From a competitive perspective, given these complementary characteristics, a provider is best positioned if it holds both low and higher frequency spectrum. Holding a mix of frequency ranges may be optimal from the perspective of providing the greatest service quality at low cost**.** For instance, given the superior propagation characteristics of spectrum under 1 GHz, particularly for providing coverage in rural areas and inside buildings, providers whose spectrum assets include spectrum below 1 GHz may possess certain competitive advantages for providing robust coverage when compared to licensees whose portfolio is exclusively comprised of higher frequency spectrum. On the other hand, providers with higher frequency spectrum may possess advantages in addressing capacity needs. For example, Verizon Wireless has stated that for a number of reasons, its Lower 700 MHz Band licenses are not as suitable to complement its 700 MHz Upper C Band for its own LTE capacity requirements as AWS.[436] Recognizing that different frequency bands can have distinct technical characteristics that affect how the bands are used to deliver mobile services, the Commission has sought comment in the *Mobile Spectrum Holdings NPRM* on whether its policies regarding mobile spectrum holdings should include separate consideration of spectrum in different frequency bands, such as spectrum below or above 1 GHz.[437]

IV. MOBILE WIRELESS SERVICES: PROVIDER CONDUCT

136. A key element of our analysis of competition in mobile wireless services is an examination of the conduct of mobile wireless services providers—in particular, whether there is evidence that service providers engage in price and non-price rivalry to attract customers from their competitors. Price rivalry includes a comparison of providers' service plans and their services, features, and prices. Non-price rivalry includes providers' network coverage, quality, and investment; providers' portfolios of innovative devices and services, and providers' advertising campaigns and expenditures to create retail distribution networks, distribute product information, and establish brand recognition. For both price and non-price rivalry providers take actions and make expenditures to differentiate themselves from competitors, as well as to imitate initiatives of their competitors that have been successful in attracting customers. For both price and non-price rivalry we report evidence of significant actions,

(Continued from previous page)

[432] *Sprint Nextel-Clearwire Order*, 23 FCC Rcd at 17596-600 ¶¶ 61-73. As discussed above, in reviewing proposed merger transactions that involve spectrum aggregation, the Commission examines market participants' holdings of suitable spectrum to ensure that there is sufficient spectrum available to competitors.

[433] *See Sprint Nextel-Clearwire Order*, 23 FCC Rcd at 17596-600 ¶¶ 61-73.

[434] *See Sprint Nextel-Clearwire Order*, 23 FCC Rcd at 17596 ¶ 61; *Verizon Wireless-Alltel Order*, 23 FCC Rcd at 17469-70 ¶¶ 45-47.

[435] *See Mobile Spectrum Holdings NPRM*, FCC 12-119, at ¶¶ 26-29 (rel. Sept. 28, 2012).

[436] Application of Cellco Partnership d/b/a Verizon Wireless and SpectrumCo, LLC For Consent to Assign Licenses, Application of Cellco Partnership d/b/a Verizon Wireless and Cox TMI Wireless, LLC For Consent to Assign Licenses, WT Docket No. 12-4, Joint Opposition to Petitions to Deny and Comments, William Stone Supp. Decl. at at ¶ 25 (Mar. 2, 2012).

[437] *Mobile Spectrum Holdings NPRM*, FCC 12-119, at ¶¶ 35-36.

changes, and expenditures undertaken by providers during 2011and the first part of 2012 and their responses to each other.

A. Price Rivalry: Developments in Mobile Service Pricing Plans

137. In the United States, most mobile wireless subscribers pay for their mobile wireless service after they have received services ("postpaid" service).[438] Other customers pay for their service prior to making calls ("prepaid" service). The following discussion of developments in mobile service pricing plans is divided into two sections. The first section covers developments in postpaid plans. The second section covers developments in prepaid plans, including traditional prepaid service plans and higher-end prepaid service plans that include data. The discussion focuses on recent changes made by providers during the period covered by the *Report* and accordingly has varied significantly from previous *Reports* as providers have changed their service plans and pricing practices. It does not present a comprehensive comparison of pricing plans and pricing data.[439]

1. Postpaid Service

138. This section of the *Sixteenth Report* traces the evolution of smartphone data pricing since the *Fifteenth Report*, which had focused on the industry's shift from unlimited data pricing to tiered, usage-based data pricing for smartphones. As discussed in the *Fifteenth Report*, this shift was a response to the effects of increased bandwidth consumption by smartphone users on network utilization and capacity constraints.[440] The *Fifteenth* Report discussed the introduction of tiered smartphone data pricing by AT&T in June 2010 and initial competitive responses by other providers to AT&T's pricing changes.[441] As documented below, three distinct models for smartphone data pricing emerged in 2011: (1) tiered, usage-based data pricing with overage charges (Verizon and AT&T); (2) tiered, usage-based data pricing with speed reductions instead of overage charges (T-Mobile); and (3) unlimited data pricing (Sprint). These pricing models remained relatively unchanged until the second half of 2012 when AT&T and Verizon launched shared data plans for smartphones and other mobile data devices, and T-Mobile reintroduced an unlimited smartphone data pricing option.

139. *AT&T and Verizon Wireless Smartphone Data Plans*. Through the first half of 2012, the smartphone data pricing plans offered by AT&T and Verizon Wireless, summarized in Table 19 below,

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[438] However, following changes in the market, the terms *post-paid* and *pre-paid* have evolved to be nearly synonymous with multi-month *contract* and *no contract*, respectively. The post-paid and pre-paid categories are industry conventions, and not always indicative of when customers pay their charges relative to the timing of the services used. In practice, with some post-paid plans, some charges are billed in advance of the service and others are billed after the customer has used the service. For example, the terms and conditions of Sprint state "Your bill provides you notice of your charges. It reflects monthly recurring charges (usually billed one bill cycle in advance), fees, taxes, Surcharges, product and equipment charges, subscription charges and usage/transaction specific charges (usually billed in the bill cycle in which they're incurred). Some usage charges, such as those that depend on usage information from a third party, may be billed in subsequent bill cycles and result in higher than expected charges for that month." *See* Sprint Nextel, https://shop2.sprint.com/en/legal/os_general_terms_conditions_popup.shtml (visited Nov. 11, 2011).

[439] The geographic coverage of any particular pricing plan or offer may vary across regional markets for a number of reasons. In some cases, service providers may not offer certain broadband data plans in geographic markets where they have not yet upgraded their networks. In other cases, service providers conduct pilot tests of new pricing plans (or changes in existing pricing plans) in selected regional markets before offering them across the rest of their network footprint. We do not attempt to make a systematic determination of the geographic availability of the pricing plans and rates covered in this section of the *Report* on a market-by-market basis. Therefore, we make no claims about whether the pricing plans and rates covered by the *Report* are representative of the plans and rates available in any given geographic market.

[440] *Fifteenth Report*, 26 FCC Rcd at 9725-27 ¶¶ 85-87.

[441] *Fifteenth Report*, 26 FCC Rcd at9726-27 ¶¶ 87-88.

shared three basic features: (1) both discontinued a $30 per month unlimited data plan for new smartphone customers;[442] (2) both offered multiple usage-based tiers with overage charges levied on customers when their monthly data usage allowances are exceeded;[443] and (3) both grandfathered their $30 per month unlimited data plan for existing smartphone users but subsequently started reducing the data throughput speeds for the heaviest data users of the grandfathered "unlimited" plans under certain circumstances.[444] As with the original unlimited data plans, customers who purchased one of the tiered data plans were also required to purchase a voice plan for an additional monthly charge.[445]

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[442] *Fifteenth Report*, 26 FCC Rcd at 9726-27 ¶¶ 87-88; Philip Goldstein, *Verizon Confirms It Will Ditch Unlimited Smartphone Data Plans Starting July 7*, FIERCEWIRELESS, Jul. 5, 2011.

[443] *Fifteenth Report*, 26 FCC Rcd at 9726-27 ¶¶ 87-88; Philip Goldstein, *Verizon Confirms It Will Ditch Unlimited Smartphone Data Plans Starting July 7*, FIERCEWIRELESS, Jul. 5, 2011.

[444] Verizon, *Network Optimization*, http://support.verizonwireless.com/information/data_disclosure.html (visited Oct. 4, 2011) stating "To optimize our network, we manage data connection speeds for a small subset of customers – the top 5% of data users with 3G devices on unlimited data plans – and only in places and at times of 3G network congestion."; Philip Goldstein, *Verizon's Network Optimization Policy is About Pricing as Much as the Network*, FIERCEWIRELESS, Sept. 21, 2011; AT&T, *An Update for Our Smartphone Customers With Unlimited Data Plans*, http://www.att.com/gen/press-room?pid=20535&cdvn=news&newsarticleid=32318&mapcode=corporate (visited Oct. 4, 2011); Philip Goldstein, *AT&T Will Throttle Heaviest Unlimited Smartphone Data Users Starting Oct. 1*, FIERCEWIRELESS, Jul. 29, 2011. *See* New York Times, *Revising the Limits for the Unlimited*, March 1, 2012. *See* PCWorld, *AT&T Wireless Bandwidth Throttling: The Backlash Has Begun*, Feb. 14, 2012, *available at* http://www.pcworld.com/article/249952/atandt_wireless_bandwidth_throttling_the_backlash_has_begun.html (visited Nov. 30, 2012).

[445] AT&T, *Individual Plans*, http://www.att.com/shop/wireless/packages/nokia-lumia-900-package-sku5910224.html#fbid=fk9VjETnPJF (visited Nov. 26, 2012). As explained below, Verizon discontinued offering its tiered smartphone data plans when it introduced shared data plans.

Table 19
AT&T and Verizon Wireless Data Plans: Unlimited with Reduced Speeds, Tiered with Overage Charges, June 2010- June 2012[446]

	Unlimited Data Plans		**Tiered Data Plans**			
	New Customers	**Existing Customers (grandfathered with reduced speeds for heaviest data users)**	**Date**	**Monthly Data**	**Monthly Charge**	**Overage Charge**
AT&T	Discontinued 6/07/2010	As of 10/2011, AT&T has reserved the right to reduce data speeds for the top 5 percent of data users in a given billing period.	June 2010	200 MB	$15	$15 per 200 MB
				2 GB	$25	$10 per GB
		As of 3/2012, AT&T will only slow data speeds when users reach 3 GB of usage in a billing cycle, or 5 GB for LTE customers.	Jan. 2012	300 MB	$20	$20 per 300 MB
				3 GB	$30	$10 per GB
				5 GB	$50	$10 per GB
Verizon Wireless	Discontinued 7/07/2011	As of 9/2011, Verizon Wireless may reduce data speeds for the top 5% of 3G device users when connected to a congested 3G cell site after reaching certain data-usage levels in a billing cycle (2 GB of data or more as of 8/2011), with an option to switch to usage-based plans or an LTE device	July 2011	2 GB	$30	$10 per GB
				5 GB	$50	$10 per GB
				10 GB	$80	$10 per GB

140. Verizon Wireless discontinued unlimited data plans for new smartphone customers more than a year after AT&T did so. Verizon Wireless retained its unlimited smartphone data plans when it first launched the CDMA iPhone in February 2011, and switched to usage-based smartphone data pricing the following July.[447] With AT&T being the only provider to offer the iPhone at that time, Verizon Wireless acknowledged that its decision to delay the switch to usage-based data pricing was an attempt to use its unlimited data plan to attract iPhone subscribers to Verizon Wireless from both AT&T's existing

[446] *See* AT&T, Support, *Info for Smartphone Customers with Unlimited Data Plans*, *available at* http://www.att.com/esupport/datausage.jsp?source=IZDUel1160000000U (visited August 7, 2012); *See* Verizon Wireless, Data Plans and Features – Terms and Conditions, http://support.verizonwireless.com/terms/products/vz_email.html (visited August 7, 2012). Customers who purchase one of unlimited data plans or the tiered data plans are also required to purchase a voice plan for an additional monthly charge.

[447] Mike Dano, *Verizon Nets 65,000 LTE Subs, Details iPhone Data Pricing*, FIERCEWIRELESS, Jan. 25, 2011 http://www.fiercewireless.com/story/verizon-nets-65000-lte-subs-details-iphone-data-pricing/2011-01-25 (visited Oct. 16, 2012);Philip Goldstein, *Sprint to Launch iPhone 4S Oct. 14, Along With AT&T, Verizon*, FIERCEWIRELESS, Oct. 4, 2011, http://www.fiercewireless.com/story/sprint-launch-iphone-4s-oct-12-along-att-verizon/2011-10-04 (visited Oct. 16, 2012).

iPhone customer base and the pool of potential new iPhone subscribers.[448]

141. Verizon Wireless structured its data tiers differently that AT&T, as shown in Table 19. Verizon Wireless offered a higher data tier than AT&T, and its tiers did not include an entry-level 200 MB plan like the one offered by AT&T. Whereas AT&T structured its usage-based tiers to attract new smartphone customers and encourage existing customers to upgrade to smartphones by lowering the entry-level cost of using smartphones, Verizon Wireless marketed its smartphone data offerings as a premium product by targeting high-end users with higher average monthly revenues per user.[449] Although Verizon Wireless included a 300 MB plan for a $20 monthly charge in a limited-time holiday promotion launched in November 2011, the promotion was applicable only to LTE smartphones.[450]

142. In January 2012, AT&T announced the first major changes to its smartphone data plans since switching to tiered data pricing in June 2010.[451] The company increased both the monthly prices and the usage tier levels for new smartphone customers, as shown in Table 19. At the new higher tier levels, the unit prices (average revenue per megabyte) are lower than those of the original tiers because the flat monthly fee is spread over a larger quantity of data. Of course, the actual price per MB paid by the subscriber depends on actual data usage, with subscribers who do not use up their monthly data allowance paying higher prices per MB than those who do. While these pricing changes brought some of AT&T's smartphone data pricing tiers closer to those of Verizon Wireless, AT&T continued to offer an entry-level plan with a monthly usage allowance well below Verizon Wireless's lowest 2 GB tier, and AT&T's highest data usage tier was only half the size of Verizon Wireless's highest 10 GB tier.

143. In March 2012, AT&T changed its network management policy for customers with

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[448] Mike Dano, *Verizon Nets 65,000 LTE Subs, Details iPhone Data Pricing*, FIERCEWIRELESS, Jan. 25, 2011. http://www.fiercewireless.com/story/verizon-nets-65000-lte-subs-details-iphone-data-pricing/2011-01-25 (visited Oct. 16, 2012).

[449] Philip Goldstein, *How Will Consumers Respond to Verizon's New Usage-Based Data Plans?*, FIERCEWIRELESS, Jul. 5, 2011 http://www.fiercewireless.com/story/how-will-switching-usage-based-pricing-affect-verizon/2011-07-05 (visited Oct. 16, 2012). However, Verizon does offer a 75 MB monthly plan for feature phones for $10 per month. Philip Goldstein, *Verizon Confirms It Will Ditch Unlimited Smartphone Data Plans Starting July 7*, FIERCEWIRELESS, Jul. 5, 2011 http://www.fiercewireless.com/story/verizon-confirms-it-will-ditch-unlimited-smartphone-data-plans-starting-jul/2011-07-05 (visited Oct. 16, 2012) ; Philip Goldstein, *How Will Consumers Respond to Verizon's New Usage-Based Data Plans?*, FIERCEWIRELESS, Jul. 5, 2011 http://www.fiercewireless.com/story/how-will-switching-usage-based-pricing-affect-verizon/2011-07-05 (visited Oct. 16, 2012).

[450] Philip Goldstein, *Verizon to Double LTE Smartphone Data Allotments*, FIERCEWIRELESS, Nov. 7, 2011. http://www.fiercewireless.com/story/verizon-double-lte-smartphone-data-allotments/2011-11-07 (visited Oct. 16, 2012) As part of the same holiday promotion, Verizon also doubled the data plan allowances for LTE smartphone customers for the same price as its existing tiered smartphone data offerings. Philip Goldstein, *Verizon to Double LTE Smartphone Data Allotments*, FIERCEWIRELESS, Nov. 7, 2011 http://www.fiercewireless.com/story/verizon-double-lte-smartphone-data-allotments/2011-11-07 (visited Oct. 16, 2012). In particular, customers who sign up for a 2 GB plan for $30 per month will get 4 GB per month, those who sign up for a 5 GB plan for $50 per month will get 10 GB and those who sign up for a 10 GB plan for $80 per month will get 20 GB. *Id*. Philip Goldstein, *Verizon Revives Double LTE Smartphone Data Promotion*, FIERCEWIRELESS, Feb. 7, 2012. http://www.fiercewireless.com/story/verizon-revives-double-lte-smartphone-data-promotion/2012-02-07 (visited Oct. 16, 2012) The holiday promotion ran from November 2011 through mid-January 2012, but in February 2012 Verizon revived the promotion that doubles the monthly data allowances of customers who purchase LTE smartphones.

[451] Philip Goldstein, *AT&T Increases Pricing, Usage Thresholds on Smartphone Data Plans*, FIERCEWIRELESS, Jan. 18, 2012. http://www.fiercewireless.com/story/att-increases-pricing-usage-thresholds-smartphone-data-plans/2012-01-18 (visited Oct. 16, 2012).

grandfathered unlimited smartphone data plans.[452] Under the previous policy instituted in October 2011, AT&T stated that it may reduce the data speeds of unlimited data subscribers when they are in the top five percent of data users in the month and area. Subsequently, many customers complained that this policy placed unreasonable limits on data usage because subscribers had no way of finding out what the limits would be ahead of time, and some subscribers ended up having their data throughput speeds reduced at just over 2 gigabytes of data use, lower than the data amount included under AT&T's current $30 per month limited smartphone data plan.[453] In response, AT&T altered its network management policy so that it will only slow down service for customers with unlimited data plans when they reach 3 gigabytes of usage in a billing cycle, or 5 gigabytes of usage for customers using the new LTE data network and smartphones.[454]

144. Under all of the above tiered data plans, individual customers or families with multiple devices were required to purchase a separate data plan for each device. At the end of June 2012, Verizon launched new tiered data pricing plans, called "Share Everything," that allow customers to pool their data usage package across multiple smartphones, tablets and other devices,[455] and in August 2012 AT&T followed suit by launching its own version of shared data plans, called "Mobile Share."[456] As set out below in Table 20, each tier of both Verizon's "Share Everything" plans for smartphones and AT&T's "Mobile Share" plans includes a single monthly data allowance that can be shared by up to ten different devices, plus unlimited voice minutes, unlimited text, video and picture messaging, and a "mobile hotspot" service. In addition, the pricing structure for each tier of both providers' shared data plans includes both a monthly charge for the monthly data allowance plus a monthly line access charge for each device added to the account, as well as an overage charge for data usage that exceeds each tier's monthly data allowance. An important difference between the two shared data offerings is that Verizon discontinued offering its existing tiered smartphone data plans to new customers and requires all new customers who purchase subsidized smartphones to sign up for its new "Share Everything" data plans, whereas AT&T introduced its new "Mobile Share" plans alongside its existing tiered smartphone data plans and does not require new customers or customers who upgrade to a subsidized smartphone to sign up for the new plans.[457] However, to continue attracting new customers with limited data needs, Verizon

[452] Brian Chen, *AT&T Sets New Rules on 'Unlimited Data' Plans*, THE NEW YORK TIMES, Mar. 1, 2012 http://bits.blogs.nytimes.com/2012/03/01/limited-unlimited-data/ (visited Oct. 18. 2012).

[453] Brian Chen, *AT&T Sets New Rules on 'Unlimited Data' Plans*, THE NEW YORK TIMES, Mar. 1, 2012. http://bits.blogs.nytimes.com/2012/03/01/limited-unlimited-data/ (visited Oct. 18, 2012).

[454]Brian Chen,, *AT&T Sets New Rules on 'Unlimited Data' Plans*, THE NEW YORK TIMES, Mar. 1, 2012. http://bits.blogs.nytimes.com/2012/03/01/limited-unlimited/ (visited Oct. 18, 2012). While Verizon Wireless's speed reduction policy for customers with grandfathered unlimited data plans is based on a similar "top five percent" rule, the company does not reduce the data speeds of customers in the top five percent of data users unless they are connected to a cell tower that is congested at that particular moment. The Associated Press, *AT&T Sets New Rules on 'Unlimited Data' Plans*, THE NEW YORK TIMES, Mar. 1, 2012; Verizon, *Network Optimization*, http://support.verizonwireless.com/information/data_disclosure.html (visited Oct. 4, 2011).

[455] Philip Goldstein, *Verizon Launches 'Share Everything' Family Data Plans*, FIERCEWIRELESS, June 12, 2012; Verizon Wireless, *Share Everything Plans*, http://www.verizonwireless.com/b2c/plan-information/?page=share-everything (visited Sept. 6, 2012).

[456] Philip Goldstein, *AT&T Follows Verizon With 'Mobile Share' Shared Data Plans*, FIERCEWIRELESS, July 18, 2012; AT&T, *Mobile Share*, http://www.att.com/shop/wireless/data-plans.html#fbid=pgSVH67Gp_M?tab2 (visited Sept. 6, 2012); Anton Troianovski and Thomas Gryta, *New Front Opens in Wireless Battle*, WALL STREET JOURNAL, June 12, 2012. http://online.wsj.com/article/SB10001424052702303901504577462241394886300.html (visited Oct. 16, 2012).

[457] Philip Goldstein, *AT&T Follows Verizon With 'Mobile Share' Shared Data Plans*, FIERCEWIRELESS, July 18, 2012 http://www.fiercewireless.com/story/att-follows-verizon-mobile-share-shared-data-plans/2012-07-18 (visited Oct. 16, 2012); Anton Troianovski and Thomas Gryta, *New Front Opens in Wireless Battle*, WALL STREET

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kept two entry-level plans for new customers with basic phones.[458]

145. The effects of the new shared data plans on the monthly price per megabyte of data paid by a subscriber depends on both the number of devices and the amount of data a family or individual customer uses. While light data users with a small number of devices will typically pay more per megabyte of data, there is a cross-over point beyond which heavy data users with many devices will be able to realize savings as a result of declines in the price per unit of data.[459]

146. The introduction of shared data offerings also represents a potentially fundamental departure from the historical model of pricing mobile voice and texting services on a per unit basis by service (cents per minute of voice service or per text message).[460] This historical model creates an incentive for what one analyst terms "bandwidth arbitrage" – substitution of low-priced, high-bandwidth data services for high-priced, low-bandwidth voice and text services by means of applications such as Skype, Facebook and Apple's iMessage.[461] The new shared data plans reduce this type of substitution by including unlimited voice and text messaging in each tier and by pricing that is based exclusively on data usage.[462]

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JOURNAL, June 12, 2012. http://online.wsj.com/article/SB10001424052702303901504577462241394886300.html (visited Oct. 16, 2012).

[458] The lowest plan includes 700 voice minutes and pay-as-you-go messaging and data for a monthly account access charge of $10 per month, and the second plan includes 300 MB of shared data plus unlimited voice minutes and text messaging for $40 per month. Both plans include an additional monthly line access charge of $30 per device. Verizon Wireless, *Share Everything Plans*, http://www.verizonwireless.com/b2c/plan-information/?page=share-everything (visited Sept. 6, 2012); Roger Entner, *Entner: Shared Data Pricing has Arrived*, FIERCEWIRELESS, June 12, 2012. http://www.fiercewireless.com/story/entner-shared-data-pricing-has-arrived/2012-06-12 (visited Oct. 16, 2012).

[459] Craig Moffett *et al*, *Quick Take – Verizon: Market Share(ing)… The Beginning of the Endgame?*, Bernstein Research, June 12, 2012, at 2-3; Roger Entner, *Entner: Shared Data Pricing has Arrived*, FIERCEWIRELESS, June 12, 2012. http://www.fiercewireless.com/story/entner-shared-data-pricing-has-arrived/2012-06-12 (visited Oct. 16, 2012).

[460] David W. Barden *et al*., *Verizon Shares New Pricing, Pre-Pay Welcomes iPhone*, Bank of America Merrill Lynch, Equity Research, July 10, 2012, at 1; Craig Moffett *et al*, *Quick Take – Verizon: Market Share(ing)… The Beginning of the Endgame?*, Bernstein Research, June 12, 2012, at 1-2.

[461] Craig Moffett *et al*, *Quick Take – Verizon: Market Share(ing)… The Beginning of the Endgame?,* Bernstein Research, June 12, 2012, at 1-2.

[462] David W. Barden *et al*., *Verizon Shares New Pricing, Pre-Pay Welcomes iPhone*, Bank of America Merrill Lynch, Equity Research, July 10, 2012, at 1; Craig Moffett *et al*, *Quick Take – Verizon: Market Share(ing)… The Beginning of the Endgame?*, Bernstein Research, June 12, 2012, at 1-2.

Table 20
Verizon Wireless's and AT&T's Shared Data Plans

	Monthly Line Access (per device)	Shared Data Allowance	Monthly Account Access (shared with up to 10 devices)	Overage Charge	Unlimited Voice and Text
Verizon	Smartphones $40	1 GB	$50	$15 per GB	Yes
	Basic phones $30	2 GB	$60		
	Jetpacks/USBs/Notebooks/	4 GB	$70		
	Netbooks $20	6 GB	$80		
	Tablets $10	8 GB	$90		
		10 GB	$100		
AT&T	Smartphones $45	1 GB	$40	$15 per GB	Yes
	$40	4 GB	$70		
	$35	6 GB	$90		
	$30	10 GB	$120		
		15 GB	$160		
		20 GB	$200		
	Basic phones $30 Laptops/netbooks $20 Tablets $10 Gaming devices $10				

147. *T-Mobile Smartphone Data Plans*. The tiered, usage-based smartphone data plans introduced by T-Mobile in 2011 differed in two key respects from the tiered plans of AT&T and Verizon Wireless.[463] T-Mobile set lower prices for comparable tiered plans, and its tiered plans depended primarily on reducing the data speeds of customers once they exceed their monthly data allowances, rather than on levying overage charges.[464] The initial version of its tiered data plans for smartphones

[463] Sue Marek, *T-Mobile Unveils New Tiered Data Plans for Smartphones, Details Throttling Speeds*, FIERCEWIRELESS, May 23, 2011. http://www.fiercewireless.com/story/t-mobile-quietly-launches-tiered-data-plans-smartphones/2011-05-23 (Visited Nov. 30, 2012).

[464] Sue Marek, *T-Mobile Unveils New Tiered Data Plans for Smartphones, Details Throttling Speeds*, FIERCEWIRELESS, May 23, 2011. http://www.fiercewireless.com/story/t-mobile-quietly-launches-tiered-data-plans-smartphones/2011-05-23 (visited Oct. 16, 2012). *See* T-Mobile, Terms and Conditions, available at www.tmobile.com, (visited Aug. 14, 2012) (stating "To provide a good experience for the majority of our customers and minimize capacity issues and degradation in network performance, we may take measures including temporarily reducing data throughput for a subset of customers who use a disproportionate amount of bandwidth. In addition, if your total usage exceeds 5GB (amount is subject to change without notice; please check T-Mobile's T&Cs on www.T-Mobile.com for updates) during a billing cycle, we may reduce your data speed for the remainder of that billing cycle. If you use your Data Plan in a manner that could interfere with other customers' service, affect our ability to allocate network capacity among customers, or degrade service quality for other customers, we may suspend, terminate, or restrict your data session, or switch you to a more appropriate Data Plan. We also manage our (continued….)

introduced in May 2011 relied exclusively on reducing data speeds once a user exceeded her data usage allowance.[465] However, T-Mobile replaced speed reductions with overage fees on its entry-level 200 MB smartphone data plan beginning on August 14, 2011 for new customers who sign up for this plan.[466] T-Mobile made the partial switch from speed reductions to overage charges for its entry-level 200 MB plan because the rate of adoption exceeded expectations.[467] As with the tiered smartphone data plans offered by Verizon and AT&T, customers who purchased one of T-Mobile's tiered smartphone data plans were also required to purchase a voice plan for an additional monthly charge.

Table 21
T-Mobile: Tiered Smartphone Data Plans with Reduced Speeds or Overage Charges, Aug. 2011-Aug. 2012

Monthly Data	Monthly Charge	Speed Reduction	Overage Charge
200 MB	$10	Reduced speeds replaced with overage fees for new customers as of 8/14/2011. Existing customers on the 200 MB plan are still subject to reduced speeds rather than overage charges.	$0.10 per MB, up to a maximum monthly charge of $40, including the cost of the 200 MB plan
2 GB	$20	Customers who exceed the cap will have their data speeds reduced to an EDGE/2G experience of around 100 Kbps or less for the rest of month, with the option of switching to a higher data tier instead	No charge
5 GB	$30		
10 GB	$60		

148. Prior to the introduction of its new tiered data plans in May 2011, T-Mobile had already begun to qualify its original $30 per month "unlimited" smartphone data plan by reducing the data speeds of customers when they reached 5 GB of data usage.[468] As a consequence, although T-Mobile continued

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network to facilitate the proper functioning of services that require consistent high speeds, such as video calling, which may, particularly at times and in areas of network congestion, result in reduced speeds for other services. Additionally, we may implement other network management practices, such as caching less data, using less capacity, and sizing video more appropriately for a Device to transmit data files more efficiently. These practices are agnostic to the content itself and to the websites that provide it. While we avoid changing text, image, and video files in the compression process when practical, the process may impact the appearance of files as displayed on your Device.").

[465] Sue Marek, *T-Mobile Unveils New Tiered Data Plans for Smartphones, Details Throttling Speeds*, FIERCEWIRELESS, May 23, 2011. http://www.fiercewireless.com/story/t-mobile-quietly-launches-tiered-data-plans-smartphones/2011-05-23 (visited Oct. 16, 2012).

[466] Philip Goldstein, *Confirmed: T-Mobile to Replace Throttling With Overage Fees on 200 MB Plan*, FIERCEWIRELESS, Aug. 11, 2011. http://www.fiercewireless.com/story/rumor-mill-t-mobile-replace-throttling-overage-fees-200-mb-plan/2011-08-11(visited Oct. 16, 2012). T-Mobile will send customers a free text message advising them they are approaching their monthly data cap at 90 percent, or 180 MB, of data in a given billing cycle, and will send them a similar message when they reach the 200 MB limit. Existing customers already on the 200 MB plan prior to August 14, 2011 do not incur overage charges, but rather remain subject to speed reductions if they exceed the 200 MB cap. *Id*.

[467] Philip Goldstein, *Confirmed: T-Mobile to Replace Throttling With Overage Fees on 200 MB Plan*, FIERCEWIRELESS, Aug. 11, 2011. http://www.fiercewireless.com/story/rumor-mill-t-mobile-replace-throttling-overage-fees-200-mb-plan/2011-08-11 (visited Oct. 16, 2012).

[468] Sue Marek, *T-Mobile Unveils New Tiered Data Plans for Smartphones, Details Throttling Speeds*, FIERCEWIRELESS, May. 23, 2011; http://www.fiercewireless.com/story/t-mobile-quietly-launches-tiered-data-plans-smartphones/2011-05-23 (visited Oct. 16, 2012); *Fifteenth Report*, 26 FCC Rcd at9729 ¶ 92.

to offer a $30 per month data plan to new smartphone customers alongside the new tiered data plans, what had been T-Mobile's original unlimited data plan became, in effect, one tier of its usage-based data plans. Therefore, like AT&T and Verizon Wireless, T-Mobile stopped offering an unlimited data plan without qualifications to new smartphone customers, and it used speed reductions to control the data usage of subscribers of its original "unlimited" data plan.

149. In July 2011, T-Mobile began "Value Plans" that offer less expensive monthly rates on its three higher tiered data plans for customers who either bring a compatible device to T-Mobile or purchase a new device in monthly installments.[469] Customers who signed up for the less expensive plans were still subject to speed reductions if they went over their monthly data allowances.[470] T-Mobile estimates that, as of December 2012, Value Plans accounted for approximately 80 percent of its postpaid activations in its stores.[471] In April 2012, T-Mobile raised the monthly charge for its two highest data tiers – from $30 to $35 for its 5 GB tier, and from $60 to $65 for its 10 GB tier.[472]

150. In September 2012, T-Mobile modified its approach to smartphone data pricing by introducing an unlimited smartphone data pricing option without tethering alongside its existing tiered, usage-based smartphone data pricing plans.[473] Like T-Mobile's original $30 per month unlimited smartphone data plan discussed above, the provider's new Unlimited Nationwide 4G Data plan is priced at $30 per month for postpaid subscribers with subsidized smartphones, with $20 per month option available to subscribers who choose to forgo a smartphone subsidy. Although T-Mobile's 5 GB and 10 GB data tiers have higher monthly prices than the new unlimited without tethering plan, they include T-Mobile's "mobile hotspot" smartphone tethering service. T-Mobile differentiates its new unlimited data plan from Sprint's unlimited smartphone data offering based on the broader geographic coverage of its HSPA+ network as compared to Sprint's 4G data service, which runs over Clearwire's mobile WiMAX network and Sprint's nascent LTE network, and the higher speeds offered by its HSPA+ network as compared to Sprint's slower nationwide 3G CDMA EV-DO network.[474]

151. As a result of the revival of its unlimited smartphone data plan and the earlier change in its entry-level tiered plan, T-Mobile's pricing of smartphone data plans can be characterized as a

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[469] Philip Goldstein, *Confirmed: T-Mobile Targets Sprint With Cheaper Unlimited Smartphone Plans*, FIERCEWIRELESS, Jul. 20, 2011. http://www.fiercewireless.com/story/t-mobile-targets-sprint-cheaper-unlimited-smartphone-plans/2011-07-20 (visited Oct. 16, 2012). In the Value plans and Classic plans, the data allotment was bundled with unlimited voice and texting. The 2 GB Value plan was $20 less expensive than the comparable Classic plan, and the 5 GB and 10 GB Value plans were each $15 less expensive than the comparable Classic plans. *Id*.

[470] Philip Goldstein, *Confirmed: T-Mobile Targets Sprint With Cheaper Unlimited Smartphone Plans*, FIERCEWIRELESS, Jul. 20, 2011. http://www.fiercewireless.com/story/t-mobile-targets-sprint-cheaper-unlimited-smartphone-plans/2011-07-20 (visited Oct. 16, 2012).

[471] T-Mobile USA, Presentation at Deutschetelekom Capital Markets Day 2012, Dec. 6, 2012, at 22, *available at* http://www.telekom.com/static/-/162600/7/presentation-jl-si. (visited Oct. 16, 2012).

[472] David W. Barden *et al*., *Verizon Shares New Pricing, Pre-Pay Welcomes iPhone*, Bank of America Merrill Lynch, Equity Research, July 10, 2012, at 5-6.

[473] *T-Mobile Celebrates 10 Years of Innovation With Launch of Unlimited Nationwide 4G Data Plans*, Press Release, T-Mobile, Sept. 5, 2012 http://newsroom.t-mobile.com/articles/t-mobile-celebrates-10-years-and-launches-unlimited-nationwide-4g-data-plans (visited Oct. 16, 2012 ; T-Mobile, *Individual Plans*, http://www.t-mobile.com/shop/plans/individual-plans.aspx (visited Sept. 6, 2012); Mike Dano, *T-Mobile Revives $30 Unlimited Data for Postpaid Smartphones*, FIERCEWIRELESS, Aug. 22, 2012. http://www.fiercewireless.com/story/t-mobile-revives-30-unlimited-data-postpaid-smartphones/2012-08-22 (visited Oct. 16, 2012).

[474] Mike Dano, *T-Mobile Revives $30 Unlimited Data for Postpaid Smartphones*, FIERCEWIRELESS, Aug. 22, 2012. http://www.fiercewireless.com/story/t-mobile-revives-30-unlimited-data-postpaid-smartphones/2012-08-22 (visited Oct. 16, 2012).

composite of the three original models of smartphone data pricing. In addition to its original tiered data plans with speed reductions, T-Mobile's array of smartphone data plans includes a low-end tier with overage charges adopted from the first model and an unlimited data pricing option from the third model. Customers who purchase one of these smartphone data plans are also required to purchase a voice plan, plus unlimited text messaging, for an additional monthly charge.[475]

152. In December 2012, T-Mobile USA CEO John Legere announced that in 2013 the company will eliminate the Classic rate plans shown in Tables 21 and 22 and instead offer only Value plans to customers, thus eliminating device subsidies.[476] As explained above, T-Mobile's Value plans allow customers to bring a compatible device to T-Mobile or pay for a new device upfront or in monthly installments in exchange for lower monthly service plan fees.

Table 22
T-Mobile: Tiered Smartphone Data Plans with Reduced Speeds or Overage Charges, Sept. 2012

Monthly Data	Monthly Charge	Speed Reduction[477]	Overage Charge	Mobile Hotspot Tethering
200 MB	$10	No	$0.10 per MB	No
2 GB	$20	Yes	No	No
Unlimited	$30	No	No	No
5 GB	$35	Yes	No	Yes
10 GB	$65	Yes	No	Yes

153. *Sprint Smartphone Data Plans*. Sprint remains the only nationwide service provider that has continuously retained its unlimited data offering despite the trend toward tiered data, and that has not yet introduced tiered smartphone data plans, discontinued offering new unlimited smartphone data plans, or reduced the data speeds on its unlimited smartphone data plans.[478] This was the standard industry smartphone data pricing plan before the shift to tiered data plan pricing – a single unlimited data plan for smartphones with no speed reductions or overage fees. Sprint has been using its unlimited smartphone data offerings and the absence of either speed reductions or overage charges for heavy data use to differentiate itself from its rivals and to seek a competitive advantage in attracting and retaining customers.[479] Sprint retained unlimited data pricing when it became the third U.S. service provider to

[475] T-Mobile, *Individual Plans*, http://www.t-mobile.com/shop/plans/individual-plans.aspx (visited Nov. 26, 2012).

[476] Phil Goldstein, *T-Mobile Kills Device Subsidies*, FIERCEWIRELESS, Dec. 6, 2012; T-Mobile USA, Presentation at Deutschetelekom Capital Markets Day 2012, Dec. 6, 2012, at 23, available at http://www.telekom.com/static/-/162600/7/presentation-jl-si.

[477] *See* Table 21 for a more detailed description of the speed reduction policy for each tier.

[478] Philip Goldstein, *Sprint not Changing Data Pricing After AT&T's Move*, FIERCEWIRELESS, June 4, 2010 http://www.fiercewireless.com/story/sprint-not-changing-data-pricing-after-ts-move/2010-06-04 (visited Oct. 16, 2012); Philip Goldstein, *Sprint: We Won't Throttle Wireless Data Speeds on our Network*, FIERCEWIRELESS, June 14, 2010 http://www.fiercewireless.com/story/sprint-we-wont-throttle-wireless-speeds-our-network/2010-06-14 (visited Oct. 16, 2012); Philip Goldstein, *Sprint Increases Unlimited Smartphone Data by $10 Per Month*, FIERCEWIRELESS, Jan. 18, 2011. http://www.fiercewireless.com/story/sprint-increases-unlimited-smartphone-data-10-month/2011-01-18 (visited Oct. 16, 2012).

[479] Mike Dano, *New Sprint Ad Campaign Hinges on Unlimited Data*, FIERCEWIRELESS, Apr. 11, 2011 http://www.fiercewireless.com/story/new-sprint-ad-campaign-hinges-unlimited-data/2011-04-11 (visited Oct. 16, 2012); Mike Dano, *Sprint Scolds Verizon's Tiered Data Plans With New Unlimited Ads*, FIERCEWIRELESS, Jul. 12, (continued….)

launch the iPhone in October 2011, and used its unlimited data plans to differentiate itself as the "value proposition" provider in competing for iPhone users against rivals AT&T and Verizon Wireless.[480]

154. Sprint prices its unlimited smartphone data plan with unlimited text messaging and varying amounts of voice minutes included in the price (Table 23). As indicated in Table 23, it costs $30 per month to add Sprint's unlimited smartphone data plan to a package that includes a limited bucket of voice minutes and unlimited text messaging services.[481]

Table 23
Sprint Postpaid Unlimited Smartphone Data Plans

Monthly Data	Voice Minutes	Text Messaging	Monthly Charge	Any Mobile Minutes	Push to Talk
Unlimited	Unlimited	Unlimited	$109.99	Yes	Yes
Unlimited	900	Unlimited	$99.99	Yes	No
0	900	Unlimited	$69.99	No	No
Unlimited	450	Unlimited	$79.99	Yes	No
0	450	Unlimited	$49.99	No	No

155. Although Sprint has yet to shift from unlimited data pricing to tiered data pricing, the company made some pricing plan changes since its nationwide rivals shifted to tiered data pricing. (Table 24). In January 2011, Sprint raised the monthly charge on its unlimited smartphone data service by ten dollars per month for new customers and also existing customers who get a new smartphone.[482] This price increase applied to both Sprint's "Simply Everything" plan, which includes unlimited voice and texting, and its "Everything Data" plans, which include a limited bucket of voice minutes and unlimited texting. Prior to this increase, Sprint had charged an extra ten dollars per month only for its WiMAX-capable smartphones.[483] In addition, Sprint has begun to move away from unlimited data pricing in other

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2011 http://www.fiercewireless.com/story/sprint-scolds-verizons-tiered-data-plans-new-unlimited-ads/2011-07-12 (visited Oct. 16, 2012).

[480] Philip Goldstein, *Sprint Confirms Unlimited Data Plans for Iphone 4S and iPhone 4*, FIERCEWIRELESS, Oct. 6, 2011 http://www.fiercewireless.com/story/sprint-confirms-unlimited-data-plans-iphone-4s-and-iphone-4/2011-10-06 (visited Oct. 16, 2012); Philip Goldstein, *Apple's iPhone 4S May Not Be That Different, But the Wireless Industry Now Is*, FIERCEWIRELESS, Oct. 5, 2011 http://www.fiercewireless.com/story/apples-iphone-4s-may-not-be-different-wireless-industry-now/2011-10-05 (visited Oct. 16, 2012).

[481] Since the unlimited smartphone data bundles include unlimited mobile-to-mobile calling (Sprint's "Any Mobile, Anytime" feature) while the voice-and-text-only bundles do not, the effective size of the voice buckets is larger in the unlimited smartphone data bundles, and therefore this estimate overstates the monthly charge for the unlimited smartphone data plan. Sprint does not offer a separate unlimited calling plan, but rather only offers unlimited calling (and texting) bundled with its unlimited smartphone data plan.

[482] Philip Goldstein, *Sprint Increases Unlimited Smartphone Data by $10 Per Month*, FIERCEWIRELESS, Jan. 18, 2011. http://www.fiercewireless.com/story/sprint-increases-unlimited-smartphone-data-10-month/2011-01-18 (visited Oct. 16, 2012) Existing smartphone customers are not affected by the price increase unless they upgrade or activate a new smartphone. The price increase applies to Sprint's Everything Data Plan, which includes 450 voice minutes and unlimited data, and its Simply Everything Plan, which includes unlimited voice, texting and data. *Id*.

[483] Philip Goldstein, *Sprint Increases Unlimited Smartphone Data by $10 Per Month*, FIERCEWIRELESS, Jan. 18, 2011. http://www.fiercewireless.com/story/sprint-increases-unlimited-smartphone-data-10-month/2011-01-18 (visited Oct. 16, 2012).

business segments, including its prepaid brands and non-smartphone devices.[484]

Table 24
Sprint Unlimited Smartphone Data Plan Changes, Jan. 2011-Mar. 2012[485]

	Unlimited Plan	**Pricing Changes**	**Speed Reduction**
Postpaid	Everything Data Simply Everything	Extra $10 per month for new customers and existing customers who got a new smartphone as of 1/20/2011	
Prepaid	Beyond Talk (*Virgin Mobile*)	In July 2011, the price of the $25 plan increased to $35, the price of the $40 plan increased to $45, the price of the $60 plan decreased to $55, and a $10 add-on fee for RIM Blackberry devices was dropped	As of March 2012, for customers who use more than 2.5 GB per month
	Boost Mobile	Extra $5 per month for new Android smartphone customers as of 10/06/2011	

156. *Smartphone Data Plans of Other Providers*. Apart from the nationwide service providers, C Spire Wireless (formerly Cellular South), in November 2011, became the fourth U.S. service provider and the first regional provider to offer the iPhone 4S.[486] The smartphone data pricing model adopted by C Spire is similar to Sprint's model in that all four bundled voice and data plans offered by C Spire include unlimited data usage.[487] The two least expensive plans curb bandwidth consumption by excluding streaming video.[488]

157. *Tablet Data Plans*. Unlike the case of smartphones, cellular network connections and data plans are optional for tablets, and surveys indicate that tablet users prefer Wi-Fi over cellular networks for connectivity.[489] One of the factors inhibiting cellular connectivity for tablets has been the

[484] In November 2011, Sprint stopped offering non-smartphone mobile broadband plans with unlimited data on Clearwire's mobile WiMAX network. Philip Goldstein, *Sprint Drops Unlimited WiMAX Data for Mobile Broadband Plans*, FIERCEWIRELESS, Oct. 21, 2011. http://www.fiercewireless.com/story/sprint-drops-unlimited-wimax-data-mobile-broadband-plans/2011-10-21 (visited Oct. 16, 2012). Under the new plans, the monthly recurring charge is unchanged, but WiMAX data now falls under the same data cap as EV-DO, with an overage charge of $0.05 per MB. This change in Sprint's mobile broadband plans does not affect smartphone users, but instead applies to other data-oriented devices, including tablets, netbooks, notebooks and USB cards. *Id*.

[485] Sprint, Virgin Mobile, and Boost Mobile are retail brands under the Sprint corporate brand. See, SEC, Form 10-K, Sprint Nextel Corporation, filed Feb. 27, 2012, at 1.

[486] "*C Spire Wireless to Offer iPhone 4S on November 11*," Press Release, C Spire Wireless, Nov. 1, 2011. http://www.cspire.com/company_info/about/news_detail.jsp?entryId=10700006 (visited Oct. 16, 2012).

[487] *Id*.

[488] *Id*. In addition to streaming video, the four plans differ with respect to voice usage. The most expensive plan and the second most expensive plan include unlimited calling, while the least expensive plan and the third most expensive plan include 500 and 1000 minutes of voice service, respectively. All four plans include unlimited texting.

[489] Philip Goldstein, *NPD: Tablet Users Increasingly Favor Wi-Fi Over Cellular Connections*, FIERCEWIRELESS, Dec. 12, 2011. http://www.fiercewireless.com/story/npd-tablet-users-increasingly-favor-wi-fi-over-cellular-connections/2011-12-12 (visited Oct. 16, 2012). According to the NPD report, 65 percent of U.S. (continued….)

need to purchase an additional data plan.[490] The introduction of new family data plans for multiple devices may make cellular network connectivity more attractive for tablet users.[491]

158. Prior to the launch of the new shared data plans, data plans for tablets were not a major focal point of price rivalry in comparison with data plans for smartphones.[492] While service providers heavily subsidize the purchase of smartphones to promote their adoption and attract and retain data users, they do not subsidize the purchase of tablets as extensively as they do smartphone purchases. Neither Verizon Wireless nor AT&T offer subsidies for the purchase of Apple iPads, although both offer subsidies on other brands provided customers sign up for a two-year contract. While T-Mobile and Sprint do not offer the iPad, T-Mobile offers subsidies on the tablets it supports and Sprint offers subsidies on some but not all tablets.[493] Data pricing for tablets is less differentiated than smartphone data pricing. In particular, all four nationwide providers offer exclusively tiered, usage-based data plans for tablets, rather than unlimited data plans.[494] In common with Verizon Wireless and AT&T, Sprint levies overage charges for usage in excess of monthly allowances, while T-Mobile reduces the data speeds of tablet users after they reach their monthly data allowances.[495] Data plan pricing for tablets by AT&T and Verizon

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tablet buyers only connect via Wi-Fi, up from 60 percent in April 2011; Philip Goldstein, *Localytics: Only 6% of iPad Data Sessions are on Cellular Networks*, FIERCEWIRELESS, Mar. 23, 2012. http://www.fiercewireless.com/story/localytics-only-6-ipad-data-sessions-are-cellular-networks/2012-03-23 (visited Oct. 16, 2012) (citing a finding of Localytics that just 6 percent of iPad data sessions are transmitted over a cellular network, and a Chetan Sharma Consulting report finding that 90 percent of tablet users are only using Wi –Fi, even if the tablets have cellular data capabilities). Localytics also found that about 89.7 percent of all iPads sold can only connect to Wi-Fi networks, 8.8 percent can connect to 3G networks and 1.5 percent can connect to LTE networks; among iPads with 3G connectivity, 55 percent of usage is over Wi-Fi and 45 percent is over 3G networks; among LTE-enabled iPads, 64 percent of usage is over Wi-Fi and 36 percent is via LTE. *Id*.

[490] Philip Goldstein, *NPD: Tablet Users Increasingly Favor Wi-Fi Over Cellular Connections*, FIERCEWIRELESS, Dec. 12, 2011. http://www.fiercewireless.com/story/npd-tablet-users-increasingly-favor-wi-fi-over-cellular-connections/2011-12-12 (visited Oct. 16, 2012).

[491] Philip Goldstein, *NPD: Tablet Users Increasingly Favor Wi-Fi Over Cellular Connections*, FIERCEWIRELESS, Dec. 12, 2011. http://www.fiercewireless.com/story/npd-tablet-users-increasingly-favor-wi-fi-over-cellular-connections/2011-12-12 (visited Oct. 16, 2012).

[492] Table data plans are generally available on a postpaid basis with a two-year contractual commitment for subsidized tablets, and on a no-contract or prepaid basis otherwise.

[493] Verizon, *Select Device*, https://preorder.verizonwireless.com/ iconic/iconic/screens/IconicDeviceSelection.do (visited Mar. 28, 2012); AT&T, *Cell Phones and Mobile Devices*, http://www.att.com/shop/wireless.html#fbid=I4cgltbUFdp (visited Mar. 28, 2012); T-Mobile, Internet Devices, http://www.t-mobile.com/shop/phones/?shape=lcards (visited Mar. 28, 2012); Sprint, *Laptops, Tablets and More*, http://shop.sprint.com/mysprint/shop/phone_wall.jsp?flow=&tabId=dvcTab1820005&filterString=tablet&isDeeplinked=true&INTNAV=ATG:HE:Tablets (visited Mar. 28, 2012).

[494] Sprint, *Plans*, http://shop.sprint.com/mysprint/shop/plan/plan_wall.jsp?tabId=plnTab1820002&flow=AAL&planFamilyType=null (visited Mar. 28, 2012); T-Mobile, *T-Mobile Has Tablets for Everyone*, http://mobile-broadband.t-mobile.com/tablets (visited Mar. 28, 2012); AT&T, *AT&T Data Plans*. http://www.wireless.att.com/cell-phone-service/cell-phone-plans/data-connect-plans.jsp?_requestid=142028 (visited Mar. 28, 2012); Verizon, *Mobile Broadband Plans Details*, http://www.verizonwireless.com/b2c/plans/?page=mobileBroadband (visited Mar. 28, 2012).

[495] Sprint, *Plans*, http://shop.sprint.com/mysprint/shop/plan/plan_wall.jsp?tabId=plnTab1820002&flow=AAL&planFamilyType=null (visited Mar. 28, 2012); T-Mobile, *T-Mobile Has Tablets for Everyone*, http://mobile-broadband.t-mobile.com/tablets (visited Mar. 28, 2012); AT&T, *AT&T Data Plans*. http://www.wireless.att.com/cell-phone-service/cell-phone-plans/data-connect-plans.jsp?_requestid=142028 (visited Mar. 28, 2012); Verizon, *Mobile*
(continued….)

Wireless is shown above in Table 20 on their shared data plans. The pricing of comparable data plans for tablets by Sprint and T-Mobile is shown in Table 25 below. Unlike with smartphone data plans, data plans for tablets are not bundled with voice plans, and customers who purchase a data plan for tablets from Sprint or T-Mobile are not required to purchase a voice plan.

Table 25
Sprint and T-Mobile Data Plans for Tablets

	Data Allowance	Monthly Price	Overage Charge	Speed Reductions
Sprint	3 GB	$34.99	$0.05 per MB	Not applicable
	6 BG	$49.99		
	12 GB	$79.99		
T-Mobile[496]	2 GB	$39.99	Not applicable	Speeds slowed after monthly limit reached
	5 GB	$49.99		
	10 GB	$79.99		

2. Prepaid Service

159. Prepaid plans typically yield lower average monthly revenue per user (ARPU) and higher churn rates for service providers in comparison to postpaid service.[497] For these reasons, initially the industry did not heavily promote prepaid offerings.[498] Subsequently, however, the pool of unsubscribed customers that met the credit requirements for postpaid plans declined to the point where prepaid offerings, which do not require credit checks, became more attractive to more service providers.[499] In recent years there has been growth in unlimited prepaid service offerings,[500] and prepaid service providers took actions to compete aggressively for customers of smartphones and other data devices.[501] Leading this trend, MetroPCS and Leap added new smartphones to their handset line-ups and introduced higher-tier pricing plans for smartphones.[502] Prepaid smartphone penetration reached 25 and 27 percent in the second quarter of 2011 for MetroPCS and Leap, respectively.[503]

160. Accompanying the growth of unlimited and tiered prepaid offerings, there is a trend towards lower per-minute rates and increased usage and ARPU in prepaid services. As a result, analysts

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Broadband Plans Details, http://www.verizonwireless.com/b2c/plans/?page=mobileBroadband (visited Mar. 28, 2012).

496 T-Mobile offers a discount of $10.00 per month to new and existing voice customers.

497 *Twelfth Report*, 23 FCC Rcd at 2293-94 ¶ 116.

498 *Id*.

499 *Id*.

500 *Fourteenth Report*, 25 FCC Rcd at 11473-74 ¶ 98; Phil Cusick *et al*., *Slumdog Millionaires*, Macquarie Capital, Equity Research, May 1, 2009, at 3 (*Slumdog Millionaires*).

501 *Fifteenth Report*, 26 FCC Rcd at 9732 ¶ 102.

502 *Fifteenth Report*, 26 FCC Rcd at 0732-33 ¶ 102.

503 Simon Flannery *et al*., *AlphaWise Survey Points to Ongoing Postpaid Cannibalization by Prepaid*, Morgan Stanley, Sept. 23, 2011, at 11.

believe that the market for prepaid service is divided into a low-end segment and a high-end segment.[504] The low-end prepaid segment comprises traditional pay-as-you-go prepaid service, while the high-end prepaid segment encompasses unlimited and tiered service plans, especially those that include data. The following discussion of developments in prepaid pricing plans discusses first the high-end and then the low-end prepaid segments.

161. *High-End Segment Prepaid Plans*. The following discussion of the high-end prepaid segment focuses on two trends, both of which were highlighted in the *Fifteenth Report*.[505] The first is the continued entry of the nationwide service providers into the unlimited and tiered prepaid segment, and the second is the continued movement by prepaid service providers into data services for smartphone users. As explained below, the high-end prepaid segment is evolving to tiered plans due to the movement of prepaid service providers into smartphone data services and the strain that heavy bandwidth consumption by smartphone data users puts on network management. Faced with network capacity constraints, some prepaid service providers are beginning to respond with plan changes designed to limit bandwidth use, including reductions in data connection speeds when usage exceeds a monthly allowance.

162. Multi-metro providers Leap and MetroPCS were the earliest retailers of unlimited prepaid talk, text, and data offerings.[506] In recent years, the nationwide service providers have entered this segment directly via their own prepaid brands and indirectly through wholesale arrangements with resellers. Unlimited offerings from Sprint Nextel's Virgin Mobile and Boost Mobile prepaid brands were among the first examples of this trend. They were followed by TracFone's "Straight Talk" service, which was launched on Verizon Wireless's network in 2009.[507]

163. Today, TracFone's Straight Talk service runs on the networks of all four nationwide service providers.[508] Following its 2009 launch on Verizon Wireless's CDMA network, in 2010 TracFone expanded Straight Talk to include feature phones that operate on AT&T's and T-Mobile's respective GSM networks.[509] In the second half of 2011, Sprint began to support TracFone's Straight Talk service when it signed an agreement to provide the underlying network for Straight Talk's first Android smartphone and future Straight Talk Android devices.[510] In January 2012, TracFone expanded its Straight Talk service for Android smartphones by launching a high-end Android smartphone (the LG

[504] Craig Moffett *et al*., *U.S. Wireless Industry Scorecard: The Haves and the Have-Nots Diverge*, Bernstein Research, Nov. 6, 2009, at 1, 9 (*The Haves and the Have-Nots Diverge*); *Slumdog Millionaires*, at 4.

[505] *Fifteenth Report*, 26 FCC Rcd at 9731-33 ¶ 99-102.

[506] *Thirteenth Report*, 24 FCC Rcd at 6295 ¶ 231.

[507] *Fourteenth Report*, 25 FCC Rcd at 11475 ¶ 101; Roger Cheng, *Wal-Mart Wireless Expands*, Wall Street Journal, Oct. 15, 2009 (*Wal-Mart Wireless Expands*).

[508] Philip Goldstein, *TracFone's Straight Talk Android Phones Will Use Sprint's Network*, FIERCEWIRELESS, Sept. 9, 2011. http://www.fiercewireless.com/story/tracfones-straight-talk-android-phones-will-use-sprints-network/2011-09-09 (visited Oct. 16, 2012).

[509] Philip Goldstein, *T-Mobile Jumps on Straight Talk Bandwagon*, FIERCEWIRELESS, Aug. 4, 2010. http://www.fiercewireless.com/story/report-t-mobile-jumps-straight-talk-bandwagon/2010-08-04 (visited Oct. 16, 2012); Philip Goldstein, *TracFone's Straight Talk Android Phones Will Use Sprint's Network*, FIERCEWIRELESS, Sept. 9, 2011. http://www.fiercewireless.com/story/tracfones-straight-talk-android-phones-will-use-sprints-network/2011-09-09 (visited Oct. 16, 2012).

[510] Philip Goldstein, *TracFone's Straight Talk Android Phones Will Use Sprint's Network*, FIERCEWIRELESS, Sept. 9, 2011. http://www.fiercewireless.com/story/tracfones-straight-talk-android-phones-will-use-sprints-network/2011-09-09 (visited Oct. 16, 2012).

Optimus 2X) on T-Mobile's HSPA+ network.[511] The price of the Straight Talk plan with unlimited voice, text, and mobile web access is $45 per month.[512] Straight Talk also offers three months, six months, and one year unlimited data plans that offer discounts to consumers who purchase the plan for longer periods.[513]

164. The *Fifteenth Report* noted that Verizon Wireless's earlier decision to support Straight Talk had represented a shift in its business strategy inasmuch as the company had largely avoided the prepaid market prior to the launch of Straight Talk in 2009.[514] Subsequently, Verizon Wireless has increased its presence in the unlimited prepaid segment by launching its own unlimited prepaid brand called "Unleashed." As detailed in Table 26, while Verizon Wireless's initial experimentation with unlimited prepaid offerings was confined to regional markets in parts of the Southeast, Florida and Southern California, these were followed by the launch of the Unleashed $50 per month unlimited prepaid plan on a nationwide basis in September 2011.[515] According to analysts, Verizon Wireless launched its own brand of unlimited prepaid plans in response to the success of traditional unlimited prepaid providers (such as MetroPCS) in certain regional markets, and its entry into the unlimited prepaid segment is likely to compete for customers with existing unlimited prepaid providers that offer comparable plans at the same or somewhat lower monthly prices, including MetroPCS ($40 per month), Leap ($45), Sprint Nextel's Boost Mobile brand ($50) and TracFone's Straight Talk service ($45).[516]

[511] Philip Goldstein, *Analyst: TracFone's Straight Talk to Launch Smartphone Via T-Mobile's HSPA+ Network*, FIERCEWIRELESS, Jan. 19, 2012. http://www.fiercewireless.com/story/analyst-tracfones-straight-talk-launch-smartphone-t-mobiles-hspa-network/2012-01-19 (visited Oct. 16, 2012).

[512] Straight Talk, Service Plans, at https://www.straighttalk.com/secure/ServicePlans (visited Sep. 14, 2012).

[513] Straight Talk, Service Plans, at https://www.straighttalk.com/secure/ServicePlans (visited Sep. 14, 2012).

[514] *Fifteenth Report*, 26 FCC Rcd at 9731 ¶ 99; Niraj Sheth and Roger Cheng, *Phone Rivals Dial Up Prepaid Services*, WALL STREET JOURNAL, May 14, 2010. http://online.wsj.com/article/SB10001424052748704635204575242232945917368.html (visited Oct. 16, 2012).

[515] Philip Goldstein, *Verizon to Launch Unleashed $50 Unlimited Prepaid Plan Nationwide Thursday*, FIERCEWIRELESS, Sept. 13, 2011. http://www.fiercewireless.com/story/verizon-launch-unleashed-50-unlimited-prepaid-plan-nationwide-thursday/2011-09-13 (visited Oct. 16, 2012); Mike Dano, *Verizon Wireless Details Unleashed $50 Prepaid Unlimited Plan*, FIERCEWIRELESS, Apr. 26, 2011. http://www.fiercewireless.com/story/verizon-wireless-details-unleashed-50-prepaid-unlimited-plan/2011-04-26 (visited Oct. 16. 2012); Philip Goldstein, *Verizon Trials $50 Prepaid Unlimited Plan*, FIERCEWIRELESS, July 22, 2010. http://www.fiercewireless.com/story/report-verizon-testing-50-prepaid-unlimited-plan/2010-07-22 (visited Oct. 16, 2012).

[516] Philip Goldstein, *Verizon Trials $50 Prepaid Unlimited Plan*, FIERCEWIRELESS, July 22, 2010. http://www.fiercewireless.com/story/report-verizon-testing-50-prepaid-unlimited-plan/2010-07-22 (visited Oct. 16, 2012); Philip Goldstein, *Verizon to Launch Unleashed $50 Unlimited Prepaid Plan Nationwide Thursday*, FIERCEWIRELESS, Sept. 13, 201. http://www.fiercewireless.com/story/verizon-launch-unleashed-50-unlimited-prepaid-plan-nationwide-thursday/2011-09-13 (visited Oct. 16, 2012); Mike Dano, *Verizon Wireless Details Unleashed $50 Prepaid Unlimited Plan*, FIERCEWIRELESS, Apr. 26, 2011. http://www.fiercewireless.com/story/verizon-wireless-details-unleashed-50-prepaid-unlimited-plan/2011-04-26 (visited Oct. 16. 2012).

Table 26
Verizon Wireless: Development of Unlimited Prepaid Offerings, Jul. 2010-2011[517]

Launch Date	Plan	Geographic Coverage	Monthly Charge	Services	Additional Conditions
7/2010	Southeast Save Program	Southeastern States	$50	Unlimited voice and texting, but no data option	Limited-time offer, only open to subscribers targeted with text message & email campaigns
4/2011	Unleashed[518]	Southern California & defined regions of Florida	$50	Unlimited voice, texting and web access	Mobile web does not provide full web browsing
9/2011	Unleashed	Nationwide	$50	Unlimited voice, texting & web access	Mobile web does not provide full web browsing. Available at Verizon Wireless stores & through Best Buy, Target & Walmart stores

165. T-Mobile increased its presence in the high-end prepaid segment in 2011 by launching its no annual contract Monthly 4G plans.[519] As detailed in Table 27, T-Mobile's Monthly 4G lineup is a tiered offering, with most of the tiers featuring unlimited calling, texting and web use.[520] The exception

[517] Verizon, *Prepaid Plans*, http://www.verizonwireless.com/b2c/splash/prepay.jsp (visited Nov. 1, 2011); Philip Goldstein, *Verizon to Launch Unleashed $50 Unlimited Prepaid Plan Nationwide Thursday*, FIERCEWIRELESS, Sept. 13, 2011 http://www.fiercewireless.com/story/verizon-launch-unleashed-50-unlimited-prepaid-plan-nationwide-thursday/2011-09-13 (visited Oct. 16, 2012); Mike Dano, *Verizon Wireless Details Unleashed $50 Prepaid Unlimited Plan*, FIERCEWIRELESS, Apr. 26, 2011. http://www.fiercewireless.com/story/verizon-wireless-details-unleashed-50-prepaid-unlimited-plan/2011-04-26 (visited Oct. 16, 2012); Philip Goldstein, *Verizon Trials $50 Prepaid Unlimited Plan*, FIERCEWIRELESS, July 22, 2010. http://www.fiercewireless.com/story/report-verizon-testing-50-prepaid-unlimited-plan/2010-07-22 (visited Oct. 16, 2012).

[518] Verizon also offered Unleashed with per-day and per-minute pricing: $1.99 per day for unlimited calling to any number, together with $0.02 per text and $0.99 per day for daily mobile Web browsing; or $0.99 per day for unlimited calling to Verizon customers, with $0.10 per minute for calls to other numbers, $0.10 per text message and $0.99 per day for mobile Web browsing. Mike Dano, *Verizon Wireless Details Unleashed $50 Prepaid Unlimited Plan*, FIERCEWIRELESS, Apr. 26, 2011. http://www.fiercewireless.com/story/verizon-wireless-details-unleashed-50-prepaid-unlimited-plan/2011-04-26 (visited Oct. 16, 2012).

[519] *T-Mobile Offers Monthly 4G Plans Featuring Unlimited Talk, Text and Web With No Annual Contract*, Press Release, T-Mobile, May 23, 2011. http://newsroom.t-mobile.com/articles/t-mobile-offers-monthly4g-plans (visited Oct. 16, 2012); Philip Goldstein, *T-Mobile Launches New Monthly and Pay-by-the-Day Plans*, FIERCEWIRELESS, Oct. 18, 2011. http://www.fiercewireless.com/story/t-mobile-launches-new-monthly-and-pay-day-plans/2011-10-18 (visited Oct. 16, 2012) ; Philip Goldstein, *T-Mobile Pushes Hard for Prepaid Subscribers Amid Uncertainty*, FIERCEWIRELESS, Oct. 24, 2011. http://www.fiercewireless.com/story/t-mobile-pushes-hard-prepaid-subscribers-amid-uncertainty/2011-10-24 (visited Oct. 16, 2012).

[520] *T-Mobile Offers Monthly 4G Plans Featuring Unlimited Talk, Text and Web With No Annual Contract*, Press Release, T-Mobile, May 23, 2011. http://newsroom.t-mobile.com/articles/t-mobile-offers-monthly4g-plans (visited (continued….)

is the data-centric Monthly 4G plan launched in an exclusive partnership with Walmart in October 2011, which includes unlimited texting and web use but not unlimited voice.[521] T-Mobile sets a different monthly allowance for high-speed data use for each tier and reduces the data throughput speeds of customers after they use up their monthly high-speed data allotment on its HSPA+ network by slowing their speeds for the remainder of the month.[522]

Table 27
T-Mobile: Monthly Prepaid 4G Service Plans, 2011-Sept. 2012[523]

Launch Date	Monthly Charge	Calling	Texting	4G Data Cap	Other Features
5/2011	$70	Unlimited	Unlimited	5 GB	NA
5/2011	$50	Unlimited	Unlimited	100 MB	NA
10/2011	$60	Unlimited	Unlimited	2 GB	NA
10/2011	$30	100 minutes, $0.10 per minute after first 100 minutes	Unlimited	5 GB	Sold exclusively at Walmart stores & online

166. MetroPCS responded to the unlimited offerings of nationwide providers in October 2011 by launching a holiday promotional offer of unlimited calling, texting and data usage in a package of four feature phones for $100 per month, or $25 per line.[524] The promotion represented a significant discount from the price of $40 per month for each line for the company's standard package of unlimited calling, texting and web use.[525] However, the promotion lasted only through December 31, 2011, only new customers were eligible for the offer, and the company's LTE and Android devices were excluded from

(Continued from previous page)
Oct. 16, 2012); *T-Mobile Adds New Plans to Monthly Lineup*, Press Release, T-Mobile, Oct. 17, 2011. http://newsroom.t-mobile.com/articles/t-mobile-adds-new-monthly4g-plans (visited Oct. 16, 2012).

[521] *Walmart and T-Mobile Introduce Exclusive No-Annual Contract 4G Offering*, Press Release, T-Mobile, Oct. 3, 2011. http://newsroom.t-mobile.com/articles/walmart-and-t-mobile-introduce-exclusive-no-annual-contract-4g-offering (visited Oct.16, 2012); Philip Goldstein, *T-Mobile, Walmart Partner o $30 No-Contract Data and Texting Plan*, FIERCEWIRELESS, Oct. 3, 2011. http://www.fiercewireless.com/story/t-mobile-walmart-partner-30-no-contract-data-and-texting-plan/2011-10-03 (visited Oct. 16, 2012).

[522] *T-Mobile Offers Monthly4G Plans Featuring Unlimited Talk, Text and Web With No Annual Contract*, Press Release, T-Mobile, May 23, 2011. http://newsroom.t-mobile.com/articles/t-mobile-offers-monthly4g-plans (visited Oct. 16, 2012); *Walmart and T-Mobile Introduce Exclusive No-Annual Contract 4G Offering*, Press Release, T-Mobile, Oct. 3, 2011. http://newsroom.t-mobile.com/articles/walmart-and-t-mobile-introduce-exclusive-no-annual-contract-4g-offering (visited Oct. 16, 2012).

[523] T-Mobile, *No Annual Contract Plans*, http://prepaid-phones.t-mobile.com/prepaid-plans (visited Oct. 31, 2012).

[524] Mike Dano, *MetroPCS Promotion: Unlimited Everything for $25 (Minimum of Four Lines)*, FIERCEWIRELESS, Oct. 27, 2011. http://www.fiercewireless.com/story/metropcs-promotion-unlimited-everything-25-minimum-4-lines/2011-10-27 (visited Oct. 16, 2012).

[525] Mike Dano, *MetroPCS Promotion: Unlimited Everything for $25 (Minimum of Four Lines)*, FIERCEWIRELESS, Oct. 27, 2011. http://www.fiercewireless.com/story/metropcs-promotion-unlimited-everything-25-minimum-4-lines/2011-10-27 (visited Oct. 16, 2012).

the offer.[526]

167. *Management of Data Consumption in High-End Prepaid Plans*. The same network management issues motivating the ongoing shift from unlimited data pricing to tiered smartphone data plans in the postpaid segment – namely, the impact of higher bandwidth consumption by smartphone users on network utilization and capacity constraints[527] – are also beginning to induce changes in the pricing and service terms and conditions of high-end prepaid plans for users of smartphone data.

168. As discussed above, T-Mobile set an allowance on high-speed data use for each tier of its Monthly 4G offerings launched in 2011. After customers use up their monthly high-speed data allotment at up to 4G speeds on T-Mobile's HSPA+ network, their speeds will potentially be slowed to 2G speeds for the remainder of the month.[528] Verizon Wireless's Unlimited prepaid plan provides unlimited talk, text & web, but is offered only with basic phones and does not include full web browsing.[529]

169. Sprint's strategy for managing data consumption in its high-end prepaid plans has evolved over time. Sprint's initial strategy was limited to pricing changes. In particular, as shown in Table 24, Sprint's Boost Mobile prepaid brand added a $5 monthly charge to its $50 per month unlimited nationwide talk, texting, and data plan for new customers of its Android smartphones in October 2011,[530] and Sprint's Virgin Mobile prepaid brand also increased the prices of its least expensive Beyond Talk unlimited data plans in July 2011.[531] Subsequently, Sprint began to move away from unlimited data pricing in its prepaid segment. In particular, while Sprint has so far continued to offer unlimited postpaid smartphone data offerings marketed under the Sprint brand, in March 2012 the company's Virgin Mobile prepaid brand began to reduce the data speeds of smartphone customers on its Beyond Talk plans if their data usage exceeds a monthly allowance of 2.5 GB of data.[532] The data speeds of Beyond Talk customers

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[526] Mike Dano, *MetroPCS Promotion: Unlimited Everything for $25 (Minimum of Four Lines)*, FIERCEWIRELESS, Oct. 27, 2011. http://www.fiercewireless.com/story/metropcs-promotion-unlimited-everything-25-minimum-4-lines/2011-10-27 (visited Oct. 16, 2012).

[527] *Fifteenth Report*, 26 FCC Rcd at 9725-27 ¶¶ 85-87; Simon Flannery *et al*., *AlphaWise Survey Points to Ongoing Postpaid Cannibalization by Prepaid*, Morgan Stanley, Sept. 23, 2011, at 12 (noting that "MetroPCS is seeing strong uptake on its CDMA network, causing its network to face capacity constraints.").

[528] Sue Marek, *T-Mobile Unveils New Tiered Data Plans for Smartphones, Details Throttling Speeds*, FIERCEWIRELESS, May 23, 2011, *available at* http://www.fiercewireless.com/story/t-mobile-quietly-launches-tiered-data-plans-smartphones/2011-05-23#ixzz23X47gEgf (visited Oct. 16, 2012) (stating "The operator [T-Mobile] also said that if customers go over their allotted data cap they will not incur overage charges but instead will have their data speeds throttled down to an EDGE, or 2G, experience of around 100 Kbps or less.").

[529] Verizon, *Prepaid Plans*, http://www.verizonwireless.com/b2c/splash/prepay.jsp (visited Nov. 1, 2012).

[530] Philip Goldstein, *Boost Mobile Tacking $5 Charge Onto Unlimited Android Phone Bill*, FIERCEWIRELESS, Sept. 16, 2011, *available at* http://www.fiercewireless.com/story/boost-mobile-tacking-5-charge-unlimited-android-phone-bill/2011-09-16 (visited Oct. 16, 2012) The additional charge took effect the day before Boost started selling the Samsung Transform Ultra Android device.

[531] Philip Goldstein, *Virgin Mobile to Raise Beyond Talk Prices But Drop Blackberry Add-On Fee*, FIERCEWIRELESS, Jul. 11, 2011. http://www.fiercewireless.com/story/virgin-mobile-raise-paylo-prices-drop-blackberry-add-fee/2011-07-11 (visited Oct. 16, 2012) Virgin Mobile concurrently cut the price of its most expensive Beyond Talk plan and dropped an add-on fee for Blackberry devices. These pricing changes were made just prior to Virgin Mobile's launch of its first Android smartphone device. All three Beyond Talk plans include unlimited texting, email and data, but differ with respect to the number of voice minutes included. *Id*.

[532] Philip Goldstein, *Virgin Mobile to Begin Smartphone Data Throttling in March*, FIERCEWIRELESS, Jan. 19, 2012. http://www.fiercewireless.com/story/virgin-mobile-begin-smartphone-data-throttling-march/2012-01-19 (visited Oct. 16, 2012) The company originally announced plans to reduce the speeds of heavy smartphone data users beginning in October 2011, but subsequently postponed smartphone data speed reductions until 2012. Sue Marek, *Virgin Mobile Will Throttle Heavy Data Users*, FIERCEWIRELESS, Jul. 13, 2011.
(continued….)

will be reduced to 256 Kbps for the remainder of the month once the 2.5 GB monthly allowance has been reached, but data speeds will return to normal at the start of the customer's next billing cycle.[533] Customers who want to avoid waiting for the start of the next billing cycle have the option to restart their plan simply by topping up their account.[534]

170. Leap was one of the first wireless providers to switch from unlimited smartphone data pricing to a tiered pricing structure for smartphone data use and to reduce the data speeds of customers who exceed their monthly data allowance instead of levying overage charges.[535] Leap began conducting market trials for its new tiered data pricing plans in several Western markets in April 2010, and the company introduced this tiered data pricing model on a nationwide basis the following August.[536] In September 2012, Leap revised its pricing model again by launching new tiered smartphone data plans that give customers the option of purchasing additional quantities of full-speed data than their selected tier provides if they need it.[537] The result is essentially a more flexible, blended tiered pricing model with either speed reductions or overage charges.

171. Under the new tiered pricing structure introduced in September 2012, Leap's smartphone rate plans start at $50 per month for unlimited calling, texting and 3G data, plus an allowance of 1 GB of full-speed data per month.[538] The two higher tiers include 2.5 GB of full-speed data for $60 per month and 5 GB of data for $70 per month, and both plans also include the ability for customers to tether their device to power additional wireless devices. If customers use up their allowance of full-speed data before the end of the month, they have several options: (1) add one or more 1 GB full-speed data add-ons to

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http://www.fiercebroadbandwireless.com/story/virgin-mobile-will-throttle-heavy-data-users/2011-07-13 (viisted Oct. 16, 2012); Philip Goldstein, *Virgin Mobile Postpones Smartphone Data Throttling Until 2012*, FIERCEWIRELESS, Sept. 30, 2011. http://www.fiercewireless.com/story/virgin-mobile-postpones-smartphone-data-throttling-until-2012/2011-09-30 (visited Oct. 16, 2012).

[533] Philip Goldstein, *Virgin Mobile to Begin Smartphone Data Throttling in March*, FIERCEWIRELESS, Jan. 19, 2012. http://www.fiercewireless.com/story/virgin-mobile-begin-smartphone-data-throttling-march/2012-01-19 (visited Oct. 16, 2012).

[534] Philip Goldstein, *Virgin Mobile to Begin Smartphone Data Throttling in March*, FIERCEWIRELESS, Jan. 19, 2012. http://www.fiercewireless.com/story/virgin-mobile-begin-smartphone-data-throttling-march/2012-01-19 (visited Oct. 16, 2012).

[535] Mike Dano, *Leap to Launch Session-Based Data Transactions on Top of Tiered Pricing*, FIERCEWIRELESS, Jan. 5, 2012. http://www.fiercewireless.com/story/leap-launch-session-based-data-transactions-top-tiered-pricing/2012-01-05 (visisted Oct. 16, 2012).

[536] Mike Dano, *Leap Experimenting With New Unlimited Broadband Plans*, FIERCEWIRELESS, Apr. 28, 2010. http://www.fiercewireless.com/story/leap-experimenting-new-unlimited-broadband-plans/2010-04-28 (visited Oct. 16, 2012); Mike Dano, *Leap Overhauls Voice Plans, Intros Tiered Data Pricing*, FIERCEWIRELESS, Aug. 3, 2010. http://www.fiercewireless.com/story/leap-overhauls-voice-plans-intros-tiered-data-pricing/2010-08-03 (visited Oct. 16, 2012).

[537] Leap Wireless, *Cricket Introduces New Wireless Rate Plans With More Wireless Choices, More Data Options, More Ways to Listen to Muve Music and More Ways to Call Internationally*, Press Release, Aug. 29, 2012. http://phx.corporate-ir.net/phoenix.zhtml?c=95536&p=irol-newsArticle&ID=1729505&highlight= (visited Oct. 16, 2012); Philip Goldstein, *Leap Overhauls Rate Plans, Adds Muve Music to All Android Plans*, FIERCEWIRELESS, Aug. 29, 2012. http://www.fiercewireless.com/story/leap-overhauls-rate-plans-adds-muve-music-all-android-plans/2012-08-29 (visited Oct. 16, 2012).

[538] Leap Wireless, *Cricket Introduces New Wireless Rate Plans With More Wireless Choices, More Data Options, More Ways to Listen to Muve Music and More Ways to Call Internationally*, Press Release, Aug. 29, 2012. http://phx.corporate-ir.net/phoenix.zhtml?c=95536&p=irol-newsArticle&ID=1729505&highlight= (visited Oct. 16, 2012; Philip Goldstein, *Leap Overhauls Rate Plans, Adds Muve Music to All Android Plans*, FIERCEWIRELESS, Aug. 29, 2012. http://www.fiercewireless.com/story/leap-overhauls-rate-plans-adds-muve-music-all-android-plans/2012-08-29 (visited Oct. 16, 2012).

their plan for $10 each; (2) purchase additional full-speed data on an as needed basis at a rate of one dollar for 50 MB; (3) upgrade to a rate plan with a higher allowance of full-speed data; or (4) make no change and use unlimited data at reduced speed through the rest of the month.[539]

172. While Leap has managed network congestion with speed reductions since 2010, MetroPCS did not resort to speed reductions until 2012.[540] Instead, MetroPCS initially used a tiered pricing structure for its LTE service that gave consumers the option of choosing less expensive "unlimited" data plans with restricted access to multimedia streaming. The company's most expensive LTE service plan ($60 per month) included unlimited multimedia streaming and unlimited access to its Rhapsody music service along with unlimited web and email service, while its entry-level LTE service plan ($40 per month) limited users to 100 MB of multimedia streaming access and its mid-range LTE service plan ($50 per month) limited users to 1 GB of multimedia streaming.[541] Customers who reached their monthly multimedia streaming allowances on these plans were no longer able to access that content, but could still use other data services. In April 2012, MetroPCS raised the price of its unlimited LTE smartphone data plan to $70 per month and eliminated the distinction between web browsing and multimedia streaming on its lower-tiered LTE plans by introducing monthly data allowances and reducing the data speeds of users who exceed the allowances in a monthly billing cycle.[542] In particular, the company set LTE data usage allowances at 5 GB on its $60 plan, 2.5 GB on its $50 plan and 250 MB on its $40 plan.[543] Customers who exceed their monthly data allowances remain on the LTE network and can continue to use their data service but at a reduced speed similar to what they might experience on the company's EV-DO networks.[544]

173. In August 2012, MetroPCS began offering its unlimited LTE data plan for $55 per month on a promotional basis for a limited time.[545] The new promotional plan, which includes unlimited voice and text messaging, does not have any data limits or speed reductions. In an apparent response to the new shared data plans launched by Verizon and AT&T, MetroPCS also offered families the option of purchasing up to four additional lines for a discounted price of $50 per month if they purchase the first

[539] Leap Wireless, *Cricket Introduces New Wireless Rate Plans With More Wireless Choices, More Data Options, More Ways to Listen to Muve Music and More Ways to Call Internationally*, Press Release, Aug. 29, 2012. http://phx.corporate-ir.net/phoenix.zhtml?c=95536&p=irol-newsArticle&ID=1729505&highlight= (visited Oct. 16, 2012).

[540] Philip Goldstein, *MetroPCS Adds Data Throttling to LTE, Increases Unlimited Data to $70*, FIERCEWIRELESS, Apr. 3, 2012. http://www.fiercewireless.com/story/metropcs-adds-data-throttling-lte-increases-unlimited-data-70/2012-04-03 (visited Oct. 16, 2012); Simon Flannery *et al*., *AlphaWise Survey Points to Ongoing Postpaid Cannibalization by Prepaid*, Morgan Stanley, Sept. 23, 2011, at 12.

[541] MetroPCS, *Plans and Services*, http://www.metropcs.com/metro/category/4G+LTE/cat270022 (visited Feb 2, 2012); Philip Goldstein, *MetroPCS Slashes Base LTE Smartphone Plan by $10, to $40/Month*, FIERCEWIRELESS, Feb. 2, 2012. http://www.fiercewireless.com/story/metropcs-slashes-base-lte-smartphone-plan-10-40month/2012-02-02 (visited Oct. 16, 2012); Philip Goldstein, *MetroPCS: Our New Plans Comply With FCC's Net Neutrality Order*, FIERCEWIRELESS, Jan. 12, 2011. http://www.fiercewireless.com/story/metropcs-our-new-plans-comply-fccs-net-neutrality-order/2011-01-12 (visited Oct. 16, 2012). The $50 plan also provides access to some of the features in the provider's MetroStudio content storefront, but only through a WiFi connection. *Id*.

[542] Philip Goldstein, *MetroPCS Adds Data Throttling to LTE, Increases Unlimited Data to $70*, FIERCEWIRELESS, Apr. 3, 2012. http://www.fiercewireless.com/story/metropcs-adds-data-throttling-lte-increases-unlimited-data-70/2012-04-03 (visited Oct. 16, 2012).

[543] *Id*.

[544] *Id*.

[545] Sue Marek, *MetroPCS Launches $55 Unlimited LTE Rate Plan*, FIERCEWIRELESS, Aug. 21, 2012. http://www.fiercewireless.com/story/metropcs-launches-55-unlimited-lte-rate-plan/2012-08-21 (visited Oct. 16, 2012).

unlimited LTE plan for $55 per month. MetroPCS indicated it would determine how long the promotion lasts based on the customer response.

174. *Low-End Segment Prepaid Plans*. TracFone, an MVNO, is generally regarded as the leader in the low-end prepaid segment.[546] Although Tracfone's rates are slightly higher on a per minute basis than some alternative prepaid offerings, the company targets low-usage customers whom other prepaid service providers are reluctant to target because the ARPU they generate is so low. In the first half of 2012, the monthly ARPU of Tracfone was $16, which was $3 less than the average monthly prepaid ARPU of the nationwide providers.[547] TracFone purchases capacity wholesale from facilities-based providers and resells them through a national distribution network under various brands, including TracFone, Net10, and Safelink.[548] The company's phones and prepaid calling cards are sold at Wal-Mart Stores, Target, and RadioShack, in addition to drug stores and other local retail outlets.[549] Analysts attribute much of TracFone's subscriber growth to its Safelink offer, a product that is supported by the Universal Service Fund through the Lifeline program.[550] T-Mobile launched new pay-by-the-day prepaid plans in October 2011.[551] The company's $1.00 per day plan includes unlimited text messages, with an additional charge of $0.10 per minute of voice service. In addition, the $2.00 per day plan includes unlimited calls, text messages and data at 2G (EDGE) speeds, while the $3.00 per day plan includes unlimited calls, text messages and data, with the first 200 MB per day at up to 4G speeds. Customers pay the daily charge only on the days they actually use their phones. As discussed above, T-Mobile also launched a new lineup of monthly prepaid plans in 2011, but the pay-per-day plans are targeted at "more down-market customers" than the monthly prepaid plans.[552]

3. Early Termination Fees (ETFs) for Postpaid Service

175. Service providers assess ETFs to postpaid subscribers when they cancel their wireless service agreements or plans before the expiration of their terms. Service providers may view ETFs as part of their service plan rates. For instance, T-Mobile states "The Early Termination Fee is part of our rates and is not a penalty."[553] Smartphones and other advanced devices typically have higher ETFs than more basic handsets, reflecting the prevailing model of handset distribution for postpaid plans in which providers sell handsets to customers below cost and subsequently recover the cost over the term of the

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[546] *The Haves and the Have-Nots Diverge*, at 9; *Slumdog Millionaires*, at 1; Roger Cheng, *TracFone's Prepaid Niche*, WALL STREET JOURNAL, Mar. 4, 2009 *available at* http://online.wsj.com/article/0,,SB123614292392926907,00.html (visited Oct. 16, 2012).

[547] *See* Section V.F, Revenue and ARPU, *infra*; Footnote 845.

[548] *Slumdog Millionaires*, at 24.

[549] Roger Cheng, *TracFone's Prepaid Niche*, WALL STREET JOURNAL, Mar. 4, 2009. http://online.wsj.com/article/0,,SB123614292392926907,00.html (visited Oct. 16, 2012).

[550] The Safelink offering for eligible low-income consumers includes a free phone, which is not supported by the Universal Service Fund, and approximately 250 minutes of free monthly wireless service. *See* Section III.B.2 *supra* for a complementary discussion of TracFone.

[551] *T-Mobile Adds New Plans to Monthly Lineup*, Press Release, T-Mobile, Oct. 17, 2011. http://newsroom.t-mobile.com/articles/t-mobile-adds-new-monthly4g-plans (visited Oct.16, 2012); Philip Goldstein, *T-Mobile Launches New Monthly and Pay-by-the-Day Plans*, FIERCEWIRELESS, Oct. 18, 2011. http://www.fiercewireless.com/story/t-mobile-launches-new-monthly-and-pay-day-plans/2011-10-18 (visited Oct. 16, 2012); T-Mobile, *No Annual Contract Plans*, http://prepaid-phones.t-mobile.com/prepaid-plans (visited Oct. 31, 2011).

[552] Philip Goldstein, *T-Mobile Launches New Monthly and Pay-by-the-Day Plans*, FIERCEWIRELESS, Oct. 18, 2011. http://www.fiercewireless.com/story/t-mobile-launches-new-monthly-and-pay-day-plans/2011-10-18 (visited Oct. 16, 2012).

[553] T-Mobile, *Terms and Conditions*, available at www.tmobile.com (visited Aug. 14, 2012).

service agreement.[554] As detailed in the *Fourteenth Report*, the nationwide providers have described their practices regarding the disclosure of ETFs to consumers and state generally that they give consumers adequate notice about the applicable ETFs that apply; that ETFs allow them to subsidize handset purchases — including purchases of smartphones — for customers; and that wireless providers normally recover those subsidies over the life of a contract, but cannot do so when a customer ends a contract early.[555]

176. In 2012, all four nationwide providers had policies to pro-rate ETFs over the course of the standard two-year contract by progressively reducing the fee postpaid customers pay to terminate their service contracts before the expiration of their terms. The AT&T ETF for advanced smartphones and devices starts at $325 and is reduced by $10 for each full month of service completed.[556] AT&T's standard ETF starts at $150 and is reduced by $4 for each full month of service completed. The Verizon ETF for advanced smartphones and devices starts at $350 and is reduced by $10 for each full month of service completed.[557] Verizon's standard ETF starts at $175 and is reduced by $5 for each full month of service completed. The Sprint ETF for advanced smartphones and devices is $350 for the first six months, and then is reduced by $20 for each full month of service completed until the ETF reaches $100.[558] Sprint's standard ETF is $200 for the first four months, and then is reduced by $10 for each full month of service completed until the ETF reaches $50. The T-Mobile ETF is $200 if more than six months remain on the service contract, $100 if three to six months remain on the service contract, $50 if one to three months remain on the service contract, and the smaller of $50 or the monthly recurring charges if less than one month remains on the contract.[559]

177. There are service plans available to customers that do not involve ETFs and service plans that include ETFs generally have a return period in which the ETF will not be triggered. Consumers can

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[554] We note that ETFs are not necessarily confined to the handset subsidy model. For example, T-Mobile's Value plans offer a lower monthly service rate to customers who pay full price for their handsets up front, but customers who take advantage of these Value plans are required to sign a two-year agreement with an early cancellation fee of up to $200 per line. T-Mobile, *Value Plans*, http://www.t-mobile.com/shop/Packages/ValuePackages.aspx (visited Oct. 22, 2012).

[555] Letter from Kathleen Grillo, Senior Vice President, Federal Regulatory Affairs, Verizon, to Joel Gurin, Chief, Consumer and Government Affairs Bureau, and Ruth Milkman, Chief, Wireless Telecommunications Bureau, FCC, CG Docket No. 09-158 (Feb. 23, 2010); Letter from Robert W. Quinn, Jr., Esq., Senior Vice President-Federal Regulatory, AT&T Services, Inc., dated Feb. 23, 2010 in CG Docket No. 09-158 to Joel Gurin, Chief, Consumer and Government Affairs Bureau, and Ruth Milkman, Chief, Wireless Telecommunications Bureau, FCC; Letter from Thomas J. Sugrue, Vice President, Government Affairs, T-Mobile, dated Feb. 23, 2010 in CG Docket No. 09-158 to Joel Gurin, Chief, Consumer and Government Affairs Bureau, and Ruth Milkman, Chief, Wireless Telecommunications Bureau, FCC; Letter from Vonya B. McCann, Esq., Senior Vice President, Government Affairs, Sprint Nextel Corporation, dated Feb. 23, 2010 in CG Docket No. 09-158 to Joel Gurin, Chief, Consumer and Government Affairs Bureau, and Ruth Milkman, Chief, Wireless Telecommunications Bureau, FCC; and Letter from Richard S. Whitt, Esq., Washington Telecom and Media Counsel, Google, Inc., dated Feb. 23, 2010 in CG Docket No. 09-158 to Joel Gurin, Chief, Consumer and Government Affairs Bureau, and Ruth Milkman, Chief, Wireless Telecommunications Bureau, FCC.

[556] AT&T, *Early Termination Fees*, available at http://www.wireless.att.com/learn/articles-resources/early-term-fees.jsp (visited Aug. 14, 2012).

[557] Verizon Wireless, *Customer Agreement and Important Information*, available at http://youreguide.vzw.com/legal-customer-agreement/ (visited Aug. 14, 2012).

[558] Sprint, *Learn About Early Termination Fee, available at* http://support.sprint.com/support/article/Learn_about_early_termination_fee/case-sp061027-20110823-171256 (visited Aug. 14, 2012).

[559] T-Mobile, *T-Mobile Terms and Conditions, available at* http://www.t-mobile.com/Templates/Popup.aspx?PAsset=Ftr_Ftr_TermsAndConditions&print=true (visited Aug. 14, 2012).

avoid ETFs entirely by purchasing mobile wireless service on a prepaid basis, which offers service at attractive prices and has grown to include smartphone data plans.[560] Some service providers have return policies that allow customers to cancel their contracts and return their handsets for a limited period of time without having to pay an ETF. In 2012, AT&T permitted service cancellations and handset returns for a full refund for up to 30 days.[561] T-Mobile, Sprint, and Verizon Wireless granted full refunds if a customer canceled a new account and returned the handset within 14 days of activation.[562]

178. The emergence of a secondary market segment for mobile wireless service contracts may facilitate consumers' ability to switch service providers. In most cases, wireless service providers allow consumers to leave their contracts without paying an ETF by transferring the remaining contract term to someone else who meets the provider's credit requirements. A number of websites exist to facilitate transfers of mobile wireless contracts from one consumer to another under these provisions.[563] In particular, the websites help mobile wireless customers avoid paying penalties for early termination by putting them in touch with people seeking a mobile wireless contract. Although these sites charge existing mobile wireless customers a range of fees to transfer or cancel a contract, these fees are typically much lower than the ETFs customers would otherwise have to pay. [564] Other potential advantages include avoiding a service activation fee and obtaining a shorter contract than if they had contracted directly with a mobile wireless service provider.

179. In addition to the secondary market for cellphone service contracts, there is a secondary market for iPhones and other high-end smartphones and devices. Customers on contracts that are not yet eligible for subsidized devices and who therefore have to pay more to upgrade immediately can partially offset the increased cost of upgrading, including ETFs and upgrade fees, by trading in their old devices.[565] Trade-in options include Gazelle, Amazon and programs offered by both Sprint and Verizon.[566] Gazelle purchases a range of devices for various forms of payment, including check, direct deposit to a Paypal account and Amazon gift card. Amazon offers better trade-in values than Gazelle, but the only form of payment is an Amazon gift card and it only offers trade-ins for Apple iPhones.[567] Sprint offers account credit and Verizon offers gift cards for used devices, but trade-in programs are limited to iPhones and the latest and most popular Android smartphones.[568] Customers may also buy and sell smartphones on eBay,

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[560] *See* Section IV.A.2, Prepaid Service, *supra*.

[561] AT&T, *AT&T Returns Policy and Early Termination Fee*, available at http://www.att.com/shop/wireless/returnpolicy.html?#fbid=y3KQeyUTqdO?tab2 (visited Aug. 14, 2012). All nationwide providers may charge a handset restocking fee if the device is returned.

[562] T-Mobile, *T-Mobile Terms and Conditions*, available at http://www.t-mobile.com/Templates/Popup.aspx?PAsset=Ftr_Ftr_TermsAndConditions&print=true (visited Aug. 14, 2012). Sprint, *Sprint Return and Exchange Policy*, available at http://www.sprint.com/landings/returns/ (visited Aug. 14, 2012). Verizon Wireless, *Customer Agreement and Important Information*, available at http://youreguide.vzw.com/legal-customer-agreement/ (visited Aug. 14, 2012). All nationwide providers may charge a handset restocking fee if the device is returned.

[563] Examples include www.trademycellular.com and www.celltradeusa.com, (visited Aug. 14, 2012).

[564] *See Breaking Free of a Cellular Contract.*

[565] Philip Cusick *et al*, *Secondary Markets for iPhones and Other High-End Smartphones Mitigate Carrier Upgrade Policies, ETFs*, J.P. Morgan, Equity Research, Sept. 14, 2012.

[566] Philip Cusick *et al*, *Telecom Services: Update on Secondary Markets for iPhones: Values Dropping Quickly on All but Samsung Galaxy S3*, J.P. Morgan, Equity Research, Nov. 5, 2012.

[567] Philip Cusick *et al*, *Telecom Services: Update on Secondary Markets for iPhones: Values Dropping Quickly on All but Samsung Galaxy S3*, J.P. Morgan, Equity Research, Nov. 5, 2012.

[568] Philip Cusick *et al*, *Telecom Services: Update on Secondary Markets for iPhones: Values Dropping Quickly on All but Samsung Galaxy S3*, J.P. Morgan, Equity Research, Nov. 5, 2012.

ReCellular.com, and Cellitused.com.[569]

B. Non-Price Rivalry

180. Mobile wireless service providers also compete for customers on other dimensions in addition to price. This section presents evidence in three broad categories of non-price rivalry among mobile wireless service providers: 1) network coverage, quality, and investment; 2) portfolios of innovative devices and services; and 3) advertising campaigns and expenditures to create retail distribution networks, distribute product information, and establish and increase brand recognition .

1. Network Coverage and Technology Upgrades

181. Network investment remains a centerpiece of service providers' efforts to improve their customers' mobile wireless service experience. During 2010, 2011, and early 2012, several providers continued to upgrade and expand their networks with technologies that enable faster data transfer speeds. Other providers announced plans to make additional upgrades in the near future.[570] As discussed below, a critical way in which mobile wireless service providers differentiate themselves is with the speeds, reliability, capabilities, and coverage of their mobile broadband networks.[571]

182. As a component of upgrading their networks, service providers can improve capacity, coverage, and service quality by improving and expanding their spectrum portfolios. Several service providers have been able to expand into new geographic areas and/or upgrade networks in existing markets after adding to their spectrum portfolios through participation in spectrum auctions and secondary market transactions.[572]

183. The Commission largely has adopted flexible licensing policies to the extent that they do not mandate any particular technology or network standard for commercial mobile wireless licensees. Mobile wireless service providers choose their own network technologies and services and abide by certain technical parameters designed to avoid radiofrequency interference with adjacent licensees.[573] As a result of this approach, U.S. service providers have deployed, over the past 15 years, different digital network technologies with divergent technology migration paths. The two main technology migration paths have been the CDMA and GSM paths, shown in Figure 2 below.[574] The evolution of mobile network technologies is now converging on LTE, as all of the major service providers are deploying or planning to deploy LTE technology, as discussed below.[575]

184. When competing mobile wireless service providers deploy compatible network technologies, greater economies of scale in the production of both end-user devices and network infrastructure equipment can result, lowering the unit cost of handsets, chipsets, and other network

[569] Gregory Tarp, *APT to Upgrade to iPhone5? You're Not Alone*, Chicago Tribune, October 4, 2011.

[570] *See* Section IV.B.1.A, Service Provider Technology Deployments, *infra*.

[571] *See Fifteenth Report*, 26 FCC Rcd at 9733 ¶ 104; AT&T Comments at 31; WCAI Reply at 5.

[572] *See* Section III.F.2, Current Spectrum Transactions, *supra*; Section VII.A.1, Infrastructure Facilities, *infra*; *Fifteenth Report*, 26 FCC Rcd at 9733 ¶ 105.

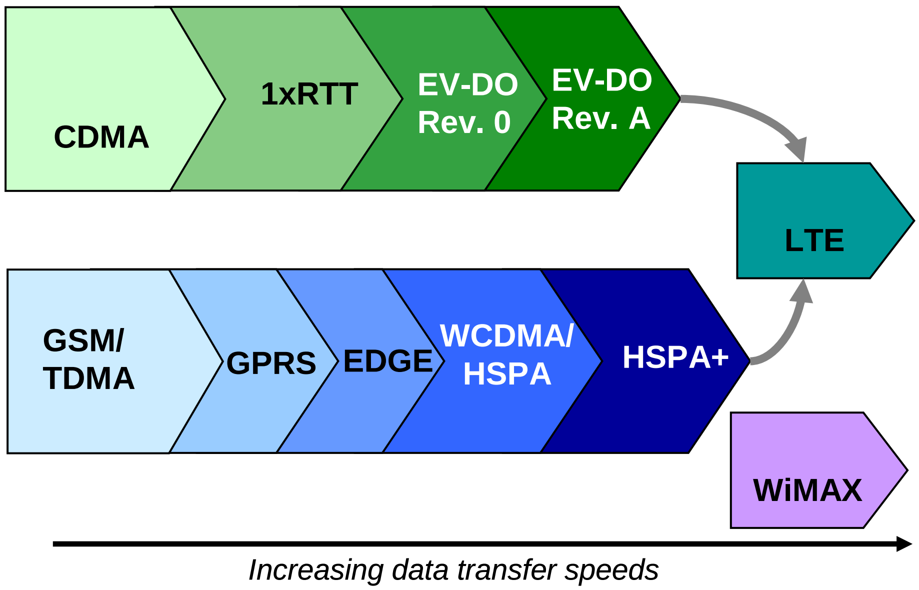
[573] In contrast, the European Community mandated a single harmonized standard for second-generation mobile telecommunications services (GSM), and also has adopted a single standard for third-generation services (WCDMA). Neil Gandal, *et al*., *Standards in Wireless Telephone Networks*, Telecommunications Policy, Vol. 27, No. 5-6, June-July 2003, at 325. The authors note that, although the European Community backed away from mandating a single standard for third-generation services, the absence of a mandate has had little practical effect as all European mobile operators have opted for the same standard and migration path. *Id.* at 330.

[574] Of the top four nationwide mobile wireless providers, AT&T and T-Mobile have deployed technologies on the GSM migration path, while Verizon Wireless and Sprint have deployed technologies on the CDMA migration path. Sprint has also used iDEN technology as a result of its acquisition of Nextel.

[575] *See* Table 27; AT&T Comments at 29-31.

equipment.[576] This, in turn, may promote more rapid adoption of mobile wireless services, a greater variety of handsets, and more price competition.[577]

Figure 2
Mobile Wireless Network Technology Evolution



a. Service Provider Technology Deployments

185. While service providers initially adopted different plans for upgrading their networks with newer technologies, all of the major mobile wireless providers now offer or plan to deploy LTE. During 2009 and 2010, Verizon Wireless launched LTE, Sprint was offering WiMAX through its investment in Clearwire, and T-Mobile and AT&T deployed different versions of HSPA+ technology.[578] While these providers continue to maintain these divergent networks, as of April 2012, all of the major providers had either begun to deploy, or announced plans to migrate to, LTE technology.

186. Below we discuss in detail the mobile network upgrades of the major mobile wireless providers in 2010, 2011, and early 2012. For purposes of this *Report*, we include all 3G and 4G network technologies – CDMA EV-DO, EV-DO Rev. A, WCDMA/UMTS/HSPA, HSPA+, LTE, and mobile WiMAX – in our discussion of mobile broadband.[579] While the Mosaik deployment data distinguish

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[576] *See Fourteenth Report* 25 FCC Rcd at 11478-79 ¶ 109.

[577] *See Fourteenth Report* 25 FCC Rcd at 11478-79 ¶ 109.

[578] *See Fifteenth Report*, 26 FCC Rcd at 9735 ¶ 108.

[579] The terms "3G" and "4G" are used by industry for marketing purposes, as well as by the International Telecommunications Union (ITU) for technical specifications. For example, Clearwire, T-Mobile, AT&T, and Verizon Wireless refer to their WiMAX, HSPA+, and LTE networks as "4G." However, these networks, as currently deployed, do not provide download speeds high enough to meet the ITU technical specifications of "IMT-Advanced" or "4G." Nevertheless, the ITU stated in December 2010 that the term 4G "while undefined, may also be applied to the forerunners of these technologies, LTE and WiMax, and to other evolved 3G technologies providing a substantial level of improvement in performance and capabilities with respect to the initial third generation systems now deployed." *See ITU World Radio Communication Seminar Highlights Future Communication Technologies*, Press Release, ITU, Dec. 6, 2010, *available at* http://www.itu.int/net/pressoffice/press_releases/2010/48.aspx (visited Oct. 16, 2012); Sara Yin, *ITU Redefines 4G. Again*, PCMagazine, Dec. 20, 2010, at http://www.pcmag.com/print_article2/0,1217,a=258308,00.asp?hidPrint=true (visited Oct. 16, 2012); Derek Kerton, *Will the Real 4G Please Stand Up?*, RCR Wireless News, Dec. 22, 2010, at (continued….)

among different mobile wireless network technologies, other factors than network technology may affect network performance, including the configuration of the network, the amount of spectrum used, and the type of backhaul connection to the cell site.[580]

Table 28
3G/4G Deployment by Selected Mobile Wireless Service Providers, 2011-2012

Service Provider	HSPA, HSPA+, and EV-DO Deployment	LTE and WiMAX Deployment
Verizon Wireless	As of May 2012, EV-DO Rev. A network covered 290 million POPs.	As of Nov. 2012, LTE network covered more than 250 million POPs. Plans to expand LTE nationwide in 2013 to have LTE coverage similar to its 3G network.
Verizon Wireless – LTE in Rural America Partners		As of March 2013, the program included 20 small, rural providers that have launched or plan to launch LTE to areas covering approximately 2.8 million people across 14 states. By March 2013, 7 of these providers had launched LTE: Bluegrass Cellular (Kentucky), Pioneer Cellular (Oklahoma), Cellcom (Wisconsin), Thumb Cellular (Michigan), Strata Networks (Utah), Chariton Valley (Missouri) and Cross Wireless (Oklahoma).
AT&T Wireless	As of mid-year 2012, all of AT&T's network is covered by HSPA+, covering 275 million POPs.	As of Nov. 2012, LTE network covered 150 million POPs. AT&T plans to deploy LTE to 80 percent of the U.S. population, or approximately 250 million POPs, by the end of 2013, and to 300 million by the end of 2014.
Sprint Nextel	As of January 2012, EV-DO Rev. A network covered approximately 274 million POPs.	As of September 2012, LTE service is offered in 19 cities and plans to deploy LTE to 100 additional cities within the next several months and to complete LTE build-out by the end of 2013.
Clearwire		As of June 2012, WiMAX network covered approximately 134 million POPs. Plans to launch LTE in 31 urban markets by June 2013.
T-Mobile	As of September 2012, HSPA+ 21 network covered over 200 million POPs and HSPA+ 42 network covered 184 million POPs.	As of December 2012, plans to deploy its LTE network in the United States to 100 million people by July 2013 and 200 million people by year-end July 2013.
MetroPCS		As of the end of July 2012, LTE

(Continued from previous page)
http://www.rcrwireless.com/article/20101222/OPINION/101229976/analyst-angle-will-the-real-4g-please-stand-up# (visited Oct. 16, 2012).

[580] *2012 Eighth Broadband Progress Report*, GN Docket No. 11-121, (rel. Aug. 21, 2012), ¶ 40.

		network covered all of the major metropolitan areas MetroPCS serves, including Atlanta, Boston, Dallas, Detroit, Jacksonville, Las Vegas, Los Angeles, Miami, New York, Orlando, Philadelphia, Sacramento, San Francisco, and Tampa.
Leap	EV-DO deployed to entire network footprint, which covered approximately 95.3 million POPs at the end of 2011.	As of October 2012, Leap had launched LTE service in Tucson, AZ and Las Vegas, Nevada. Leap expects its LTE network to cover approximately 21 million POPs by the end of 2012. The company plans to deploy LTE to approximately two-thirds of its network footprint over the next two to three years.
US Cellular	EV-DO network covers 98 percent of its customers.	As of June 2012, LTE network covers 30 percent of customers and expects to cover 58 percent by the end of 2012.
C-Spire	EV-DO network covered approximately 4.7 million POPs at the end of 2011.	As of October 2012, C-Spire offered LTE service in 31 cities in Mississippi. C-Spire plans to further expand its LTE network to 6 more cities by the end of 2012.

187. *Verizon Wireless*. Verizon Wireless's EV-DO Rev. A network – which provides advertised average download speeds of 600 kbps to 1.4 megabits per second (Mbps) and upload speeds of 500-800 kbps – was available to more than 290 million people as of May 2012, slightly higher than the 289 million covered by its network in September 2010.[581] As discussed in the *Fifteenth Report*, Verizon Wireless launched its LTE network in December 2010, deploying in 20 megahertz in 38 major U.S. cities covering approximately 110 million people.[582] As of May 2012, Verizon Wireless's LTE network covered more than 200 million people, and the company plans to expand its LTE network to 260 million people by the end of 2012 and to its entire EV-DO footprint by the end of 2013.[583] Verizon Wireless advertises that its LTE network provides average data rates of 5-12 Mbps downstream and 2-5 Mbps upstream.[584]

188. In addition to upgrading its own network to LTE, Verizon Wireless in 2010 launched an initiative called the LTE in Rural America Program to expand LTE coverage in rural areas. Under this program, Verizon Wireless leases portions of its 700 MHz Upper C Block spectrum licenses to facilities-based mobile wireless service providers in rural areas where Verizon Wireless currently lacks coverage

[581] Verizon Wireless, *Network Facts*, http://aboutus.vzw.com/bestnetwork/network_facts.html (visited May 8, 2012); Verizon Comments at 33-34. *See Fifteenth Report*, 26 FCC Rcd at 9736 ¶ 109. Estimates of coverage represent mobile network deployment and may not indicate the extent to which providers actually offer service in the covered areas or have customers living in those areas.

[582] *See Fifteenth Report*, 26 FCC Rcd at 9736 ¶ 109.

[583] Verizon Wireless, 3Q 2012 Quarter Earnings Conference Call, Transcript, Oct. 18, 2012, available at http://www22.verizon.com/investor/webcast_3q_2012_quarter_earnings_conference_call_webcast_10182012.htm Verizon Wireless, *Network Facts*, http://aboutus.vzw.com/bestnetwork/network_facts.html (visited May 8, 2012); *Fifteenth Report*, 26 FCC Rcd at 9736 ¶ 109.

[584] Verizon Wireless, *Network Facts*, http://aboutus.vzw.com/bestnetwork/network_facts.html (visited May 8, 2012).

and does not intend to build out.[585] The rural providers then use this spectrum to build out an LTE network in those areas.[586] As of March 2013, the program included 20 small, rural providers that have launched or plan to launch LTE to areas covering approximately 2.8 million people across 14 states.[587] In April 2012, Pioneer Cellular became the first rural provider to launch LTE service, to six counties in Oklahoma, as part of the program.[588] The program includes reciprocal roaming rights; the LTE customers of the rural providers can roam on Verizon Wireless's nationwide LTE network, while Verizon Wireless's customers can roam on the rural providers' LTE networks when traveling in such areas.[589]

189. *AT&T*. AT&T is using both HSPA+ and LTE technologies, as well as enhanced backhaul connections, to increase data transfer speeds for customers on its network.[590] As of January

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[585] Verizon Comments at 33; Bernie Arnason, *Nemont Partners with Verizon for Rural LTE Program*, Telecompetitor, Mar. 22, 2012, http://www.telecompetitor.com/nemont-partners-with-verizon-for-rural-lte-program/.(visited Oct. 16, 2012).

[586] *See*, e.g. Chariton Valley 4G LTE, http://www.cv4g.com/2012-07-16-14-32-05/2012-05-23-17-36-24 (visited Mar. 13, 2013). *See e.g.* Bluegrass Launches 4G LTE Network https://bluegrasscellular.com/index.php/about/news/bluegrass_launches_4g_lte_network visited Mar. 13, 2013) .

[587] Communications Daily, September 19, 2012, at 11. Joan Engecretson, *Pioneer Cellular Is First Verizon Rural Partner to Launch 4G LTE*, Telecompetitor, Apr. 30, 2012, http://www.telecompetitor.com/pioneer-cellular-is-first-verizon-rural-partner-to-launch-4g-lte/ (visited Oct. 16, 2012); Bernie Arnason, *Nemont Partners with Verizon for Rural LTE Program*, Telecompetitor, Mar. 22, 2012, http://www.telecompetitor.com/nemont-partners-with-verizon-for-rural-lte-program/(visited Oct. 16, 2012).

[588] Kevin Fitchard, *Pioneer Launches Rural LTE Over Verizon Spectrum*, GigaOm, May 3, 2012, http://gigaom.com/broadband/pioneer-launches-rural-lte-over-verizon-spectrum/(visited Oct. 16, 2012); Joan Engecretson, *Pioneer Cellular Is First Verizon Rural Partner to Launch 4G LTE*, Telecompetitor, Apr. 30, 2012 http://www.telecompetitor.com/pioneer-cellular-is-first-verizon-rural-partner-to-launch-4g-lte/(visited Oct. 16, 2012). *See* Verizon Wireless, *Pioneer Cellular's 4G LTE Network Testing Signals All Systems Go*, Dec. 16, 2011. V (visited Oct. 16, 2012) (stating "Verizon Wireless announced the LTE in Rural America initiative in June 2010 to bring the benefits of high-speed mobile broadband to rural areas of the United States where Verizon Wireless currently does not have a network. Under the program, Verizon Wireless shares access to its 700 MHz spectrum with rural operators who use their tower and backhaul assets to build a 4G LTE network."). *See* Telecompetitor, *Pioneer Cellular is First Verizon Rural Partner to Launch 4G LTE*, *available at* http://www.telecompetitor.com/pioneer-cellular-is-first-verizon-rural-partner-to-launch-4g-lte/, April 30, 2012 (stating "Initially Pioneer will offer three devices for use with the network, said Pioneer Cellular CEO Richard Ruhl in an interview. These include a MiFi hot spot, a dongle for a personal computer and a fixed home router. Within 30 days, Pioneer hopes to offer mobile handsets for use with the service.") Verizon Wireless, *4G LTE Goes Live in Rural America*, May 11, 2012, *available at* http://news.verizonwireless.com/news/2012/05/4g-lte-goes-live-in-rural-america.html. Cellcom, *Cellcom Provides High Speed Internet to Hannahville Community*, news release, June 13, 2012. http://www.nsightnews.com/nsight-cellcom-news/nsight-cellcom-press-releases/241-cellcom-provides-high-speed-internet-to-hannahville-community- (visited Oct. 16, 2012) (stating "Cellcom launched 4G LTE in portions of their service area in April of 2012. This is the first area where a residential product is being offered. Cellcom plans to roll out 4G residential broadband to additional areas in the future and will continue to add 4G coverage throughout its service area in the coming years."). Cellcom states that 4G LTE mobile handsets will be in stock soon. Cellcom, www.cellcom.com (visited Sept. 17, 2012).

[589] Kevin Fitchard, *Pioneer Launches Rural LTE Over Verizon Spectrum*, GigaOm, May 3, 2012, http://gigaom.com/broadband/pioneer-launches-rural-lte-over-verizon-spectrum/ (visited Oct. 16, 2012); *Two Verizon Rural LTE Partners Nearing Launch; Scheme Gains Two New Operators*, TeleGeography, Mar. 28, 2012, http://www.telegeography.com/products/commsupdate/articles/2012/03/28/two-verizon-rural-lte-partners-nearing-launch-scheme-gains-two-new-operators/ (visited Oct. 16, 2012); Dan Meyer, *Verizon Wireless Adds Chariton to Rural LTE Program*, RCR Wireless, Sept. 12, 2011, http://www.rcrwireless.com/article/20110912/carriers/verizon-wireless-adds-chariton-to-rural-lte-program/ (visited Oct 16, 2012).

[590] AT&T Comments at 29-30.

2012, AT&T's HSPA+ network covered approximately 234 million people,[591] and AT&T has announced that it plans to expand HSPA+ technology to its full wireless footprint, covering approximately 97 percent of the U.S. population, or 303 million people, by the end of 2012.[592] As mentioned in the *Fifteenth Report*, in January 2011, AT&T had upgraded most of its HSPA footprint from HSPA 7.2 to HSPA+ 14 technology, which provides theoretical peak download speeds of 14.4 Mbps.[593] During 2011, AT&T began further upgrading its HSPA+ network with HSPA+ 21 technology, which provides theoretical peak download speeds of 21 Mbps.[594] As of March 2012, AT&T's HSPA+ 21 footprint reportedly covered more than 200 million POPs.[595] In September 2011, AT&T launched its LTE network in five cities – Atlanta, Chicago, Dallas, Houston, and San Antonio – and announced at that time that it planned to extend LTE to a total of 15 cities covering 70 million people by the end of 2011.[596] By March 2012, AT&T had expanded its LTE network to 74 million people in 28 cities,[597] and by September 2012, AT&T announced that it has LTE coverage in 63 markets, utilizing approximately 20 megahertz in most of those.[598] AT&T has stated that it expedited its rollout of LTE by a year in order to compete with other firms on the basis of network speeds and because LTE is a more spectrally efficient technology than those on the UMTS/HSPA migration path.[599] AT&T has stated that it plans to deploy LTE to 80 percent of the U.S. population, or approximately 250 million people, by the end of 2013.[600]

190. In conjunction with upgrading its cell sites with HSPA+ and LTE technologies, AT&T is rolling out high-speed backhaul connections, primarily fiber, to many of its cell sites in order to increase network capacity.[601] These connections are meant to accommodate the faster data speeds that HSPA+ and LTE enable and the increasing traffic that results from the faster data connections and more advanced end-user devices. In 2011, AT&T began using the term "4G" to refer to the portions of its network where

[591] As stated above, these estimates of coverage represent mobile network deployment and may not indicate the extent to which providers actually offer service in the covered areas or have customers living in those areas. We estimate this coverage based on a census block analysis of Mosaik CoverageRight coverage maps (AT&T's HSPA+ coverage) for January 2012. Population data are derived from the 2010 Census. *See* Section III.B Overview of the Mobile Wireless Industry *supra*.

[592] Applications of AT&T Inc. and Deutsche Telekom AG for Consent to Transfer Control of Licenses and Authorizations, WT Docket No. 11-65, *Order*, 26 FCC Rcd 16184, 16286 ¶ 245 (WTB 2011) (*Bureau Order dismissing transfer applications without prejudice, Staff Analysis and Findings*).

[593] *See Fifteenth Report*, 26 FCC Rcd at 9737 ¶ 110.

[594] Sascha Segan, *AT&T Defines 4G as HSPA 14.4*, PCMag.com, May 5, 2011, http://www.pcmag.com/article2/0,2817,2384959,00.asp (visited Oct. 16, 2012).

[595] Phil Goldstein, *AT&T to Expand LTE Coverage to 12 More Markets*, FierceWireless, Mar. 12, 2012, http://www.fiercewireless.com/story/att-expand-lte-coverage-12-more-markets/2012-03-12. (visited Oct. 16, 2012).

[596] *4G LTE from AT&T Available in Chicago,* Press Release, AT&T, Sept. 19, 2011, *available at* http://www.att.com/gen/press-room?pid=21165&cdvn=news&newsarticleid=32813&mapcode=wireless-networks-general|consumer (visited Nov. 30, 2012), AT&T Comments at 31.

[597] Phil Goldstein, *AT&T to Expand LTE Coverage to 12 More Markets*, FierceWireless, Mar. 12, 2012, http://www.fiercewireless.com/story/att-expand-lte-coverage-12-more-markets/2012-03-12 (visited Oct 16, 2012); Phil Goldstein, *Study: AT&T, T-Mobile Top Network Speed Tests*, FierceWireless, Apr. 17, 2012, at http://www.fiercewireless.com/story/study-att-t-mobile-top-network-speed-tests/2012-04-17 (visited Oct. 16, 2012).

[598] AT&T, http://www.att.com/network/ (Visited Sept. 18, 2012).

[599] AT&T Comments at 31.

[600] Applications of AT&T Inc. and Deutsche Telekom AG for Consent to Transfer Control of Licenses and Authorizations, WT Docket No. 11-65, *Order*, 26 FCC Rcd 16184, 16286 ¶ 245 (WTB 2011) (*Bureau Order dismissing transfer applications without prejudice, Staff Analysis and Findings*). AT&T is using both its 700 MHz and AWS spectrum holdings for its LTE deployment. *See Fifteenth Report*, 26 FCC Rcd at 9737 ¶ 110.

[601] *See Fifteenth Report*, 26 FCC Rcd at 9737 ¶111.

LTE or HSPA+ with enhanced backhaul had been deployed.[602] Its 4G network covered 250 million POPs in April 2012.[603]

191. *Sprint Nextel/Clearwire*. Sprint operates an extensive CDMA EV-DO network that covered approximately 274 million POPs as of January 2012.[604] As discussed in the *Fifteenth Report*, in 2011, Sprint began its Network Vision upgrade to consolidate its multiple network technologies operating in a range of spectrum bands into multi-mode base stations.[605] According to Sprint, this upgrade, in conjunction with backhaul upgrades and background applications that shift data sessions to Wi-Fi, improves the network speed, coverage, and efficiency for the company's EV-DO customers.[606] The Network Vision upgrade will also result in Sprint shutting down its iDEN network in 2013.[607]

192. As part of its Network Vision implementation, Sprint announced that it would begin deploying an LTE network in 2012, with its initial launch of LTE service in Atlanta, Baltimore, Dallas, Houston, Kansas City, and San Antonio by mid-2012.[608] In anticipation of its launch, it began selling LTE-compatible devices in April 2012.[609] As of September 2012, Sprint Nextel offers LTE service in 19 metropolitan areas and has plans to expand coverage to more than 100 additional cities in the coming months.[610] Sprint has deployed the LTE network using its 10 megahertz PCS G block licenses in the 1910-1915 MHz and 1990-1995 MHz bands.[611] Because the LTE network is deployed initially in 10, rather than 20 or more, megahertz of spectrum, its average connection speeds will be lower than those

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[602] Sascha Segan, *AT&T Defines 4G as HSPA 14.4*, PCMag.com, May 5, 2011, http://www.pcmag.com/article2/0,2817,2384959,00.asp (visited Nov. 30, 2012).

[603] Mike Dano, *AT&T, T-Mobile Wrangling Over Who Has the Largest 4G Network,* FierceWireless, April 18, 2012, at http://www.fiercewireless.com/story/att-t-mobile-wrangling-over-who-has-largest-4g-network/2012-04-18 (citing Steven Schwadron of AT&T).

[604] As stated above, these estimates of coverage represent mobile network deployment and may not indicate the extent to which providers actually offer service in the covered areas or have customers living in those areas. We estimate this coverage based on a census block analysis of Mosaik CoverageRight coverage maps (AT&T's HSPA+ coverage) for January 2012. Population data are derived from the 2010 Census. *See* Section III.B Overview of the Mobile Wireless Industry *supra*.

[605] *See Fifteenth Report*, 26 FCC Rcd at 9738 ¶ 112.

[606] Sascha Segan, *Sprint: A Better Network Is Coming*, PCMag.com, May 9, 2012, http://www.pcmag.com/article2/0,2817,2404184,00.asp. (visited Oct. 16, 2012).

[607] Roger Cheng, *Sprint to Launch Own 4G LTE Network in Early 2012*, CNET News, Sept. 27, 2011, http://news.cnet.com/8301-1035_3-20112095-94/sprint-to-launch-own-4g-lte-network-in-early-2012-scoop/ (visited Oct. 16, 2012).

[608] *Baltimore and Kansas City Sprint Customers to Benefit from 4G LTE and 3G Enhancements in 2012*, Press Release, Sprint, Feb. 8, 2012, *available at* http://newsroom.sprint.com/article_display.cfm?article_id=2180 (visited Oct. 16, 2012).

[609] *Sprint Continues 4G LTE Momentum with Launch of Galaxy Nexus by Samsung on April 22 for $199.99*, Press Release, Sprint, Apr. 16, 2012, *available at* http://newsroom.sprint.com/article_display.cfm?article_id=2240 (visited Oct. 16, 2012); *Sprint Debuts HTC EVO 4G LTE on May 18 for $199.99*, Press Release, Sprint, May 9, 2012, *available at* http://newsroom.sprint.com/article_display.cfm?article_id=2269 (visited Oct. 16, 2012).

[610] Sprint, News Release, *Sprint 4G LTE Available in More Than 100 Additional Cities in the Coming Months*, Sept. 10, 2012, *available at* http://newsroom.sprint.com/article_display.cfm?article_id=2382 (visited Sept. 19, 2012).

[611] Sascha Segan, *Sprint: A Better Network Is Coming*, PCMag.com, May 9, 2012, http://www.pcmag.com/article2/0,2817,2404184,00.asp (visited Oct. 16, 2012); Roger Cheng, *Sprint to Launch Own 4G LTE Network in Early 2012*, CNET News, Sept. 27, 2011, http://news.cnet.com/8301-1035_3-20112095-94/sprint-to-launch-own-4g-lte-network-in-early-2012-scoop/ (visited Oct. 16, 2012).

offered on the LTE networks of Verizon Wireless or AT&T.[612]

193. Sprint continues to resell the mobile WiMAX service offered by Clearwire, in which Sprint has a significant ownership interest.[613] Many of the devices sold by Sprint are compatible with both EV-DO and WiMAX, allowing users to connect to both types of networks.[614] In December 2011, Sprint announced a new agreement with Clearwire under which Sprint will continue to resell WiMAX, will have access to Clearwire's network through at least 2015, and will eventually resell the LTE services offered by Clearwire's planned LTE network to supplement its own LTE services.[615]

194. Clearwire operates an extensive WiMAX network and has announced plans to deploy LTE in the future. As of year-end 2011, Clearwire's WiMAX network covered 132 million people in 71 markets, compared to approximately 120 million people at the end of 2010.[616] The network operates on spectrum in the 2.5 GHz BRS/EBS band and, according to Clearwire, provides average download speeds of 3-6 Mbps with burst rates up to 10 Mbps.[617] As discussed in the *Fifteenth Report*, Clearwire began testing LTE in the 2.5 GHz band in 2010.[618] The company has continued with its plans to deploy LTE and is expected to launch its LTE network in mid-2013.[619] Clearwire's initial LTE plans are to overlay 5,000 of its existing WiMAX sites in 31 urban markets with TDD (Time Division Duplex) LTE technology by June 2013.[620]

195. In contrast to other facilities-based providers, Clearwire is focused on pursuing a wholesale, rather than a retail, business model. While it has maintained its retail service under the CLEAR brand, the majority of Clearwire's customers are wholesale, it has added wholesale partners over the past year, and it is focused on growing its business through wholesale agreements.[621] In addition to

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[612] Sascha Segan, *Sprint: A Better Network Is Coming*, PCMag.com, May 9, 2012, http://www.pcmag.com/article2/0,2817,2404184,00.asp (visited Oct. 16, 2012) (citing Sprint Senior Vice President, Bob Azzi).

[613] *See* Footnote 612, *infra.*

[614] Sprint, *Phones*, http://shop.sprint.com/mysprint/shop/phone_wall.jsp?INTNAV=ATG:HE:Phones_Devices (visited May 31, 2012).

[615] *Sprint and Clearwire Announce New Agreements*, Press Release, Sprint, Dec. 1, 2011, *available at* http://newsroom.sprint.com/article_display.cfm?article_id=2121 (visited Oct. 16, 2012); Clearwire, SEC Form 10-K, filed Feb. 16, 2012, at 7.

[616] Clearwire, SEC Form 10-K, filed Feb. 16, 2012, at 2; *See Fifteenth Report*, 26 FCC Rcd at 9738 ¶ 113. Estimates of coverage represent mobile network deployment and may not indicate the extent to which providers actually offer service in the covered areas or have customers living in those areas.

[617] *See Fifteenth Report*, 26 FCC Rcd at 9739 ¶ 113.

[618] *See Fifteenth Report*, 26 FCC Rcd at 9739 ¶ 113.

[619] Clearwire, SEC Form 10-K, filed Feb. 16, 2012, at 2; Philip Cusick, *et al.*, *Clearwire*, J.P. Morgan, North America Equity Research, Apr. 27, 2012, at 1.

[620] Clearwire, SEC Form 10-K, filed Feb. 16, 2012, at 2; Philip Cusick, *et al.*, *Clearwire*, J.P. Morgan, North America Equity Research, Apr. 27, 2012, at 1; Clearwire, *Announcing the Future of LTE*, http://www.clearwire.com/company/featured-story (visited May 10, 2012). The TDD version of LTE is different from the FDD (Frequency Division Duplex) version of LTE being deployed by most other providers. FDD-LTE uses two separate sets of frequencies for uplink and downlink transmissions, while TDD-LTE uses a single set of frequencies for both and being adopted more widely in other countries. Ed Oswald, *Is Clearwire the Savior of Global LTE?*, ExtremeTech, May 9, 2012, at http://www.extremetech.com/extreme/129090-is-clearwire-the-savior-of-global-lte (visited Oct. 16, 2012).

[621] Clearwire, SEC Form 10-K, filed Feb. 16, 2012, at 2-3; *Clearwire Reports Record Fourth Quarter and Full 2010 Growth*, Financial Release, Clearwire, Feb. 17, 2011, *available at* http://investors.clearwire.com/phoenix.zhtml?c=214419&p=irol-newsArticle&ID=1530258&highlight= (visited Oct. 16, 2012).

reselling to Sprint, Clearwire has also resold its WiMAX service to Comcast, Time Warner, Best Buy, and NetZero, and in March 2012, announced an LTE wholesale agreement with Leap.[622] Clearwire has stated that it hopes to obtain wholesale partners seeking to offload data traffic onto Clearwire's WiMAX or planned LTE networks.[623] To help facilitate such arrangements, Clearwire signed a deal with Qualcomm in May 2012 under which Qualcomm will manufacture chipsets that connect to the different versions of LTE that the different mobile wireless service providers, including Clearwire, are deploying.[624] This deal would enable LTE subscribers of other mobile wireless service providers, such as AT&T and T-Mobile, to roam onto Clearwire's LTE network in capacity-constrained areas if those providers established a wholesale sale agreement with Clearwire.[625]

196. *T-Mobile*. T-Mobile, like AT&T, is deploying HSPA+ technology across its mobile wireless network and, in early 2012, announced plans to launch an LTE network in 2013. As mentioned in the *Fifteenth Report*, T-Mobile began upgrading its HSPA+ network to HSPA+ 21 technology in late 2009, and this network covered 200 million people as of the end of 2010.[626] During 2011, T-Mobile further upgraded its HSPA+ network with HSPA+ 42 technology, which doubles the peak downstream rate of HSPA+ 21 technology to 42 Mbps. In January 2012, T-Mobile reported that its HSPA+ 42 network covered 184 million people and that its HSPA+ 21 network covered more than 200 million people.[627] The company reports that customers using HSPA+ 42-compatible devices experience average download speeds of 8 Mbps.[628]

197. In 2012, T-Mobile announced plans to deploy an LTE network using the AWS-1 spectrum licenses it acquired from AT&T as a result of the breakup of the companies' proposed merger. T-Mobile plans to launch the LTE network in 18 to 19 of the top 25 U.S. markets in 2013 by deploying "LTE-Advanced" Release 10 technology at 37,000 cell sites. T-Mobile expects its LTE network in the United States to cover 100 million people by July 2013 and 200 million people by year-end July 2013.[629] In conjunction with its roll out of LTE in the AWS-1 band, T-Mobile is also refarming its PCS spectrum

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[622] Clearwire, SEC Form 10-K, filed Feb. 16, 2012, at 7-8; *Cricket and Clearwire Announce Long-Term Wholesale 4G LTE Agreement*, Press Release, Leap, Mar. 14, 2012, *available at* http://leapwireless.mediaroom.com/index.php?s=13383&item=124331 (visited Oct. 16, 2012). Clearwire stated that it expects Comcast and Time Warner to reduce or eliminate additional sales of Clearwire's services during 2012 as a result of the cable companies' co-marketing agreements with Verizon Wireless. *Id.*

[623] Clearwire, SEC Form 10-K, filed Feb. 16, 2012, at 7-8. Clearwire stated that it would consider upgrading additional sites in its network with LTE in areas where Sprint or other existing or future wholesale partners expressed a need for additional capacity. *Id.* at 2.

[624] Greg Bensinger, *Clearwire Says Qualcomm Pact to Help with Wholesale Deals*, Dow Jones Newswires, May 8, 2012, at http://online.wsj.com/article/BT-CO-20120508-715265.html (visited Oct. 16, 2012).

[625] Greg Bensinger, *Clearwire Says Qualcomm Pact to Help with Wholesale Deals*, Dow Jones Newswires, May 8, 2012, at http://online.wsj.com/article/BT-CO-20120508-715265.html (visited Oct. 16, 2012) (citing Cleawire CEO Erik Prusch).

[626] *See Fifteenth Report*, 26 FCC Rcd at 9739 ¶ 114. Estimates of coverage represent mobile network deployment and may not indicate the extent to which providers actually offer service in the covered areas or have customers living in those areas.

[627] *T-Mobile Expands America's Largest 4G Network and Showcases 4G Experiences at 2012 CES*, Press Release, T-Mobile, Jan. 10, 2012. http://newsroom.t-mobile.com/articles/t-mobile-expands-network-showcases-4g-at-ces (visited Oct. 16, 2012)

[628] *T-Mobile USA Selects Infrastructure Vendors to Support $4 Billion 4G Network Evolution Plan*, Press Release, T-Mobile USA, May 7, 2012, *available at* http://newsroom.t-mobile.com/articles/4GNetworkEvolutionVendorsSelected (visited Oct. 16, 2012).

[629] *Deutsche Telekom Capital Markets Day 2012, Press Conference*, p. 22, *available at* http://www.telekom.com/media/company/164844 (visited Dec. 10, 2012).

to be able to deploy HSPA+ technology in that band. T-Mobile claims that these refarming efforts will increase average data transfer speeds on its HSPA+ network, improve in-building coverage, and allow consumers to use a broader range of HSPA+ devices.[630]

198. *MetroPCS*. MetroPCS, which never generally upgraded its CDMA network with EV-DO technology, became the first U.S. mobile wireless service provider to launch LTE – in Las Vegas and Dallas – in September 2010.[631] As of the end of 2011, the operator had deployed LTE in all of the major metropolitan areas it serves, including Atlanta, Boston, Dallas, Detroit, Jacksonville, Las Vegas, Los Angeles, Miami, New York, Orlando, Philadelphia, Sacramento, San Francisco, and Tampa.[632] It has been reported that MetroPCS's LTE average data speeds are lower than those offered on the LTE networks of other providers.[633]

199. *Leap*. Leap has deployed EV-DO across its entire network footprint, which covered approximately 95.3 million POPs at the end of 2011, and has begun rolling out LTE.[634] In December 2011, Leap launched LTE service in Tucson, AZ and plans to cover approximately 25 million people with LTE by the end of 2012.[635] The company plans to deploy LTE to approximately two-thirds of its network footprint by sometime in 2014.[636]

200. *US Cellular*. US Cellular has deployed an EV-DO network covering 98 percent of its customers, and in March 2012, the company launched LTE service.[637] US Cellular initially rolled out

[630] *T-Mobile USA Selects Infrastructure Vendors to Support $4 Billion 4G Network Evolution Plan*, Press Release, T-Mobile USA, May 7, 2012, *available at* http://newsroom.t-mobile.com/articles/4GNetworkEvolutionVendorsSelected. (visited Oct. 16, 2012)

[631] *MetroPCS Launches First 4G LTE Services in the United States and Unveils World's First Commercially Available 4G LTE Phone*, Press Release, MetroPCS, Sept. 21, 2010, *available at* http://investor.metropcs.com/phoenix.zhtml?c=177745&p=irol-newsArticle&ID=1473355&highlight (visited Oct. 16, 2012); *MetroPCS Launches Commercial 4G LTE Services in the Dallas/Fort Worth Metroplex*, Press Release, MetroPCS, Sept. 29, 2010, *available at* http://investor.metropcs.com/phoenix.zhtml?c=177745&p=irol-newsArticle&ID=1475926&highlight(visited Oct. 16, 2012) =. At the same time MetroPCS launched its LTE network, the company also began offering the first commercially available, dual-mode LTE/CDMA device in the United States, the Samsung Craft. For more information, *see* Section IV.B.1.b, *infra*.

[632]MetroPCS, SEC Form 10-K, filed Feb. 29, 2012, at 6.

[633] Roger Cheng, MetroPCS's 4G Isn't Exactly Greased Lightning, CNET News, Aug. 3, 2011, http://news.cnet.com/8301-1035_3-20087512-94/metropcss-4g-isnt-exactly-greased-lightning/ (visited Oct. 16, 2012); Sascha Segan, *The Fastest Mobile Networks 2011*, PCMag.com, June 27, 2011,at http://www.pcmag.com/Fastest-Mobile-Networks-2011(visited Oct. 16, 2012).

[634] Leap Wireless International, Inc., SEC Form 10-K, filed Feb. 21, 2012, at 4. Estimates of coverage represent mobile network deployment and may not indicate the extent to which providers actually offer service in the covered areas or have customers living in those areas.

[635] *Leap's Cricket Service Begins Network Transition to 4G LTE with First Commercial Market Launch in Tucson, Arizona*, Press Release, Leap, Dec. 21, 2011, *available at* http://leapwireless.mediaroom.com/index.php?s=13383&item=97670 (visited Oct. 16, 2012) ; Leap Wireless International, Inc., SEC Form 10-K, filed Feb. 21, 2012, at 4; Leap Reply at 4.

[636] Leap Wireless International, Inc., SEC Form 10-K, filed Feb. 21, 2012, at 4; Leap Reply at 4.

[637] United States Cellular Corporation, SEC Form 10-K, filed Feb. 27, 2012, at 7; United States Cellular Corporation, SEC Form 10-Q, filed May 4, 2012, at 7; Stephen Lawson, *U.S. Cellular Throws Its 4G LTE Hat in the Ring*, ComputerWorld, Mar. 22, 2012, at http://www.computerworld.com/s/article/9225498/U.S._Cellular_throws_its_4G_LTE_hat_in_the_ring (visited Oct. 16, 2012).

LTE to 25 percent of its customers and plans to cover 54 percent of its customers by the end of 2012.[638]

201. *Other Providers*. In addition to the providers discussed above, several other smaller, regional operators had deployed 3G and 4G technologies within their networks as of January 2012. These networks combined had been deployed in census blocks covering 66.6 million people, or 21.3 percent of the U.S. population, as of January 2012.[639]

b. Coverage by Technology Type

202. We present estimates of coverage by air interference type in approximately 11 million census blocks in the U.S. [640] This census block level analysis is based on data from Mosaik Solutions, and while this analysis likely overstates the coverage experienced by consumers because of limitations in Mosaik data, we find that this analysis is useful because it provides a general baseline that can be compared over time across network types, technologies, and providers. As of October 2012, an estimated 99.9 percent of the United States population lived in census blocks where operators have deployed digital mobile wireless coverage over at least part of the census block using CDMA, GSM/TDMA, or iDEN (including their respective next generation technologies), or some combination of the three. As shown in Table 30 below, we estimate that both CDMA and GSM/TDMA have been deployed in census blocks containing 310.3 million people. As stated above, these estimates of coverage represent deployment of mobile wireless networks and do not indicate the extent to which providers actually offer service in the covered areas or have customers residing in those areas. iDEN coverage has declined slightly as Sprint has been phasing out its iDEN network. The technology covered 89 percent of the U.S. population as of October 2012, down from 91 percent in July 2010. A map showing coverage by mobile wireless digital technologies can be found in Appendix C, Maps C-23 to C-30.

[638] Stephen Lawson, *U.S. Cellular Throws Its 4G LTE Hat in the Ring*, ComputerWorld, Mar. 22, 2012, at http://www.computerworld.com/s/article/9225498/U.S._Cellular_throws_its_4G_LTE_hat_in_the_ring (visited Oct. 16, 2012).

[639] Commission estimates based on census block analysis of Mosaik CoverageRight coverage maps, January 2012. Population data are from the 2010 Census. Estimates of coverage represent mobile network deployment and may not indicate the extent to which providers actually offer service in the covered areas or have customers living in those areas.

[640] *See* Section IV.B.1.b, Coverage by Technology Type, *supra*, for a discussion of the limitations of Mosaik data.

Table 29
Estimated Mobile Wireless Coverage by Technology, Jan. 2012[641]

Technology	POPs in Covered Blocks (Thousands)	% of Total POPs	Square Miles Contained in Those Blocks (Thousands)	% of Total Square Miles	Road Miles Contained in Those Blocks (Thousands)	% of Total U.S. Road Miles
CDMA	310,306	99.3%	2,656	67.0%	6,140	90.0%
GSM/TDMA	310,276	99.3%	2,419	65.0%	6,030	88.4%
iDEN	281,138	90.0%	1,135	25.1%	3,338	48.9%
Total Digital	**311,982**	**99.8%**	**2,895**	**73.3%**	6,462	94.7%

Table 30
Estimated Mobile Wireless Coverage by Technology, Oct. 2012[642]

Technology	POPs in Covered Blocks (Thousands)	% of Total POPs	Square Miles Contained in Those Blocks (Thousands)	% of Total Square Miles	Road Miles Contained in Those Blocks (Thousands)	% of Total U.S. Road Miles
CDMA	310,370	99.3%	2,547	67.0%	6,147	90.1%
GSM/TDMA	310,315	99.3%	2,495	65.6%	6,059	88.8%
iDEN	278,435	89.1%	895	23.5%	3,200	46.9%
Total Digital	**312,004**	**99.9%**	**2,791**	**73.4%**	6,465	94.8%

203. Table 31 below provides estimates of the extent of mobile data and mobile broadband network coverage in the United States based on Mosaik data. Table 31 shows that 2.5G mobile data networks, which were widely deployed several years ago, covered an estimated 99.8 percent of the total U.S. population as of October 2012. We estimate that 99.3 percent of the population is covered by the individual CDMA and GSM path technologies – 1xRTT and GPRS/EDGE. For mobile broadband coverage, Table 31 shows that an estimated 99.5 percent of the U.S. population (residing in an estimated 67.8% of the U.S. land area) was covered by at least one mobile provider using a 3G or 4G network technology as of October 2012, up from 98.5 percent in August 2010.[643] We also estimate that EV-DO

[641] Includes Federal lands. Commission estimates based on census block analysis of Mosaik CoverageRight coverage maps, January 2012. Population data are from the 2010 Census, and the square miles include the United States and Puerto Rico. Our analysis of road miles includes the following road miles categories from census: Primary Road (S1100), Secondary Road (S1200), Local Neighborhood Road, Rural Road, City Street (S1400), Vehicular Trail [4WD] (S1500), Service Drive usually along a limited access highway (S1640), and Private Road for service vehicles (S1740) as defined in MAF/TIGER Feature Class Code (MTFCC) Definitions, pages F-186 and F-187 at http://www.census.gov/geo/www/tiger/tgrshp2010/documentation.html (visited Sep 26, 2012). In calculating the number of road miles associated with each census block, we also used two tables ("Faces" and "Edges"), published by the US Census Bureau as part of the TIGER database. A description of these relationship tables can be found at http://www.census.gov/geo/www/tiger/rel_file_desc.pdf (visited Oct. 16, 2012) . The datasets themselves are available in the FACES and EDGES directories at ftp://ftp2.census.gov/geo/tiger/TIGER2010/ (visited Oct. 16, 2012).

[642] Includes Federal lands. Commission estimates based on census block analysis of Mosaik CoverageRight coverage maps, October 2012. Population data are from the 2010 Census, and the square miles include the United States and Puerto Rico.

[643] *See Fifteenth Report*, 26 FCC Rcd at 9742 ¶ 120, Table 13.

coverage increased from 98.3 percent to 99.2 percent of the U.S. population, while estimated HSPA coverage grew from 79.8 percent to 95.3 percent of the U.S. population.[644] In addition, we estimate that LTE networks, which had not been deployed in the U.S. as of July/August 2010, covered 267.5 million people, or 85.6 percent of the U.S. population as of October 2012. Finally, we estimate that mobile WiMAX network coverage increased from 17.7 percent to 33.6 percent.[645]

Table 31
Estimated Mobile Wireless Data/Broadband Network Coverage by Census Block, Jan. 2012[646]

Technology		POPs in Covered Blocks (Thousands)	% of Total POPs	Square Miles Contained in Those Blocks (Thousands)	% of Total Square Miles	Road Miles Contained in Those Blocks (Thousands)	% of Total U.S. Road Miles
2.5G	CDMA 1xRTT	310,226	99.3%	2,530	66.6%	6,121	90.0%
	GPRS/EDGE	310,258	99.3%	2,464	64.9%	6,028	88.4%
	Total 2.5G Mobile Data Network Coverage	**311,960**	**99.8%**	**2,771**	**72.9%**	**6,453**	**94.6%**
3G/ 4G	WCDMA/HSPA/HSPA+	291,056	93.1%	1,597	42.0%	4,341	63.6%
	EV-DO/EV-DO Rev. A	309,486	99.0%	2,365	62.3%	5,917	86.8%
	Mobile WiMAX	105,124	33.6%	43	1.1%	416	6.1%
	LTE	210,940	67.5%	292	7.7%	1,475	21.6%
	Total Mobile Broadband Coverage (3G/4G)	**310,519**	**99.4%**	**2,517**	**66.2%**	**6,115**	**89.6%**

[644] *See Fifteenth Report*, 26 FCC Rcd at 9742 ¶ 120, Table 13.

[645] Mobile broadband coverage across different states and areas of the country is shown in Map D-29 in Appendix C.

[646] Includes Federal lands. Commission estimates based on census block analysis of Mosaik CoverageRight coverage maps, January 2012. Population data are from the 2010 Census, and the square miles include the United States and Puerto Rico. The Commission may include other combinations of mobile network technologies when referring to "mobile broadband" in other contexts. *See, e.g., Eighth Broadband Progress Report* at Table 15. Our analysis of road miles includes the following road miles categories from census: Primary Road (S1100), Secondary Road (S1200), Local Neighborhood Road, Rural Road, City Street (S1400), Vehicular Trail [4WD] (S1500), Service Drive usually along a limited access highway (S1640), and Private Road for service vehicles (S1740) as defined in MAF/TIGER Feature Class Code (MTFCC) Definitions, pages F-186 and F-187 at http://www.census.gov/geo/www/tiger/tgrshp2010/documentation.html (last visited Sep 26, 2012). In calculating the number of road miles associated with each census block, we also used two tables ("Faces" and "Edges"), published by the US Census Bureau as part of the TIGER database. A description of these relationship tables can be found at http://www.census.gov/geo/www/tiger/rel_file_desc.pdf(visited Oct. 16, 2012) . The datasets themselves are available in the FACES and EDGES directories at ftp://ftp2.census.gov/geo/tiger/TIGER2010/(visited Oct. 16, 2012).

Table 32
Estimated Mobile Wireless Data/Broadband Network Coverage by Census Block, Oct. 2012[647]

Technology		POPs in Covered Blocks (Thousands)	% of Total POPs	Square Miles Contained in Those Blocks (Thousands)	% of Total Square Miles	Road Miles Contained in Those Blocks (Thousands)	% of Total U.S. Road Miles
2.5G	CDMA 1xRTT	310,296	99.3%	2,534	66.6%	6,129	89.9%
	GPRS/EDGE	310,312	99.3%	2,488	65.4%	6,058	88.8%
	Total 2.5G Mobile Data Network Coverage	**311,986**	**99.8%**	**2,777**	**73.1%**	**6,455**	**94.6%**
3G/ 4G	WCDMA/HSPA/HSPA+	297,921	95.3%	1,782	46.9%	4,771	69.9%
	EV-DO/EV-DO Rev. A	310,011	99.2%	2,431	63.9%	6,012	88.1%
	Mobile WiMAX	105,340	33.7%	44	1.2%	418	6.1%
	LTE	267,464	85.6%	766	20.2%	2,816	41.3%
	Total Mobile Broadband Coverage (3G/4G)	**311,025**	**99.5%**	**2,577**	**67.8%**	**6,209**	**91.0%**

204. Additional information on mobile broadband network deployment can be found in the National Broadband Map.[648] The National Broadband Map displays the geographic areas where broadband service is available, the technology used to provide the service, and the speeds of the service.[649] The Map is searchable by address and indicates the broadband providers offering service in the corresponding census block or street segment.[650] According to a Commission analysis of State Broadband Initiative map data submitted for the National Broadband Map, mobile broadband networks offering speeds of 3 Mbps downstream and 768 kbps upstream covered an estimated 93.8 percent of the U.S. population as of June 2011.[651]

205. Chart 7 below depicts the pace of 3G/4G network deployment over the past seven years. As stated above, these estimates of coverage represent mobile network deployment and may not indicate the extent to which providers actually offer service in the covered areas or have customers residing in those areas. EV-DO network coverage has grown from 62.6 percent of the U.S. population in 2006 to 99.2 percent in 2012. HSPA network coverage was not nearly as extensive as EV-DO coverage in 2006, covering only 20 percent of the U.S. population. However, HSPA deployment has been increasing in recent years, and HSPA networks covered 95.3 percent of the population in October 2012. Looking at the more recently-launched network technologies, WiMAX and LTE, we see that WiMAX coverage has increased since 2009 but still only covers about a third of the U.S. population and actually declined

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[647] Includes Federal lands. Commission estimates based on census block analysis of Mosaik CoverageRight coverage maps, October 2012. Population data are from the 2010 Census, and the square miles include the United States and Puerto Rico.

[648] The National Broadband Map was created by the National Telecommunications and Information Administration (NTIA) in partnership with Commission, 50 states, five territories, and the District of Columbia. It can be accessed at http://www.broadbandmap.gov/.(visited Oct. 16, 2012).

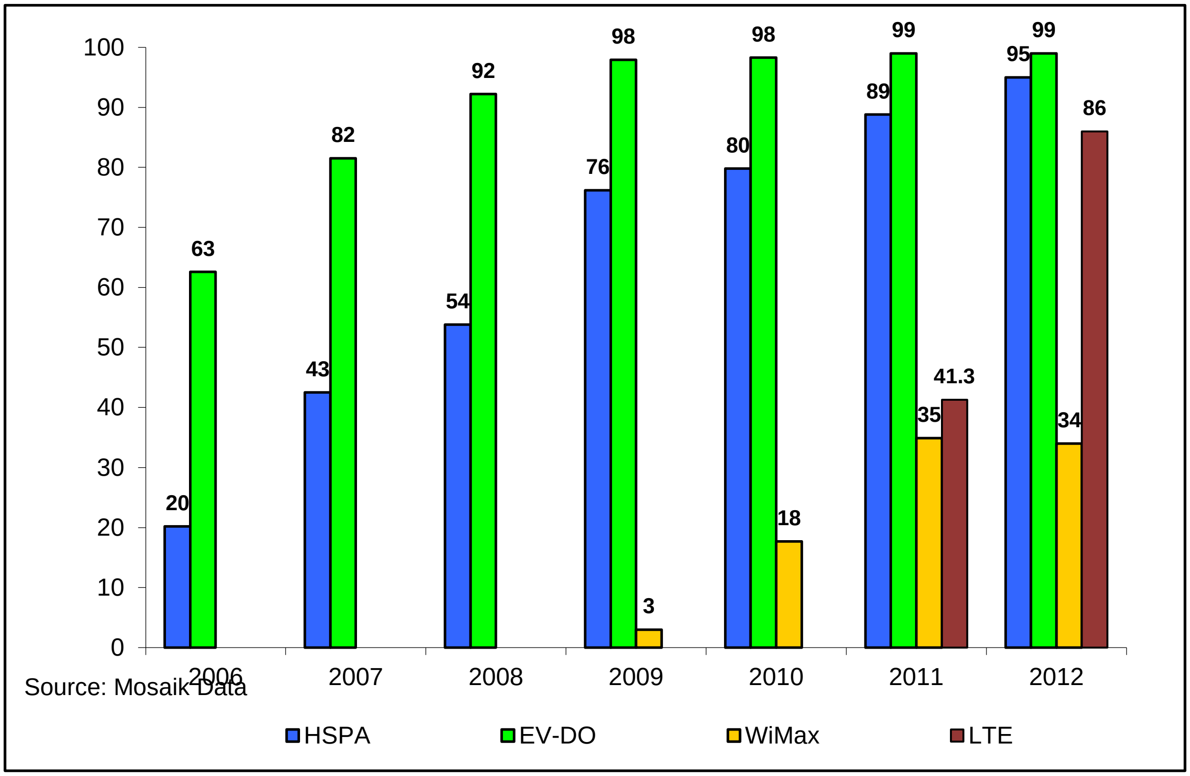
[649] http://www.broadbandmap.gov/. (visited Oct. 16, 2012).

[650] http://www.broadbandmap.gov/. (visited Oct. 16, 2012).

[651] *2012 Eighth Broadband Progress Report*, GN Docket No. 11-121, ¶ 86.

slightly from 2011 to 2012. LTE coverage, on the other hand, has grown rapidly over the past year-and-a-half, from nothing in mid-2010 to 86 percent of the U.S. population as of October 2012. This trend reflects the LTE network launches by the major providers that began in the fall of 2010.[652]

Chart 7
Estimated 3G and 4G Network Coverage, 2006-2012[653]
(Percent of U.S. Population Covered)



206. While mobile broadband network deployment has grown in recent years, certain geographic areas of the country remain unserved. To expand mobile network deployment into such unserved areas, the Commission adopted rules creating the Mobility Fund in November 2011.[654] The Mobility Fund will use Universal Service Fund reserves to support the deployment of current- or future-generation mobile network technologies that provide mobile voice and Internet services.[655] Phase I of the Mobility Fund used a reverse auction to assign approximately $300 million in one-time support to service

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[652] *See* Section IV.B.1.a, Service Provider Technology Deployments, *supra*.

[653] Commission estimates based on census block analysis of Mosaik CoverageRight coverage maps, April 2011 and October 2012. Estimates for previous years were obtained from the Annual Mobile Wireless Competition Reports and the Annual CMRS Competition Reports. *See Fifteenth Report*, 26 FCC Rcd at 9743 ¶ 122; *Fourteenth Report*, 25 FCC Rcd at 11487-88 ¶ 122, Table 13; *Thirteenth Report*, 24 FCC Rcd at 6257 ¶ 145; *Twelfth Report*, 23 FCC Rcd at 2304 ¶ 143; *Eleventh Report*, 21 FCC Rcd at 10995 ¶ 117.

[654] Connect America Fund, A National Broadband Plan for Our Future, Establishing Just and Reasonable Rates for Local Exchange Carriers, High-Cost Universal Service Support, Developing an Unified Intercarrier Compensation Regime, Federal-State Joint Board on Universal Service, Lifeline and Link-Up, Universal Service Reform – Mobility Fund, *Report and Order and Further Notice of Proposed Rulemaking*, 26 FCC Rcd 17663 (2011). *See* Section IX, Urban-Rural Comparisons, *infra*.

[655] *Id*.

providers seeking to deploy 3G or better mobile networks in census blocks with no 3G network coverage as of January 2012.[656] The Mobility Fund Phase I auction occurred on September 27, 2012.[657] The auction assigned support to 33 winning bidders to provide services covering up to 83,494.23 road miles in 795 biddable geographic areas located in 31 states and 1 territory.[658]

c. Roaming

207. Some providers offer their customers coverage outside of their network coverage areas through roaming arrangements with other providers.[659] Roaming arrangements between mobile wireless service providers allow customers of one mobile wireless provider to automatically receive service from other providers' networks when they are in areas that are covered by their roaming partners' networks but not their own network.[660] Smaller providers that rely on roaming arrangements to offer nationwide coverage to their customers may include the price of nationwide roaming services in the plans' monthly fees instead of billing for roaming on a usage basis. In contrast to the purchase of capacity wholesale from other service providers, a provider uses roaming services to market extended coverage to consumers residing within the provider's network coverage area, not to acquire customers where a provider does not have network coverage.

208. Service providers may use roaming services to enhance their coverage for a variety of reasons, including temporary arrangements while their networks are being deployed, and as permanent arrangements due to the economics of the market or their business models. No mobile wireless provider – including the four nationwide providers – has built out its entire licensed service area, and consequently all providers employ roaming to some extent to fill gaps in their coverage.[661] In addition, as discussed in section III.B.1, Facilities-Based Providers, there are non-nationwide providers whose business plans do not employ nationwide networks. Many of these non-nationwide providers are able to offer voice coverage and service plans that are national in scope through roaming agreements with other mobile wireless providers.[662] For example, Leap offers voice plans that already come with a certain number of

[656] *Id*; "Mobility Fund Phase I Auction Scheduled for September 27, 2012, Notice and Filing Requirements and Other Procedures for Auction 901," AU Docket No. 12-25, *Public Notice*, DA 12-641 (WTB rel. May 2, 2012).

[657] "Mobility Fund Phase I Auction Closes, Winning Bidders Announced For Auction 901." *Public Notice*, DA 12-1566 (WTB rel. Oct. 3, 2012).

[658] *Id*.

[659] *Fourteenth Report*, 25 FCC Rcd at 11489 ¶ 124; *see also* Reexamination of Roaming Obligations of Commercial Mobile Radio Service Providers, *Order on Reconsideration and Second Further Notice of Proposed Rulemaking*, 25 FCC Rcd 4181, 4192 ¶ 23 (2010) ("*Roaming Order on Reconsideration" and "Second Further Notice of Proposed Rulemaking"* respectively) (finding that in some areas of the country, low population densities, along with insufficient demand, make it uneconomic for several carriers to build out).

[660] All mobile calling plans specify a calling area – such as a particular metropolitan area, a state, a region, the provider's entire network, or the entire United States – within which the subscriber can make a call without incurring additional charges. Outside of this calling area, roaming services are obtained by a carrier for its customers through a roaming agreement with another carrier.

[661] *Fourteenth Report*, 25 FCC Rcd at 11489-90 ¶ 125; *Roaming Order on Reconsideration*, 25 FCC Rcd at 4192 ¶ 23. One potential measure of the significance of roaming in the wireless industry is roaming revenues, which are discussed in detail below. *See also* AT&T Reply Comments at 18-19.

[662] *See, e.g.,* Cricket, *Best Cell Phone Coverage Areas, Cellular Maps*, http://www.mycricket.com/coverage/cell-phone-coverage (visited June 5, 2012) (stating that Cricket Wireless offers a wide variety of cell phone plans to choose from "with coverage available all over the U.S."); Cricket, *Wireless Coverage Maps*, http://www.mycricket.com/coverage/maps/wireless (visited June 5, 2012) (providing an interactive U.S. map showing Cricket's roaming coverage and stating that they have expanded their coverage all across the U.S.); MetroPCS, *Unlimited Cell Phone Plans*, http://www.metropcs.com/plans/ (visited June 5, 2012) (showing MetroPCS plans that include nationwide coverage); MetroPCS, *Coverage Map*, http://www.metropcs.com/metro/whymetro/ourcoverage.jsp (visited June 5, 2012) (providing an interactive U.S. (continued….)

nationwide roaming minutes included in the plan.[663] Accordingly, roaming remains particularly important for small and regional providers with limited network population coverage to remain competitive by meeting their customers' needs for nationwide service.[664] Similarly, roaming provides important assistance to new entrants who wish to begin offering service before they have fully deployed their networks.[665] In section V.E.3, Intercarrier Roaming Rates and Revenue, recent data on intercarrier roaming revenues and voice minutes are presented.

209. As noted in the *Fifteenth Report*, in recent years, the Commission has taken actions to facilitate roaming arrangements.[666] In 2007, for instance, it clarified that automatic voice roaming is a common carrier obligation for CMRS providers.[667] In April 2010, the Commission adopted the *Roaming Order on Reconsideration*, which eliminates the home roaming exclusion and establishes the same general obligation to provide automatic voice roaming, regardless of whether the provider requesting roaming holds spectrum in an area.[668] In April 2011, the Commission issued the *Data Roaming Order*.[669] The *Data Roaming Order* requires facilities-based providers of commercial mobile data services, whether or not such providers also offer CMRS, to offer data roaming arrangements to other mobile data service providers on commercially reasonable terms and conditions, subject to certain limitations.[670] The Commission found that its actions to promote commercial data roaming would facilitate investment in and deployment of mobile broadband networks.[671]

210. Several providers have stated that, although the Commission adopted the *Data Roaming*

(Continued from previous page)
map showing the various types of coverage provided by MetroPCS in different geographic areas); US Cellular, *Cell Phone Plans*, http://www.uscellular.com/uscellular/plans/showPlans.jsp?type=plans&plan-selector-type=individual (visited June 5, 2012) (after entering a valid zip code, shows US Cellular national plans); US Cellular, *Voice and Data Maps*, http://www.uscellular.com/coverage-map/index.html (visited June 5, 2012) (providing interactive U.S. maps depicting US Cellular national voice and data coverage).

[663] *See e.g.*, Leap, *Cricket Best Cell Phone Coverage Areas, Cellular Maps* http://www.mycricket.com/coverage/glossary (visited June 5, 2012) (Subscribers to these plans can also add roaming minutes to their plan each month as an add-on or pay-as-you-go using Flex Bucket.) ; *see also* AT&T Comments at 10 (stating that "almost all major providers that market services only in some geographic regions – such as U.S. Cellular, MetroPCS, Cincinnati Bell, and Cellular South (now C Spire) – now offer nationwide coverage, generally without retail roaming fess in areas covering most of the U.S. population.")

[664] *See FifteenthReport*, 26 FCC Rcd at 9746 ¶ 126; *see also* RCA Comments at 15; NTCA Comments at 3-4 (arguing that regional and local carriers offer a small footprint and need to partner with other carriers through roaming agreement to offer their subscribers competitive expanded coverage).

[665] *See Fifteenth Report*, 26 FCC Rcd at 9746 ¶ 126; *see also Roaming Order on Reconsideration*, 25 FCC Rcd at 4191-92 ¶ 21 (recognizing that without the ability to offer roaming in markets where they hold spectrum, new entrants would in effect be required "to build out their networks extensively throughout the newly obtained license area before they can provide a competitive service to consumers, all without the benefit of financing the construction of new networks over time with revenues from existing services and reliance on roaming to fill in gaps during build out"); *see also* MetroPCS Comments at 22; NTCA Comments at 3.

[666] Fifteenth Report, 26 FCC Rcd at 9747 ¶128.

[667] *See* Roaming Obligations of Commercial Mobile Radio Service Providers, *Report and Order and Further Notice of Proposed Rulemaking*, 22 FCC Rcd 15817, 15828 ¶ 27 (2007) (*2007 Roaming Order and FNPRM*) ("[W]e recognize that automatic roaming benefits mobile telephony subscribers by promoting seamless CMRS service around the country, and reducing inconsistent coverage and service qualities.").

[668] *Roaming Order on Reconsideration*, 25 FCC Rcd at 4182 ¶ 2.

[669] *Data Roaming Order*, 26 FCC Rcd 5411. Aff'd sub nom. Cellco Partnership v. FCC, 700 F.3d 534, (DC Cir. 2012).

[670] *Id.* at 5418-5428 ¶¶ 13-31.

[671] *Id.*

Order in 2011, the ability to negotiate data roaming agreements on non-discriminatory terms and at reasonable rates remains a concern.[672] According to a recent survey by NTCA of its membership, which consists exclusively of small, rural providers, 55 percent of the survey respondents indicated that "negotiating roaming agreements" remains a major area of concern.[673] When asked about their experience in negotiating data roaming and in-market roaming agreements with other carriers, 68 percent of the NTCA survey respondents categorized it as "moderately to extremely difficult."[674] AT&T and Verizon Wireless state that, to the extent parties believe that the terms they have been offered are commercially unreasonable, they have every opportunity to raise those claims in the case-by-case complaint proceedings authorized by the *Data Roaming Order*.[675] AT&T also states that it is a net purchaser of roaming services overall because, although AT&T has a larger network than its roaming partners, it also has more customers who roam on its partners' networks and generate more minutes and megabytes on those networks than vice versa.[676]

2. Investment

211. Capital expenditure, or "CAPEX," measures the amount of money invested in capital assets in the mobile wireless service industry. CAPEX in system/network assets provides a financial measure of network deployment that is an alternative to the engineering-oriented metrics such as network coverage, capacity, and throughput that are the results of CAPEX.

212. CAPEX includes expenditures on system/network assets and non-system assets such as buildings and vehicles. The data sources for capital investment in this *Report* include CTIA, the Census Bureau, and provider financial reports. Disaggregated data on system/network CAPEX and non-system CAPEX are not consistently available from all data sources. Spectrum licenses and expenditures, normally treated as intangible assets,[677] are not accounted for in capital assets.[678]

213. CTIA reports that incremental capital investment by wireless operators rose to $24.9 billion in 2010, a 22 percent increase from the $20.4 billion spent in 2009, and then increased another 1.7 percent to $25.3 billion in 2011.[679] The increases in 2010 and 2011 follow a one percent increase in capital investment by mobile wireless service providers in 2009, reversing the trend of declining investment in 2006 through 2008. Estimates by the U.S. Census Bureau likewise show an 11 percent increase in total wireless industry capital expenditures to $23 billion in 2010 following an 18 percent

[672] *See* Free Press Comments at 8; Leap Reply Comments at 5 (intending to defend the Commission's *Data Roaming Orde*r in the court.); MetroPCS Comments at 25; RCA Comments at 2-3, 15; NTCA Comments at 3. The *National Broadband Plan* recognizes the importance of data roaming to entry and competition for mobile broadband services. *National Broadband Plan,* at 49. Accordingly, it encourages the industry to adopt voluntary data-roaming arrangements and recommends that the Commission move forward promptly on its data roaming proceeding. *Id.*

[673] NTCA 2011 Wireless Survey Report, August 2011, at 3, 13.

[674] NTCA 2011 Wireless Survey Report at 13.

[675] AT&T Reply Comments at 18-19; Verizon Wireless Comments at 15.

[676] AT&T Reply Comments at 18-19.

[677] *See, e.g*. Sprint Nextel, Form 10-K.

[678] *CTIA Year-End 2010 Wireless Indices Report*, at 137-138. The CTIA figures also exclude capital investment in systems that have not yet initiated commercial service.

[679] *CTIA Year-End 2010 Wireless Indices Report*, at 137, 139; *CTIA Year-End 2011 Wireless Indices Report*, at 139, 141. CTIA's figure includes incremental investment in currently operational systems, including expenditures for building operating systems, land and capital leases, and all tangible non-system capital investment, but does not include the cost of spectrum licenses purchased at auctions or other acquisition processes or greenfield builds. *CTIA Year-End 2010 Wireless Indices Report,* at 137-138.

decline to $20.7 billion in 2009.[680]

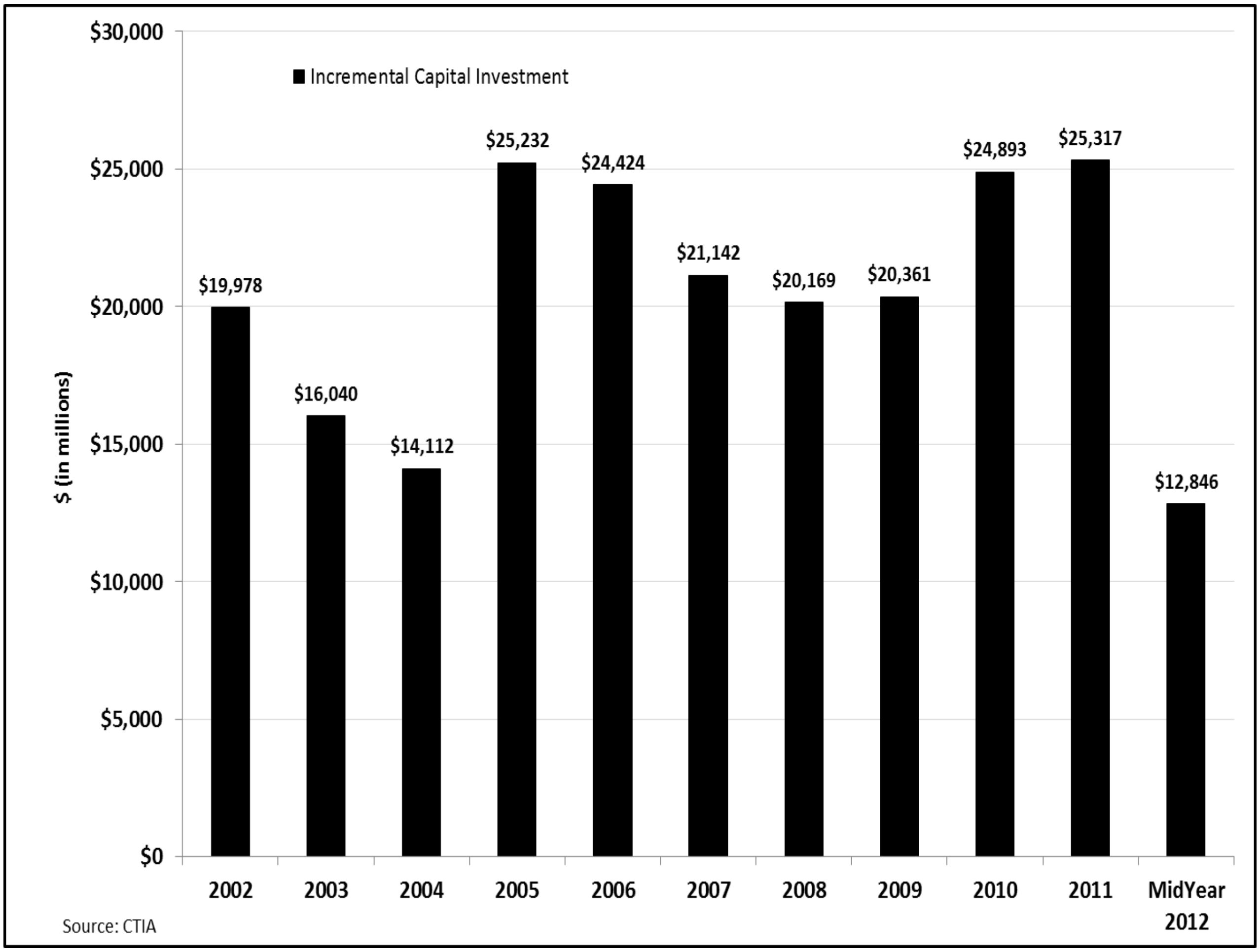
Table 33
Annual Capital Expenditures by Wireless Service Providers, 2006-2011[681]

	2006	2007	2008	2009	2010	2011
Census Bureau: Total Annual Capital Expenditures (in billions)	$27.9	$22.2	$25.3	$20.7	$23.0	NA
Census Bureau: Percent Change in Capital Expenditures from Previous Year	2.2%	(20.4%)	14.0%	(18.2%)	11.1%	NA
CTIA: Total Annual Incremental Capital Investment (in billions)	$24.4	$21.1	$20.2	$20.4	$24.9	$25.3
CTIA: Percent Change in Incremental Capital Investment from Previous Year	(3.2%)	(13.5%)	(4.3%)	1.0%	22.3%	1.7%

680 *See* U.S. Census Bureau, Annual Capital Expenditures Survey, http://www.census.gov/econ/aces/index.html, (visited Feb. 9, 2011).

681 U.S. Census Bureau, Annual Capital Expenditures Surveys (NAICS code 5172), 2006-2010, http://www.census.gov/econ/aces/xls/2010/full_report.html, (visited June 14, 2012); *CTIA Year-End 2011 Wireless Indices Report*. Year-end 2011 Census Bureau ACES data not available as of June 2012.

Chart 8
CTIA: Total Annual Incremental Capital Investment (in billions)



214. Averages and ratios of industry CAPEX also show a pattern of fluctuation during this period. Data from CTIA show that incremental investment per subscriber increased from $73.24 in 2009 to $85.55 in 2010 and then declined to $82.70 in 2011 but still remained well above the 2009 level. Data from CTIA likewise show that investment as a percentage of revenue increased from 13 percent in 2009 to 16 percent in 2010 and then declined to 15 percent in 2011, but Census Bureau data show that this metric remained flat at 14 percent from 2009 through 2010.

Chart 9
Annual Incremental Capital Investment per Customer, 2006- Mid Year 2012[682]

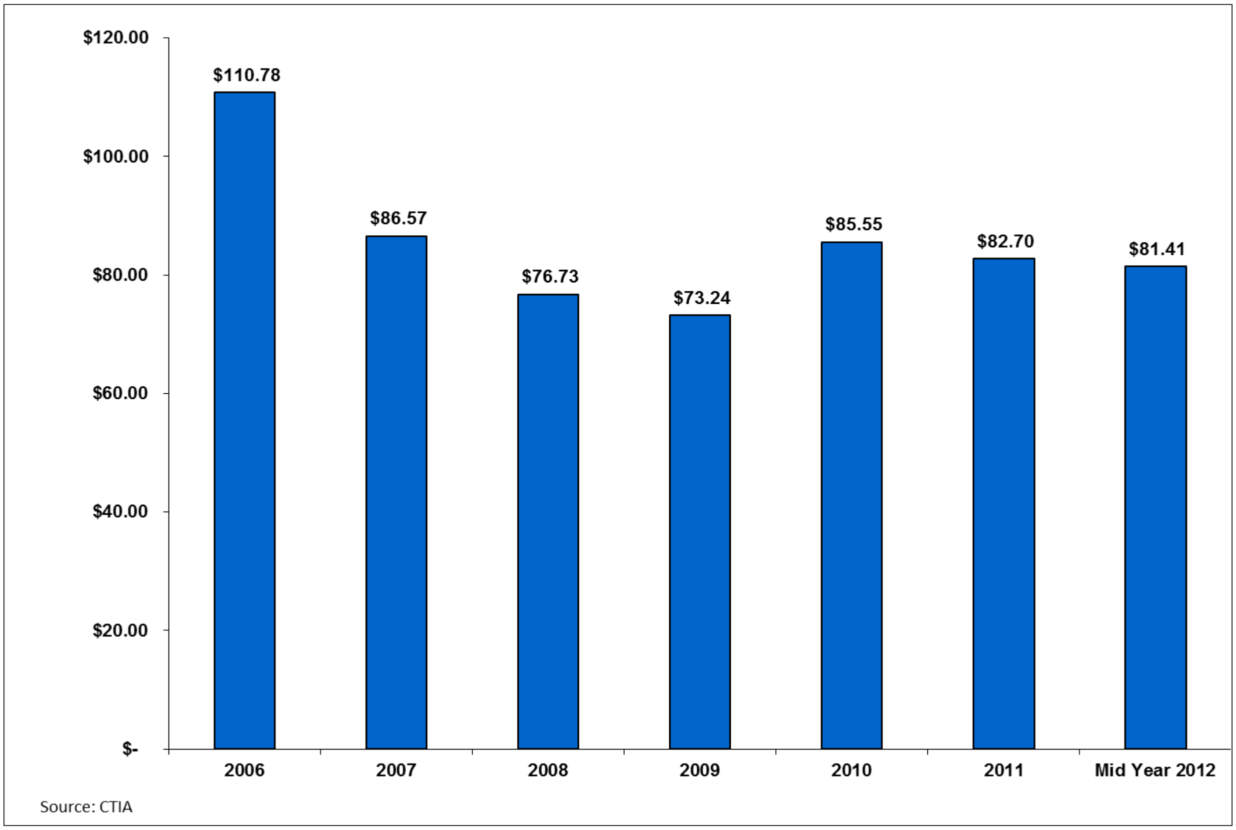
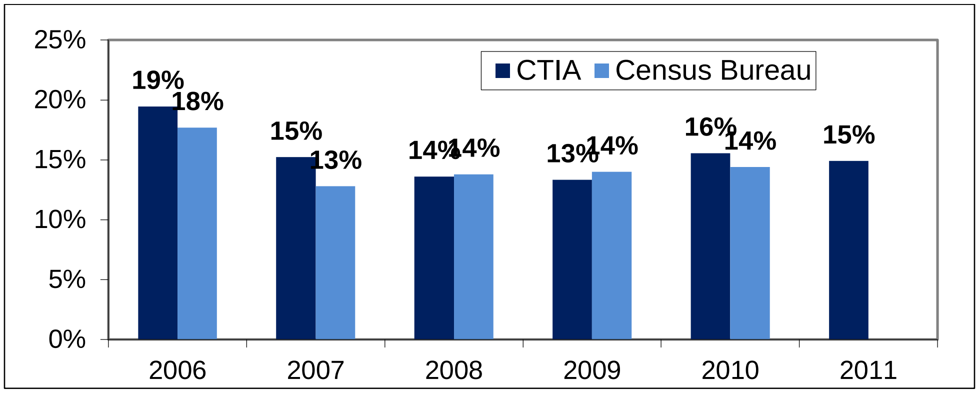


Chart 10
Annual Capital Investment as a Percentage of Industry Revenue, 2006-2011[683]



[682] *CTIA Year-End 2011 Wireless Indices Report* (reported incremental capital investment, estimated total connections). Incremental Capital Investment for the years 2006-2011 is the investment that occurred in the reporting periods of the calendar year. For mid-year 2012, it is the investment that occurred since mid-year 2011.

[683] U.S. Census Bureau, Annual Capital Expenditures Surveys (NAICS code 5172), 2006-2010, http://www.census.gov/econ/aces/xls/2010/full_report.html, (visited June 14, 2012); *CTIA Year-End 2011 Wireless Indices Report*. Year-end 2011 Census Bureau ACES data not available as of June 2012.

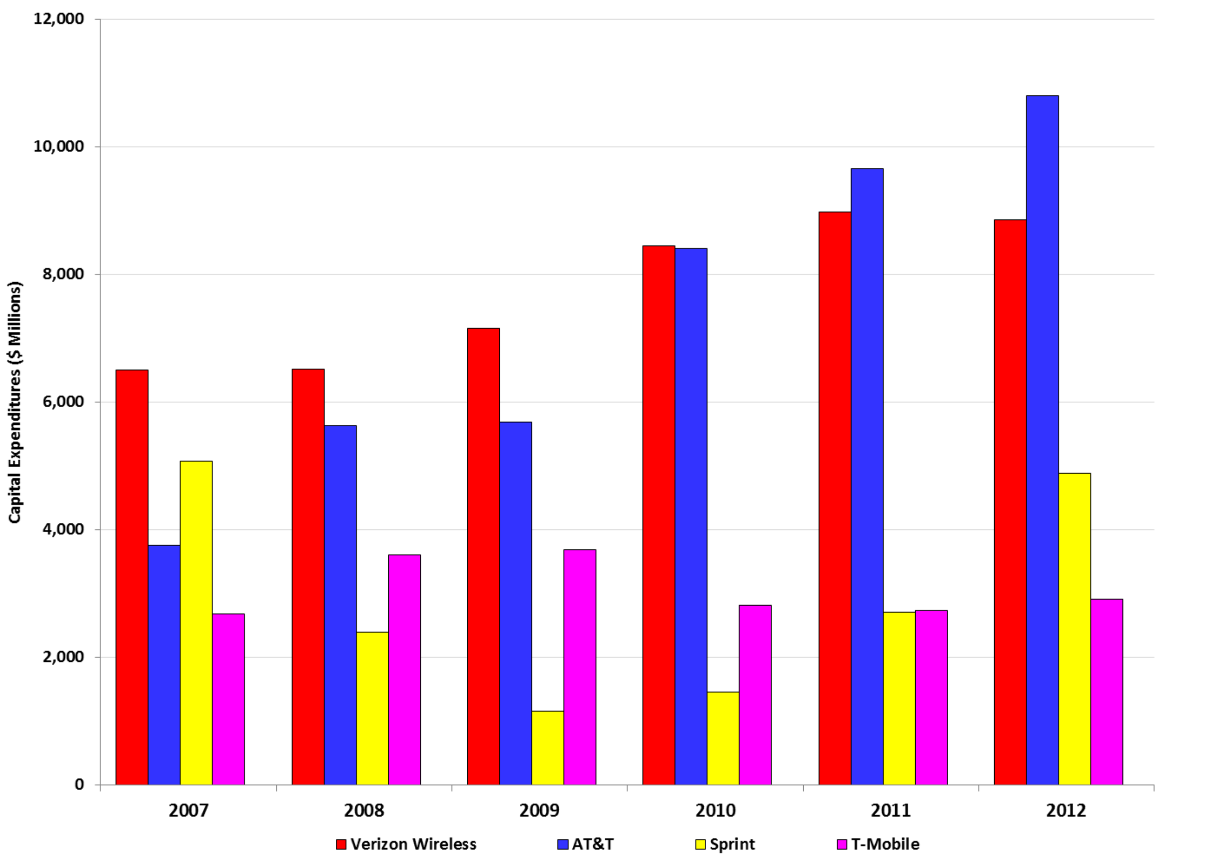
215. The foregoing estimates of CAPEX reveal a cyclical pattern in which a period of declining investment is followed by a period of rising investment. Increases in CAPEX are closely correlated with periods in which there are mobile wireless network deployments and upgrades, described in detail in Section IV.B.1 of this *Report*.[684] CAPEX in system/network assets may be cyclical or "lumpy" because technological change in the mobile wireless service industry is commercially implemented in successive generations of technologies. As detailed in Section IV.B.1 of this *Report*, the mobile wireless service industry has progressively transitioned from first-generation analog to second-generation digital wireless network technologies to third-generation technologies, and now is in the process of transitioning to fourth-generation technologies. In addition to these inter-generational transitions, there have been overlay upgrades within both the second- and third-generation technologies. Consequently, CAPEX may vary between periods when a provider stays with the current technology and periods when the provider replaces the current technology with the next technology. Thus, fluctuations in measures of CAPEX are consistent with the cyclical nature of technological adoption in the mobile wireless service industry, with the upswing in capital investment since 2009 possibly reflecting the transition from third- to fourth-generation wireless network technologies.

216. As shown in Chart 11, capital expenditures have continued to vary significantly from operator to operator. AT&T and Verizon Wireless continued to invest more than Sprint or T-Mobile by wide margins. In December 2012, Deutsche Telekom announced that the CAPEX for T-Mobile USA would be approximately $4.7 billion in 2013 and $3 billion annually in 2014 and 2015.[685]

[684] For example, CTIA notes that the pattern of peaks in its estimates of incremental capital investment, and in derived figures such as incremental capital investment per subscriber, "correlate with …the build-out of PCS and ESMR systems in 1996-97, as well as on-going investment in network upgrades by cellular companies during the same periods, and the subsequent competitive build-outs and overlay upgrading of all carriers' networks." *CTIA Year-End 2010 Wireless Indices Report*, at 159.

[685] *Deutsche Telekom Capital Markets Day 2012, Press Conference*, p. 20, available at http://www.telekom.com/media/company/164844 (visited Dec. 10, 2012).

Chart 11
Capital Expenditures by Service Provider, 2007-2012 (In millions)[686]



Source: Company Data

217. Variations in CAPEX may not be synchronized across providers for several reasons. First, providers follow different technological migration paths on different timeframes. Recently, the industry has followed two distinct technological migration paths, GSM and CDMA, each with its own sequence of upgrades. As a result, CAPEX can vary from one service provider to the next because each is following a different technological migration path.

218. Second, providers often base their investment decisions on an assessment of how network deployments and upgrades affect future earnings. For instance, applying a net present value ("NPV") analysis to investment decisions would result in service providers approving network deployments and upgrades when the present value of future sales of wireless services and other cash flows exceeds the initial cost of the investment.[687] To undertake a NPV analysis, a service provider must forecast the future stream of cash flows based on estimates of the service revenues and costs associated with a new network

[686] Verizon Communications, Inc., SEC Forms 10-K, filed Feb. 14, 2012, filed Feb. 28, 2011, filed Feb. 26, 2010, and Feb. 24, 2009; AT&T Inc., SEC Forms 10-K, filed Feb. 24, 2012, filed Mar. 1, 2011, filed Feb. 25, 2010, filed Feb. 25, 2009, filed Feb. 27, 2008; Sprint Nextel, SEC Forms 10-K, filed Feb. 27, 2012; filed Feb. 24, 2011; filed Feb. 26, 2010; *US Wireless 411 4Q11*, at 37.

[687] Zvi Bodie and Robert C. Merton, *Finance*, Prentice-Hall, Inc., 2000, pp. 112-118, 168-173. More precisely, the NPV is calculated by taking the present value of all future cash inflows (service revenues) and subtracting the present value of all current and future cash outflows. The NPV rule holds that a firm should accept a project if its NPV is positive, and reject a project if its NPV is negative. *Id.*, p. 112.

deployment or upgrade. Variations in CAPEX may not be synchronized across providers because these forecasts are influenced by provider-specific factors as well as current market conditions.

219. Finally, the timing of network investments often has a strategic component vis-à-vis rivals. Some providers strategically make CAPEX decisions to differentiate their service offerings from those of rivals by becoming the first to deploy a particular upgrade or new network technology. Other providers wait for rivals to make the first move and then respond with a lag by upgrading their own networks. Section IV.B.1 of this *Report* describes in detail how the CAPEX of individual providers in network deployments and upgrades are a measure of non-price rivalry.

3. Differentiation in Mobile Wireless Handsets/Devices and Applications

220. In addition to competing on price and network quality, mobile wireless providers continue to compete by offering consumers a variety of different mobile wireless devices with innovative features.[688] In particular, providers are offering a range of data-centric smartphones[689] and tablets made by different manufacturers and running different operating systems, in order to respond to growing consumer demand for mobile data products. As evidence of this demand for smartphones, comScore estimates that the number of smartphone users grew from 67 million to 104 million during 2011.[690] However, while smartphone adoption is growing, the ability of the major mobile wireless service providers to distinguish their device offerings from those of their rivals by offering exclusive devices diminished during 2011 as a result of several major developments: the end of iPhone exclusivity, the availability of innovative smartphones that are not subject to exclusive arrangements,[691] and the emergence of two leading mobile operating systems, Apple's iOS and Google's Android, which generally define the user interfaces of the devices.[692]

221. During 2011, AT&T's iPhone exclusivity ended, and other providers began selling the iPhone for use on their networks. With the loss of iPhone exclusivity, AT&T was no longer able to differentiate itself as the only provider carrying the iPhone, and consumers began purchasing iPhone

[688] AT&T Comments at 4, 24, 27; Verizon Comments at 77.

[689] While there is no industry standard definition of a smartphone, for purposes of this *Report*, we consider the distinguishing features of a smartphone to be an HTML browser that allows easy access to the full, open Internet; an operating system that provides a standardized interface and platform for application developers; and a larger screen size than a traditional, voice-centric handset. Many smartphones also have touch screens and/or a QWERTY keypad, and, as discussed below, run an operating system that offers a standard platform for application developers to create and sell device software through an application store. *See Fifteenth Report*, 26 FCC Rcd at 9751 n. 426. In addition to smartphones and basic handsets, a third category of devices is data-centric devices, which includes devices with no inherent voice capability, such as USB wireless modem laptop cards, mobile Wi-Fi devices, e-readers, and laptops and netbooks with embedded mobile wireless modems. The basic handset category includes voice-centric handsets that do not allow or are not designed for easy web browsing.

[690] comScore, MobiLens Trend (May 2, 2012). comScore MobilLens U.S. data are derived from a monthly survey of over 13,000 respondents ages 13 and older who are recruited to represent U.S. Census demographics. The total universe size is estimated from data provided by CTIA and comScore's monthly subscriber studies.*See* Section IV.B.3, Differentiation in Mobile Wireless Handsets/Devices and Applications, *supra*, for a detailed discussion of the mobile device sector.

[691] Service providers may offer a particular device model exclusively and highlight the distinguishing features of that model separate from its operating system.

[692] Verizon Comments at 78-79 ("the two most prevalent operating systems for smartphones and other high-end devices are Google's Android OS, which is used in numerous manufacturers' handsets, tablets, e-readers, and other devices, and Apple's iOS, which is used in Apple iPhones and iPads"); Tamara Rutter, *Who's Winning the Smartphone Platform Wars?*, The Motley Fool, Mar. 10, 2012, at http://www.dailyfinance.com/2012/03/10/whos-winning-the-smartphone-platform-wars/. (visited Oct. 16, 2012).

devices for use on other providers' networks.[693] As mentioned in previous *Reports*, AT&T had been the only mobile wireless provider to offer the Apple iPhone – the first three models – since 2007.[694] However, AT&T's exclusivity arrangement with Apple ended in 2011, when Verizon Wireless began selling the iPhone 4 for use on its CDMA EV-DO network in February 2011.[695] Sprint began doing the same in October 2011. In June 2012, Leap Wireless became the first U.S. prepaid provider to offer the iPhone.[696] In addition, as of March 2012, more than 30 smaller, regional providers and resellers were also offering the iPhone, including C-Spire, Appalachian Wireless, and Cellcom.[697]

222. With the increased availability of the iPhone from multiple mobile wireless providers, its decreasing price, and its continued popularity among consumers, adoption of the iPhone and its bundled iOS mobile operating system by customers on different networks grew significantly during 2011. During the fourth quarter of 2011, 13.7 million iPhones were activated by AT&T, Verizon and Sprint, compared to 4.1 million on AT&T's network during the fourth quarter of 2010.[698] iPhones also accounted for a significant portion of smartphone sales – 81 percent at AT&T, 62 percent at Verizon Wireless, and 44 percent at Sprint – during the fourth quarter of 2011.[699] For a complementary discussion of the handset/device market see section VII.B.1, Mobile Wireless Handsets/Devices and Operating Systems.

223. Google's Android also increased its market share, though via a different approach than Apple. While Apple bundles its iOS with Apple devices, Google offers Android on a free, open source basis to device manufacturers. Android also integrates Google's other products – including its search engine, web browser, Gmail, and mapping software – into the mobile device, provides a popular navigation service, and offers an increasing number of applications through the Google Play application store. As of December 2011, 48 equipment manufacturers had released more than 550 device models worldwide running the Android operating system, and all of the top seven mobile wireless providers currently offer Android smartphones**.**

224. The increasing number of smartphone users and the growing prevalence of the Apple and Android smartphone operating systems contributed to the growth in the number of mobile apps developed for the Apple App Store and Google Play application store (formerly Android Market).[700] The number

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[693] Simon Flannery, et al., *4Q11 Tracker: Margins Squeezed as iPhones Ramp, Better Enterprise Trends*, Morgan Stanley, Mar. 19, 2012, at 1.

[694] *See Fourteenth Report*, 25 FCC Rcd at 11496 ¶ 138.

[695] *Verizon Wireless & Apple Team Up to Deliver iPhone 4 on Verizon*, Press Release, Verizon Wireless, Jan. 11, 2011, *available at* http://news.vzw.com/news/2011/01/pr2011-01-11a.html (visited Oct.16, 2012)

[696] Phil Goldstein, *Leap Launches Prepaid iPhone to Little Fanfare, But Says Sales Were 'Brisk'*, FIERCEWIRELESS, June 25, 2012. http://www.fiercewireless.com/story/leap-launches-prepaid-iphone-little-fanfare-says-sales-were-brisk/2012-06-25 (visited Oct. 16, 2012)

[697] The Hearing Aid Compatibility status reports filed by service providers in January 2012 include a list of service providers that offered iPhones in December 2011. This list is *available at* http://wireless.fcc.gov/hac/index.htm?job=reports_dm (visited Oct. 16, 2012) ("View Information by Handset" table); see also C-Spire (http://www.cspire.com/shop_and_learn/iphone/(visited Oct. 16, 2012)) , Appalachian (http://www.appalachianwireless.com/?page=phones&sort=6 (visited Oct. 16, 2012)), and Cellcom (http://www.cellcom.com/deviceCategory.html?categoryid=1&navtype=personal (visited Oct. 16, 2012)) for their iPhone offerings.

[698] Simon Flannery, et al., *4Q11 Tracker: Margins Squeezed as iPhones Ramp, Better Enterprise Trends*, Morgan Stanley, Mar. 19, 2012, at 1.

[699] Simon Flannery, et al., *4Q11 Tracker: Margins Squeezed as iPhones Ramp, Better Enterprise Trends*, Morgan Stanley, Mar. 19, 2012, at 29.

[700] *See* Olga Kharif, *Apple Tops Android in App Wars*, Bloomberg News, Feb. 14, 2012, at http://www.sfgate.com/cgi-bin/article.cgi?f=/c/a/2012/02/13/BUDC1N708B.DTL (visited Oct. 16, 2012) ; Tamara (continued….)

of applications available in the Apple App store exceeded 700,000 in September 2012, up from 425,000 in June 2011, while the number of apps in the Google Play store increased from 200,000 to 675,000 between May 2011 and September 2012. The growing number of applications offered for these two operating systems increases the demand for the devices that run these operating systems. In turn, this increases the incentives for third parties to create applications for these operating systems. With devices running these operating systems being available from multiple service providers, consumers are able to choose a service provider based on other elements, including network quality, coverage, and price. Hence, while service providers do differentiate their device portfolios to attract customers, providers are competing for the growing number of customers seeking the Apple and Android platforms on many factors besides devices.

225. *Data-Only Devices.* In addition to offering a variety of smartphones and traditional handsets, mobile wireless providers also sell or provide connectivity for – other, data-only devices such as tablets, e-readers, wireless data cards, mobile Wi-Fi hotspots,[701] and netbook computers with embedded modems.[702] The use of data-only devices with mobile network connectivity has grown in recent years,[703] and providers compete with one another by offering such devices and on the speed, coverage, and price of the mobile data connections on which these devices rely.

226. Mobile wireless providers offer wireless data cards and mobile Wi-Fi hotspots to consumers seeking mobile Internet connections for laptop computers and other Wi-Fi enabled devices. Because such devices tend to have similar characteristics and functionality across equipment manufacturers, providers generally differentiate their offerings of these products based on the speed and coverage of their mobile data networks to which such devices connect, rather than the uniqueness of the devices themselves.[704]

227. In addition, several mobile wireless providers sell or offer mobile Internet connections for iPads and other tablet devices, although many tablet users connect to the Internet only through Wi-Fi. Certain tablets, such as the Amazon.com Kindle Fire and Google Nexus 7, are offered with Wi-Fi only and do not include 3G or 4G modems for mobile network connectivity. With other devices, including the most popular tablet, the iPad,[705] mobile network connectivity is offered as an option, though only around 10 percent of iPads were sold with such functionality as of March 2012.[706] While at least two mobile wireless providers offer mobile data service plans for iPad consumers who want such connectivity, providers do not subsidize iPads and offer mobile data access for iPads without a long term service

(Continued from previous page)
Rutter, *Who's Winning the Smartphone Platform Wars?*, The Motley Fool, Mar. 10, 2012, at http://www.dailyfinance.com/2012/03/10/whos-winning-the-smartphone-platform-wars/ (visited Oct. 16, 2012).

[701] Mobile Wi-Fi, or "Mi-Fi," devices are credit card-sized, mobile Wi-Fi routers with mobile broadband wide-area connections that allow a certain number of Wi-Fi-enabled devices in short range to connect to the Internet via a Wi-Fi connection. Many smartphones are now sold with built-in Wi-Fi hotspot capabilities, allowing them to serve as mobile Wi-Fi hotspots for an additional charge.

[702] *See* Section V.A, Numbers of Mobile Wireless Connections , *infra*, for data on the number of mobile wireless subscribers by device type.

[703] *Mobile Hotspot Router Growth Explodes as Huawei and ZTE Dominate 2011 Cellular Modem Market*, Press Release, Strategy Analytics, June 14, 2012. http://www.strategyanalytics.com/default.aspx?mod=pressreleaseviewer&a0=5239 (visited Oct. 16, 2012); Kathryn Huberty, *et al.*, *Tablet Landscape Evolution – Window(s) of Opportunity*, Morgan Stanley, May 31, 2012.

[704] *See* Mark Sullivan and Ken Biba, *Mobile Hotspots: Which Are Fastest, Most Reliable?*, PC World, Oct. 19, 2010, at http://www.pcworld.com/article/208154/mobile_hotspots_which_are_fastest_most_reliable.html (visited Oct. 16, 2012).

[705] Kathryn Huberty, *et al.*, *Tablet Landscape Evolution – Window(s) of Opportunity*, Morgan Stanley, May 31, 2012, at 10 (Apple iPads account for 54 percent of installed base of tablet owners as of May 2012).

[706]*See* Section VIII.C, Small Area Wireless Coverage Technologies, *infra*.

contract.[707] With other tablets, such as the Samsung Galaxy Tab, mobile network connectivity is included in all models. Certain mobile wireless providers offer such devices at a discounted price if the user purchases a long term service contract[708] or at an unsubsidized price with a month-to-month plan.[709] In June 2012, Verizon Wireless announced that tablets would be subject to the company's new Shared Everything data plans and would no longer be offered at a discounted or subsidized price.[710]

228. In addition to offering tablets and mobile Internet connection devices for computers directly, mobile wireless operators also provide data connections on a wholesale basis for data-only devices sold by other companies that act as resellers of data connectivity to consumers. These devices include electronic reading devices, such as the Amazon Kindle or the Barnes & Noble Nook,[711] machine-to-machine communication devices, and vehicle and alarm/security monitoring systems.

229. *Mobile Applications.* Each of the major smartphone operating system/platform developers has created an application store in which consumers can download applications, some free and some paid, that have been designed to work on that specific operating system.[712] While mobile wireless service providers allow their customers with data plans to generally use whatever mobile data services and applications they want, many service providers have maintained certain restrictions on this usage, largely in an effort to manage network traffic. For example, AT&T prohibits, as part of its wireless terms and conditions, certain uses of data plans "that cause extreme network capacity issues and interference with the network."[713] These include, for example, downloading movies using peer-to-peer file sharing

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[707] Arnold Kim, *iPad 4G LTE Data Plan Prices for AT&T and Verizon*, MacRumors, Mar. 7, 2012, at http://www.macrumors.com/2012/03/07/ipad-4g-lte-data-plan-prices-for-att-and-verizon/ (visited Oct. 16, 2012); Danile Eran Dilger, *Inside AT&T vs Verizon iPad 2 Data Service Plans*, Apple Insider, Mar. 8, 2011, at http://www.appleinsider.com/articles/11/03/08/inside_att_vs_verizon_ipad_2_data_service_plans.html (visited Oct. 16, 2012).

[708] *See* T-Mobile, *Internet Devices*, http://www.t-mobile.com/shop/phones/?shape=tab (last visited June 28, 2012) (T-Mobile selling three tablet devices with discounts/rebates ranging from $100 to $150); Sprint, *ZTE Optik*, http://shop.sprint.com/mysprint/shop/phone_details.jsp?prodId=dvc6290005prd&deviceSKUId=62900028&flow=AAL&planSKUId=&firstSelection=PHONES&ptn=&tabId=dvcTab1820005 (last visited June 29, 2012); AT&T, *Tablets*, http://www.att.com/shop/wireless/devices/tablets.html (last visited June 29, 2012); Brad Reed, *Sorry, T-Mobile: Your Shared Data Plans Are Just As Lame As Verizon's*, BGR, June 13, 2012, http://www.bgr.com/2012/06/13/t-mobile-verizon-family-plan-comparison-criticism/ (visited Oct. 16, 2012).

[709] *See, e.g.*, Sprint, *Samsung Galaxy Tab 10.1*, http://shop.sprint.com/mysprint/shop/phone_details.jsp?deviceSKUId=55000038 (last visited June 29, 2012); Verizon Wireless, *DROID XYBOARD 10.1 by Motorola 64GB,* http://www.verizonwireless.com/b2c/store/controller?item=phoneFirst&action=viewPhoneDetail&selectedPhoneId=5824&cmp=EXL-EGUIDE-ENGLISH-DEVICES-DROID-XYBOARD-10.1-BY-MOTOROLA-64-GB1 (last visited June 29, 2012).

[710] *Verizon Share Everything Data Plans: Applying Corporate Discounts, Tablets No Longer Subsidized or Discounted*, DroidLife, June 12, 2012, at http://www.droid-life.com/2012/06/12/verizon-share-everything-data-plans-applying-corporate-discounts-tablets-no-longer-subsidized-or-discounted/ (visited Oct. 16, 2012); Verizon Wireless, *Tablets*, http://www.verizonwireless.com/b2c/store/controller?&item=phoneFirst&action=viewPhoneOverviewByDevice&deviceCategoryId=12 (last visited June 29, 2012).

[711] With e-readers, users typically do not pay a separate fee for data access but instead pay the e-book retailer a fee for purchasing and downloading books or other reading materials. *See Fifteenth Report*, 26 FCC Rcd at 9755 ¶ 146.

[712] *See Fifteenth Report*, 26 FCC Rcd at 9757 ¶ 154.

[713] AT&T, *Wireless Customer Agreement*, http://www.att.com/shop/legalterms.html?toskey=wirelessCustomerAgreement& (visited June 29, 2012).

services, web broadcasting, and operating servers.[714] In addition, Verizon Wireless prohibits the use of data services for purposes that interfere "with the network's ability to fairly allocate capacity among users or that otherwise degrades service quality for other users."[715] As discussed above under Developments in Mobile Service Pricing Plans, recent data plan pricing changes reflect that providers are managing capacity and traffic issues on their data networks primarily through pricing mechanisms, as well as with reductions of data throughput speed,[716] rather than through restricting access to certain applications or content.[717]

230. In December 2010, the Commission adopted rules on Internet openness. The rules require all broadband providers to publicly disclose network management practices, restrict broadband providers from blocking Internet content and applications, and bar fixed broadband providers from engaging in unreasonable discrimination in transmitting lawful network traffic.[718]

4. Advertising, Marketing, Sales Expenditures, and Retailing

231. Mobile wireless providers also compete for customers through advertising and marketing, including by establishing retail and distribution networks that reach the people they target. Mobile wireless providers market their services through many channels. Through their retail and distribution networks they market their services in their pricing plans, through sales representatives, in the design and location of their retail outlets, and on the internet in their on-line stores. They also market their services in the media, in internet and mobile applications, in sponsorships and co-branding, and at events. [719] Several providers state that the goal of these advertising and marketing efforts is to increase and maintain brand awareness and to support distribution.[720] Providers may also engage in advertising and marketing either to inform consumers about available products or services or to try to increase sales by influencing consumer preferences.[721]

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[714] AT&T, *Wireless Customer Agreement*, http://www.att.com/shop/legalterms.html?toskey=wirelessCustomerAgreement& (visited June 29, 2012).

[715] Verizon Wireless, *Customer Agreement & Important Information*, http://youreguide.vzw.com/legal-customer-agreement (visited June 29, 2012).

[716] Some mobile wireless providers significantly reduce the data connection speeds of customers who exceed a certain amount of data usage in a month. *See* Section IVA, Price Rivalry Development in Mobile Service Pricing Plans; *see also* Jeffrey Glueck, *Don't Throttle Me: Other Ways to Manage Wireless Traffic*, Forbes, April 19, 2012, at http://www.forbes.com/sites/ciocentral/2012/04/19/dont-throttle-me-other-ways-to-manage-wireless-traffic/ (visited Oct. 16, 2012) .

[717] *See* Section IV.A, Price Rivalry Development in Mobile Service Pricing Plans, *supra*.

[718] Preserving the Open Internet, Broadband Industry Practices, GN Docket No. 09-191, WC Docket No. 07-52, *Report and Order*, FCC 10-201 (rel. Dec. 23, 2010) (*Open Internet Order*).

[719] *See*, for example, SEC Form 10-K for Clearwire, Leap Wireless, MetroPCS, Sprint Nextel, and US Cellular; Sue Marek, *T-Mobile Launches Mobile Ad Initiative with Android App*, FIERCEWIRELESS, June 14, 2011, *available at* http://www.fiercemobilecontent.com/story/t-mobile-launches-mobile-ad-initiative-android-app/2011-06-14 (visited Oct. 16, 2012); Mike Shields, *Zynga Links Up With T-Mobile for Treasure Isle Ad Play*, ADWEEK, February 16, 2011, *available at* http://www.adweek.com/news/advertising-branding/zynga-links-t-mobile-treasure-isle-ad-play-126322#1(visited Oct. 16, 2012); Kunur Patel, Warner Bros., *Verizon Link for 'Inception' Marketing Stunt*, ADVERTISING AGE, July 12, 2010, *available at* http://adage.com/article/news/warner-bros-verizon-link-inception-marketing-stunt/144876/(visited Oct. 16, 2012).

[720] See SEC Form 10-K for Leap Wireless, MetroPCS, Sprint Nextel, and US Cellular; Judann Pollack, *AT&T's Esther Lee on Marketing Out of the Telecom Box*, ADVERTISING AGE, October 21, 2011, *available at* http://adage.com/article/special-report-ana-annual-meeting/esther-lee-marketing-telecom-box/230581/(visited Oct. 16, 2012).

[721] *See* AT&T Comments at 8; Verizon Wireless Comments at 39, 44; Kyle Bagwell, "The Economic Analysis of Advertising," in *Handbook of Industrial Organization, Volume 3*, ed. M. Armstrong and R. Porter, (Elsevier B.V.,
(continued….)

a. Advertising Expenditures

232. Advertising expenditures by wireless service providers continued to decline for the fourth straight year during 2011.[722] According to Advertising Age, measured advertising expenditures for mobile wireless service dropped almost two percent from $5.5 billion in 2009 to $5.4 billion in 2010, and more than seven percent to $5 billion in 2011.[723] In contrast, total U.S. advertising expenditures increased during the same period, rising 0.8 percent, to $144 billion in 2011.[724] Despite the drop in measured advertising spending, wireless service providers continued to spend more on advertising agencies than firms in many other industries. In Advertising Age's 2010 rankings of advertising spending, AT&T and Verizon Communications were the second and fourth largest U.S. advertisers, respectively, followed by Sprint Nextel in twentieth place and Deutsche Telekom (T-Mobile) in forty-fifth.[725] In 2011, Verizon Communications became the third largest advertiser, surpassing AT&T, which dropped to fifth. Sprint Nextel and Deutsche Telekom dropped to twenty-second and fifty-fourth, respectively.[726] Moreover, AT&T and Verizon were respectively, the first and second most advertised brands by media spending in both 2010 and 2011.[727]

233. At the level of individual firms, measured advertising expenditures for the top four service providers generally declined from 2009 to 2011. According to Advertising Age, measured advertising expenditures for Verizon Wireless and Sprint Nextel dropped steadily from 2009 to 2011.

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2007), at 1705-1706. Mobile wireless service is an "experience good" – a product or service that the customer must consume before determining its quality. *See* Lynne Pepall, Dan Richards, and George Norman. Industrial Organization (4th ed.), Blackwell Publishing, 2008, at 524. Consequently, information contained in wireless advertising tends to be indirect information. By advertising, a firm may signal that it is efficient, implying that it offers good deals. Advertising may also remind repeat consumers of the quality of an experience good. Finally, since a firm has an incentive to direct its advertising toward the consumers who may value its product the most, a seemingly uninformative advertisement can better match products with buyers. See Kyle Bagwell, "The Economic Analysis of Advertising," in *Handbook of Industrial Organization, Volume 3,* ed. M. Armstrong and R. Porter, (Elsevier B.V., 2007), at 1718-1720, 1774-1791; Phillip Nelson, "Advertising as Information," in *Journal of Political Economy*, v. 82 (1974) at 729-754.

[722] *See Fifteenth Report*, 26 FCC Rcd at 9748 ¶ 130; *Fourteenth Report*, 25 FCC Rcd at 11491-92 ¶ 128; *Thirteenth Report,* 24 FCC Rcd at 6261 ¶ 158.

[723] "U.S. Market Share for Wireless-Service Providers," in *Advertising Age: 100 Leading National Advertisers 2010*, June 20, 2011; U.S. Market Share for Wireless-Service Providers," in *Advertising Age: 100 Leading National Advertisers 2011*, June 25, 2012. According to Advertising Age, while advertising in measured media declined from 2010 to 2011, U.S. ad spending has increased because of an increase in spending on unmeasured media such as search marketing, online video, and certain forms of social media. Measured media expenditures consists of spending on magazine, newspaper, outdoor, TV, radio, and Internet advertising.

[724] *See Kantar Media Reports U.S. Advertising Expenditures Increased 0.8 Percent in 2011*, News Release, Kantar Media, Mar. 12, 2012, *available at* http://kantarmediana.com/intelligence/press/us-advertising-expenditures-increased-08-percent-2011?destination=node%2F24%2Fpress (visited August 16, 2012); *See Kantar Media Reports U.S. Advertising Expenditures Increased 6.5 Percent in 2010*, News Release, Kantar Media, Mar. 12, 2012, *available at* http://kantarmediana.com/intelligence/press/us-advertising-expenditures-increased-65-percent-2010?destination=node%2F24%2Fpress%3Fpage%3D1 (visited August 16, 2012). Due to revisions in Kantar Media data, we are unable to provide an accurate absolute total expenditures figure for 2010 or 2009.

[725] "Advertisers by Total U.S. Advertising Spending in 2010," in *Advertising Age: 100 Leading National Advertisers 2010*, June 20, 2011.

[726] "Advertisers by Total U.S. Advertising Spending in 2011," in *Advertising Age: 100 Leading National Advertisers 2011*, June 25, 2012.

[727] "Top 50 Megabrands, Most-Advertised Brands by Media Spending," in *Advertising Age: 100 Leading National Advertisers 2010*, June 20, 2011; "Top 50 Megabrands, Most-Advertised Brands by Media Spending," in *Advertising Age: 100 Leading National Advertisers 2011*, June 25, 2012.

Verizon Wireless' measured advertising expenditures fell from $1.8 billion in 2009 to $1.5 billion in 2010 and to $1.3 billion in 2011 while Sprint Nextel's expenditures dropped from $1.2 billion in 2009 to $1.0 billion in 2010 and to $881 million in 2011.[728] AT&T's measured advertising expenditures increased from $1.6 billion in 2009 to $1.7 billion in 2010, but then declined to $1.4 billion in 2011. T-Mobile was the only service provider among the top four to spend more on measured advertising in 2011 than in 2009. T-Mobile's expenditures increased from $510 million in 2009 to $582 million in 2010, dropping to $517 million in 2011. Advertising campaigns may bundle advertisements for wireless services with products offered by other subsidiaries. According to Kantar Media, in 2010, AT&T spent $2.2 billion on advertising while Verizon Communications spent $1.9 billion.[729] These figures fell to $1.9 billion and $1.6 billion respectively in 2011.[730]

b. Marketing Campaigns

234. From mid 2010 to early 2012, mobile wireless service providers' marketing campaigns continued to focus on the quality and size of their mobile broadband networks.[731] Many providers sought to highlight their network speed, coverage and the data capabilities of devices available on these networks. Some providers also promoted the advantages of their particular service plans relative to those of rivals.

235. Providers continued to make claims about who has the "best" network. Toward the end of 2010, Sprint Nextel, which had previously designated itself as the first to offer 4G service with the launch of its EVO phone, contested T-Mobile advertisements claiming its HSPA+ network is "America's Largest 4G Network."[732] By 2012, T-Mobile, AT&T, and Verizon Wireless, each claimed to have the largest 4G network.[733] In April 2012, in a video posted on its website, Verizon Wireless challenged the other top four providers to a '4G Throw Down,' arguing that "its LTE network is faster than the other 4G networks."[734]

236. Some providers' advertisements highlighted the particular qualities and capabilities of their networks and handsets/devices. AT&T ran advertisements showcasing the myriad features of their

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[728] "U.S. Market Share for Wireless-Service Providers," in *Advertising Age: 100 Leading National Advertisers 2010*, June 20, 2011; U.S. Market Share for Wireless-Service Providers," in *Advertising Age: 100 Leading National Advertisers 2011*, June 25, 2012.

[729] *See Kantar Media Reports U.S. Advertising Expenditures Increased 6.5 Percent in 2010*, News Release, Kantar Media, Mar. 12, 2012, *available at* http://kantarmediana.com/intelligence/press/us-advertising-expenditures-increased-65-percent-2010?destination=node%2F24%2Fpress%3Fpage%3D1 (visited August 16, 2012).

[730] *See Kantar Media Reports U.S. Advertising Expenditures Increased 0.8 Percent in 2011*, News Release, Kantar Media, Mar. 12, 2012, *available at* http://kantarmediana.com/intelligence/press/us-advertising-expenditures-increased-08-percent-2011?destination=node%2F24%2Fpress (visited August 16, 2012).

[731] *See Fourteenth Report*, 25 FCC at 11493 ¶ 132.

[732] *See* Kunur Patel, *Sprint Claims 'First' Title With Launch of 4G Phone*, ADVERTISING AGE, June 02, 2010, *available at* http://adage.com/article/digital/sprint-claims-title-launch-4g-phone/144194/ (visited Oct. 16, 2012); Sue Marek, *Battle Erupts Over T-Mobile's 'Largest 4G Network' Claims*, FIERCEWIRELESS, November 02, 2010, *available at* http://www.fiercewireless.com/story/battle-erupts-over-t-mobiles-largest-4g-network-claims/2010-11-02 (visited Oct. 16, 2012).

[733] *See* Mike Dano, *AT&T, T-Mobile Wrangling Over Who Has the Largest 4G Network*, FIERCEWIRELESS, April 18, 2012, *available at* http://www.fiercewireless.com/story/att-t-mobile-wrangling-over-who-has-largest-4g-network/2012-04-18 (visited Oct. 16, 2012).

[734] Phil Goldstein, *Verizon Challenges Other Carriers' Network Speeds in '4G Throw Down,'* FIERCEWIRELESS, Apr. 5, 2012, *available at* http://www.fiercewireless.com/story/verizon-challenges-other-carriers-network-speeds-4g-throw-down/2012-04-05 (visited Oct. 16, 2012).

devices, showing people multitasking at rapid speeds in different social settings.[735] These advertisements, along with several others, showed off the different lines of AT&T handsets, including the iPhone, the BlackBerry Torch, the Samsung Infuse, and most recently, the Lumia.[736] Verizon Wireless advertised the benefits of their devices for small business with a series of "Susie's Lemonade" commercials, featuring children successfully running a business with the aid of Verizon Wireless technology.[737] Verizon Wireless continued to advertise DROID handsets, but without focusing on comparisons to the iPhone.[738] At the start of 2011, Verizon Wireless began running commercials for its iPhones, bringing back its "Test Man" spokesman to point out the advantage of using the iPhone on its network.[739] Sprint Nextel ran ads showing customers using their devices for unlimited Web, e-mail and text services.[740] Sprint also ran a commercial specifically featuring unlimited data for its iPhone, which was released in October 2011.[741]

237. Providers also advertised the advantages of their pricing plans. Sprint continued advertising its unlimited data plans throughout 2011 and going into 2012, often pointing out the dilemmas of customers with limited data plans from other providers.[742] BoostMobile, a subsidiary of Sprint Nextel,

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[735] David Gianatasio, *Surprise! Diaper Dad Is a Hapless Moron in AT&T's New Ad*, ADWEEK, Sept. 9 2011, *available at* http://www.adweek.com/adfreak/surprise-diaper-dad-hapless-moron-atts-new-ad-134702 (visited Oct. 16, 2012); David Kiefaber, Single Grunt From Random Actor Makes AT&T Spot Explode, ADWEEK, Nov. 10, 2011, *available at* http://www.adweek.com/adfreak/single-grunt-random-actor-makes-att-spot-explode-136465 (visited Oct. 16, 2012); David Kiefaber, *For AT&T, Romantic Dinners Are About Love of the Game*, ADWEEK, Nov. 21, 2011, *available at* http://www.adweek.com/adfreak/att-romantic-dinners-are-about-love-game-136652 (visited Oct. 16, 2012).

[736] *See* Rebecca Cullers, *AT&T Fools Cute and Gullible Animals With the Samsung Infuse*, ADWEEK, June 15, 2011, *available at* http://www.adweek.com/adfreak/att-fools-cute-and-gullible-animals-samsung-infuse-132579 (visited Oct. 16, 2012); Kunur Patel, *Why AT&T Is Spending More on Lumia Launch Than It Did on iPhone*, ADVERTISING AGE, Apr. 9, 2012, *available at* http://adage.com/article/digital/t-spending-lumia-launch-iphone/234010/ (visited Oct. 16, 2012).

[737] *See* Mike Chapman, *Ad of the Day: Verizon Wireless, 'Lemonade,'* AdWeek, April 13, 2011, *available at* http://www.adweek.com/news/advertising-branding/ad-day-verizon-wireless-lemonade-129362 (visited Oct. 16, 2012).

[738] *See Fifteenth Report*, 26 FCC Rcd at 9750 ¶ 135; Gabriel Beltrone, *Ad of the Day: Verizon A Foxy Space Warrior Builds Motorola's Droid Bionic From the Innards of a Rampaging Killer Cyborg*, AdWeek, September 13, 2011, *available at* http://www.adweek.com/news/advertising-branding/ad-day-verizon-134822 (visited Oct. 16, 2012).

[739] *See iPhone 4 Arrives On the Nation's Most Reliable Network on Thursday*, News Release, Verizon Wireless News Center, February 7, 2011, *available at* http://news.verizonwireless.com/news/2011/02/pr2011-02-06.html (visited Oct. 16, 2012); Eleftheria Parpis; *Verizon "It Begins,"* AdWeek, January 21, 2011, *available at* http://www.adweek.com/news/advertising-branding/verizon-it-begins-130455 (visited Oct. 16, 2012); Kunur Patel, *Reports of Verizon Guy's Demise (Slightly) Exaggerated*, AdvertisingAge, April 14, 2011, *available at* http://adage.com/article/news/reports-verizon-guy-s-demise-slightly-exaggerated/227001/(visited Oct. 16, 2012).

[740] *See* David Gianatasio, *Sprint Users Always On, Always Out of Touch*, AdWeek, February 03, 2011, *available at* http://www.adweek.com/adfreak/sprint-users-always-always-out-touch-11613 (visited Oct. 16, 2012).

[741] *See Sprint Statement on Launch Day Sales of iPhone 4S and iPhone* 4, News Release, Sprint Newsroom, October 14, 2011, *available at* http://newsroom.sprint.com/article_display.cfm?article_id=2073 (visited May 16, 2012); Unlimited *iPhone*, YouTube, Nov 29, 2011, *available at* http://www.youtube.com/watch?v=sOLm23MBWXI&feature=plcp (visited Oct. 16, 2012).

[742] *See* Gabriel Beltrone, *Sprint Nextel, "Dictionary,"* AdWeek, March 18, 2011, *available at* http://www.adweek.com/news/advertising-branding/sprint-dictionary-130495 (visited Oct. 16, 2012); Gabriel Beltrone, *Team Sprint's First TV Spot Stars Durant*, AdWeek, March 01, 2012, *available at* http://www.adweek.com/news/advertising-branding/team-sprints-first-tv-spot-stars-durant-138697 (visited Oct. 16, 2012); Sprint Nextel, YouTube Page, *available at* http://www.youtube.com/user/sprintnow (visited May 16, 2012).

advertised its "shrinking payment" plan, in contrast to flat-rate plans of other providers.[743] MetroPCS's "Tech & Talk" commercials promised "Nationwide 3G Coverage, No Contract, $40 a month. Period."[744] US Cellular ran a campaign to draw attention to its Belief Project, a rewards program with points, faster upgrades, and other features.[745]

238. Nationwide and other providers' advertisements seemed aimed at refreshing their images. AT&T, refined its "Rethink Possible," campaign, supplementing it with "It's What You Do With What We Do," in a series of commercials intended to focus on human experiences.[746] Sprint tweaked its "Now Network" tagline to "All. Together. Now," characterizing the new campaign as an evolution of the "Now Network" campaign designed to highlight Sprint's unlimited plans.[747] In the aftermath of its abandoned acquisition by AT&T, T-Mobile's spokeswoman Carly Foulkes traded in her magenta dress for the black leather of a biker in an aggressive ad blitz promoting T-Mobile's HSPA+ network.[748] MetroPCS launched the "Everybody's Moving to Metro" campaign to focus on factors other than brand awareness.[749]

239. In addition to marketing with traditional media, service providers have also advertised their products on the internet, social media, and mobile applications. In 2011, AT&T ran a Valentine's Day campaign on Facebook.[750] It also advertised the HTC Status handset, which comes with a "Facebook share button."[751] During the 2010 holiday season, Sprint teamed up with the blog Awkward

[743] Gabriel Beltrone, Ad of the Day: BoostMobile The Carrier Tries to Calm Your Nerves in this Horror Parody from 180LA, AdWeek, February 07, 2012, *available at* http://www.adweek.com/news/advertising-branding/ad-day-boost-mobile-138101 (visited Oct. 16, 2012).

[744] *See* Bill Imada, *MetroPCS: Bad Advertising, Plain and Simple*, AdvertisingAge, April 28, 2011, *available at* http://adage.com/article/the-big-tent/metropcs-bad-advertising-plain-simple/143548/ (visited Oct. 16, 2012).

[745] Mark Dolliver, *U.S. Cellular "Fireworks,"* AdWeek, October 06, 2010, *available at* http://www.adweek.com/news/advertising-branding/us-cellular-fireworks-130478 (visited Oct. 16, 2012).

[746] *See* Phil Goldstein, *AT&T Refreshes 'Rethink Possible' Ad Campaign for Mobile*, FierceWireless, April 9, 2012, *available at* http://www.fiercewireless.com/story/att-refreshes-rethink-possible-ad-campaign-mobile/2012-04-09 (visited Oct. 16, 2012); Kunur Patel, *AT&T's Strategy to Win Consumer Love: Be Human*, AdvertisingAge, April 18, 2012, *available at* http://adage.com/article/special-report-digital-conference/strategy-win-consumer-love-human/234204/ (visited Oct. 16, 2012).

[747] Kunur Patel, *Sprint Drops 'Now Network' Tagline for Beatles' Ditty*, AdvertisingAge, April 11, 2011, *available at* http://adage.com/article/news/sprint-drops-network-tagline-beatles-ditty/226924/(visited Oct. 16, 2012).

[748] *See* Phil Goldstein, *T-Mobile Ads Get Aggressive with 'No More Mr. Nice Girl.'* Fierce Wireless, April 16, 2012, *available at* http://www.fiercewireless.com/story/t-mobile-gets-tough-new-advertising-campaign/2012-04-16 (visited Oct. 16, 2012); Kunur Patel, *T-Mobile Doubles Down on 'Carly' Web Videos*, AdvertisingAge, May 03, 2012, *available at* http://adage.com/article/the-viral-video-chart/t-mobile-doubles-carly-web-videos/234519/(visited Oct. 16, 2012).

[749] Shira Ovide, *TV Ad Takes Potshot at AT&T/T-Mobile Merger*, The Wall Street Journal, October 27, 2011, *available at* http://blogs.wsj.com/deals/2011/10/27/tv-ad-takes-potshot-at-attt-mobile-merger/ (visited Oct. 16, 2012); MetroPCS, Wireless for All, *available at* http://www.metropcs.com/metro/category/Why+MetroPCS/cat290017 (visited on May 16, 2012); MetroPCS, YouTube Page, *available at* http://www.youtube.com/user/metropcs (visited on May 16, 2012).

[750] Tim Nudd, *AT&T shouting your love from mountaintop!*, AdWeek, February 14, 2011, *available at* http://www.adweek.com/adfreak/att-shouting-your-love-mountaintop-11560 (visited Oct. 16, 2012).

[751] David Kiefaber, *Blink-182 Feeling Blue in New Partnership With AT&T*, AdWeek, August 03 2011, *available* at http://www.adweek.com/adfreak/blink-182-feeling-blue-new-partnership-att-133846 (visited Oct. 16, 2012).

Family Photos to give customers a chance to make awkward portraits of themselves.[752] In addition to marketing using mobile apps, T-Mobile advertised using various YouTube posts.[753] Verizon Wireless, which started its iPhone marketing campaign on YouTube, also used mobile apps in order to target customers.[754] Each of the top four providers, along with smaller providers such as MetroPCS and C Spire have YouTube pages where users can view their marketing campaigns and additional videos about these firms.[755]

c. Retailing

240. Mobile wireless service providers sell their products and services through their distribution and retail networks. Providers may try to design their distribution and retail networks to increase customer growth, reduce customer acquisition costs, and attract customers from competitors.[756] Distribution channels include: 1) direct sales representatives who target businesses and government agencies 2) direct retail outlets, such as provider-owned stores and kiosks; 3) indirect retail outlets, including mass-market electronics retailers such as Best Buy, Wal-Mart, Target, Costco, Radio Shack, and Amazon; 4) provider websites; and 5) telemarketers.[757] The reliance on direct versus indirect channels varies by provider. For instance, among providers outside the top four, the number of third-party agent locations is typically greater than the number of company-operated retail stores.[758]

241. In a study of full-service wireless purchase experience released in February, 2012, J.D. Power and Associates found that customer satisfaction with the wireless purchase experience has declined from 2011, mainly due to changing customer expectations and the level of service provided to customers

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[752] Rebecca Cullers, *Sprint Continues its Mockery of the Holidays*, AdWeek, December 02, 2010, *available at* http://www.adweek.com/adfreak/sprint-continues-its-mockery-holidays-11876 (visited Oct. 16, 2012).

[753] *See* Tim Nudd, *William & Kate Boogie Down the Aisle for T-Mobile*, AdWeek, April 17, 2011, *available at* http://www.adweek.com/adfreak/william-kate-boogie-down-aisle-t-mobile-130675 (visited Oct. 16, 2012); Cotton Delo, *Another T-Mobile Flash Mob Video Strikes Viral Gold*, Advertising Age, December 22, 2011, *available at* http://adage.com/article/the-viral-video-chart/t-mobile-flash-mob-video-strikes-viral-gold/231720/(visited Oct. 16, 2012).

[754] Michael Learmonth, *Verizon's iPhone Marketing Blitz Begins on YouTube*, AdvertisingAge, January 21, 2011, *available at* http://adage.com/article/digitalnext/verizon-s-iphone-ad-debuts-youtube/148364/(visited Oct. 16, 2012); Kunur Patel, *Verizon Exec Tries to Structure Media Around People, Not Content*, AdvertisingAge, April 17, 2012, *available at* http://adage.com/article/special-report-digital-conference/verizon-data-structure-media-people-content/234179/ (visited Oct. 16, 2012).

[755] These YouTube pages can be found at http://www.youtube.com/user/### with the company name or tagline in place of the ### placeholder (i.e., replace ### with VerizonWireless, SprintNow, ShareATT, TMobile, MetroPCS, or CSpire).

[756] *See* SEC Form 10-K for AT&T, Cincinnati Bell, Leap Wireless, MetroPCS, NTELOS Holding Corp, Sprint Nextel, US Cellular, and Verizon Wireless.

[757] *Id.*; *See in particular*, Leap Wireless, SEC Form 10-K, filed Feb. 21, 2012, at 6-7; MetroPCS, SEC Form 10-K, filed Feb. 29, 2012, at 9; Sprint Nextel, SEC Form 10-K, filed Feb. 21, 2012, at 3; US Cellular, SEC Form 10-K, filed Feb. 27, 2012, at 6; Verizon Communications, SEC Form 10-K, filed Feb. 24, 2012, at 6; Phil Goldstein, *Leap Expands Cricket Brand Nationwide with Best Buy Retail Deal*, *FierceWireless*, September 22, 2011, *available at* http://www.fiercewireless.com/story/leap-expands-cricket-brand-nationwide-best-buy-retail-deal/2011-09-22 (visited Oct. 16, 2012); Phil Goldstein, *Leap's Cricket Expands National Retail Presence to Target Stores*, FierceWireless, April 20, 2012, *available at* http://www.fiercewireless.com/story/leaps-cricket-expands-national-retail-presence-target-stores/2012-04-20 (visited Oct. 16, 2012).

[758] As of December 31, 2011, for every 10 company operated retail locations, US Cellular had 25 indirectly operated locations, NTELOS had approximately 63, Cincinnati Bell had approximately 119, and Leap Wireless had approximately 191. US Cellular, SEC Form 10-K, filed Feb. 27, 2012, at 6; Cincinnati Bell, SEC Form 10-K, filed Feb. 28, 2012, at 9-10; NTELOS, SEC Form 10-K, filed Feb. 29, 2012, at 5; Leap Wireless, SEC Form 10-K, filed Feb. 21, 2012, at 6-7.

in sales made by phone.[759] J.D. Power's semi-annual survey evaluates the wireless purchase experience of customers using any of three channels of contact: phone calls with sales representatives; visits to a retail wireless store; and on the Web. The survey also ranks wireless providers on customer purchase satisfaction. Among the top four providers, Sprint Nextel ranked first, followed by Verizon Wireless, and then by AT&T and T-Mobile, both of which ranked below the full-service average. In the previous six month period study, Sprint tied for first with T-Mobile, which was followed by Verizon Wireless and AT&T.[760] The 2011 study pointed out that overall satisfaction with the wireless purchase experience differs widely across the three channels of contact.

V. MOBILE WIRELESS SERVICES: PERFORMANCE AND OUTCOMES

242. Competitive rivalry among providers is desirable not as an end in itself, but rather as a means of bringing tangible benefits to consumers, such as lower prices, higher quality, and greater choice of services. To determine if the market is producing outcomes that bring benefits to consumers, in this section we analyze various metrics, including subscriber/connection growth and penetration, usage, pricing levels and trends, and network performance.

243. As in previous reports, the performance and outcomes section of this *Report* tracks the pricing of mobile wireless services using available measures of prices or proxies based on average revenue. In addition, this section supplements the analysis of price data with an analysis of measures of industry output, including subscribership and connection levels, net adds, and output and usage. Churn data are an indicator of how often customers are switching between providers and pricing plans. A decomposition of industry service revenues between voice and data shows that mobile wireless services continue to become increasingly data centric. The analysis of profitability incorporates cost data that are not reflected in the pricing and revenue data.

A. Numbers of Mobile Wireless Connections and Customers

1. Industry-Wide Connections

244. Based on estimates from two sources, the total number of mobile wireless connections now exceeds the total U.S. population.[761] According to data from NRUF, there were an estimated 317.3 million total mobile wireless connections at the end of 2011, up five percent from 301.8 million at the end of 2010, and up nine percent from 290.7 million at the end of 2009 (see Table 34).[762] According to data from CTIA, the total number of mobile wireless connections grew four percent from the end of 2009 to the end of 2010 to 296.3 million and an additional seven percent during 2011 to 316.0 million at year-end

[759] *J.D. Power and Associates Reports: Satisfaction with the Wireless Purchase Experience Has Declined Among Customers Who Make Sales Transactions by Phone*, Press Release, J.D. Power and Associates, February 16, 2012, *available at* http://www.jdpower.com/content/press-release/ytOQWTp/2012-u-s-wireless-purchase-experience-studies--volume-1.htm (visited May 25, 2012).

[760] *J.D. Power and Associates Reports: Satisfaction with the Wireless Purchase Experience Differs Considerably Among Sales Channels*, Press Release, J.D. Power and Associates, August 11, 2011, *available at* http://www.jdpower.com/content/press-release/rYyXr7H/wireless-purchase-experience.htm (visited May 25, 2012).

[761] According to the Bureau of the Census, the combined population of the 50 states, the District of Columbia, and Puerto Rico, as of July 1, 2011, was estimated to be 311.6 million. *See* U.S. Census Bureau, http://www.census.gov/popest/data/national/totals/2011/index.html (visited June 17, 2011). As noted in the *Fifteenth Report*, if NRUF is used to calculate a mobile wireless penetration rate (of a population), that penetration rate is overstated in terms of the number of individuals who have more than one mobile wireless device. The penetration rate now exceeds 100 percent on a nationwide basis and in many EAs, as discussed below.

[762] Commission estimate, based on year-end 2010 and year-end 2011 NRUF filings, adjusted for porting.

2011.[763]

Table 34
Estimated Total Mobile Wireless Connections, Year-end 2001-2011[764]

	NRUF			CTIA
Year	***Connected Devices (millions)***	***Increase from previous year (millions)***	***Connections Per 100 People***	***Estimated Connections (millions)***
2001	128.5	n/a	45	128.4
2002	141.8	13.3	49	140.8
2003	160.6	18.8	54	158.7
2004	184.7	24.1	62	182.1
2005	213.0	28.3	71	207.9
2006	241.8	28.8	80	233.0
2007	263.0	21.2	86	255.4
2008	279.6	16.6	91	270.3
2009	290.7	11.1	94	285.6
2010	301.8	11.1	97	296.3
2011	317.3	15.5	102	316.0

245. The *Report* uses different data sources to estimate the number of mobile wireless subscribers and connections. One source, Numbering Resource Utilization Forecast (NRUF), tracks the number of telephone numbers (TNs) that have been assigned to devices connected to mobile wireless networks.[765] However, NRUF data have certain limitations that are becoming increasingly significant. First, an increasing number of consumers now use more than one mobile wireless device with an assigned TN, and because many devices without circuit-switched voice connections – such as e-readers, tablets, Internet access cards for laptops, and telematics systems – are assigned TNs, estimates of the number of individual subscribers are less accurate. An additional limitation of the NRUF data arises due to providers following different practices for how and whether to assign TNs to non-voice devices. Some providers assign TNs to all non-voice devices, while others assign TNs to some or no data-only devices. For instance, Clearwire's WiMAX mobile and fixed Internet access devices do not have TNs assigned to

[763] *CTIA Year-End 2011 Wireless Indices Report. See also* Appendix B, Table B-1, *infra*. A detailed explanation of the differences between the NRUF data and CTIA's survey can be found in the *Seventh Report*, 17 FCC Rcd at 13004.

[764] Commission estimates based on NRUF data. *CTIA Year-End 2011 Wireless Indices Report*. In the second half of 2012, CTIA revised estimated connections for the years 2009-2011. *See CTIA's Wireless Industry Indices, Semi-Annual Data Survey Results, A Comprehensive Report From CTIA Analyzing the U.S. Wireless Industry, Mid-Year 2012 Results* (stating "Nor do we make an M2M adjustment for participating companies that do not include their M2M numbers in their reported subscriber counts. Indeed, the mid-year 2012 estimate – and the *revised* subscriber connection figures for five previous periods – reflects the exclusion of some M2M and other units not currently treated as "subscriber connections" which previously *had* been treated as such connections.")

[765] In filing their NRUF data, carriers do not report TNs that have been ported to them. Therefore, in order to develop an estimate of mobile wireless connections, it is necessary to adjust the raw NRUF data to account for mobile wireless subscribers who have transferred their wireline TNs to wireless accounts. Porting adjustments are developed from the TN porting databases managed by Neustar, acting as the administrator of the regional Number Portability Administration Centers (NPACs). The databases contain all ported TNs currently in service. They also contain information about when the TN was most recently ported (to a provider other than the provider to which the number originally was assigned) or, in some cases, when the database was updated to reflect a new area code. *Trends in Telephone Service*, FCC, Apr. 2005, at 8-2 – 8-3.

them and are not accounted for in the NRUF data. Therefore, NRUF is becoming increasingly less useful in measuring the number of individual subscribers. Instead, it is providing more of an estimate of the number of mobile wireless connections or connected devices, and will become a less accurate measure of connected devices to the extent that more devices are sold that do not use telephone numbers. Furthermore, we note that devices represented as mobile connections in the NRUF data – because they are assigned TNs by mobile wireless providers and connect to mobile wireless networks – are actually offered on a fixed basis, although it is not clear whether the number of these connections is significant at this point.[766] Another limitation of NRUF data relates to its use in sub-national analyses. When a subscriber moves to a new location but does not change his/her mobile telephone number, the TN is still assigned to the rate center in the previous location, and the subscriber is therefore counted as living in an area in which he/she does not reside.

2. Connections by Type of Service and Device

246. *Mobile Wireless Voice Connections*. The Form 477 mobile telephone data report nationally and by state the number of mobile wireless connections to devices with circuit-switched voice connections.[767] Providers reported on Form 477 that there were 298.3 million mobile telephone connections as of December 2011, an increase of 4.6 percent from 285.1 million at the end of 2010, and an increase of 8.8 percent from 274.3 million at the end of 2009 (see Chart 12).[768] The number of connections overestimates the number of individuals with a mobile voice device to the extent that some individuals own or use more than one mobile voice device. Another source, comScore, estimates the number of individuals who are over the age of 13 and own a mobile wireless voice handset to be 234 million.[769]

247. *Mobile Wireless Internet Access Connections*. In this *Report*, Form 477 provides data on the number of mobile wireless Internet access connections exceeding 200 kbps, and therefore using 3G or 4G technologies.[770] Approximately 142.1 million terrestrial mobile wireless Internet access subscriber

[766] Such devices would include, for example, home alarm systems that rely on a wireless rather than landline connection for communication and monitoring, as well as fixed LTE broadband connections offered under Verizon Wireless's recently announced Home Fusion program.

[767] In contrast, NRUF data do not distinguish among the various types of mobile wireless services.

[768] *See* Appendix B, Table B-2, *infra*. These Form 477 data do not distinguish those mobile voice subscribers who also have a mobile data or Internet access plan from those who do not.

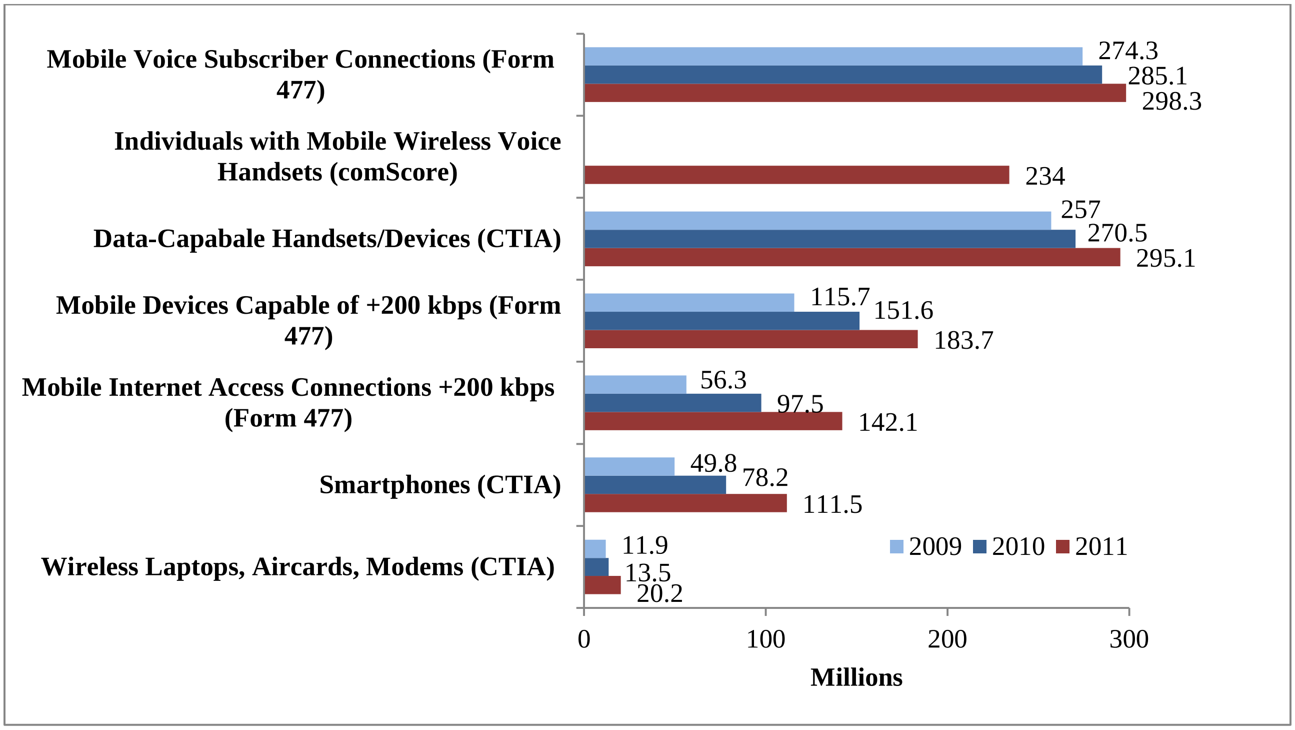
[769] ComScore MobiLens, Dec. 2011. comScore MobilLens U.S. data are derived from a monthly survey of over 13,000 respondents ages 13 and older who are recruited to represent U.S. Census demographics. The total universe size is estimated from data provided by CTIA and comScore's monthly subscriber studies.

[770] *See* Table B-6, Appendix B, *infra*. Under the Commission's current Form 477 data collection rules, terrestrial mobile wireless providers are required to report, on a state-by-state basis and by speed tier, their number of mobile wireless connections with a device and subscription that permits the user to access the lawful Internet content of his or her choice at data rates exceeding 200 kbps in at least one direction. Development of Nationwide Broadband Data to Evaluate Reasonable and Timely Deployment of Advanced Services to All Americans, Improvement of Wireless Broadband Subscribership Data, and Development of Data on Interconnected Voice over Internet Protocol (VoIP) Subscribership, WC Docket No. 07-38, *Report and Order and Further Notice of Proposed Rulemaking*, 23 FCC Rcd 9691, 9700 ¶ 20 (2008) (*Broadband Data Order*). In addition, such providers report, on a state-by-state basis, their number of devices in service that are capable of sending or receiving information at speeds greater than 200 kbps in at least one direction, regardless of whether the user subscribes to a mobile Internet access plan. *Broadband Data Order*, 23 FCC Rcd at 9703 ¶ 23. Terrestrial mobile wireless providers are not required to submit their number of Internet access subscribers broken down on a Census Tract basis, as other providers are required to do. *Broadband Data Order*, 23 FCC Rcd at 9698 ¶ 16. We note that the Form 477 mobile wireless Internet access subscriber data do not capture those mobile data users who access the mobile Internet on a casual or *à la carte* basis but do not have a monthly or longer-term subscription to a mobile wireless Internet access service. Other Commission reports use alternative speed categories in presenting data on mobile broadband services. The *Eighth Broadband Progress Report* presents data on Americans without access to mobile broadband services between June (continued….)

connections were reported to the Commission on Form 477 for the end of 2011, and 97.5 million were reported for the end of 2010, a significant increase from the 56.3 million (restated) reported for year-end 2009.

248. *Mobile Wireless Devices In Use*. Alternative measures of mobile wireless adoption are provided by the numbers of different types of devices in use (irrespective of the service plans mobile wireless consumers). The adoption of data-capable mobile devices has significantly increased in recent years. According to Form 477 data, an estimated 183.7 million mobile wireless devices in use were reported to be capable of transmitting data at over 200 kbps in at least one direction as of year-end 2011, up 21 percent from the 151.6 million reported for year-end 2010, and up 59 percent from the 115.7 million reported for year-end 2009 (see Chart 12).[771] Alternatively, CTIA estimated a total of 295.1 million data-capable handsets and devices were in use by the end of 2011, up from 270.5 million at the end of 2010, and 257 million at the end of 2009 (see Chart 12).[772] Additionally, CTIA estimated that the number of wireless-enabled laptops, netbooks, and aircards in use increased 49 percent during 2011 from 13.6 million to 20.2 million.[773]

Chart 12
Mobile Wireless Connections by Type of Service and Device, 2009-2011 (In Millions)



249. The adoption of smartphones, a sub-category of data-capable mobile devices, has

(Continued from previous page)
30, 2010 and June 30, 2011 for three speed categories, at least 768 kbps/200 kbps, at least 3 Mbps/768 kbps and at least 6 Mbps/ 1.5 Mbps. *2012 Eighth Broadband Progress Report*, GN Docket No. 11-121, (rel. Aug. 21, 2012) ¶ 86.

[771] Form 477. Because reporting practices previously varied among providers to a largely unknown degree, the year-end 2008 and 2009 figures are not directly comparable to figures reported on Form 477 for earlier dates. *See Fifteenth Report*, 26 FCC Rcd at 9761 n. 493.

[772] *CTIA Year-End 2011 Wireless Indices Report*, at 10; *Fifteenth Report*, 26 FCC Rcd at 9761 ¶ 162.

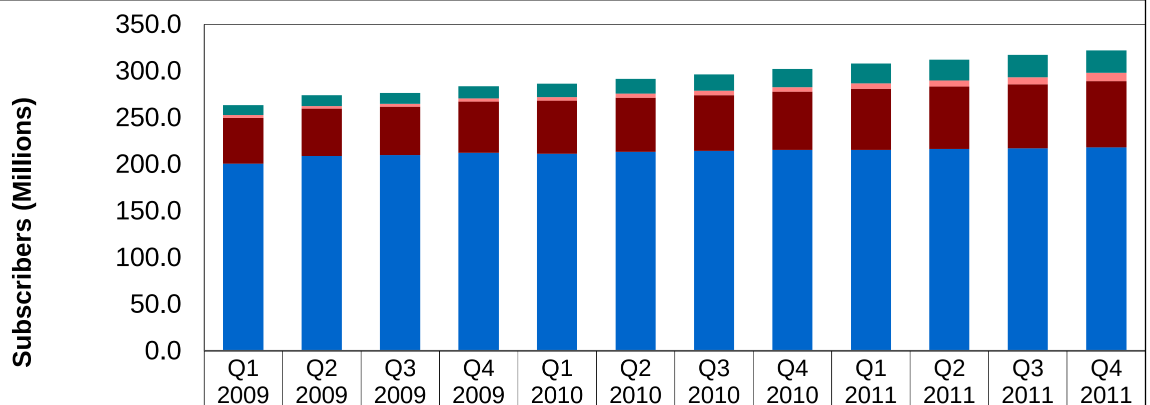
[773] *CTIA Year-End 2011 Wireless Indices Report*, at 10-11.

increased dramatically over the past two years. ComScore estimates that the number of individuals owning a smartphone increased 55 percent during 2011 from 61.5 million to 98 million, and the smartphone penetration rate had reached 42 percent as of December 2011.[774] ComScore also estimated that nearly 60 percent of all recently-acquired mobile devices were smartphones in December 2011, with the Apple iPhone 4 being the smartphone with highest adoption rate during that month. CTIA reported that, as of the end of 2011, there were 111.5 million smartphones in service, up from 78.2 million at the end of 2010 and 49.8 million at the end of 2009.[775] Finally, the Pew Internet & American Life Project (Pew) reported that, as of February 2012, an estimated 46 percent of American adults had smartphones, an increase of 11 percentage points over the 35 percent who owned a smartphone in May 2011.[776]

3. Connections by Service Segment

250. While the substantial majority of mobile wireless connections in the United States today are on a postpaid subscription plan, the prepaid, wholesale, and connected device segments are growing at a much faster pace than postpaid. According to the UBS data shown in Chart 13 below, the number of prepaid subscriptions grew 29 percent from the end of 2009 to the end of 2011, the number of connected devices grew 82 percent, and the number of wholesale connections nearly tripled.[777] During the same period, the number of postpaid subscriptions grew just under three percent.[778]

Chart 13
Mobile Wireless Customers by Pricing Plan, 2009-2011[779]



	Q1 2009	Q2 2009	Q3 2009	Q4 2009	Q1 2010	Q2 2010	Q3 2010	Q4 2010	Q1 2011	Q2 2011	Q3 2011	Q4 2011
Connected Devices	10.9	11.7	11.8	13.2	14.2	15.9	17.5	19.3	21.0	22.5	23.9	24.0
Wholesale	2.8	2.8	2.9	3.2	3.9	4.4	5.0	5.0	5.9	6.6	7.6	9.1
Prepaid	49.2	50.8	51.8	55.0	57.1	58.0	59.6	62.5	65.6	67.0	68.8	70.8
Postpaid	200.6	208.8	210.0	212.3	211.3	213.4	214.4	215.3	215.5	216.3	217.0	218.2

Source: UBS

[774] ComScore, *2012 Mobile Future in Focus Report*, February 2012, at 7-11.

[775] *CTIA Year-End 2011 Wireless Indices Report*, at 10-11.

[776] Aaron Smith, *Nearly Half of American Adults Are Smartphone Owners*, Pew, Mar. 1, 2012, *available at* http://pewinternet.org/Reports/2012/Smartphone-Update-2012/Findings.aspx. (visited Nov. 30, 2012).

[777] *US Wireless 411 4Q11*, at 10.

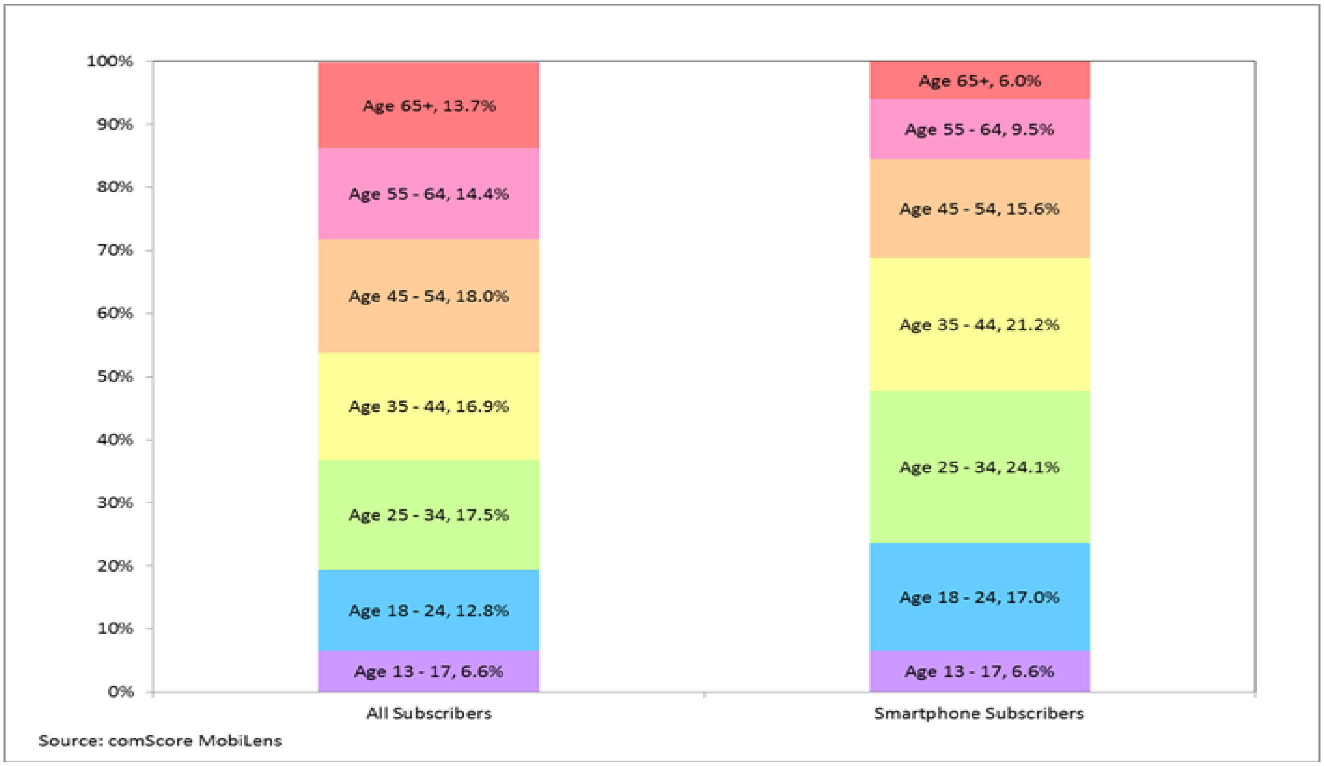
[778] *US Wireless 411 4Q11*, at 10.

[779] *US Wireless 411 4Q11*, at 10. UBS modified the categories it uses to track mobile connections by type of subscription in 2010 and 2011. The previous four categories were Postpaid, Traditional Prepaid, Unlimited Prepaid, and Wholesale. *See Fifteenth Report*, 26 FCC Rcd at 9766 Chart 11. In 2010, UBS began reporting the Connected Devices category, to reflect and account for changes made by the major providers in the way the report subscriber counts. *See US Wireless 411 3Q10*, at 3-4. In November 2011, UBS combined the two types of prepaid subscriptions into a single category. *See US Wireless 411 3Q11*, at 3-4. When UBS made these changes, it also retroactively modified the data for previous quarters, going back to the first quarter of 2009.

4. Connections by Age

251. ComScore has estimated the age distribution of mobile wireless subscribers and of smartphone subscribers, as shown in Chart 14 below. While the adoption of all mobile wireless devices is fairly evenly distributed among various age groups, smartphone adoption is more concentrated in younger age groups. Chart 14 shows that adults age 18-44 comprise 47 percent of all mobile wireless subscribers, but make up 62 percent of smartphone users.[780] On the other hand, adults over age 55 comprise 28 percent of all mobile wireless subscribers but only 16 percent of smartphone subscribers.[781] Additionally, Pew has estimated that about one in four teens reports owning a smartphone.[782] Of teens ages 12-17, 23 percent said they have a smartphone, with ownership highest amongst older teens ages 14-17, at 31 percent.[783]

Chart 14
Age Breakdown of Mobile Wireless Subscribers, Q4 2011 (Percent)[784]



[780] ComScore MobiLens, Dec. 2011. comScore MobilLens U.S. data are derived from a monthly survey of over 13,000 respondents ages 13 and older who are recruited to represent U.S. Census demographics. The total universe size is estimated from data provided by CTIA and comScore's monthly subscriber studies.

[781] ComScore MobiLens, Dec. 2011. comScore MobilLens U.S. data are derived from a monthly survey of over 13,000 respondents ages 13 and older who are recruited to represent U.S. Census demographics. The total universe size is estimated from data provided by CTIA and comScore's monthly subscriber studies.

[782] Amanda Lenhart, *Teens, Smartphones & Texting*, Pew, Mar. 19, 2012, *available at* http://pewinternet.org/Reports/2012/Teens-and-smartphones/Summary-of-findings.aspx (visited Oct. 16, 2012).

[783] Amanda Lenhart, *Teens, Smartphones & Texting*, Pew, Mar. 19, 2012, *available at* http://pewinternet.org/Reports/2012/Teens-and-smartphones/Summary-of-findings.aspx (visited Oct. 16, 2012).

[784] Estimated by ComScore MobiLens, Dec. 2011. comScore MobilLens U.S. data are derived from a monthly survey of over 13,000 respondents ages 13 and older who are recruited to represent U.S. Census demographics. The total universe size is estimated from data provided by CTIA and comScore's monthly subscriber studies.

5. Connections by Economic Area (EA)

252. To analyze mobile wireless connections across geographic areas, we have estimated mobile wireless connections per 100 people (penetration rates) in the EAs of the United States using NRUF data.[785] As discussed above, we use EAs as the geographic unit for measuring the level of concentration in the mobile wireless services industry in order to maintain continuity with past *Reports*[786] and ensure that we do not compromise the confidential information contained in the NRUF data.[787] Regional penetration rates for the 172 EAs range from 79.5 percent in Hobbs, NM to 135 percent in Monroe, LA.[788] As discussed above, the nationwide penetration rate based on NRUF data now exceeds 100 percent, and the penetration rate in 60 of the 172 EAs was at least 100 percent at the end of 2011. This is up from 18 EAs at the end of 2009 and 30 EAs at the end of 2010.

B. Mobile Wireless Net Additions of Customers

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[785] NRUF data are collected on a small area basis and thus allows the Commission to compare the spread of mobile wireless subscribership across different areas within the United States. NRUF data are collected by the area code and prefix (NXX) level for each provider, which enables the Commission to approximate the number of subscribers that each provider has in each of the approximately 18,000 rate centers in the country. Rate center boundaries generally do not coincide with county boundaries. However, for purposes of geographical analysis, rate centers (including those that cross county boundaries) can be associated with the county that contains the (usually) centralized geographic point for that rate center. Counties, for which population and other data exist, can be aggregated together and associated with several larger geographic areas based on counties, such as EAs and Cellular Market Areas (CMAs). Aggregation to larger geographic areas reduces the level of inaccuracy inherent in combining non-coterminous areas such as rate center areas and counties.

[786] There are 172 EAs, each of which is an aggregation of counties. Each EA is made up of one or more economic nodes and the surrounding areas that are economically related to the node. The main factor used in determining the economic relationship between the two areas is commuting patterns, so that each EA includes, as far as possible, the place of work and the place of residence of its labor force. *See* Kenneth P. Johnson, *Redefinition of the EA Economic Areas*, Survey of Current Business, Feb. 1995, at 75 (*Redefinition of the EA*). For its spectrum auctions, the Commission has defined four additional EAs: Guam and the Northern Mariana Islands (173); Puerto Rico and the U.S. Virgin Islands (174); American Samoa (175); and Gulf of Mexico (176). *See* FCC, *FCC Auctions: Maps*, *available at* http://wireless.fcc.gov/auctions/data/maps.html (visited Dec. 15, 2008). In November 2004, the Bureau of Economic Analysis released updated definitions of EAs; however, for consistency, we use the previous release of definitions. *See New BEA Economic Areas For 2004*, Bureau of Economic Analysis, Nov. 17, 2004. As noted above, the Commission typically has used smaller geographic areas, such as CMAs, in its analysis of mobile wireless transactions. *See, e.g., Sprint Nextel-Clearwire Order*, 23 FCC Rcd at 17591 ¶¶ 51-52; *Verizon Wireless-Alltel Order*, 23 FCC Rcd at 17472-73 ¶ 52.

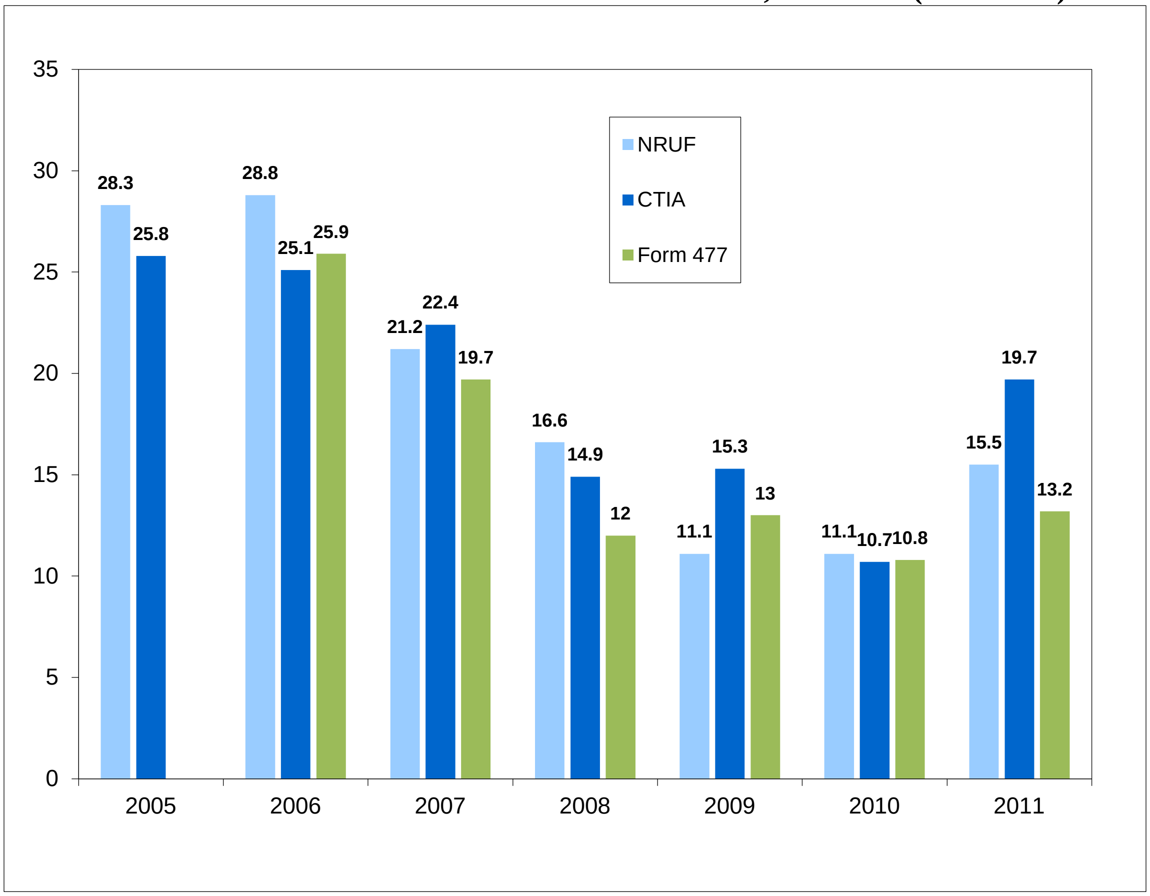
[787] Wireless providers have considerable discretion in how they assign telephone numbers across the rate centers in their operating areas and, according to one analyst, assign numbers so as to minimize the access charges paid to local wireline companies. *See* Linda Mutschler *et al.*, *Wireless Number Portability*, Merrill Lynch, Equity Research, Jan 9, 2003, at 8 ("For wireless operators, the standard practice is to aggregate phone numbers within the same area code onto the same or several rate centers, whose physical locations would result in the least amount of access charges paid to ILECs. Therefore, in each market, wireless operators are present in only a small number of rate centers. According to our industry sources, this percentage is probably below 20%, and could be meaningfully lower than 20%"). Therefore, a mobile wireless subscriber can be assigned a phone number associated with a rate center that is a significant distance away from the subscriber's place of residence or usage, but generally still in the same EA. *See* Linda Mutschler, *et al.*, *US Wireless Services: Wireless Number Portability – Breaking Rules*, Merrill Lynch, Equity Research, Feb. 28, 2003, at 3 ("Once the NPA-NXX (*i.e.*, 212-449) is assigned to the wireless carrier, the carrier may select any one of its NPA-NXXs when allocating that number to a particular subscriber. Therefore, with regard to wireless, the subscriber's physical location is not necessarily a requirement in determining the phone number assignment – which is very different from how wireline numbers are assigned").

[788] EA connection levels and penetration rates as of December 2010 and December 2011 can be seen in Appendix C, Table C-3. In addition, a map showing regional penetration rates by EAs can be found in Appendix C. *See* Map C-30, Appendix C, *infra*. In seven EAs, the penetration rate could not be reported for confidentiality reasons because the number of competing providers in the EA is less than four.

1. Industry-Wide Net Additions

253. Data on the net additional connections during a period of time ("net adds") provide information about the sources and level of growth in mobile wireless connections. According to data from CTIA, after declining from 2006 through 2008, net adds increased significantly in 2009 to 20.6 million (revised data) and remained at just over 20 million in 2010 and 2011 (Chart 15). According to NRUF data, net adds were flat in 2010 at 11.1 million and increased in 2011 to 15.5 million.[789] Data from Form 477, which reports data on both mobile voice connections and mobile Internet access connections, suggest that data-only connections are driving a large portion of net adds. While the number of mobile connections continued to grow in 2010 and 2011, particularly as people in younger age groups purchase mobile wireless services for the first time,[790] the growth rate has been declining as mobile voice adoption reaches increasingly larger percentages of the population. At the same time, the number of devices with data-only mobile wireless connectivity has increased, reflecting the increased demand for mobile wireless data services.

Chart 15
Total Mobile Wireless Connection Annual Net Additions, 2005-2011 (In millions)[791]



[789] As discussed above, the NRUF data used to generate an estimate of mobile wireless connections are based on the number of phone numbers assigned to mobile wireless devices. Therefore, any device with a mobile wireless phone number is counted as a connection, and many data-only devices with mobile wireless network connections, such as laptop cards and e-readers, have phone numbers assigned to them.

[790] *See* Section V.A.4, Connections by Age, *supra*.

[791] *See* Table 34, *supra*.

2. Net Additions by Service Segment

254. Data on net adds by service segment provide information on which segments contributed to the growth in mobile wireless connections. As shown in Chart 16, there has been significant variation in net adds across service segments in recent years. The number of postpaid subscriptions in 2010 and 2011 declined from their 2009 levels. According to UBS, there were 2.5 million postpaid net adds in 2010 (14 percent of total net adds), and 3 million in 2011 (15 percent of the total), down from 3.7 million (25 percent of total net adds) in 2009. The number of prepaid net adds, both unlimited and traditional, still constituted a large portion of total net adds – 41 percent – in both 2010 and 2011, but declined from 54 percent of total net adds in 2009.

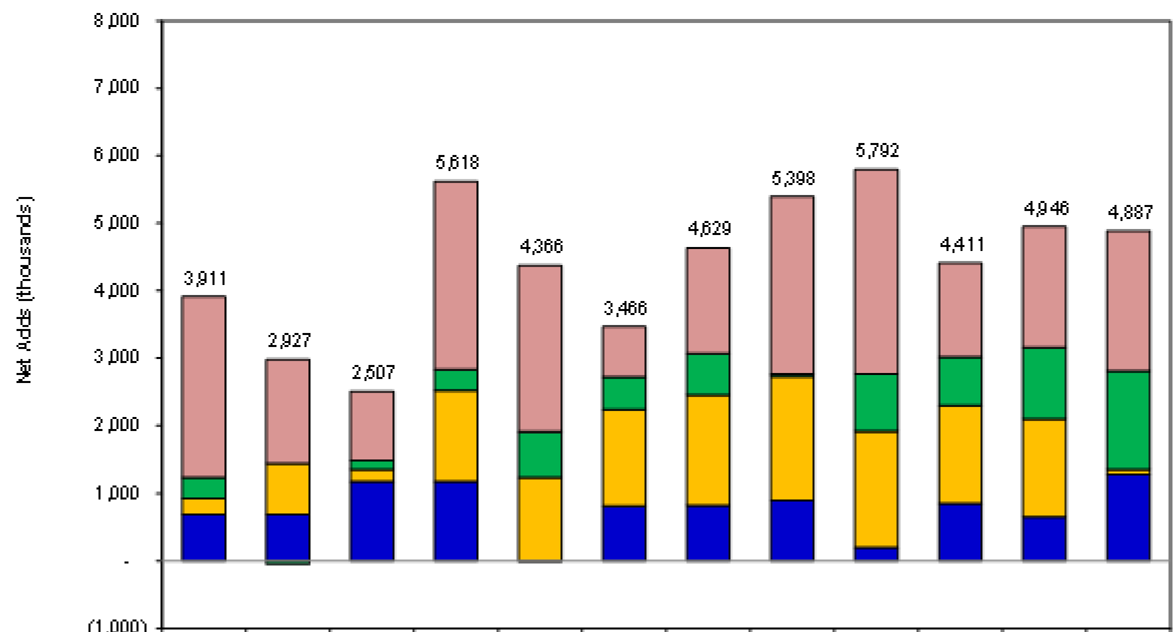
255. The number of wholesale and connected device net adds grew significantly in 2010 and 2011 compared to their 2009 levels. UBS estimates that wholesale subscribers as a percentage of total net adds grew five percent in 2009, 10 percent in 2010, and 20 percent in 2011.[792] In addition, connected device net adds constituted 34 percent of total net adds in 2010 and 23 percent in 2011, up from 17 percent in 2009.[793] The increases in the numbers of wholesale connections and connected devices since 2009 may reflect the growing adoption of data-only mobile devices, such as tablets and e-readers, which are sold on both a retail basis by mobile wireless providers and a wholesale basis by resellers and other retailers. For instance, Comcast, Bright House Networks, and Best Buy were all reselling Clearwire's WiMAX service in 2010 and 2011.[794]

[792] *US Wireless 411 4Q11*, at 10. Wholesale subscribers exclude TracFone.

[793] *US Wireless 411 4Q11*, at 10.

[794] *See* Sections III.D.3.a, Entry; Section IV.B.1.a, Service Provider Technology Deployments, *supra*.

Chart 16
Quarterly Net Additions by Service Segment, 2009-2011 (In thousands)[795]



	1Q09	2Q09	3Q09	4Q09	1Q10	2Q10	3Q10	4Q10	1Q11	2Q11	3Q11	4Q11
Total Net Adds	3,911	2,927	2,507	5,618	4,366	3,466	4,629	5,398	5,792	4,411	4,946	4,887
Prepaid	2,675	1,530	1,018	2,792	2,464	749	1,565	2,633	3,025	1,395	1,787	2,078
Wholesale	308	(50)	132	306	671	483	607	39	846	715	1,061	1,451
Connected Devices	244	758	184	1,345	1,237	1,421	1,634	1,831	1,725	1,452	1,446	76
Postpaid	684	689	1,173	1,175	(6)	813	823	895	196	849	652	1,282

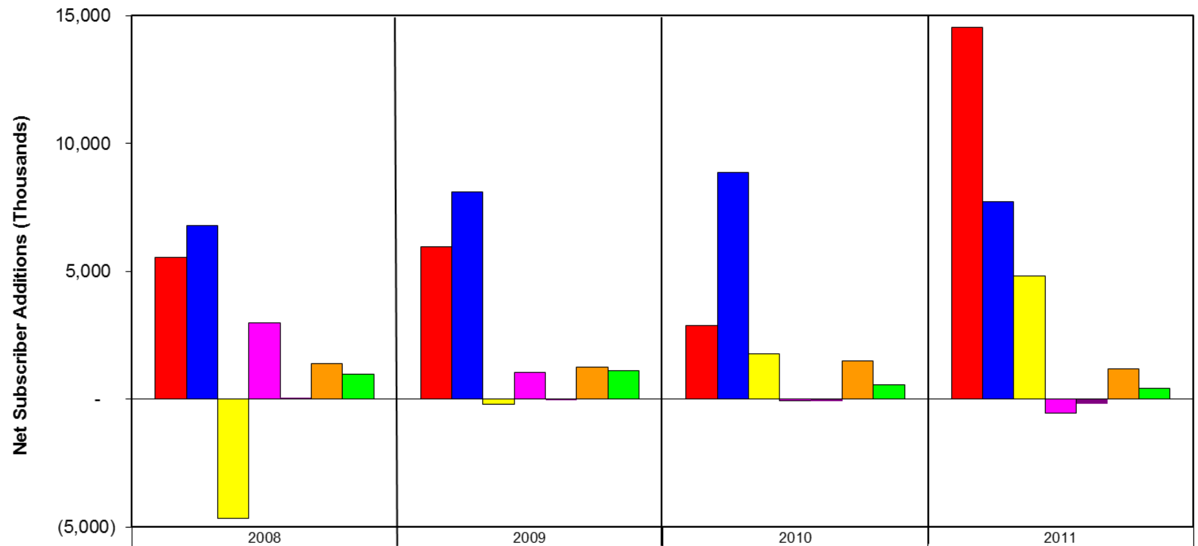
Source: UBS Data

3. Net Adds by Service Provider

256. As shown in Chart 17 below, net additions vary significantly across service providers. In each year since 2008, AT&T and Verizon Wireless have each gained more net adds than has any other service provider. During 2010 and 2011, AT&T had 8.9 million and 7.7 million net adds, respectively, and Verizon Wireless had 2.9 million and 14.5 million net adds during the same two years. After experiencing steep negative net adds in 2008, Sprint's net adds have increased each year since 2009, up to 4.8 million in 2011. T-Mobile incurred annual customer losses in both 2010 and 2011 of 56,000 and 549,000, respectively. MetroPCS and Leap, following multi-metro business models, continued to increase their subscriber bases in 2010 and 2011. MetroPCS had 1.5 million net adds in 2010 and 1.2 million in 2011, figures that are comparable to its 1.3 million net adds in 2009. Leap's net adds in 2010 and 2011 of around a half a million were about half the size of its net adds of around 1 million in 2008 and 2009.

[795] *US Wireless 411 4Q11*, at 10. UBS categorizes Tracfone customers in prepaid, not wholesale.

Chart 17
Annual Net Additions by Service Provider, 2008-2011 (In thousands)[796]



	2008	2009	2010	2011
Verizon Wireless	5,558	5,974	2,886	14,532
AT&T	6,785	8,111	8,853	7,711
Sprint Nextel	(4,667)	(205)	1,777	4,811
T-Mobile	2,973	1,032	(56)	(549)
US Cellular	74	(55)	(69)	(181)
MetroPCS	1,404	1,273	1,515	1,192
Leap Wireless	981	1,109	564	416

Source: Company Data, SEC Form 10-K

C. Connection Churn

257. Churn is a measure of the number of connections that are disconnected from mobile wireless service during a given period of time.[797] Churn is usually expressed as a percentage of the estimated number of connections during the period. For example, if a service provider has an average monthly churn rate of two percent in each month of a year, the service provider would lose approximately 24 percent of its customers over the course of the year. Current average monthly churn rates of individual service providers range from about 1.5 percent for AT&T and Verizon Wireless up to 3.5 percent for T-Mobile (Chart 18). The average industry monthly churn rates have been between 2.0 percent and 2.5 percent since at least 2005. Churn rates for prepaid connections are typically significantly higher than churn rates for postpaid connections, because prepaid customers, unconstrained by a multi-month or multi-year service contract, are more likely than postpaid customers to terminate a relationship with a wireless service provider (

258.

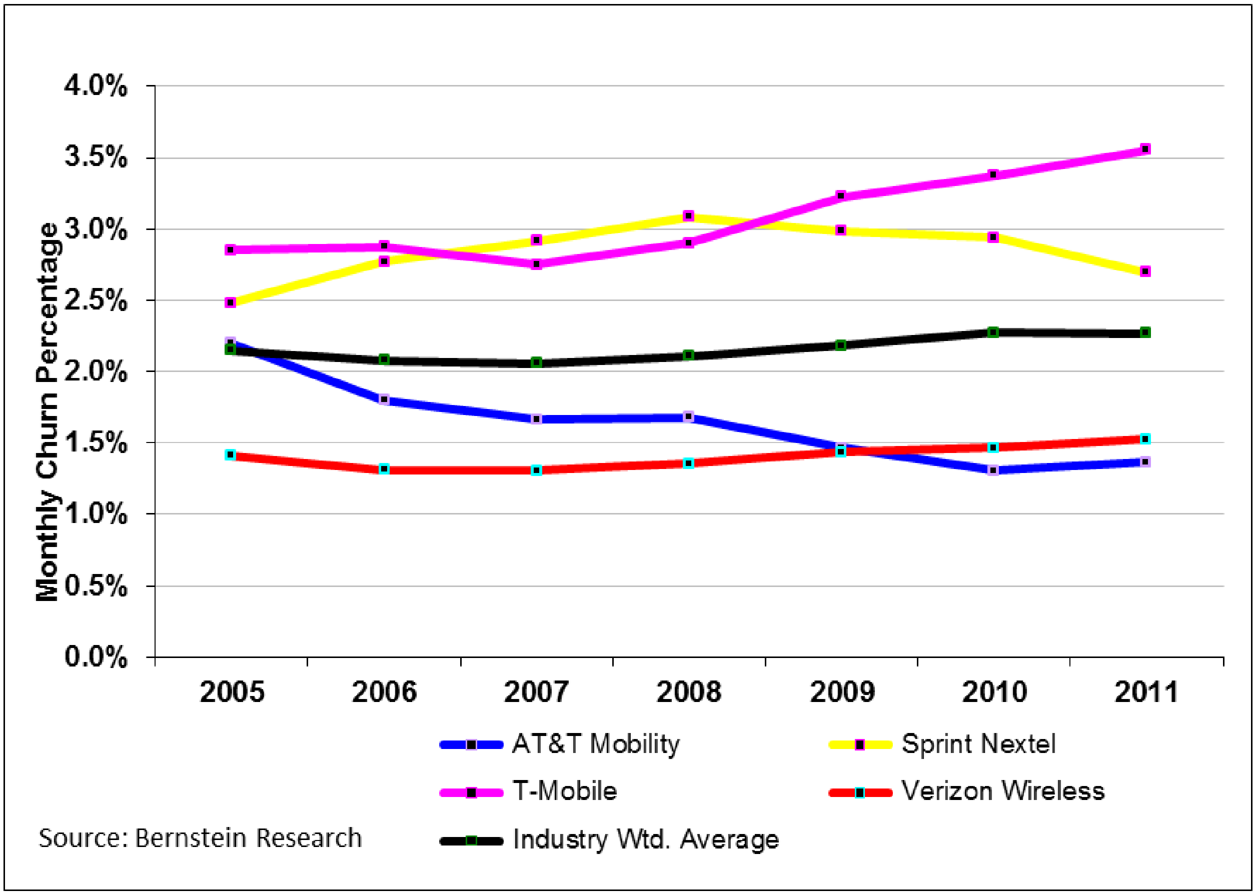
259.

[796] *See* Table 13, *supra*; *Fifteenth Report*, 26 FCC Rcd at 9697 Table 3, 9775 Chart 18; *Fourteenth Report*, 25 FCC Rcd at 11521, Chart 20, 11648, Table C-4. These calculations include wholesale subscribers. *Pro-forma* calculations were made to account for mergers and show only "organic" net adds generated independent of mergers. For instance, Verizon Wireless's reported net additions for 2009, including the subscribers acquired from Alltel, totaled 19,193,000. *See Fifteenth Report*, 26 FCC Rcd at 9775 n. 544.

[797] *CTIA Year-End 2011 Wireless Indices Report*, at 75.

260. Chart 19).[798] A service provider's churn rate depends on many factors including the distribution of its customers between postpaid and prepaid service plans, customer satisfaction with service provider, service provider switching costs, and competition. The inverse of the churn rate gives an estimate of the number of months an average customer is expected to remain a customer of a particular service provider.[799] These customer lifetimes are presented in Table 35.

Chart 18
Average Monthly Churn Rates of the Nationwide Service Providers, 2005-2011[800]



[798] *Leap Wireless & Metro PCS: Low Cost Prepaid Wireless…A Survival Story; Initiating Coverage at Outperform*, Bernstein Research, Dec 14, 2009.

[799] For instance, AT&T's 2011 average monthly churn rate is estimated to be 1.37 percent. Then the expected lifetime of an AT&T customer in 2011 is calculated as 1/0.0137, which is 73 months or 6.1 years.

[800] Data provided by Bernstein Research. The churn rate for each year is an average of the monthly churn rates. The calculation includes postpaid, prepaid, and reseller connections. Verizon Wireless is combined with Alltel.

Chart 19
Average Monthly Churn Rates by Segment, 2005-2011[801]

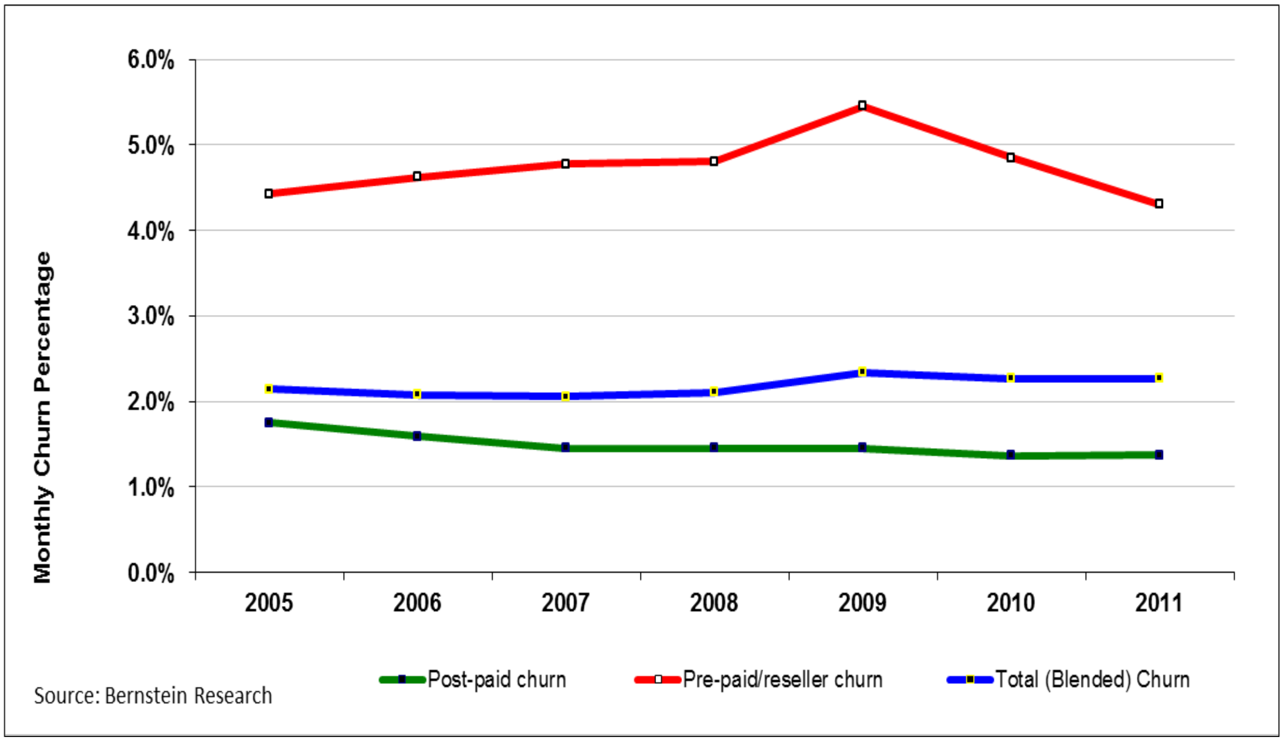


Table 35
Average Customer Lifetime, 2005-2011 (In Years)[802]

Provider	2005	2006	2007	2008	2009	2010	2011
AT&T	3.8	4.6	5.0	5.0	5.7	6.4	6.1
Verizon Wireless	5.9	6.4	6.4	6.1	5.8	5.7	5.5
Sprint Nextel	3.4	3.0	2.9	2.7	2.8	2.8	3.1

[801] Data provided by Bernstein Research. Annual churn is an average for each of the four quarters. Verizon Wireless is combined with Alltel.

[802] Data provided by Bernstein Research.

T-Mobile	2.9	2.9	3.0	2.9	2.6	2.5	2.3
Industry Wtd. Average	3.9	4.0	4.0	3.9	3.8	3.7	3.7

D. Output and Usage Levels

1. Mobile Voice

261. Billable minutes of use (MOUs), a measure of mobile voice usage, are reported by CTIA.[803] As shown in Chart 20 below, MOUs continued to decline over each six-month reporting period in 2010 and 2011, from 686 in the first half of 2010 to 615 in the second half of 2011. There is evidence indicating that the declining trend of voice minutes is due to substitution from mobile voice to mobile messaging and other mobile data services.[804] Reflecting the trend in the aggregate data, MOU data disaggregated across providers (Chart 21) shows that the average MOUs of all four nationwide service providers has declined steadily since 2009.

Chart 20
Average MOUs Per Subscriber Per Month, 2005-2011[805]

[803] CTIA aggregates all of the service providers' MOUs from January 1 through June 30, or from July 1 through December 31, then divides by the average number of subscribers for the period, and then divides by six. *See Thirteenth Report*, 24 FCC Rcd at 6284 n. 582.

[804] *See*, *e.g.*, Pew Internet, *Teens, Smartphones, and Texting*, March 19, 2012, summary *available at* http://www.pewinternet.org/Reports/2012/Teens-and-smartphones/Summary-of-findings.aspx (visited Oct. 16, 2012).

[805] *CTIA Year-End 2011 Wireless Indices Report*, at 215. (This CTIA calculation uses its originally Reported Subscribers numbers for 2009-2011, and not the estimated subscribers for 2009-2011, as revised by CTIA during the second half of 2012.)

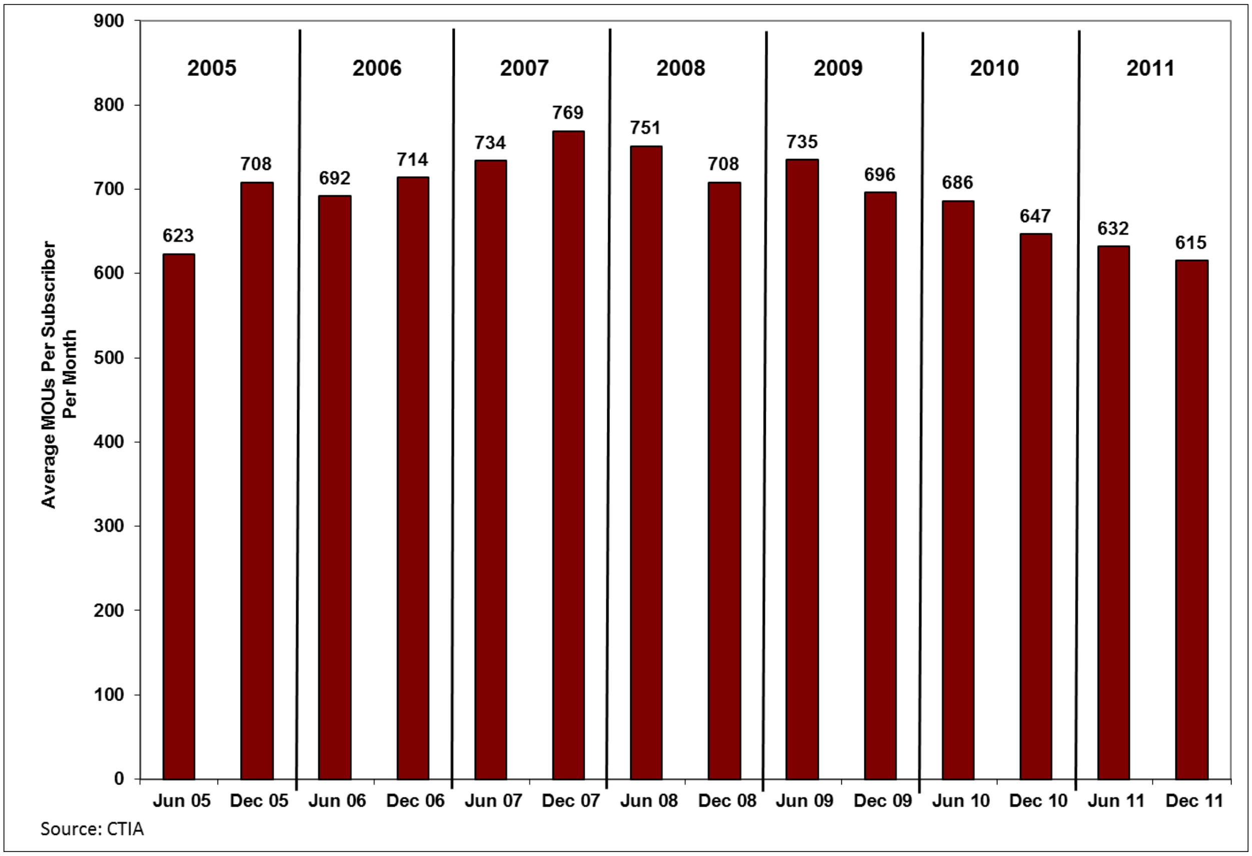
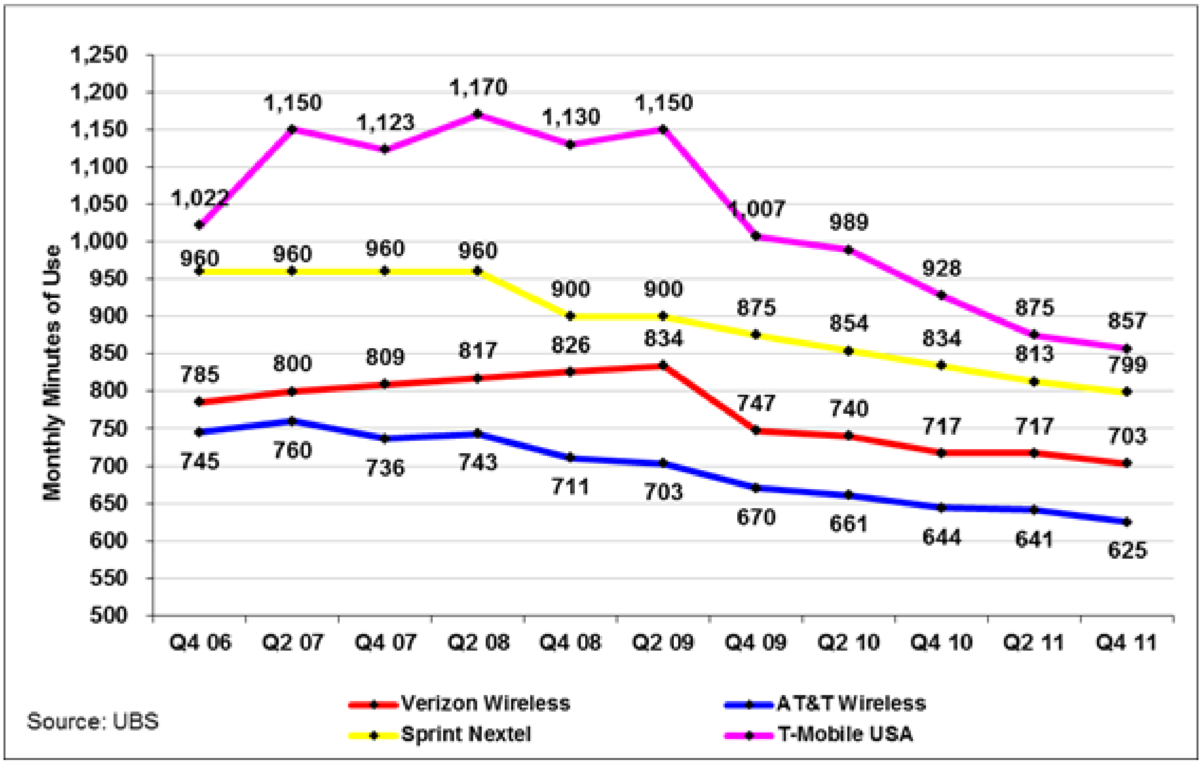


Chart 21
MOUs Per Subscriber: Four Nationwide Service Providers, 2006-2011[806]

[806] *US Wireless 411 4Q11.*



2. Mobile Messaging

262. Mobile text messaging traffic continued to grow in 2011, though at a slower rate than in 2010. According to data reported by CTIA, text messaging volumes grew from a total of 1.14 trillion in the first half of 2011 to 1.17 trillion in the second half of 2011 (Chart 22).[807] Mobile wireless subscribers sent fewer photo, video, and other multimedia messages (MMS) with their devices during 2011 than in 2010 (Chart 23). CTIA reports that a total of 52.8 billion MMS messages were sent during 2011, a 6.7 percent decrease from the 56.6 billion sent during 2010.[808] Data on mobile messaging do not include other types of data usage such as Internet browsing sessions, downloads or uploads.[809]

Chart 22
Six-Month Text Messaging Traffic Volumes, 2005-2011 (In billions)[810]

[807] *CTIA Year-End 2011 Wireless Indices Report*, at 224.

[808] *CTIA Year-End 2011 Wireless Indices Report*, at 227.

[809] *CTIA Year-End 2011 Wireless Indices Report*, at 229.

[810] *CTIA Year-End 2011 Wireless Indices Report*, at 224.

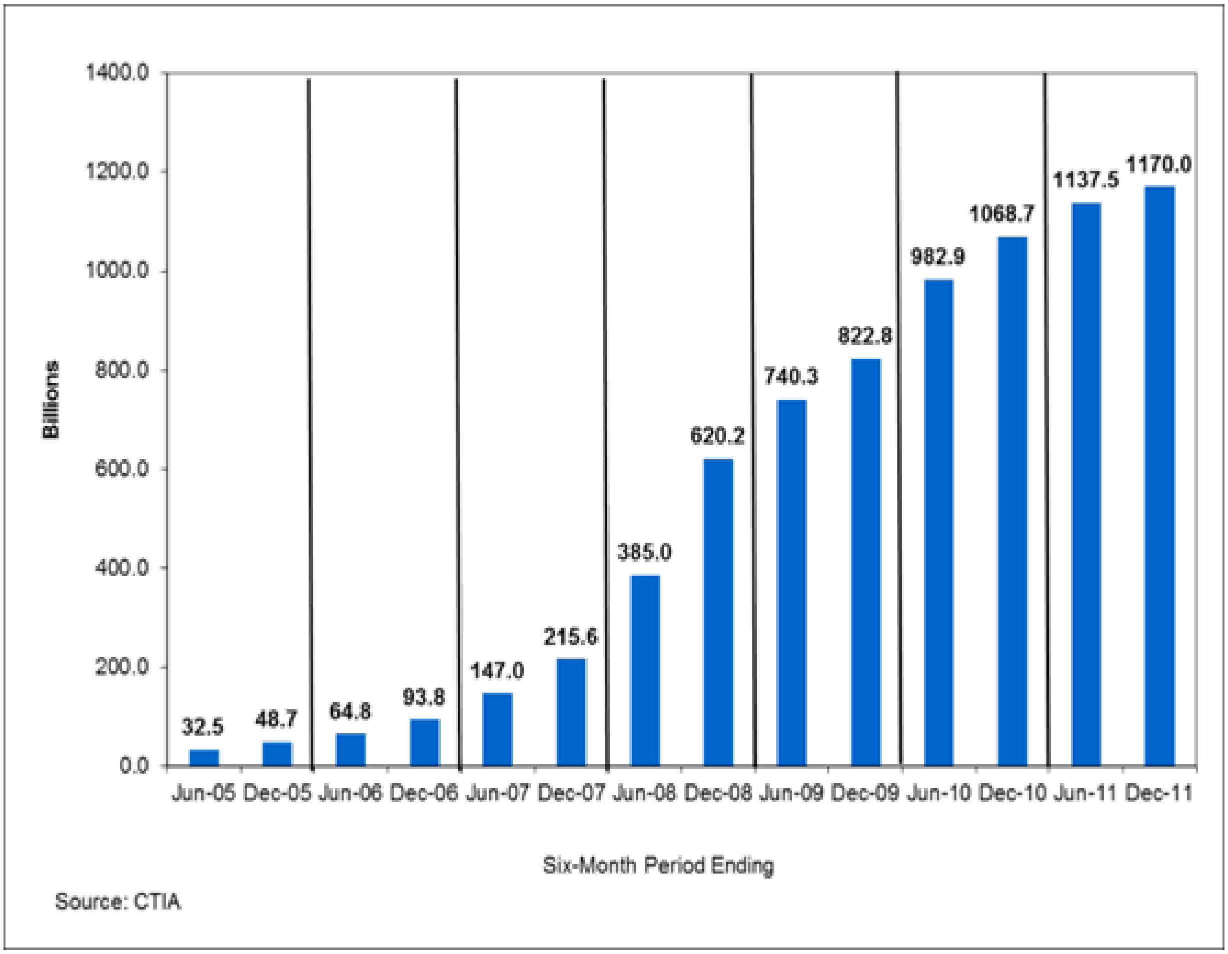
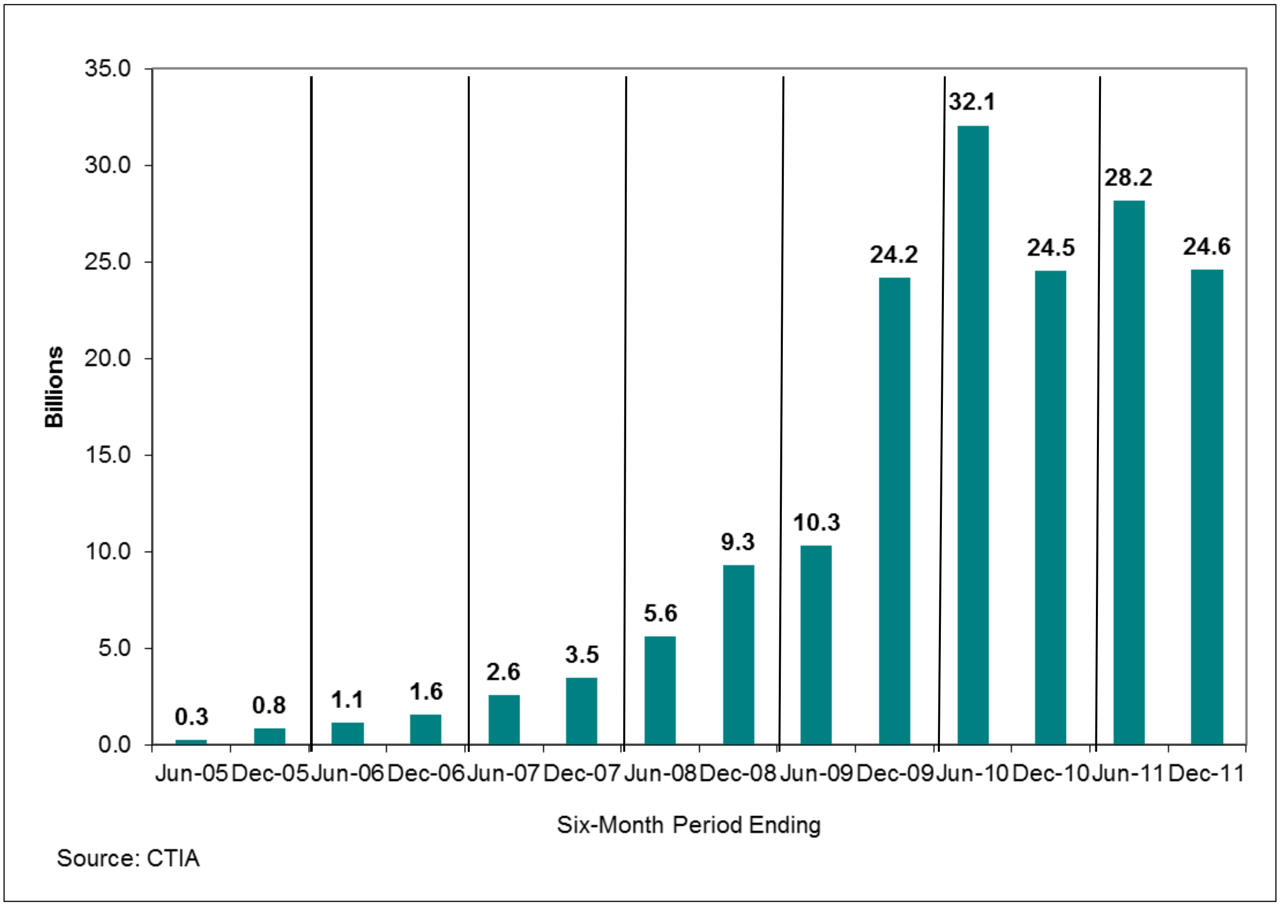


Chart 23
Six-Month MMS Traffic Volumes, 2005-2011 (In billions)[811]

[811] *CTIA Year-End 2011 Wireless Indices Report*, at 227.



263. The average number of text and MMS messages per subscriber per month can be estimated by dividing the total number of messages by the average number of mobile wireless connections, while recognizing that not all mobile wireless customers use messaging services. As shown in Table 36, the average mobile wireless customers sent 594 text messages and 12.5 MMS messages per month during the second half of 2011. While the growth rates for SMS and MMS usage per customer show steady or declining trends, the usage of other data services, discussed below, has steadily increased during the same period. With consumers substituting among applications that are categorized under different data services, a comprehensive picture of data usage currently requires aggregation of the various measures of mobile messaging and mobile data. For instance, the Apple iPhone's iMessage service routes messages (to other iOS5 devices) through the customer's mobile broadband data service instead of through an SMS or MMS service. The messaging traffic of a customer who substitutes traditional messaging with iMessage would be accounted for under mobile data instead of under text and MMS messages.

Table 36
Average Text and MMS Messages Per Subscriber Per Month, 2005-2011[812]

[812] *CTIA's Wireless Industry Indices, Year-End 2011 Results*, released May 2012. These calculations were derived from data on reported subscribers, six-month text/SMS message volumes, and six-month MMS message volumes. (continued….)

Six-Month Period Ending	Average Text Messages Per User Per Month	Average MMS Messages Per User Per Month
Jun-05	29	0.3
Dec-05	40	0.7
Jun-06	51	0.9
Dec-06	69	1.2
Jun-07	103	1.8
Dec-07	144	2.3
Jun-08	248	3.6
Dec-08	388	5.8
Jun-09	451	6.3
Dec-09	488	14.4
Jun-10	566	18.5
Dec-10	598	13.7
Jun-11	606	15.0
Dec-11	594	12.5

3. Mobile Data Traffic (Non-Messaging)

264. Mobile data traffic is growing significantly,[813] reflecting the continuing evolution of mobile wireless services from voice-centric mobile services to data-centric mobile services. Data traffic is increasing with: (1) the growth in mobile device connections, including multiple connections held by the same subscriber; (2) the growing use of data-only mobile devices, such as laptop cards, e-readers, and tablets; (3) the increased popularity of higher-bandwidth mobile applications; and (4) the deployment of faster networks.[814] It is estimated that U.S. mobile data traffic increased 62 percent from 2011 to 2012, and that mobile data traffic in 2012 was approximately 73 times the volume of U.S. mobile traffic in 2007.[815] The average U.S. mobile connection consumed an estimated 568 MB of data per month in 2012, and an estimated 11 percent of U.S. mobile users consumed over 2 GB of data per month.[816] The largest amount of mobile data traffic during the second half of 2011 was generated by streaming video (42 percent), followed by file sharing (26 percent), web browsing (24 percent), VoIP and IM applications (five percent), and other applications (three percent).[817] It is projected that the volume of mobile video traffic in 2017 will be nine times the volume in 2012.[818]

(Continued from previous page)
CTIA did not revise its number of reported subscribers for 2009-2011, when it issued its revised estimated subscribers during the second half of 2012.

[813] *See Fourteenth Report*, 25 FCC Rcd at 11526-27 ¶ 181; *Torch Passes from Voice to Data*.

[814] Simon Flannery, *et al*., *3Q Trend Tracker – Signs of Life for Telecom*, Morgan Stanley, Morgan Stanley Research – North America, Dec. 4, 2009, at 59. *See* Section VII.B.2, Mobile Applications, *infra*. Cisco Visual Networking Index U.S. Mobile Data Traffic Forecast Update, February 2012.

[815] Cisco Visual Networking Index, http://www.cisco.com/en/US/netsol/ns827/networking_solutions_sub_solution.html.

[816] Cisco Visual Networking Index, http://www.cisco.com/en/US/netsol/ns827/networking_solutions_sub_solution.html.

[817] *Allot MobileTrends - Global Mobile Broadband Traffic Report*, H2/2011, at 5, 7.

[818] Cisco Visual Networking Index, http://www.cisco.com/en/US/netsol/ns827/networking_solutions_sub_solution.html.

Chart 24
U.S. Average Data Traffic per Device Type, Cisco, 2012[819]

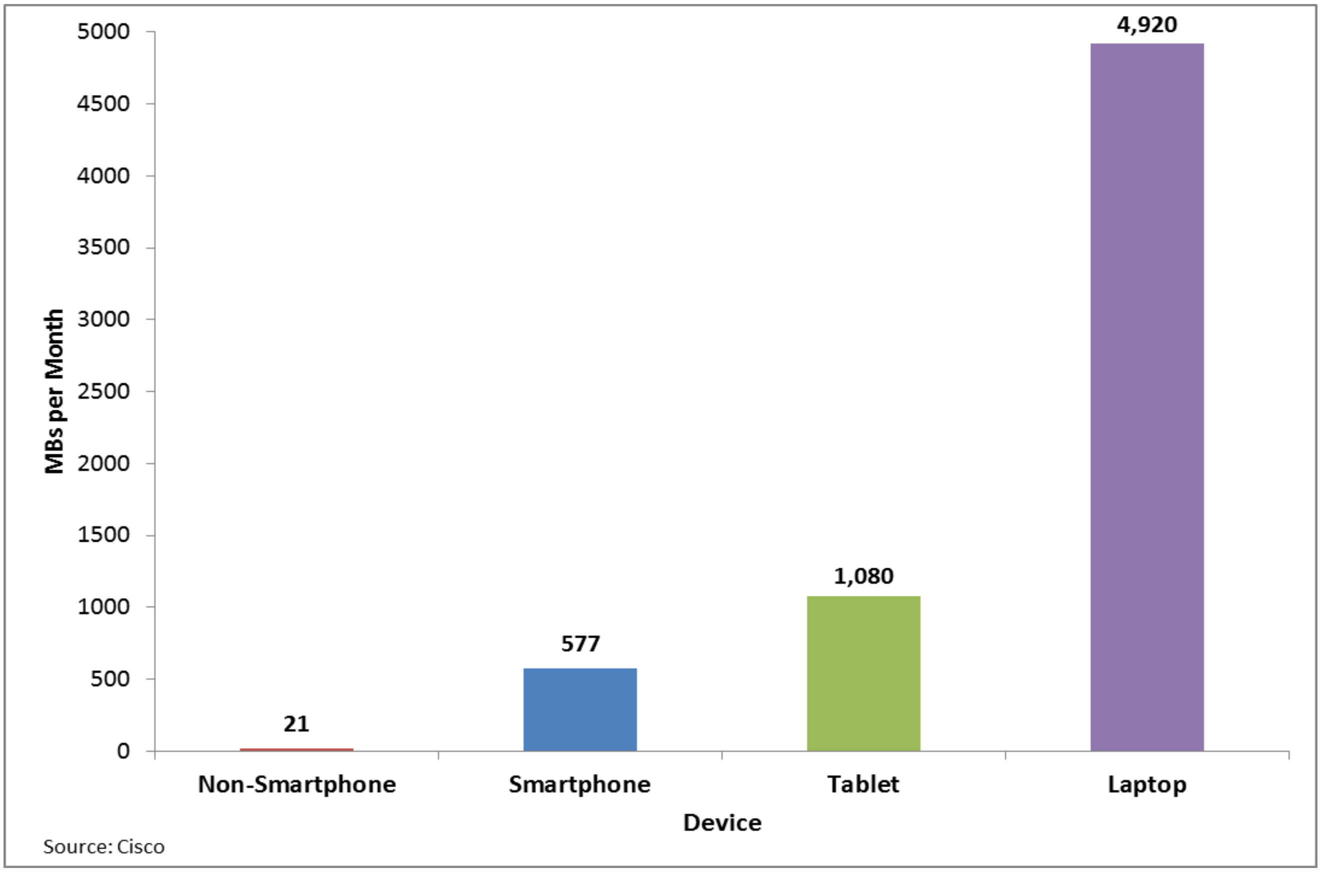


Chart 25
Average Monthly Data Consumption Per Device, CTIA, 2010-2011 [820]

[819] Cisco Visual Neworking Index (VNI) Global Mobile Data Traffic Forecast Update, United States Highlights, February 2013.

[820] *CTIA Year-End 2011 Wireless Indices Report*, at 233.

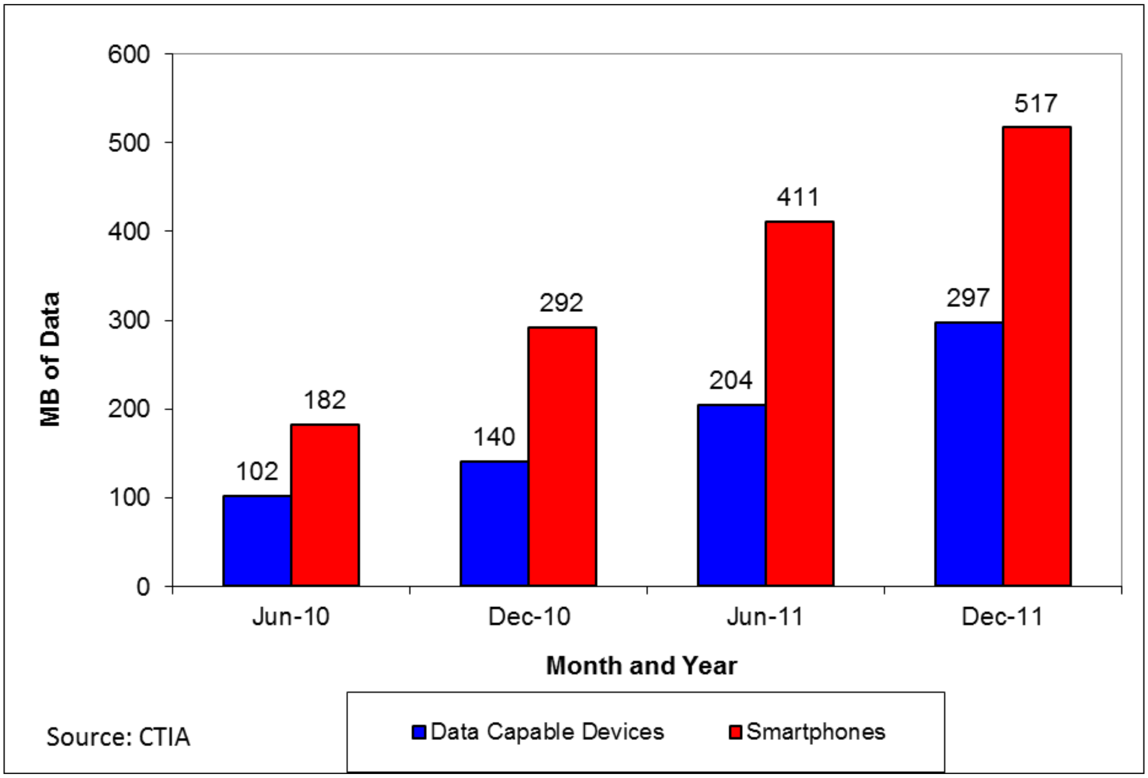


Chart 26
Average Monthly Data Consumption per User: Nationwide Providers, Validas, 2009-2011[821]

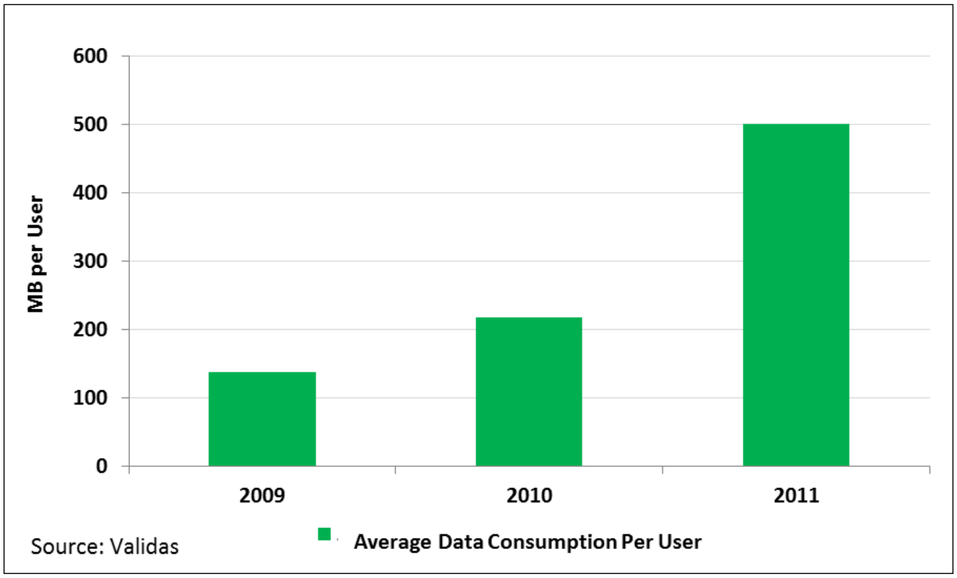


Chart 27
Average Monthly Data Consumption Per User, Validas, 2009-2011[822]

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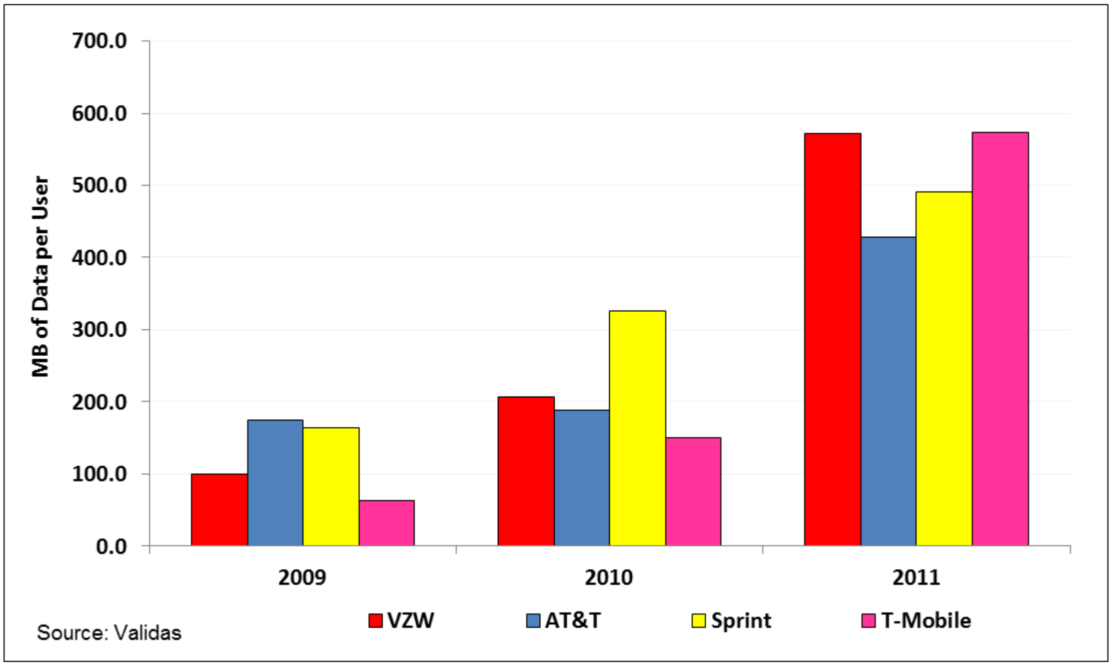
[821] Validas, *3 Year View of US Wireless Data Consumption: 2009-2011*, Prepared for the FCC by Validas. The Validas estimates are averages calculated from data from a sample of approximately 20,000 customer bills obtained from customers of the four nationwide providers.

[822] Validas, *3 Year View of US Wireless Data Consumption: 2009-2011*, Prepared for the FCC by Validas.



E. Pricing Levels, Changes, and Trends

1. Price Metrics

265. Variations in the non-price terms and features of mobile wireless service plans make it difficult to compare or aggregate the prices of mobile wireless service. Consequently, it is difficult to identify sources of information that track actual mobile wireless service prices in a comprehensive and consistent manner.[823] As documented in previous *Reports*, two different pricing indicators – the Wireless Telephone Services CPI and the per-minute price of voice service – show that mobile wireless prices have declined significantly since the launch of PCS service in the mid-1990s. In 2010 and 2011, the Wireless Telephone Services CPI declined for two consecutive years, while the per-minute price of voice service remained roughly stable in 2010 and then declined in 2011.[824]

266. *Wireless Telephone Services CPI*. The wireless telephone services' component of the CPI (Wireless Telephone Services CPI) is published by the U.S. Department of Labor's Bureau of Labor Statistics (BLS) on a national basis.[825] As shown in Table 37 below, from 2009 to 2010, the annual

[823] *See Fourth Report*, 14 FCC Rcd at 10164-10165.

[824] Only indicators of the price of mobile wireless *services* are discussed in this section. *See* Section VII.B.1, Mobile Wireless Handsets/Devices and Operating Systems, *infra*, for information on handset and device pricing.

[825] *See* Table 29**,** *infra*. The CPI is a measure of the average change over time in the prices paid by urban consumers for a fixed market basket of consumer goods and services. The basket of goods includes over 200 categories including items such as food and beverages, housing, apparel, transportation, medical care, recreation, education, and communications. The CPI allows consumers to compare the price of the basket of goods and services this month with the price of the same basket a month or a year ago. Starting in December 1997, the basket included a category for cellular/wireless telephone services. All CPI figures discussed above were taken from BLS databases found at http://www.bls.gov. The index used in this analysis, the CPI for All Urban Consumers (CPI-U), represents about 87 percent of the total U.S. population. *See* Bureau of Labor Statistics, *Consumer Price Index: Frequently Asked Questions*, http://www.bls.gov/cpi/cpifaq.htm (visited Nov. 12, 2010). The Cellular CPI includes charges from all telephone companies that supply "cellular telephone services," which are defined as "domestic personal consumer phone services where the telephone instrument is portable and it sends/receives signals for calls by wireless transmission." This measure does not include business calls, telephone equipment rentals, portable radios, (continued….)

Wireless Telephone Services CPI decreased by nearly three percent while the overall CPI increased by 1.6 percent and the Telephone Services CPI was unchanged. From 2010 to 2011, the annual Wireless Telephone Services CPI decreased by another 3.6 percent while the overall CPI increased by 3.2 percent and the Telephone Services CPI decreased by 1.1 percent. The Wireless Telephone Services CPI's back-to-back declines in 2010 and 2011 followed an unchanged Wireless Telephone Services CPI in 2009 and a series of much smaller declines in the period from 2002 to 2008. Since December 1997, the Wireless Telephone Services CPI has declined nearly 40 percent while the overall CPI has increased by 40 percent.

Table 37
Change in CPI, 1997-2011[826]

Year	CPI		Wireless Telephone Services CPI		Telephone Services CPI		Land-line Telephone Services CPI	
	Index Value	Annual Change	Index Value	Annual Change	Index Value	Annual Change	Index Value	Annual Change
Dec 1997	100		100		100		-	-
1998	101.6		95.1		100.7		-	-
1999	103.8	2.2%	84.9	-10.7%	100.1	-0.6%	-	-
2000	107.3	3.4%	76.0	-10.5%	98.5	-1.6%	-	-
2001	110.3	2.8%	68.1	-10.4%	99.3	0.8%	-	-
2002	112.1	1.6%	67.4	-1.0%	99.7	0.4%	-	-
2003	114.6	2.3%	66.8	-0.9%	98.3	-1.4%	-	-
2004	117.7	2.7%	66.2	-0.9%	95.8	-2.5%	-	-
2005	121.7	3.4%	65.0	-1.8%	94.9	-0.9%	-	-
2006	125.6	3.2%	64.6	-0.6%	95.8	0.9%	-	-
2007	129.2	2.8%	64.4	-0.3%	98.2	2.6%	-	-
2008	134.1	3.8%	64.2	-0.2%	100.5	2.2%	-	-
2009	133.7	-0.4%	64.3	0.0%	102.4	1.9%	-	-
2010	135.9	1.6%	62.4	-2.9%	102.4	0.0%	101.6	-
2011	140.1	3.2%	60.1	-3.6%	101.2	-1.1%	103.3	1.7%
1997 to 2011		**40.1%**		**-39.9%**		**1.2%**		

267. *Voice Revenue per Minute*. In addition to the Wireless Telephone Services CPI, Voice Revenue per Minute (RPM) offers a proxy for mobile voice prices.[827] Voice RPM is calculated by dividing an estimate of average monthly revenue per subscriber (often referred to as average revenue per unit, or "ARPU") for voice services by average monthly minutes of use (MOU) per subscriber for the

(Continued from previous page)
and pagers. *Id*. While the CPI-U is urban-oriented, it does include expenditure patterns of some of the rural population. *See Fourteenth Report*, 25 FCC Rcd at 11529, n. 561. Information submitted by companies for the CPI is provided on a voluntary basis. *Id*.

[826] Bureau of Labor Statistics. All CPI figures were taken from BLS databases found on the BLS Internet site available at http://www.bls.gov. Beginning in January 2010, the CPIs for local telephone service and long-distance telephone service were discontinued and replaced by a new CPI for land-line telephone services.

[827] *See US Wireless Matrix 1Q07*, at 52.

equivalent period, obtaining an estimate of revenue per minute.[828] Using estimates of industry-wide voice ARPU[829] and MOUs from CTIA, we estimate that Voice RPM in December of 2010 and 2011, rounded to the nearest cent, remained at $0.05 for the fourth and fifth straight years, while the unrounded estimate of Voice RPM increased approximately one percent in December of 2010 from its value in the previous year, and then decreased about 5 percent in December of 2011 (see Table 30). Voice RPM has declined over the past 18 years, from more than $0.40 to the current $0.05, with the rate of decline decreasing as Voice RPM has reached the low single digits.

Table 38
Average Voice Revenue Per Minute, 1993-2011[830]

Year	Average Local Monthly Bill	MOU Per Subscriber Per Month[831]	Blended Average RPM[832]	Annual Percentage Change in Blended Average RPM	Data Revenue as Percent of Total Service Revenues	Average Local Monthly Bill (ex. Data Revenues)	Average Voice RPM[833]	Annual Percentage Change in Voice RPM
1993	$61.49	140	$0.44		n/a	$61.49	$0.439	
1994	$56.21	119	$0.47	8%	n/a	$56.21	$0.472	8%
1995	$51.00	119	$0.43	-9%	n/a	$51.00	$0.429	-9%
1996	$47.70	125	$0.38	-11%	n/a	$47.70	$0.382	-11%
1997	$42.78	117	$0.37	-4%	n/a	$42.78	$0.366	-4%
1998	$39.43	136	$0.29	-21%	n/a	$39.43	$0.290	-21%
1999	$41.24	185	$0.22	-23%	0.2%	$41.16	$0.222	-23%
2000	$45.27	255	$0.18	-20%	0.4%	$45.09	$0.177	-21%
2001	$47.37	380	$0.12	-30%	0.9%	$46.94	$0.124	-30%
2002	$48.40	427	$0.11	-9%	1.2%	$47.82	$0.112	-9%
2003	$49.91	507	$0.10	-13%	2.5%	$48.66	$0.096	-14%
2004	$50.64	584	$0.09	-12%	4.8%	$48.21	$0.083	-14%
2005	$49.98	708	$0.07	-19%	8.3%	$45.83	$0.065	-22%
2006	$50.56	714	$0.07	0%	13.5%	$43.73	$0.061	-5%
2007	$49.79	769	$0.06	-9%	17.9%	$40.88	$0.053	-13%
2008	$50.07	708	$0.07	9%	23.3%	$38.40	$0.054	2%
2009	$48.16	696	$0.07	-2%	28.7%	$34.34	$0.049	-9%
2010	$47.21	647	$0.07	5%	31.4%	$32.39	$0.050	1%
2011	$47.00	615	$0.08	5%	38.0%	$29.14	$0.047	-5%

[828] To generate Voice RPM, we subtracted wireless data revenues, derived from CTIA's survey, from ALMB (we assumed this was the same percentage of wireless data revenues in CTIA's measure of total service revenues), then we divided that number by CTIA's average MOUs per month. *See also Twelfth Report*, 23 FCC Rcd at 2323-24 ¶ 200. The average monthly minutes of use figure reflects voice minutes *used* and captured as network traffic, rather than minutes *paid for* as part of a monthly service package.

[829] Note that this version of ARPU is CTIA's "Average Local Monthly Bill" ("ALMB"), which does not include toll or roaming revenues where they are not priced into a calling plan.

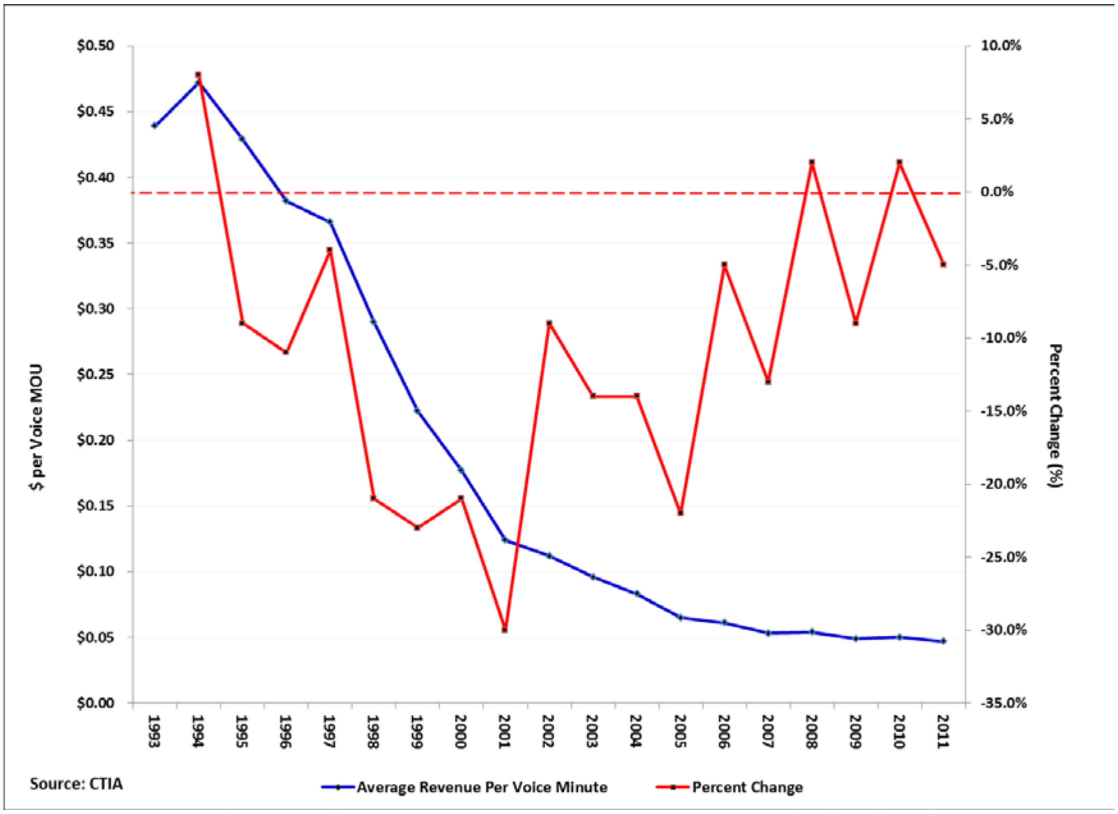
[830] *CTIA Year-End 2011 Wireless Indices Report*, at 199, 214. For purposes of this presentation in this table, RPM is rounded to two decimal places, but RPM change is based on absolute RPM.

[831] *See* Table 87, *CTIA Year-End 2011 Wireless Indices Report*, at 214.

[832] Blended Average Revenue per Minute = (Average Local Monthly Bill)/(MOU per Subscriber per Month).

[833] Average Voice Revenue per Minute = (Average Local Monthly Bill ex. Data Revenues)/(MOU per Subscriber per Month).

Chart 28
Mobile Wireless Voice Revenue per Minute, 1993-2011



268. The above voice RPM estimates are calculated with MOU data that include non-voice-oriented and some non-voice capable devices, which can cause MOU per reported subscriber per month to be underestimated and voice RPM to be overestimated.[834] Since the second half of 2008, the CTIA survey has requested data on the number of laptops, netbooks and wireless broadband modems.[835] As shown in Table 39, when these CTIA estimates of the number of laptops, netbooks and wireless broadband modems are excluded, the adjusted subscriber estimates result in higher estimates of MOU per subscriber per month, and hence lower voice RPM estimates. With the revised estimates, voice RPM still increased by one percent in December of 2010, but it declined by seven percent in December of 2011. The revised estimates of average monthly MOUs also yield an 11 percent decrease in voice RPM in December of 2009, as compared with a nine percent decrease with the unrevised estimates. These revised estimates still understate average monthly MOUs per subscriber and overstate voice RPM to some degree because the adjusted subscriber data continue to include in the denominator of the MOU calculation the number of "other non-voice-oriented devices" for which CTIA does not collect data.[836]

Table 39

[834] *CTIA Year-End 2011 Wireless Indices Report*, at 217-218. MOU per reported subscriber would be underestimated because the metric is calculated by dividing total MOU by average subscribers.

[835] *CTIA Year-End 2011 Wireless Indices Report*, at 218.

[836] Quotation from *CTIA Year-End 2011 Wireless Indices Report*, at 218.

Average Revenue Per Minute Excluding Non-Voice Devices, 2008-2011[837]

Year	Average Local Monthly Bill	MOU Per Subscriber Per Month	Blended Average RPM	Annual Percentage Change in Blended Average RPM	Data Revenue as Percent of Total Service Revenues	Average Local Monthly Bill (ex. Data Revenues)	Average Voice RPM	Annual Percentage Change in Voice RPM
2008	$50.07	724	$0.07		23.3%	$38.40	$0.053	
2009	$48.16	729	$0.07	-4%	28.7%	$34.34	$0.047	-11%
2010	$47.21	679	$0.07	5%	31.4%	$32.39	$0.048	1%
2011	$47.00	658	$0.07	3%	38.0%	$29.14	$0.044	-7%

269. *Revenue per Text Message*. In previous *Reports*, we derived a proxy for the pricing of text messages based on CTIA data by dividing an estimate of text messaging revenues by an estimate of the number of text messages sent during a specified period.[838] The results showed that the average price for text messages steadily declined from between three and four cents per message in 2005 to approximately one cent per message in 2008. In 2009, however, the industry stopped reporting a breakout of text messaging revenues from overall wireless data service revenues. As a consequence, it is no longer possible to calculate unit prices for text messaging based on industry data collected by CTIA, and therefore we discontinue reporting this particular pricing indicator in this *Report*.

270. Although we are no longer able to derive an estimate of average revenue per text message based on CTIA data, an estimate based on Nielsen data suggests that the unit price for text messages has continued to fall since 2008. Using Nielsen Customer Value Metrics, Recon Analytics estimates that the effective price of a mobile text message has declined from 1.4 cents to 0.9 cents, or by about 33 percent, from the fourth quarter of 2008 to the fourth quarter of 2010.[839] Recon Analytics attributes the decline in the unit price of text messages to consumers taking advantage of messaging bundles, and notes that the largest decline in the effective price per message occurred between 2005 and 2008, when large text messaging bundles were introduced.[840]

Table 40

[837] CTIA. (This CTIA calculation uses Reported Subscribers which were not revised in the second half of 2012 when CTIA revised estimated subscribers for 2009-2011.)

[838] *See Fourteenth Report*, 25 FCC Rcd at 11532 ¶¶ 191-92.

[839] Roger Entner, *What is the Price of a Megabyte of Wireless Data?*, FIERCEWIRELESS, Apr. 13, 2011. http://www.fiercewireless.com/story/entner-what-price-megabyte-wireless-data/2011-04-13 (visited Oct. 16, 2012)

[840] Roger Entner, *What is the Price of a Megabyte of Wireless Data?*, FIERCEWIRELESS, Apr. 13, 2011. http://www.fiercewireless.com/story/entner-what-price-megabyte-wireless-data/2011-04-13 (visited Oct. 16, 2012)

Average Revenue Per Text Message, 2005-2008[841]

Year	Text Traffic Volume	Average Messages Per User Per Year	Text Messaging Revenues	Average Revenue Per Text Message
2005	81,208,225,767	476	$2,991,666,181	$0.037
2006	158,648,546,798	779	$5,672,984,205	$0.036
2007	362,549,531,172	1,572	$8,976,574,961	$0.025
2008	1,005,144,143,136	4,183	$11,355,095,991	$0.011

271. *Price Metrics for Broadband Data*. It is not possible to calculate unit prices for non-messaging mobile data services (price per MB) using CTIA data because CTIA's estimate of wireless data revenues includes revenues from messaging services. However, based on data from Nielsen Customer Value Metrics, Recon Analytics estimates that the effective price per megabyte of data declined from $0.47 per megabyte in the third quarter of 2008 to about $0.05 per megabyte in the fourth quarter of 2010, which is roughly an 89 percent decrease.[842] Likewise, as shown in Chart 29, Validas estimates that the price per megabyte of data declined from about $0.11 in 2009 to $0.06 in 2010, and to $0.03 in 2011.

Chart 29
Average Price per Megabyte: Nationwide Providers, Validas, 2009-2011[843]

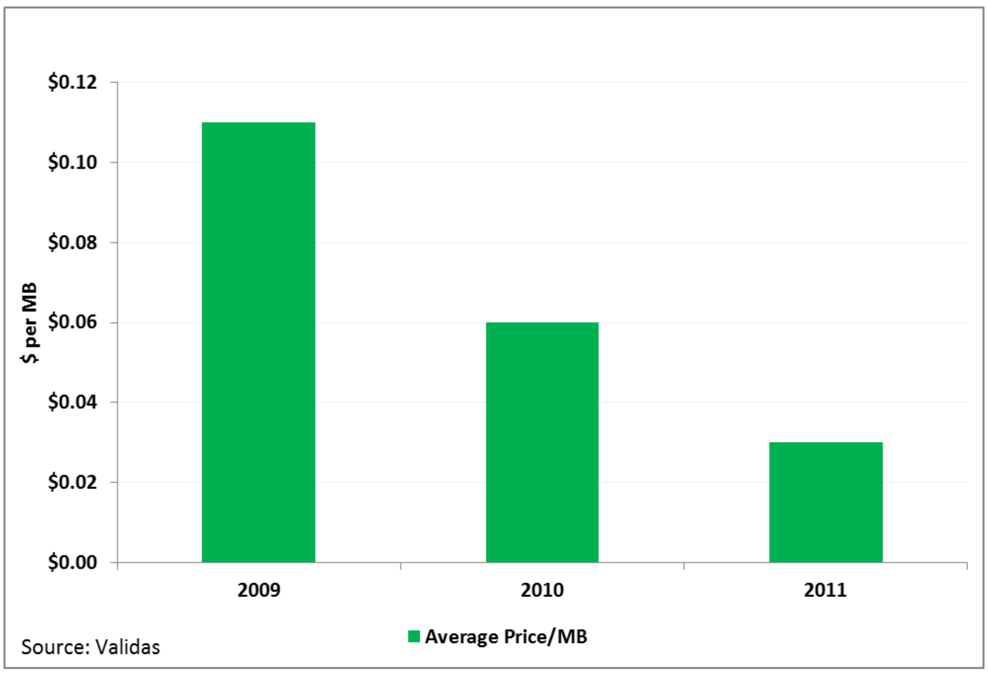


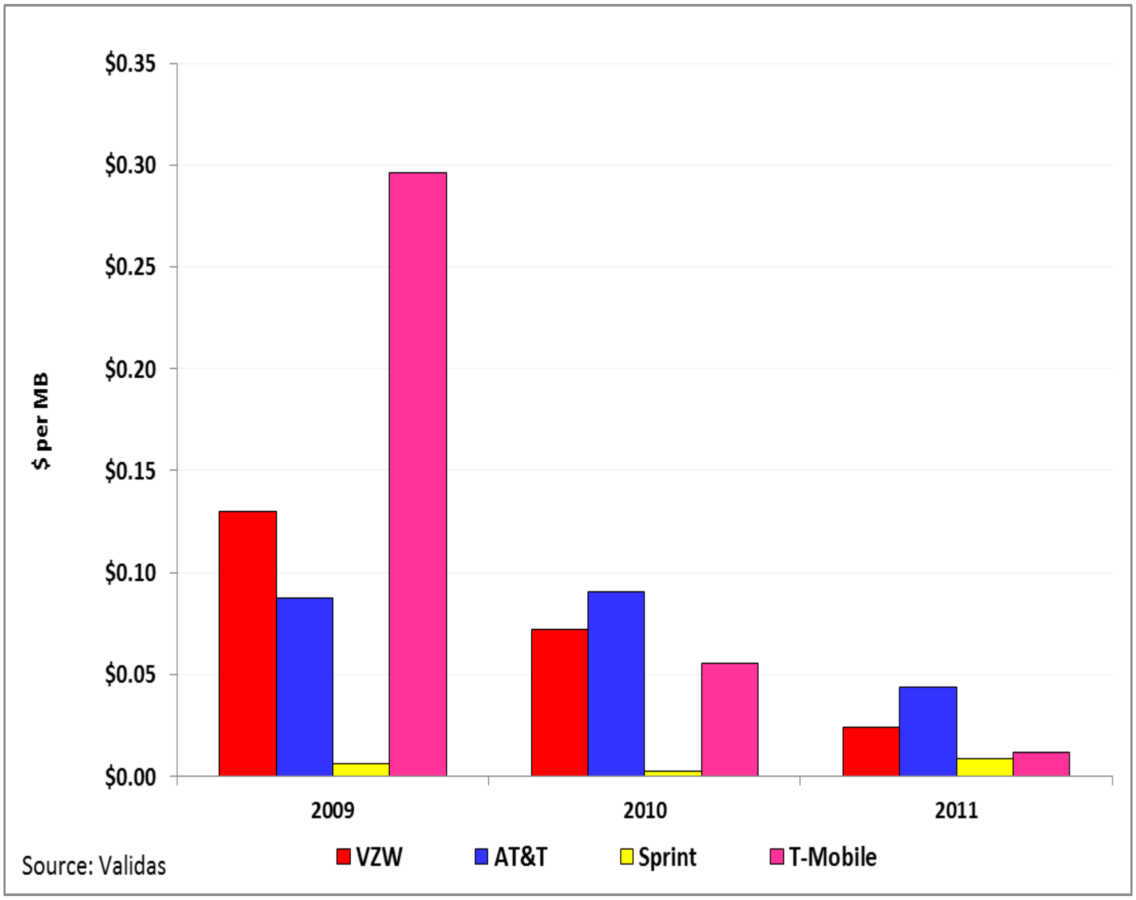
Chart 30

[841] *CTIA Year-End 2009 Wireless Indices Report*, at 115, 198-200; Commission estimates. (A CTIA calculation uses Reported Subscribers which were not revised in the second half of 2012 when CTIA revised estimated subscribers for 2009-2011.)

[842] Roger Entner, *What is the Price of a Megabyte of Wireless Data?*, FIERCEWIRELESS, Apr. 13, 2011. http://www.fiercewireless.com/story/entner-what-price-megabyte-wireless-data/2011-04-13 (visited Oct. 16, 2012)

[843] Validas, *3 Year View of US Wireless Data Consumption: 2009-2011*, Prepared for the FCC by Validas.

Average Price Per Megabyte, Validas, 2009-2011[844]



2. Wholesale Pricing

272. Resellers and MVNOs purchase minutes at wholesale prices from facilities-based mobile service providers. Contractual agreements, and therefore wholesale prices, between MVNOs and resellers depend upon the rates that each MVNO or reseller negotiates with facilities-based providers. These negotiated rates are generally not publicly available, so it is not possible to track wholesale pricing in the mobile wireless sector in a comprehensive manner. Many MVNOs that purchase capacity wholesale operate on prepaid basis. For instance, ARPU data show that the average monthly prepaid ARPU of the nationwide providers was $3 higher than the monthly ARPU of Tracfone, an MVNO that uses the networks of the four nationwide providers.[845]

3. Intercarrier Roaming Rates and Revenue

273. Intercarrier roaming rates are set by contractual agreements that are confidential, and particular rates vary across agreements depending on the terms negotiated by service providers. However, CTIA data on roaming revenues and roaming minutes of use (MOUs) can be used to derive a metric for average voice roaming revenue per minute. CTIA reports "outcollect" roaming revenues, which are the revenues generated by roamers inside the providers' home coverage areas.[846] We note that

[844] Validas, *3 Year View of US Wireless Data Consumption: 2009-2011*, Prepared for the FCC by Validas.

[845] See Chart 34, which indicates that the average monthly prepaid ARPU is near $20 in the first half of 2012 and the monthly prepaid ARPU of Tracfone is $16 during the same period. Removing MetroPCS and Leap from the average yields an average monthly prepaid ARPU near $19 in the first half of 2012.

[846]*CTIA Year-End 2011 Wireless Indices Report*, at 101.

CTIA's roaming revenue estimates include revenue from both voice and data roaming services, while the roaming MOU data include traffic from only voice roaming services. As shown in Table 41 below, the contribution of roaming revenues to total service revenues has declined over time, as has the contribution of voice roaming traffic to total voice traffic.

274. We derive an average roaming RPM by dividing reported annual roaming revenues by reported annual roaming MOUs. This aggregate proxy for intercarrier roaming rates is likely to somewhat overstate average revenue per minute of voice roaming service because the numerator includes revenue from both voice and data services, while the denominator includes only voice roaming MOUs. Without separate data for voice and data roaming revenue and traffic, we do not know the degree to which this estimate of average voice roaming RPM is overstated.

275. As shown in Table 41 below, average voice roaming RPM has declined from just over 30 cents per minute in 1999 to less than three cents per minute in 2010 and 2011, and has been roughly stable for the past seven years. Total annual intercarrier roaming revenues and voice minutes have generally declined as a percentage of total service revenues and total minutes, respectively, over the past ten years, except in 2011. In 2011, total annual roaming revenue rose to $3.31 billion from $3.03 billion in 2010, and total roaming minutes rose from 112.0 billion in 2010 to 138.4 billion in 2011. The growth over the last decade of networks with near-nationwide coverage has been accompanied by service plans with larger geographic calling areas, which may have contributed to the general decrease in roaming over the last decade.

Table 41
Roaming Revenues and Rates, 1999-2011[847]

	Outcollect Roaming Revenues (in $000s)	Percent Change	Percent of Total Service Revenues	Voice Roaming MOUs	Percent of Total MOUs	Average Roaming Revenue Per Minute (Blended)
1999	$4,085,417	16.71%	10.2%	13,038,555,635	8.8%	$0.31
2000	$3,882,981	-4.96%	7.4%	20,852,266,390	8.1%	$0.19
2001	$3,752,826	-3.35%	5.7%	27,811,907,410	6.1%	$0.13
2002	$3,895,511	3.80%	5.1%	43,846,470,833	7.1%	$0.09
2003	$3,766,267	-3.32%	4.3%	56,828,973,359	6.8%	$0.07
2004	$4,210,330	11.79%	4.1%	71,440,711,110	6.5%	$0.06
2005	$3,786,332	-10.07%	3.3%	115,008,338,841	7.7%	$0.03
2006	$3,494,294	-7.71%	2.8%	91,991,570,460	5.1%	$0.04
2007	$3,742,015	7.09%	2.7%	107,615,715,912	5.1%	$0.03
2008	$3,739,274	-0.07%	2.5%	121,438,208,469	5.5%	$0.03
2009	$3,061,344	-18.1%	2.3%	121,092,013,905	5.3%	$0.025
2010	$3,026,009	-1.15%	1.9%	111,965,766,175	5.0%	$0.027
2011	$3,314,895	9.55%	1.9%	138,389,805,762	6.0%	$0.024

F. Revenue and ARPU

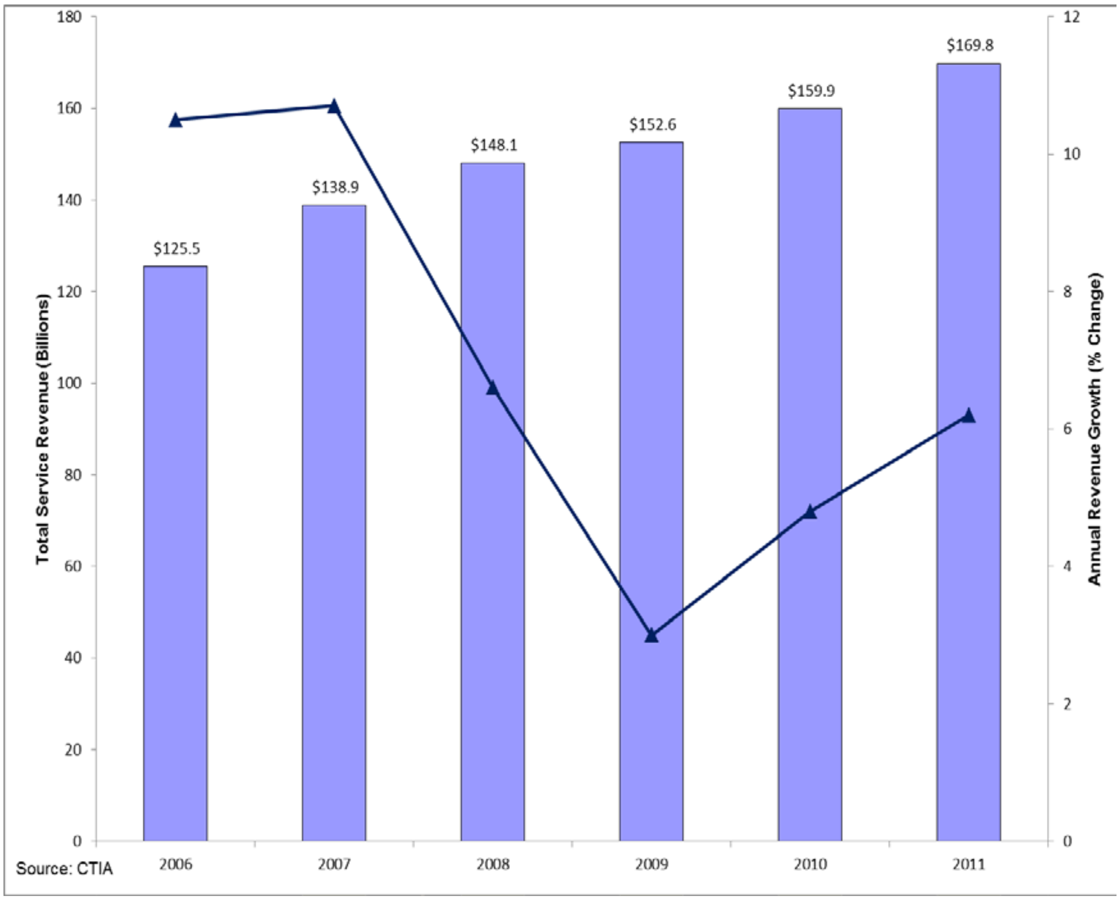
276. Average monthly revenue per user (ARPU) metrics are financial metrics derived by dividing a revenue figure by an estimate of the number of subscribers that generated that revenue. ARPU metrics are widely used by Wall Street analysts to evaluate and compare the performance of service providers. ARPU can be influenced by multiple factors including changes in the number of connections, changes in the quantity of services purchased, customers switching between services or adding additional

[847] *CTIA Year-End 2011 Wireless Indices Report* at 104.

services, and changes in the prices of the various services. A given change in ARPU could be caused by various individual or combined changes in the underlying factors (prices, quantities, and number of connections) that determine ARPU. Hence, changes in revenue and ARPU are not necessarily reliable indicators of changes in prices, nor are revenue or ARPU indicators of the degree of competition or market power.

277. While both total service revenues and wireless data revenues have been rising continuously in recent years, voice revenues began to decline in 2009 and continued to decline in 2010 and 2011 (Chart 31, Chart 32).[848] In addition, while total service revenues have been rising, blended ARPU has declined continuously since 2008 (Chart 32, Chart 33), with voice ARPU decreasing by more than data ARPU has increased since 2006.[849]

Chart 31
Wireless Industry Service Revenues, 2006-2011 (In billions)[850]

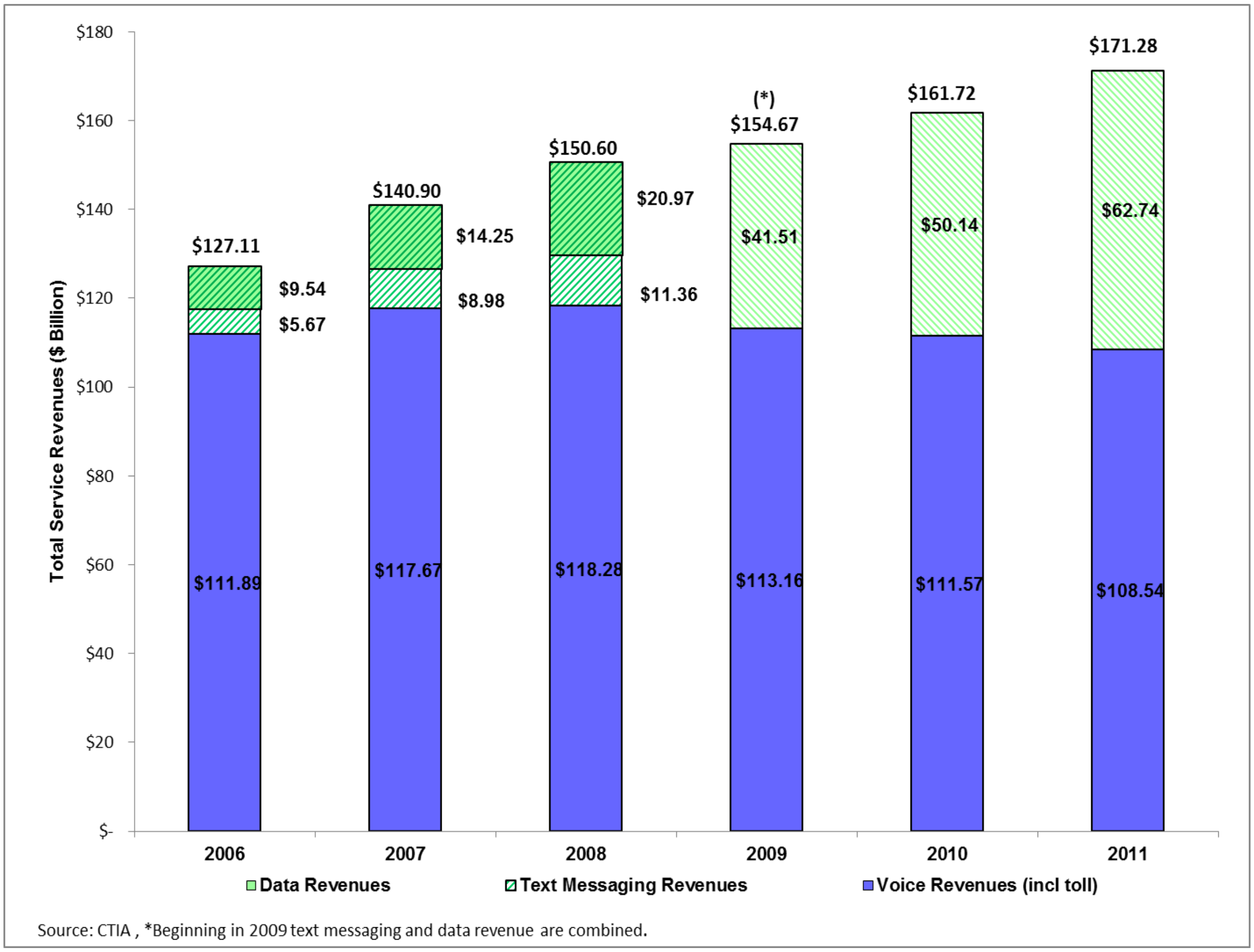


[848] We estimate voice revenues as the residual that remains after subtracting CTIA's estimate of wireless data revenues from its estimate of total service revenues.

[849] Estimates of blended ARPU, voice ARPU and data ARPU are derived by dividing the respective revenue figures by CTIA's estimates of the number of wireless connections. In 2009, CTIA discontinued the practice of reporting a breakout data series for text messaging service revenues. The estimates of both wireless data revenues and data ARPU therefore include text messaging service revenues as well as other mobile data service revenues, even though service providers transmit text messages using a special channel on their voice networks.

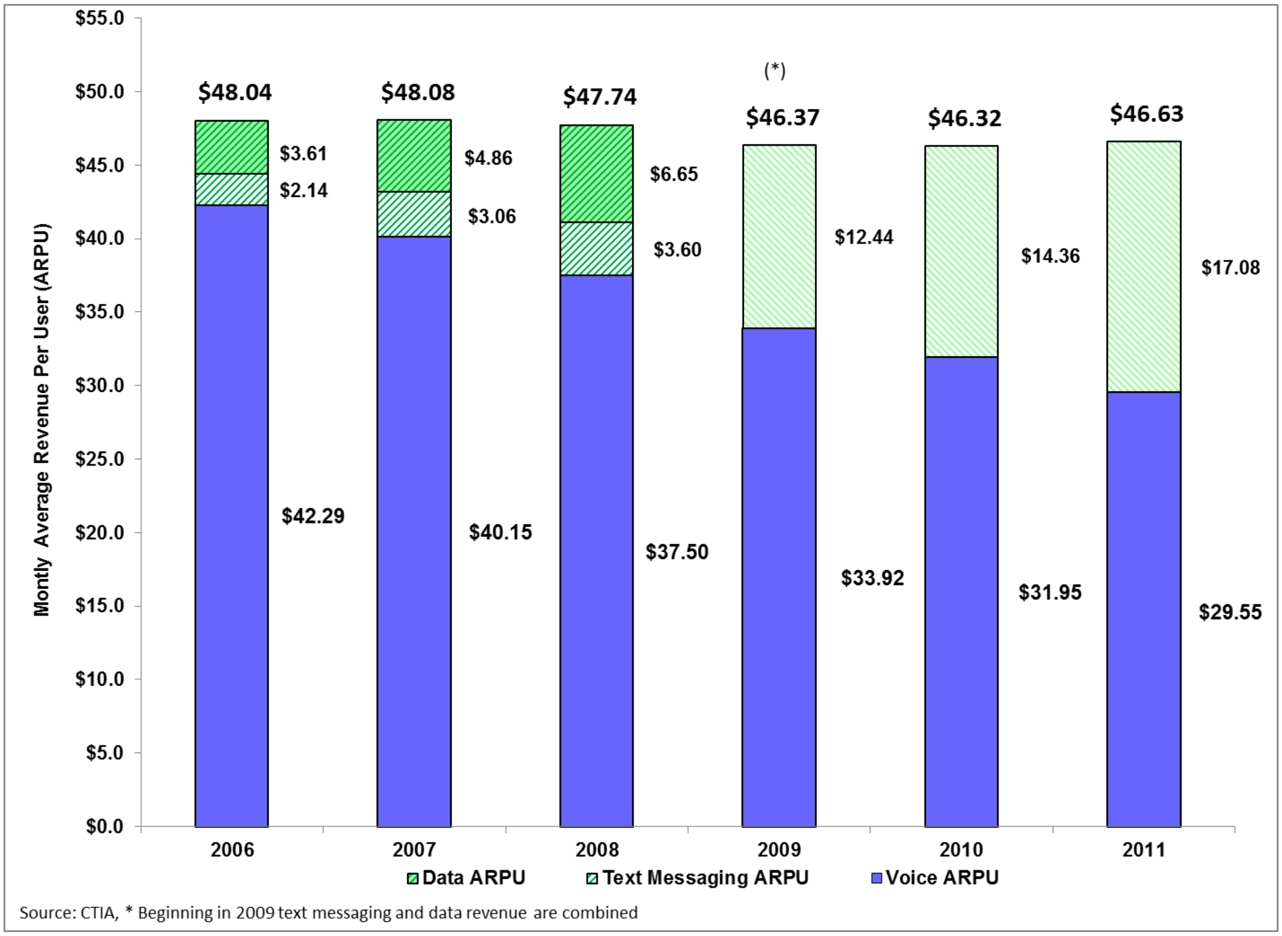
[850] *CTIA Year-End 2011 Wireless Indices Report.*

Chart 32
Total Mobile Wireless Industry Revenues, 2006-2011 (In billions)[851]



[851] *CTIA Year-End 2011 Wireless Indices Report.* In 2009, CTIA discontinued the practice of reporting a breakout data series for text messaging service revenues. The estimates of both wireless data revenues and data ARPU therefore include text messaging service revenues as well as other mobile data service revenues.

Chart 33
Monthly ARPU by Type of Service, 2006-2011[852]



278. The trends of declining voice ARPU and rising data ARPU may be the result of several factors. As discussed in the preceding section, the unit prices for voice, text messaging and wireless data services have all declined since 2006. Consumers generally respond to lower prices by increasing the quantity of services they purchase. The net effect of a decrease in price on revenue depends on the size of the quantity increase relative to the price decrease.[853] Changes in ARPU are not necessarily reliable indicators of pricing changes, because a decrease in the price of wireless services can be accompanied by a decrease or increase in ARPU depending on how consumer demand changes in response to the price change and how the other factors changed.

279. Substitution from voice service to messaging and data services may have contributed to the decrease in voice revenue and ARPU and the increase in data revenue and ARPU. Many consumers may consider voice calls and various messaging services to be close substitutes in certain circumstances.

[852] *CTIA Year-End 2011 Wireless Indices Report*; Commission analysis. Total and voice ARPU include roaming and toll revenues. The ARPU calculations are based on CTIA's total estimated subscriber connection numbers, as revised in the second half of 2012. *See CTIA Year-End 2011 Wireless Indices Report.*

[853] This effect is referred to by economists as the *price elasticity* of demand. If there is an increase in total revenue when a decrease in price results in a proportionately larger increase in quantity demanded, then demand is considered to be price elastic. Conversely, if there is a decrease in total revenues when there is a decrease in price then demand is considered to be price inelastic.

For instance, since 2005, the price per text message has fallen sharply due to consumers purchasing messaging bundles, while the per-minute price of voice service has declined at a relatively slow rate.[854] As a result, text messaging has become relatively less expensive compared to talking on a mobile phone, potentially creating an incentive for mobile subscribers to substitute text messaging for voice calls.[855]

280. The existence of Internet-based messaging services may also be encouraging consumers to substitute Internet applications for mobile voice calls and traditional text messaging. These Internet applications allow subscribers to use their data plans to send and receive messages over the internet without subscribing to their service provider's messaging bundles or incurring the per-message fees charged by service providers for pay-as-you-go text messaging services.[856] These include device-specific services like BlackBerry Messenger ("BBM") for Blackberry smartphone users, and a number of downloadable third-party applications such as GroupMe, TextPlus, WhatsApp, Kik and Pinger.[857] Analysts predict that these new services will cut into service providers' text messaging revenues and profits by encouraging subscribers to bypass their providers' text messaging offerings.[858] In combination with the recent declines in the price per megabyte of mobile data services, these texting services may be encouraging subscribers to substitute data services for mobile voice service.

281. Factors other than pricing changes and the substitution of messaging services for mobile voice calling may be contributing to the trends of declining voice ARPU and rising data revenue and ARPU. In particular, data revenue and data ARPU may, in part, be growing due to the growth of innovative smartphones and application stores that encourage subscribers to increase their use of data services.[859] The increased availability and popularity of new data-only mobile devices, such as laptop cards, e-readers, and tablets, likewise stimulates demand for wireless data services.

282. Average monthly ARPU for the postpaid and prepaid customers of the nationwide

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[854] *Twelfth Report*, 23 FCC Rcd at 2323-2324 ¶ 202 (noting that the average price per text message declined for the first time in 2006 after rising continuously since 2002); Roger Entner, *What is the Price of a Megabyte of Wireless Data?*, FIERCEWIRELESS, Apr. 13, 2011 http://www.fiercewireless.com/story/entner-what-price-megabyte-wireless-data/2011-04-13 (visited Oct. 16, 2012). As shown in Chart 20, CTIA estimates of minutes of use for voice calls have been declining annually since 2008. In contrast, it is estimated that the number of text messages that the average U.S. mobile subscriber sends or receives each month rose to approximately 600 in 2011, up from about 40 in 2005.

[855] *See* Thomas W. Hazlett, *The Federal Communication Commission's Excellent Mobile Competition Adventure*, Working Paper No. 11-46, Mercatus Center, George Mason University, Nov. 2011, at 4. See also Morgan Stanley: Big Debate '12 - Will Wireless ARPUs Start Declining? Dec 8, 2011 (stating, "Some of what would be voice minutes are being replaced by text messages in our view. However, substitution by alternative web-based communication (Facebook) or communication applications (WhatsApp) may pressure growth of text messaging as well.")

[856] Jenna Wortham, *Free Texts Pose Threat to Carriers*, NEW YORK TIMES, Oct. 9, 2011. http://www.nytimes.com/2011/10/10/technology/paying-to-text-is-becoming-passe-companies-fret.html?pagewanted=all (visited Oct. 16, 2012).

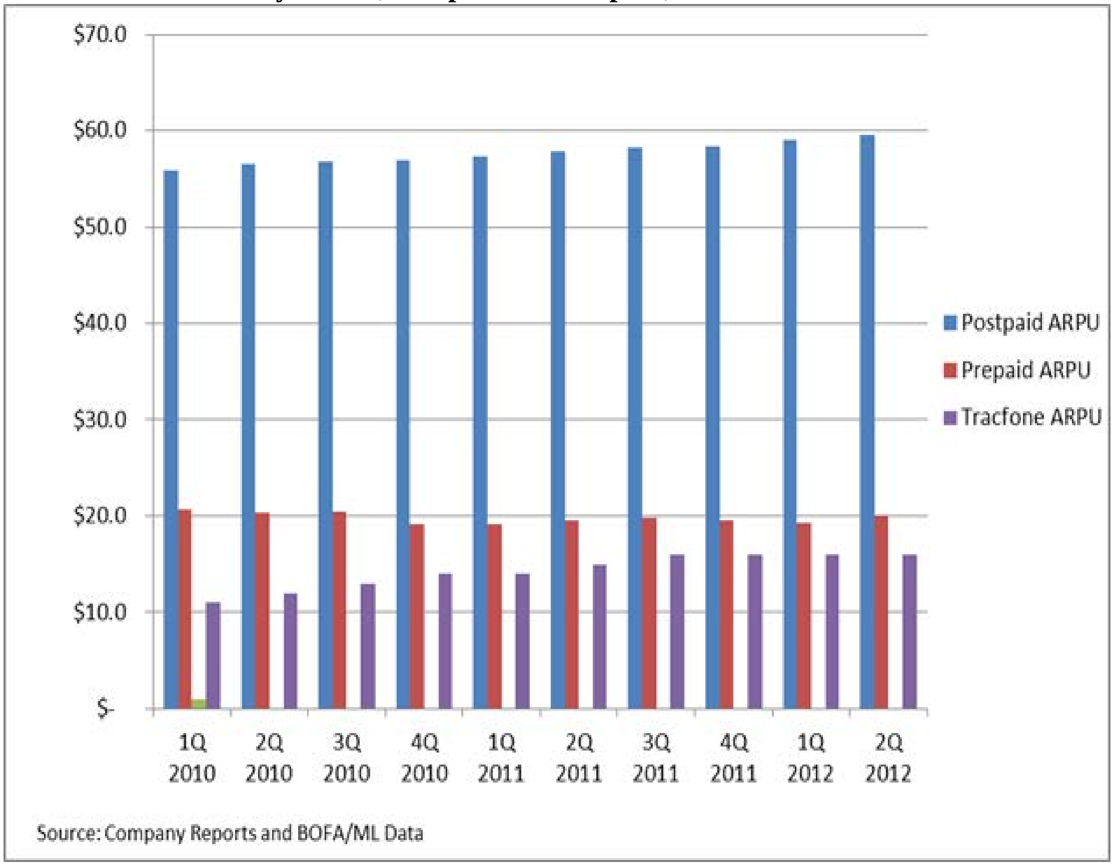
[857] Jenna Wortham, *Free Texts Pose Threat to Carriers*, NEW YORK TIMES, Oct. 9, 2011. http://www.nytimes.com/2011/10/10/technology/paying-to-text-is-becoming-passe-companies-fret.html?pagewanted=all (visited Oct. 16, 2012).

[858] Jenna Wortham, *Free Texts Pose Threat to Carriers*, NEW YORK TIMES, Oct. 9, 2011. http://www.nytimes.com/2011/10/10/technology/paying-to-text-is-becoming-passe-companies-fret.html?pagewanted=all (visited Oct. 16, 2012).

[859] Jenna Wortham, *Free Texts Pose Threat to Carriers*, NEW YORK TIMES, Oct. 9, 2011. http://www.nytimes.com/2011/10/10/technology/paying-to-text-is-becoming-passe-companies-fret.html?pagewanted=all (visited Oct. 16, 2012) (quoting a Verizon spokesperson as indicating that "the company views social messaging as being complementary to other features on the phone," and further that "from a business perspective, customers still need a data plan to connect to a device.").

providers, Leap, and MetroPCS are displayed in Chart 34. The chart also displays the monthly ARPU of Tracfone, which operates entirely on a prepaid basis. While the average monthly postpaid ARPU is near $60 in the first half of 2012, the average monthly prepaid ARPU is near $20. The monthly prepaid ARPU of Tracfone is $16 during the same period.

Chart 34
Monthly ARPU, Postpaid and Prepaid, 2010-2012[860]

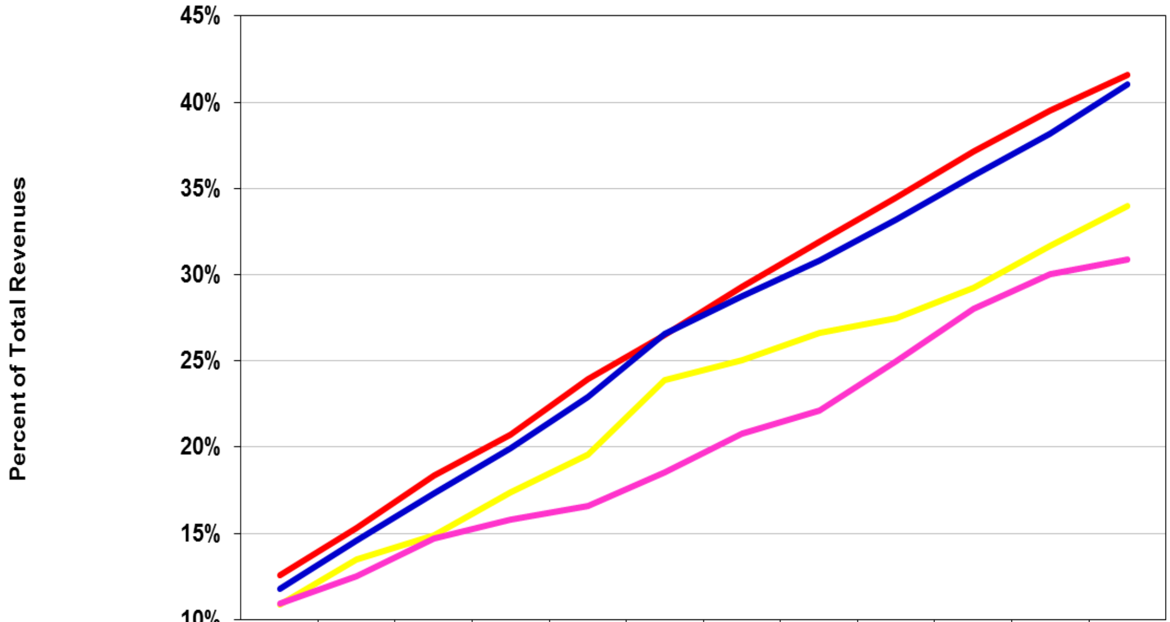


283. The growth in data revenue as a percentage of total revenue for the individual four nationwide service providers is shown in Chart 35. While data revenues have been growing at all four providers, data continues to account for a larger percentage of total revenue at Verizon Wireless and AT&T. According to one analyst, this difference reflects the higher smartphone penetration at AT&T and Verizon Wireless.[861]

[860] Data comes from company reports and Bank of America Merrill Lynch. Postpaid ARPU is an average of the postpaid ARPU of the nationwide providers. Prepaid ARPU is an average of the prepaid ARPU of the nationwide providers plus Leap and MetroPCS.

[861] *Torch Passes from Voice to Data*, at 24.

Chart 35
Wireless Data Revenue as a Percentage of Total Revenue, 2006-2011[862]



	Q2 06	Q4 06	Q2 07	Q4 07	Q2 08	Q4 08	Q2 09	Q4 09	Q2 10	Q4 10	Q2 11	Q4 11
Verizon Wireless	12.6%	15.3%	18.4%	20.7%	24.0%	26.5%	29.3%	31.9%	34.5%	37.1%	39.5%	41.6%
AT&T	11.8%	14.6%	17.3%	19.9%	22.9%	26.6%	28.7%	30.8%	33.2%	35.7%	38.2%	41.0%
Sprint Nextel	10.9%	13.5%	14.9%	17.4%	19.5%	23.9%	25.0%	26.6%	27.5%	29.2%	31.7%	34.0%
T-Mobile	10.9%	12.5%	14.7%	15.8%	16.6%	18.5%	20.8%	22.1%	25.0%	28.0%	30.0%	30.9%

Source: Bernstein Research

G. Accounting-Based Measures of Profitability

284. Profitability indicators differ from the pricing indicators and revenue data (for example, ARPU) discussed in preceding sections of this *Report* in that they account for certain elements of firms' costs. These accounting-based indicators of profitability are not estimates of economic profit,[863] and neither accounting nor economic profits are considered reliable estimators of market power.[864] Accounting-based measures of mobile wireless industry profitability are mainly used by Wall Street financial analysts to compare the market value and financial performance of different service providers for investors.[865] The differences across providers in the various measures of accounting profits discussed below may reflect many underlying factors including product differentiation across providers, differences in profitability across product segments, different network designs and capabilities, merger and acquisition costs, different cost structures, efficiencies of size, and the degree of competitive rivalry.

[862] Sanford Bernstein Research.

[863] Economic profit is defined as revenue minus opportunity costs. A main distinction between economic and accounting profits is the former accounts for opportunity costs. *See Modern Industrial Organization*, at 247.

[864] *See* Jonathan B. Baker and Timothy Bresnahan, "Economic Evidence in Antitrust: Defining Markets and Measuring Market Power" in *Handbook of Antitrust Economics*, ed. Paolo Buccirossi, MIT Press, 2008.

[865] *See, e.g.*, Bank of America Merrill Lynch, *Wireless pricing: Verizon and Swisscom shake it up*, June 18, 2012; Bernstein Research, *U.S. Telecommunications: If This Is a Duopoly, Why Aren't the Duopolists Making More Money?*, March 7, 2012; UBS Investment Research, *US Wireless 411 4Q11*, March 7, 2012.

285. *Earnings Before Interest and Taxes (EBIT)*. EBIT is the accounting profit of a company before interest expenses and corporate taxes are deducted.[866] EBIT deducts from revenue the cost of equipment sold to users (*e.g.* the price paid by a provider for the handsets that it sells to consumers), service costs (*e.g.* network interconnection, roaming, and long-distance costs), selling, general, and administrative costs, but it does not deduct costs such as interest payments on debt and corporate income taxes. EBIT has the advantages of being a general indicator of the profits of mobile wireless segments and it deducts operating costs that would also be deducted in more detailed profitability estimates. However, as interest payments on debt and corporate income taxes are generally recurrent cash flow obligations, some experts argue that these measures may not always be good estimates of operating cash flow.[867] Federal and State corporate income taxes can be over one-third of pre-tax income and they are deducted in most profit formulas.[868] Further, EBIT data are sensitive to accounting practices for depreciation and mergers.

286. *Earnings Before Interest, Taxes, Depreciation, and Amortization (EBITDA)*. EBITDA equals accounting profits before deducting interest expenses, corporate income taxes, depreciation, and amortization.[869] Like EBIT, EBITDA does not account for cash flow expenses such as interest and taxes. EBITDA differs from EBIT in that EBITDA does not account for depreciation and amortization. However, EBITDA also does not account for capital expenditures which can be substantial and vary significantly across service providers.[870] Hence, differences in EBITDA across providers will be partly explained by differences in capital expenditures across service providers.

287. *EBITDA minus Capital Expenditures (EBITDA minus CAPEX)*. EBITDA minus CAPEX equals EBITDA, discussed above, less capital expenditures. EBITDA minus CAPEX incorporates capital expenditures into the profitability measure, providing a rough approximation of free cash flow. [871] Although it is a better approximation of cash flow than EBITDA because it deducts capital expenditures,

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[866] *See* A Dictionary of Finance and Banking (2nd ed.), Oxford University Press, 1997, at 112 (defining EBIT as "The profit of a company as shown on the profit and loss account, before deducting the variables of interest and tax. This figure, which is used in calculating many ratios, enables better comparisons to be made with other companies").

[867] *See, e.g.*, B. Tunick, *In the GAAP/EBITDA World Nothing's Easy*, Investment Dealer's Digest, Sept. 16, 2002, Vol. 68, Issue 35, at 30; M. Fridson, *EBITDA Is Not King*, Journal of Financial Statement Analysis, Spring 1998, Vol. 3, Issue 3, at 59; *Let's Agree to Agree on What EBITDA Means*, Bank Loan Report, Vol. 23, No. 26, June 30, 2008. *See* D. Shook, *EBITDA's Foggy Bottom Line*, BusinessWeek Online, Jan. 14, 2003. http://www.businessweek.com/stories/2003-01-13/ebitdas-foggy-bottom-line (visited Oct. 16, 2012) available from the database Business Source Premier, (stating that if a firm has interest payments equal to 20 percent of EBITDA then EBITDA will ignore one of the firm's largest expenses).

[868] The statutory federal corporation income tax is 35 percent for corporate income over $18,333,333. *See* IRS, *Publication 542, Corporations*, at 17, Rev. Feb. 2006, *available at* http://www.irs.gov/pub/irs-pdf/p542.pdf (visited Oct. 16, 2012).

[869] The definition of EBITDA is an extension of EBIT, also excluding Depreciation and Amortization. EBITDA is readily calculated from a provider's SEC 10-K form even if the provider does not report EBITDA.

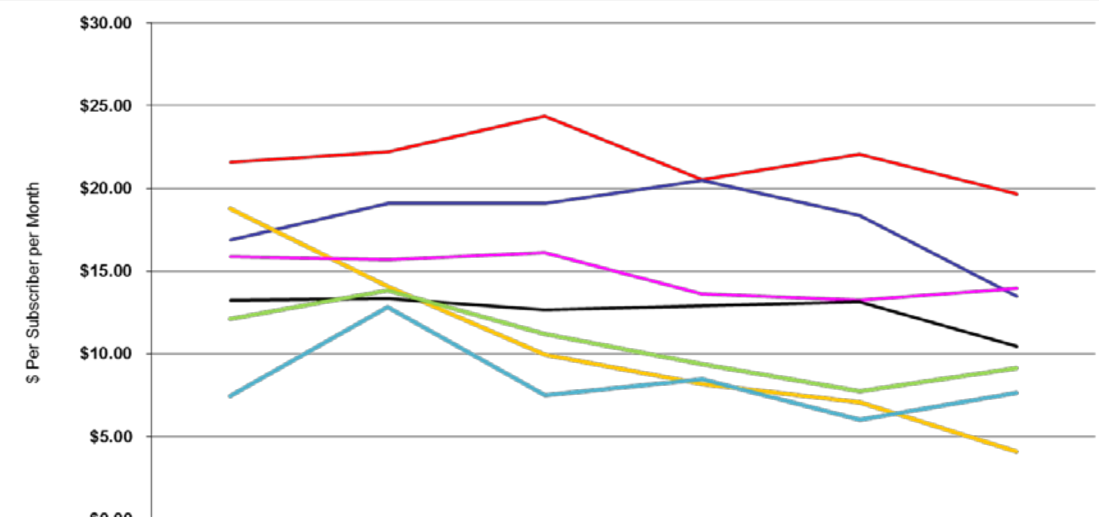
[870] *See* Chart 11, Section IV.B.2, Investment, *infra*.

[871] *See* Donald E. Kieso, *et al.*, *Intermediate Accounting* (11th ed.), John Wiley & Sons, Inc., 2004, at 197 (Defining *free cash flow* as *net cash provided by operating activities* less *capital expenditures* less *dividends*. Some companies do not subtract dividends because they believe these expenditures to be discretionary. Net cash provided by operating activities adjusts net income for depreciation and amortization, but not for interest expenses and tax expenses. Free cash flow is interpreted as the amount of discretionary cash flow a company has for purchasing additional investments, retiring its debt, purchasing treasury stock, or adding to its liquidity.) *See, also*, Tom Copeland, *et al.*, *Valuation: Measuring and Managing the Value of Companies* (2nd ed.), John Wiley & Sons, 1995, at 167 (stating that free cash flow is the total after-tax cash flow generated by the company and available to all providers of the company's capital, both creditors and shareholders).

we note that capital expenditures may differ from estimates of annual capital costs that are used in estimates of economic profits.[872] Also, EBITDA minus CAPEX does not account for purchases of spectrum licenses, a significant expense of mobile wireless providers. Although EBITDA minus CAPEX accounts for capital expenditures, standard capital accounting practices normally depreciate capital expenditures over time to represent their current market value and earning life.[873] Furthermore, as discussed in Section IV.B.2, in the context of capital expenditures, deducting capital expenditures from EBITDA may hinder comparisons across providers due to the lack of synchronization in the timing of capital expenditures of different service providers.

288. *Earnings per Subscriber*. EBITDA per subscriber data for selected service providers are presented in Chart 36. As shown in Chart 36, in 2011, EBITDA per subscriber ranged from a low of $4.11 (Sprint Nextel) to a high of $19.66 (Verizon Wireless). The EBITDA per subscriber of Sprint Nextel has declined significantly over the past several years. EBITDA minus CAPEX per subscriber data for selected service providers are presented in Table 42. Between 2006 and 2011, the EBITDA minus CAPEX per subscriber for Sprint Nextel declined each year. The EBITDA minus CAPEX per subscriber of AT&T and Verizon Wireless have decreased relative to 2009, but are above the levels of Sprint Nextel and T-Mobile. ARPU, EBITDA, and EBITDA minus CAPEX are presented together in Chart 37. EBITDA minus CAPEX per subscriber data for selected service providers are presented in Table 42. Between 2006 and 2011, the EBITDA minus CAPEX per subscriber for Sprint Nextel declined each year. The EBITDA minus CAPEX per subscriber of AT&T and Verizon Wireless have decreased relative to 2009, but are above the levels of Sprint Nextel and T-Mobile. ARPU, EBITDA, and EBITDA minus CAPEX are presented together in Chart 37.

Chart 36
EBITDA per Customer (Selected Providers), 2006-2011[874]



	2006	2007	2008	2009	2010	2011
Verizon Wireless	$21.61	$22.20	$24.39	$20.53	22.08	$19.66
AT&T	$16.90	$19.11	$19.11	$20.48	18.38	$13.47
Sprint Nextel	$18.78	$14.10	$9.94	$8.16	7.06	$4.11
T-Mobile	$15.89	$15.68	$16.11	$13.64	13.26	$13.95
Leap Wireless	$7.48	$12.84	$7.52	$8.47	6.01	$7.63
Metro PCS	$13.24	$13.35	$12.68	$12.92	13.12	$10.45
US Cellular	$12.09	$13.84	$11.20	$9.37	7.74	$9.14

Source: UBS

[872] *See also Modern Industrial Organization*, at 247.

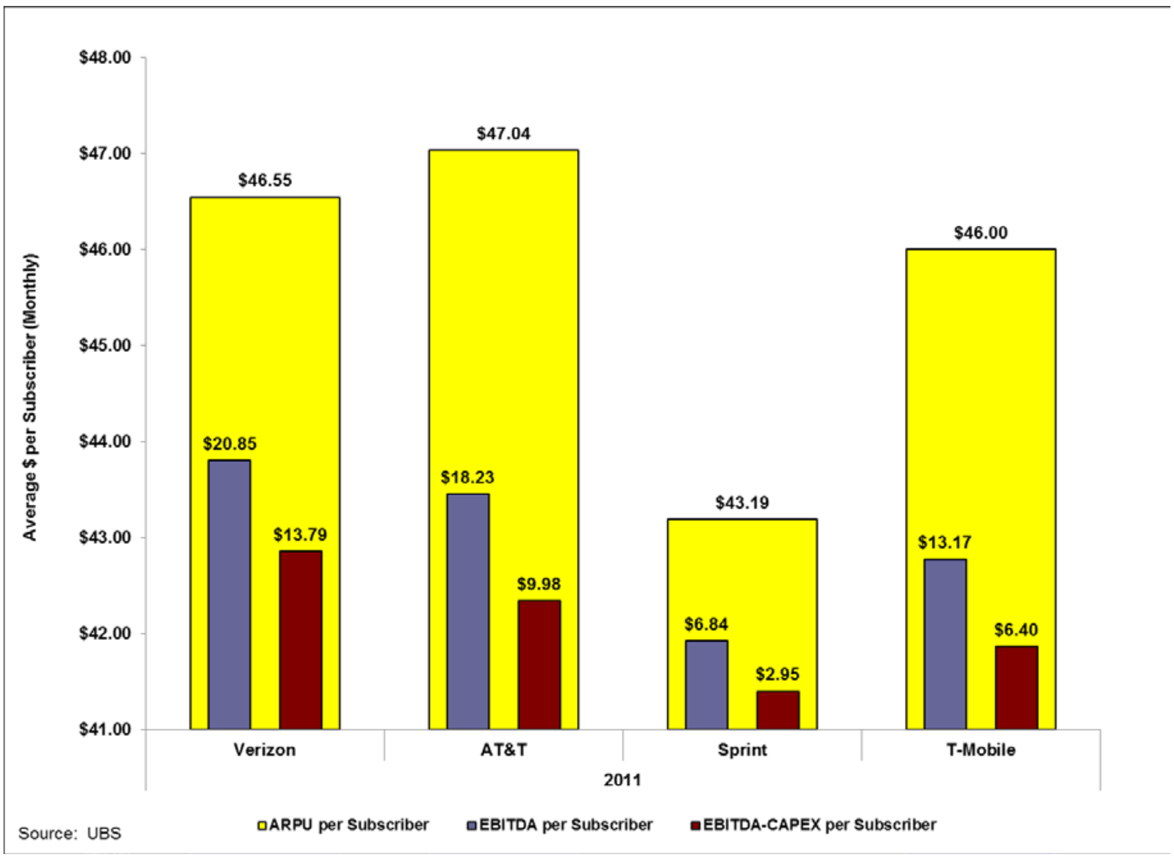
[873] *The New Palgrave: A Dictionary of Economics*, Second Edition, 2008, edited by S. Durlauf and L. Blume.

[874] UBS, *US Wireless 411 Reports*, 2006 – 2011.

Table 42
EBITDA minus CAPEX per Customer per Month (Selected Providers), 2006-2011[875]

Provider	2006	2007	2008	2009	2010	2011
Verizon Wireless	$11.77	$13.83	$16.52	$16.34	$14.77	$13.79
AT&T	$5.91	$14.00	$12.38	$14.47	$11.67	$9.98
Sprint Nextel	$9.67	$7.84	$8.52	$7.03	$5.30	$2.95
T-Mobile	$7.37	$8.15	$6.61	$5.55	$6.57	$6.40

Chart 37
ARPU, EBITDA, and EBITDA minus CAPEX of Nationwide Providers, 2011[876]

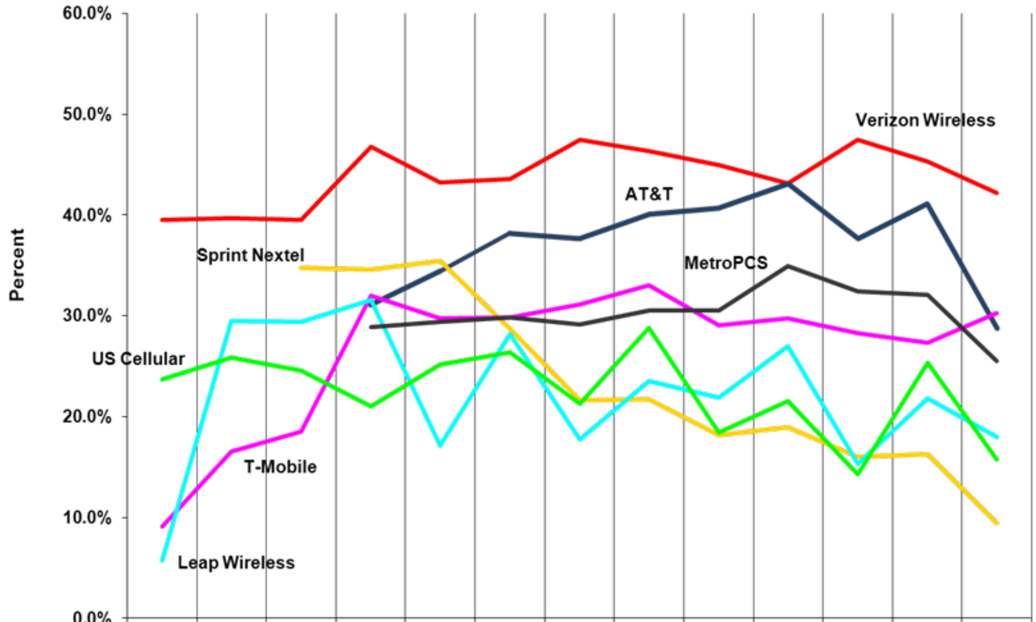


289. *EBITDA Margin.* EBITDA as a percentage of service revenue, also called EBITDA margin, appears in Chart 38. In 2011, the difference between the provider with the highest EBITDA margin (Verizon Wireless) and the provider with the lowest (Sprint Nextel) was 32.7 percent. Verizon Wireless has remained above 40 percent since 2006. AT&T's EBITDA margin has decreased after 2009, dropping to 28.7 percent in 2011, while T-Mobile's EBITDA margin increased to 30.2 percent in 2011. The graph of EBITDA per subscriber versus net adds of the four nationwide service providers (Chart 39), shows that the EBITDA per subscriber and net adds of T-Mobile have been decreasing in recent years, and the EBITDA per subscriber of Sprint has been decreasing while its net adds have been increasing.

[875] UBS, *US Wireless 411 Reports*, 2006 – 2011.

[876] *Id.*

Chart 38
Reported EBITDA Margins (Selected Providers), 2002-2011[877]

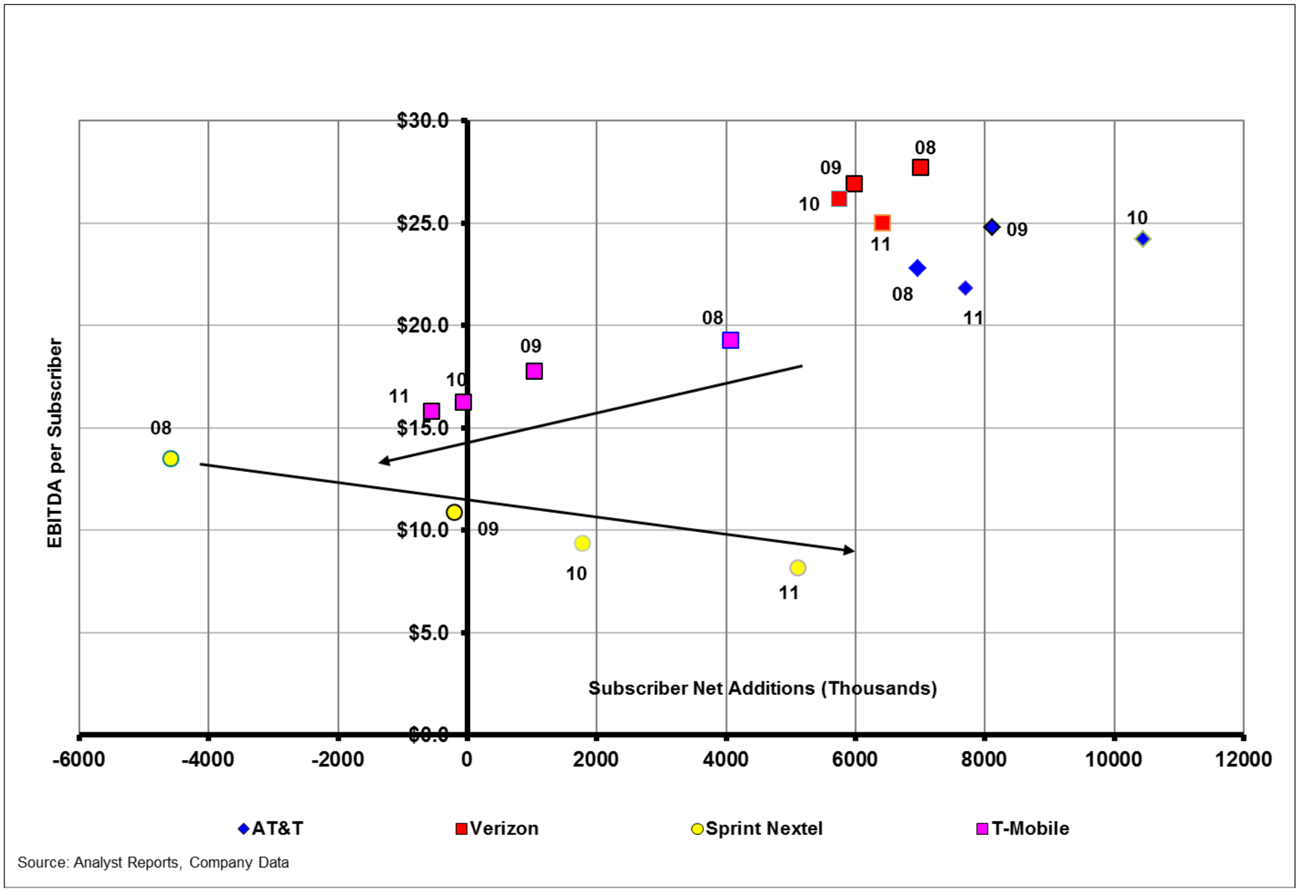


	2002 (Q4)	2003 (Q4)	2004 (Q4)	2005 (Q4)	2006 (Q4)	2007 (Q4)	2008 (Q4)	2009 (Q2)	2009 (Q4)	2010 (Q2)	2010 (Q4)	2011 (Q2)	2011 (Q4)
Verizon Wireless	39.5%	39.7%	39.5%	46.8%	43.2%	43.6%	47.5%	46.3%	45.0%	43.1%	47.5%	45.4%	42.2%
AT&T				31.1%	34.4%	38.2%	37.7%	40.1%	40.7%	43.1%	37.6%	41.1%	28.7%
Sprint Nextel			34.8%	34.6%	35.4%	28.7%	21.6%	21.7%	18.2%	19.0%	16.0%	16.3%	9.5%
T-Mobile	9.1%	16.5%	18.5%	32.0%	29.8%	29.8%	31.1%	33.1%	29.1%	29.7%	28.2%	27.3%	30.2%
Leap Wireless	5.7%	29.5%	29.4%	31.6%	17.1%	28.2%	17.7%	23.5%	21.9%	27.0%	15.3%	21.8%	18.0%
US Cellular	23.7%	25.9%	24.6%	21.0%	25.2%	26.4%	21.3%	28.8%	18.4%	21.5%	14.3%	25.3%	15.7%
MetroPCS				28.9%	29.4%	29.9%	29.2%	30.5%	30.5%	35.0%	32.4%	32.1%	25.5%

Source: UBS

[877] UBS, *US Wireless 411 Reports*, 2006 – 2011.

Chart 39
Subscriber Additions vs. EBITDA Per Subscriber, 2008-2011



H. Network Performance

290. The Commission has recognized the importance of accurate and timely data on mobile network performance and coverage in informing consumer decisions, Commission policy, and service provider network investment decisions. The National Broadband Plan recommends that the Commission develop broadband performance testing standards for mobile services, expand on current initiatives to collect user-generated data on network performance and coverage, and continue to work with measurement companies, application designers, device manufactures, and service providers to create an online database to inform the decisions consumers make for their mobile broadband services.[878] To this end, in March 2010, the Commission released an iPhone and Android consumer broadband test application that collects and reports data rates, latency, and user location when initiated on the handset.[879] In June 2010, the Commission released a Public Notice seeking comment on the measurement of mobile broadband network performance and coverage, including the best metrics and data collection methods to

[878] *Connecting America: The National Broadband Plan*, at 47.

[879] The mobile application is available for download from the iPhone or Android App store. As of May 19, 2010, about 50,000 unique users had installed the Commission's mobile application, and many unique users have taken the test multiple times. The Commission also released a fixed consumer broadband test that collects street address and broadband performance data. The fixed application is accessible at www.broadband.gov/qualitytest (visited Oct. 16, 2012).

measure the performance of mobile broadband network.[880] Additionally, in October 2010, the Commission released a Request for Information soliciting information from entities that can provide mobile broadband performance measurement and mapping services, or data that represent the performance of mobile broadband networks across the United States.[881]

291. In December 2010, as part of its rules on Internet openness, the Commission adopted a transparency rule for both fixed and mobile broadband Internet providers under which they are required to "publicly disclose accurate information regarding the network management practices, performance, and commercial terms of its broadband Internet access services sufficient for consumers to make informed choices regarding use of such services."[882] In providing guidance regarding effective disclosure models, the order lists types of information, some or all of which the Commission expects would be included in an effective disclosure.[883] Included in this list are "[a] general description of the service, including the service technology, expected and actual access speed and latency, and the suitability of the service for real-time applications."[884] In February 2011, the Commission adopted the Modernizing the FCC Form 477 Data Program NPRM to modernize and streamline the data collection and utilization to better support informed policymaking, promoting competition and protecting consumers.[885] Also as part of our Consumer Empowerment Agenda, the Commission released the second *Measuring Broadband America* report in July 2012, a comprehensive nationwide study of actual home broadband network performance provided by fixed broadband service providers cable, DSL, and fiber in the United States.[886]

292. On September 21, 2012, Commission staff held a public meeting to discuss the initiation of a new program to develop consistent information on industry wide mobile broadband service performance in the United States.[887] In particular, Commission staff discussed with industry representatives and other interested parties the technical methods for performance testing of mobile broadband Internet service, methodological approaches to remotely acquiring and analyzing such data, and other methodological considerations for the testing of mobile broadband performance.[888]Currently, obtaining accurately measured data on the overall quality of a mobile wireless service provider's network presents certain challenges. For instance, there is neither a standardized industry-wide definition of

[880] *See* "Comment Sought on Measurement of Mobile Broadband Network Performance and Coverage," CG Docket No. 09-158, CC Docket No. 98-170, WC Docket No. 04-36, *Public Notice*, DA 10-988 (rel. June 1, 2010).

[881] *See* "Request for Information: Measurement and Reporting of Mobile Broadband Performance and Coverage," RFI 10082010BROADBAND, *Request for Information* (rel. Oct. 8, 2010).

[882] *Open Internet Order* at ¶ 54.

[883] *See Open Internet Order* at ¶ 56.

[884] *Id.*

[885] *See* "Modernizing the FCC Form 477 Data Program" Notice of Proposed Rulemaking, http://www.fcc.gov/document/modernizing-fcc-form-477-data-program-et-al (visited Oct. 16, 2012)

[886] *See* "Measuring Broadband America - A Report on Consumer Wireline Broadband Performance in the U.S (released July 2012).," http://www.fcc.gov/document/measuring-broadband-america-report-consumer-broadband-performance-us (visited Oct. 26, 2012).

[887] *See* Mobile Broadband Services Testing and Measurement Program, http://www.fcc.gov/events/mobile-broadband-services-testing-and-measurement-program; (visited Nov. 30, 2012); "FCC Announces 'Measuring Mobile America' Program to Test Mobile Broaedband Performance" News Release, Sept. 5, 2012, http://transition.fcc.gov/Daily_Releases/Daily_Business/2012/db0905/DOC-316109A1.pdf (visited Nov. 30, 2012);"FCC to Launch Mobile Broadband Services Testing and Measurement Program" CG Docket No. 09-158, Public Notice, http://transition.fcc.gov/Daily_Releases/Daily_Business/2012/db0904/DA-12-1442A1.pdf (visited Nov. 2012).

[888] *See* "FCC to Launch Mobile Broadband Services Testing and Measurement Program" CG Docket No. 09-158, Public Notice, http://transition.fcc.gov/Daily_Releases/Daily_Business/2012/db0904/DA-12-1442A1.pdf. (visited Nov. 30, 2012).

network quality nor a definitive method to measure it. For voice services, network quality metrics include the strength and coverage of the signal, voice call quality,[889] and metrics that measure the reliability of the connection such as dropped or blocked calls. For broadband data services, network quality metrics include downlink and uplink data speeds and latencies as well as metrics that measure the reliability of the data connection such as the connectivity and maintainability of successful data sessions.

293. In addition, the overall mobile broadband network service quality experienced by consumers may vary greatly with a number of real world factors such as the service provider's received signal quality, cell traffic loading, and network capacity in different locations as well as the capability of consumers' devices.[890] Moreover, from the customer's perspective, overall network performance is the product of more than network quality alone and often reflects differences in device capability as well.[891] For data services, network quality as perceived by the customer may also be use-case or application-dependent (*e.g.,* a consumer who solely uses e-mail may view the quality of the network differently than one who streams video regularly). Furthermore, consumers may place more weight on one particular aspect of network quality than another – such as coverage or peak data speeds – when choosing their mobile wireless services.[892]

294. Despite these challenges, a variety of organizations have conducted mobile wireless broadband network performance studies that make cross-provider comparisons. The results of these tests are informative, as described below, though these results usually are limited in their scope.[893] The

[889] Voice call quality is commonly measured using a subjective metric known as the Mean Opinion Score (MOS). MOS testing has several variations but generally users rate the clarity and overall quality of the voice call on a scale from 1 to 5, with 5 being the best. Then scores of several subjects are averaged to give an overall MOS score for a particular voice call. Since this kind of testing is impossible to do outside a controlled laboratory environment, various companies have attempted to develop objective algorithms that give scores that correlate well to actual subjective MOS scores. There are several standardized algorithms for doing this as well as several proprietary ones.

[890] For example, the received signal quality is dependent on the service provider's deployed cell site density, low/high frequency radio wave propagation losses, user locations, indoor obstructions and outdoor foliage or clutter, weather, inter-cell interference conditions, and wireless network optimization parameters. The cell traffic loading or demand is dependent on the overall number of concurrent active mobile broadband users sharing the same cell, which in turn depends on user locations, the day of the week, and the time of the day. The capacity of a provider's wireless network is dependent on the deployed mobile wireless technology, sites and equipment, available bandwidth, and enhanced backhaul connections.

[891] The capability of consumer devices (e.g. smartphones, tablets, USB dongles, and laptops) could result in users experiencing different data speeds on the same mobile wireless broadband network. Even differing capabilities within each device category, such as smartphone processing power and memory, could result in better user experiences on 4G networks.

[892] *See* Section VI.C, Consumer Satisfaction with Service Providers, *infra*, for a discussion of overall consumer satisfaction with their mobile wireless services.

[893] *See RootMetrics Data Network Performance Study*; *PCMag Mobile 3G/4G Network Performance Study*; *PCWorld/Novarum 3G/4G Network Performance Study*. These three studies were conducted during different time periods, in different groups of cities, using different devices and different methodologies to obtain their results. For example, the *PCWorld/Novarum 3G/4G Network Performance Study*, conducted laptop and smartphone tests during January 2011 and February 2011 at 20 locations in the center of each city of 13 U.S. cities. In comparison, the *PCMag Mobile 3G/4G Network Performance Study*, published in June 2011, performed its tests using 16 smartphones covering more than 6,000 miles across 21 cities. Finally, the *RootMetrics Data Network Performance Study* provides consumers with its RootScore drive test reports for a large number of cities. All studies tested data speeds on 4G networks when available, and fall back to 3G networks when 4G signals are insufficient. The studies also used different payload sizes for their tests, which is another variable that can affect network performance test results. Data from these studies, along with descriptions of the different parameters and methodologies used, is presented in Appendix C. Overall, network performance results varied among the studies – likely due in part to the factors discussed above – with certain providers scoring both better and worse than others in particular markets according to different metrics from the studies.

currently available studies also are not intended to provide a comprehensive measure of industry-wide performance. In addition, studies often utilize different parameters and testing methodologies, making it difficult to draw conclusions related to network performance across these studies.

295. *Network Performance Data and Studies*. Service providers often publish network quality information, such as coverage maps and data throughput ranges, which are based on sampling measurements of their network performance. This network quality information is typically based on data gathered on the actual network performance, which are obtained in several ways, including through consumer surveys, network drive tests, fixed probes, internal network level assessments, and the use of crowd-sourcing smartphone applications.

296. J.D. Power publishes a consumer survey study twice a year that measures wireless call quality performance in terms of the number of problems per 100 calls (PP100), where a lower score reflects fewer problems and higher wireless call quality performance.[894] The *2011 Wireless Call Quality Study – Volume 1*, conducted during the second half of 2010, found the fraction of wireless calls in indoor environments increased to an average of 56 percent which may have contributed to a drop in call quality from 13 PP100 to 14 PP100 scores. The report found that Verizon Wireless ranked highest in most regions of the country and U.S. Cellular ranked the highest in the North Central region.[895] In the *2011 Wireless Call Quality Study – Volume 2*, conducted during the first half of 2011, J.D. Power changed the overall network performance study to include voice calling, text messaging and data connections where the PP100 scores are now based on ten problem areas of network connection problems. The report found that Verizon Wireless ranked highest in most regions of the country with the new PP100 scores except the North Central region where U.S. Cellular ranked highest.[896]

297. The *2012 Wireless Call Quality Study – Volume 1*, conducted during the second half of 2011, found that data-related issues such as mobile Web and email problems had increased overall since early 2011. Problems of excessively slow mobile Web download speeds and email connection errors had increased from an average of 19 PP100 in the first half of 2011 to an average of 21 PP100 in the second half of 2011. However, the latest report also found that other network quality areas such as calling or text messaging had remained steady.[897] The overall average industry network performance quality survey for the six study regions degraded slightly in the second half of 2011 from the first half of 2011.[898]

298. The Nielsen Company's national service quality benchmark program provides a detailed snapshot of mobile wireless network performance and reliability using its fleet of 35 test vehicles and state-of-the-art mobile wireless network testing equipment. It performs extensive drive tests annually in 264 US markets and provides a detailed voice and data network quality test report. An update of Nielsen's 2011 national wireless data network performance report, released in March 2012, finds that mobile wireless broadband coverage is expanding across the top 100 US markets with new deployments of LTE and HSPA+.[899] The small-file (0.2 MB) industry median download data speed increased from 0.398 Mbps with 98.2 percent reliability in 2009 to 0.523 Mbps with 98.3 percent reliability in 2011. The large-file (4 MB) industry median download data speed increased from 0.632 Mbps with 94.3 percent

[894] The study measures wireless call quality based on seven customer-reported problem areas that impact overall carrier performance: dropped calls; static/interference; failed connection on first try; voice distortion; echoes; no immediate voicemail notification; and no immediate text message notification.

[895] *2011 Wireless Call Quality Study – Volume 1*, at 1-2.

[896] *2011 Wireless Call Quality Study – Volume 2*, at 1-2.

[897] *2012 Wireless Call Quality Study – Volume 1*, at 1-2.

[898] *Id.* 12, 13, and 14.

[899] *See* Nielson's 2011 National Wireless Data Network Performance Update, March 2012 at 3-5, 8.

reliability in 2009 to 1.693 Mbps with 95.2 percent reliability in 2011.[900]

299. Nielsen also evaluated the availability of mobile wireless broadband networks that have at least 2 Mbps and at least 4 Mbps average download data speeds in the top 100 markets. It found that in nine of the top 100 markets, there is no mobile wireless broadband network capable of 4 Mbps average download data speed, in 34 markets there is only one network, in 44 markets there are two networks, and in 13 markets there are three networks. For wireless broadband networks capable of 2 Mbps average download data speed in the top 100 markets, in six of the top 100 markets there is only one mobile wireless network available, in 28 markets there are two networks, in 25 markets there are three networks, in 36 markets there are four networks, and in five markets there are five networks. It also found that there are at least two mobile wireless broadband networks capable of offering 90 percent reliability and 95 percent large file download reliability in 100 and in 94 of the top 100 markets, respectively. [901]

I. Network Coverage by Income Level

300. We also analyze how the number of facilities-based mobile wireless providers that have coverage in a census tract varies based on median household income levels. The analysis is based on mobile wireless and mobile broadband coverage data reported by Mosaik and the median household income levels in each of the country's 74,000 census tracts based on United States Census Bureau's American Community Survey 2006-2010 (ACS).[902] Chart 40 below shows that the average number of mobile wireless providers increased from 5.38 in census tracts with median household income less than $25,000 to 5.81 in census tracts with median household income of more than $150,000, an increase of 0.43 service providers. The average number of mobile broadband providers increased from 4.85 in census tracts with median household income less than $25,000 to 5.47 in census tracts with median household income of more than $150,000, an increase of 0.62 service providers. Compared to the results reported in the *Fifteenth Report*, the average number of mobile broadband providers has increased by more than 1.3 since August 2010 in all income groups (see Chart 41).[903]

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[900] *See* Nielson's 2011 National Wireless Data Network Performance Update, March 2012 at 11, 12.

[901] *See* Nielson's 2011 National Wireless Data Network Performance Update, March 2012 at 16, 21.

[902] Data on numbers of mobile wireless providers and mobile broadband providers are based on Mosaik (formerly American Roamer) database, January 2012. Data on median household income are based on United States Census Bureau's American Community Survey 2006-2010 (ACS). The analysis is done on a census tract, rather than census block, basis because the smallest geographic area for which medium household income data is available is census tracts. These data do not allow for an analysis of adoption rates for mobile wireless or mobile broadband services.

[903] *See Fifteenth Report*, 26 FCC Rcd at 9745 Chart 5 for the average number of mobile broadband providers by median household income levels in August 2010.

Chart 40
Average Numbers of Mobile Wireless Providers and Mobile Broadband Providers in Census Tracts by Median Household Income in January 2012

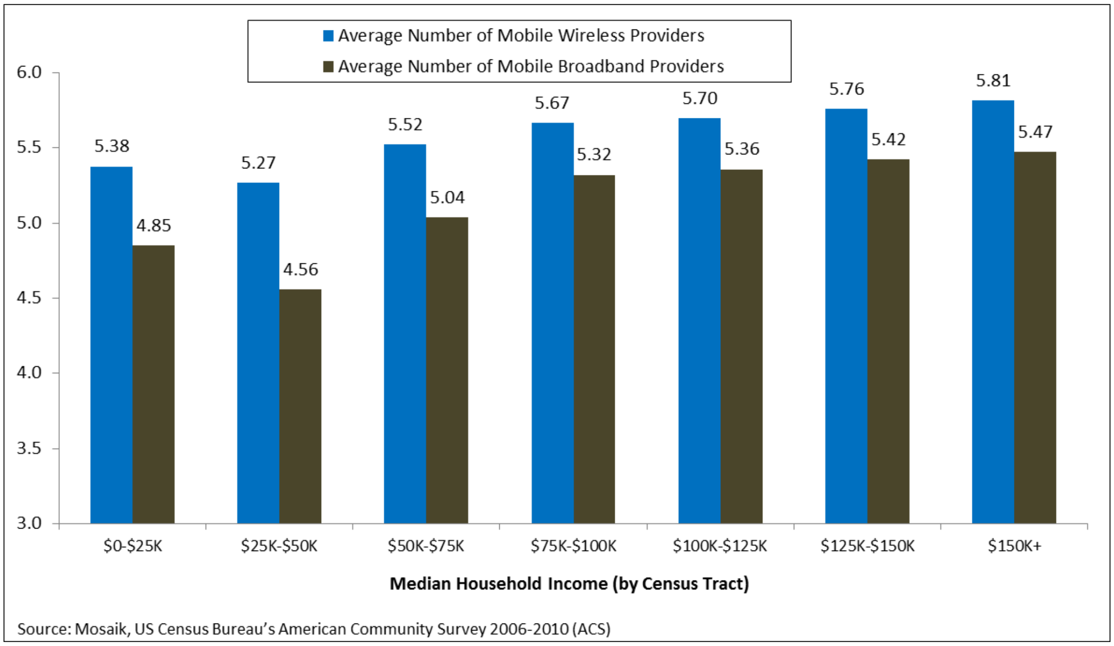
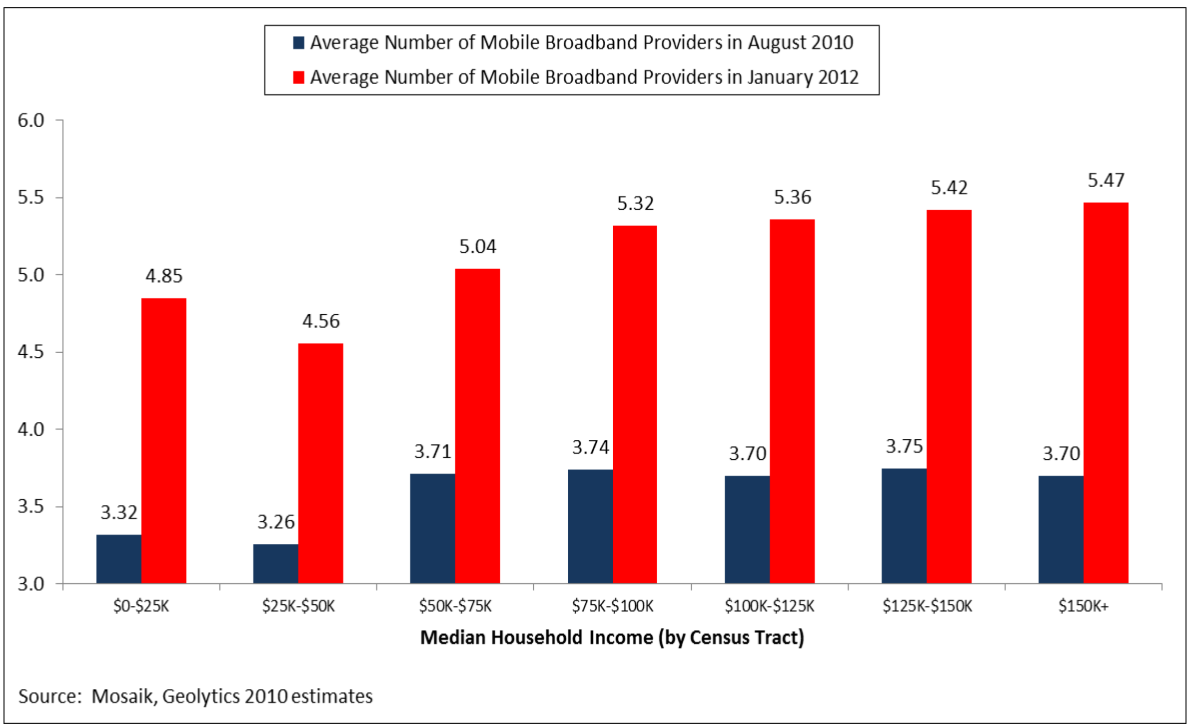


Chart 41
Average Numbers of Mobile Broadband Providers in August 2010 and January 2012 in Census Tracts by Median Household Income



VI. MOBILE WIRELESS SERVICES: CONSUMER BEHAVIOR

301. Consumer responses to changes in prices and service quality are an important aspect of competition in the mobile wireless services industry. In well-functioning markets firms compete for customers who are readily able to switch their purchases between competitors. Consumers who are well-informed about price and non-price factors are better able to choose the service providers that offer the services and prices that best suit the consumers' tastes and budgets. There are many purchase decision factors on which consumers base their choice of a service provider, including price, service plans, network quality, devices and mobile data services. There are also factors that affect when or if consumers change providers including how satisfied consumers are with their existing service providers, new offerings by competing service providers, the launch of innovative devices and services, and switching costs. As discussed in the Service Provider Conduct section,[904] mobile wireless service providers compete on many dimensions to retain their current customers and to attract customers away from competitors. In the Industry Performance and Outcomes section, we presented data showing that there were an estimated 15.5 to 20.6 million total net additions in 2011, and that the annual average industry churn rate is in excess of 24 percent. [905] Below, we discuss factors in consumers' decisions to choose a service provider and to switch between service providers, consumer access to information on mobile wireless services, and surveys of consumer satisfaction with service providers.

A. Consumer Decision Factors in Choosing a Service Provider

302. *Purchase Decision Factors*. The reasons consumers choose a service provider or switch between providers vary. According to a quarterly study by Nielsen, price has been the most important purchase decision factor for consumers choosing a service provider since at least 2007, with 25.7 percent of customers in the first half of 2011 indicating that they picked their service provider based on price, an increase from 17.6 percent of consumers in 2008.[906] After price, the next most common purchase decision factor customers give for choosing a service provider is family plans, with just under 15 percent of customers in the first half 2011 indicating that they chose a service provider based on family plans. In the first half of 2011, 8.1 percent choose a service provider based on network quality, the third most important purchase decision factor.[907] Following these top-three factors are free/unlimited in-network calling, billing/payment options/ credit, reputation/recommendation, previous experience with operator, other, customer service, mobile data services, specific phone, and bundling of mobile phone services with other services. The availability of specific phone was the second least common purchase decision factor, at 4.7 percent. The importance of mobile data service as a purchase decision factor has more than doubled since 2008, with 4.9 percent of customers choosing a service provider based on mobile data service in the first half of 2011.

303. The importance of price as a purchase decision factor is reflected in a *Consumer Reports* article setting forth five ways consumers can save money on their mobile phone bills, including ways to save money on data services. *Consumer Reports* suggests that wireless users not only carefully compare service plans, but also consider using a low-priced service provider in order to save money on data services.[908] The organization urges wireless consumers to bypass their service provider and use third-

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[904] *See* Section IV, Mobile Wireless Services: Provider Conduct, *supra.*

[905] *See* Section V, Mobile Wireless Services: Performance and Outcomes, *supra.*

[906] Roger Enter, "Price, data services are an increasingly important part of choosing wireless carrier," Fierce Wireless, at 1. Aug. 1, 2011. http://www.fiercewireless.com/story/entner-price-data-services-are-increasingly-important-part-choosing-wireles/2011-08-01 (visited Oct. 16, 2012).

[907] *Id*.

[908] Consumer Reports.org, "How to cut your phone bill, Five tips to help you save money," Mar. 2012. http://www.consumerreports.org/cro/2012/03/how-to-cut-your-phone-bill/index.htm (visited Oct. 16, 2012).

party services, such as Heywire and TigerText, for texting and Skype Mobile for voice calls.[909] In addition, *Consumer Reports* recommends that consumers use the rising number of Wi-Fi networks as a way of keeping data costs down.[910] *Consumer Reports* also suggests that consumers consider alternatives to buying their phones from operator stores and that they investigate employee discounts.

304. Nielsen's finding that network quality and mobile data services are important purchase decision factors is reflected in other studies and is consistent with the rising penetration rate of smartphones. A 2012 study found that heavy users of advanced mobile services are more likely to switch service providers than other mobile customers.[911] In this study of 16,000 people in 17 countries, more than 40 percent were considered heavy users of advanced services and more than half of the group of heavy users had recently switched mobile service. Further, some 40 percent indicated that they were prepared to switch providers in the following year.[912] The study found that most customers rank network coverage and voice quality as the top criteria for staying with an operator, and that heavy users of advanced services also rank mobile broadband quality as high as network coverage and voice quality in determining whether to switch to a different provider. According to the study, customers rated high-speed mobile broadband as the most important service over the next few years. The study found that the number of heavy users of advanced services is rapidly increasing, with the category having grown by 34 percent in mature markets during 2011.[913] More than half of the users in this group, the study found, are below the age of 35.[914]

305. Another study found that after price, the main reason smartphone owners switch service providers is to get better data coverage and download speeds. In the sample, 40 percent indicated that they switched providers in the past year to get better data speed and coverage compared with 26 percent who said they switched to get better voice coverage.[915] The study was composed of more than 900 U.S. smartphone users and more than 1,000 British smartphone users. Eighty-six percent said that when their mobile connection is poor, they care more about seeing standard definition video rather than seeing high definition video.[916]

306. *Switching Decision Factors*. When mobile wireless customers wish to switch service providers before they had previously expected to upgrade their service, they may incur some switching costs. In the context of mobile wireless services, switching costs are costs that a consumer who switches service providers incurs when past investment specific to her current provider must be duplicated for a

[909] *Id*.

[910] *Id*.

[911] Tammy Parker, "Nokia Siemens: Study shows mobile broadband quality is key to customer churn," Fierce broadband Wireless, at 1 (Feb. 15, 2012), available at http://www.fiercebroadbandwireless.com/story/nokia-siemens-study-shows-mobile-broadband-quality-key-customer-churn/2012-02-15 (visited Oct. 16, 2012). The study classified respondents as "heavy users of advanced services" if they used at least two of the following services once a week: send/receive emails, chat, browse the Web, download or upload data files, play online games, use personalized applications, mobile payment, mobile TV, location based services and/or GPS navigation and video calling.

[912] *Id*.

[913] *Id*.

[914] *Id*.

[915] Sue Marek, "Study: Data speed is more critical than voice coverage for smartphone users," Fierce Wireless, at 1. July 13, 2012. http://www.fiercewireless.com/story/study-data-speed-more-critical-voice-coverage-smartphone-users/2012-07-13?utm_medium=nl&utm_source=internal (visited Oct. 16, 2012).

[916] *Id*. at 2.

new provider.[917] There are several potential sources of switching costs in the mobile wireless industry:[918] First, there may be costs, such as research time, associated with acquiring information about the offerings of various service providers. Second, mobile wireless customers that have entered into multi-month service subscriptions with their service providers may be liable for early termination fees (ETFs) if they choose to prematurely terminate their contracts. Third, there are the costs associated with potentially obtaining a new handset when changing service providers. Whether a consumer obtains a new handset when switching providers may depend on the age of her current handset, the air interface technologies and spectrum of her current and new service providers,[919] and if she is able to unlock her current handset.[920] Finally, there may be non-economic switching costs such as brand loyalty.[921]

307. *Churn Data on Switching*. Churn data measure the percentage of customers who switch providers in a given time period are presented in Section 0, Connection Churn. The annual average

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[917] Switching costs generally are defined as "a consumer's desire for compatibility between his current purchase and a previous investment." *See* Klemperer, P., 1995, "Competition when Consumers have Switching Costs: an Overview with Applications to Industrial Organization, Macroeconomics and International Trade," Review of Economic Studies, 62, 515-539. Switching costs are not unique to the mobile wireless industry, but are also present in the banking, automobile insurance industry and the retail electric industry among others. Various studies have been carried out to attempt to estimate switching costs. *See*, *e.g.*, Shy, O. 2002, "A quick-and-easy-method for estimating switching costs," International Journal of Industrial Organization, 20, 71-87; Kim, M., Kliger, D., and Vale, B., 2003, "Estimating switching costs: the case for banking"; The Journal of Financial Intermediation, 12, 25-56; Israel, M. A., 2005; "Tenure-dependence in consumer-firm relationships: an empirical analysis of consumer departures from automobile insurance firms," RAND Journal of Economics, 36, 165-192; Waterson, M., 2003; "The role of consumers in competition and competition policy," International Journal of Industrial Organization, 21, 129-150. Farrell and Klemperer (2007) provide an extensive review and summary of the literature on switching costs. *See* Farrell, J and Klemperer, P., 2007, Coordination and Lock-In: Competition with Switching Costs and Network Effects," Handbook of Industrial Organization, Volume 3, Elsevier.

[918] As of October 2010, consumers can transfer their telephone numbers when they switch providers. Under the Commission's rules and orders, wireless service providers were required to be LNP-capable by May 24, 2004. 47 C.F.R. § 52.31(a). Prior to the Commission's actions, the switching cost was significant. A recent study found that the implementation of LNP enhanced competition in the wireless telecommunication industry, where the competitive effects were more pronounced for higher volume users. Park, M., 2009, "The Economic Impact of Wireless Number Portability," Working Paper, University of Minnesota. Using data from EconOne and MyRatePlan.com, Park found that for the plans with fewest minutes, average prices decreased by $0.19 per month (0.97 percent). In contrast, average prices for medium- and high-volume plans decreased by $3.64 per month (4.84 percent) and $10.29 per month (6.81 percent), respectively. *See also* Viard, V. B., 2007, "Do Switching Costs Make Markets More or Less Competitive? The Case of 800-Number Portability," RAND Journal of Economics. His results show that competition intensified (via a price reduction of around 14 percent per customer) after the implementation of 800-number portability. The average number of wireless subscribers per month porting their phone number from one service provider to another has been steadily increasing over time to an average of 1.3 million per month for the first nine months of 2009, up from 0.9 million per month in 2005, the first full year after all mobile wireless providers were required to be LNP capable. Stroup, C. and Vu, J, February 2010, *Numbering Resource Utilization in the United States*, Federal Communications Commission.

[919] Service providers in the United States generally use one of two technically incompatible air interfaces (GSM or CDMA) and handsets are built to work with one interface. Thus, GSM handsets cannot be used with a service provider that deploys a CDMA interface. Even if both providers employ the same underlying air interface, handset replacement may be necessary because many handset models are produced to the specifications of a single wireless service provider to enable certain functionalities unique to that service provider.

[920] *See* Section VII.B.1., Mobile Wireless Handsets/Devices and Operating Systems, *supra*.

[921] Marketing research suggests that repeated use of an incumbent provider increases the likelihood that a consumer will continue to choose that provider rather than switch to another service provider. Baker, C. A., 2007, "Breaking up is hard to do: Consumer Switching Costs in the U.S. Marketplace for Wireless Telephone Service," AARP Public Policy Institute. Farrell, J and Klemperer, P, 2007, "Coordination and Lock-in: Competition with Switching Costs and Network Effects," Handbook of Industrial Organization, Volume 3, 1970-2056, Elsevier.

industry churn rate is in excess of 24 percent. Churn rate varies by industry segment, with Chart 19 indicating that the churn rate for pre-paid/reseller services is several percentage points higher than for post-paid plans. Part of this differential may be explained by the presence of ETFs, and part of it may be explained by differences in other service and product characteristics between pre-paid and post-paid plans. This difference between average pre-paid and post-paid churn rates is reflected in the churn rates of different service providers according to the distribution of their customer bases across pre-paid and post-post service plans.

B. Consumer Access to Information on Mobile Wireless Services

308. In order to make informed decisions, consumers need detailed information about the price, availability, quality, and features of mobile wireless services. All mobile wireless service providers offer resources on their websites that advertise their products, services, and prices and that give potential customers information on their networks, service plans, and terms of service. A number of third parties – such as *Consumer Reports*, trade associations, marketing and consulting firms, and several websites – also provide consumers with an overview and comparison of the mobile wireless services available in their local areas.[922] In addition, organizations such as *Consumer Reports* and *J.D. Power* publish the results of their wireless user surveys, which rate wireless service providers based on customer satisfaction. Additional third party surveys and studies relevant to provider service quality appear above in Section V.H., Network Performance.

309. Most service provider websites include online street-level coverage maps so consumers can assess the level of service they can expect to receive in a given area.[923] Nonetheless, it can be difficult for consumers to compare coverage between providers in a particular geographic location, as the providers' coverage maps do not currently provide the capability for overlay viewing. Independent websites such as BillShrink have begun to compile coverage data, which enables consumers to comparison shop based upon coverage at specific geographic locations. The coverage data released by providers may provide only a binary "yes" or "no" coverage reading and is not quality of service data that would account for variable environmental and network conditions or the actual service quality experienced by consumers.[924]

310. In addition to coverage maps, mobile wireless service providers also publish "up-to" or "typical" data throughput rates for their data networks. However, these published data throughput rates are generally rough estimations of actual performance. Several third parties test mobile wireless network performance and publish their results, which can include metrics for coverage, reliability, and data throughput rates.[925] As discussed above, the Commission has recognized the importance of accurate, up-to-date data on mobile broadband performance for consumers and has solicited information on the measurement of mobile broadband network performance and coverage, including the best metrics and

[922] *See Fourteenth Report*, 25 FCC Rcd at 11553-54 ¶ 231. For example, websites such as billshrink.com, myrateplan.com, reviews.cnet.com/cell-phone-buying-guide, and prepaidreviews.com, provide consumers with free and user-friendly means to identify the best wireless service to meet their needs.

[923] *See* CTIA Comments at 44-45; Sprint Nextel Comments at 16. *See, e.g.*, AT&T Coverage Viewer, http://www.wireless.att.com/coverageviewer/#?type=voice (visited Oct. 16, 2012); Sprint – Nationwide Coverage, http://coverage.sprintpcs.com/IMPACT.jsp?PCode=vanity:coverage (visited Oct. 16, 2012); T-Mobile, Personal Coverage Check, http://www.t-mobile.com/coverage/pcc.aspx (visited Oct. 16, 2012); Verizon Wireless, Coverage Locator, http://www.verizonwireless.com/b2c/CoverageLocatorController?requesttype=NEWREQUEST&market=All (visited Oct. 16, 2012).

[924] In addition, to our knowledge, no reliable coverage dataset currently exists besides Mosaik's licensed dataset, for which the underlying contours are generally supplied by providers who may use different definitions of coverage. *See National Broadband Plan*, at 25, n.56; 39.

[925] *See* Section V.H, Network Performance, *supra*.

data collection methods to use.[926] Information on mobile broadband availability can also be found in the National Broadband Map.[927]

311. Through the *Consumer Code for Wireless Service*, CTIA and the service providers that are signatories to the Code, voluntarily commit to providing consumers with information to assist them in the selection of mobile wireless service.[928] For example, implementation of initial trial periods in multi-month service subscriptions is a policy that may alleviate a "buyer's regret" problem, and some wireless service providers have implemented formal procedures to permit consumers to use their service on a trial basis for periods ranging from 14 to 30 days, consistent with one of the elements of CTIA's Consumer Code.[929] In addition to offering a trial period for new service, signatories to CTIA's Consumer Code commit to disclose rates, additional taxes, fees, surcharges, and terms of service; provide coverage maps; and make customer service readily accessible.[930] In July 2010, CTIA updated the Consumer Code to require carriers to ensure disclosure of data allowances offered in a service plan, whether there are any prohibitions on data service usage, and whether there are network management practices that will have a material impact on the customer's wireless data experience.[931] The Consumer Code also states that prepaid service providers must disclose the period of time during which any prepaid balance is available for use.[932]

312. *Bill Shock*. Some mobile wireless service providers also have policies in place that attempt to prevent "bill shock" among their customers, *i.e.*, a sudden increase in their monthly bill that is not caused by a change in service plan. Bill shock can happen when a customer unknowingly exceeds plan limits for data, voice, or text, or is unaware of the magnitude of international roaming charges. Survey results released by the Commission in May 2010 indicate that 30 million Americans – or one in six mobile users – have experienced bill shock.[933] In addition, according to survey data published by *Consumer Reports* in January 2011, one in five survey respondents reported receiving an unexpectedly high bill in the previous year.[934]

313. The Commission has been proactively working to clear up consumer confusion surrounding bill shock. On October 14, 2010, the Commission proposed new rules that would require mobile service providers to send usage alerts to consumers when they approach and reach monthly plan limits, and also send alerts when they were about to incur international roaming charges. As a result of these proposals, the Commission reached an agreement with CTIA that its member providers could voluntarily agree to provide these types of alerts that the Commission was proposing. In October 2011, CTIA revised its Consumer Code to require that its participating providers provide four types of alerts

[926] *Id*.

[927] *See* Section IV.B.1.b, Coverage by Technology Type, *supra*.

[928] *See* CTIA, *Consumer Code for Wireless Service*, *available at* http://files.ctia.org/pdf/ConsumerCode.pdf (visited Oct. 16, 2012). (*Consumer Code for Wireless Service*).

[929] *See* CTIA Comments at 44-45; *See* also *Consumer Code for Wireless Service*. The ability of consumers to terminate a wireless service contract within 14 days is also one of a number of provisions of the Assurance of Voluntary Compliance agreed to by AT&T (then Cingular), Sprint Nextel, and Verizon Wireless with the attorneys general of 32 states on June 25, 2004.

[930] *See* CTIA Comments at 46; *See* also *Consumer Code for Wireless Service*.

[931] *See* CTIA Comments at 46; CTIA, *CTIA-The Wireless Association® Announces Updates to Its 'Consumer Code for Wireless Service,'* Press Release, July 28, 2010, *available at* http://www.ctia.org/media/press/body.cfm/prid/1992 (visited Oct. 16, 2012).

[932] *Id.*

[933] Federal Communications Commission, "FCC Survey Confirms Consumers Experience Mobile Bill Shock and Confusion About Early Termination Fees," rel. May 26, 2010.

[934] *Best Phones & Plans,* Consumer Reports, Jan. 2011, at 29.

(data, voice, text, international roaming) by April 17, 2013, and at least two out of the four types of alerts by October 17, 2012.[935] The member providers agreeing to this plan account for service to 97 percent of U.S. wireless customers and all customers are included unless they opt out. As of October 2012, the Commission announced that participating U.S. wireless companies had met or exceeded the initial deadline in CTIA's Consumer Code to provide two out of the four specified alerts, and that were on track to provide all of the specified alerts by April 2013.[936]

314. As part of the Commission's effort to empower consumers by putting information online, the Commission has established a web site where consumers can find out which providers are implementing their voluntary commitments.[937] The web site contains a table showing which providers are providing which types of alerts and the Commission will regularly update the table to reflect each provider's progress in providing the agree-upon alerts, based on information that CTIA provides the agency.

315. *Open Internet Rules*. The rules on Internet openness adopted by the Commission in December 2010 require both fixed and mobile broadband Internet providers to "publicly disclose accurate information regarding the network management practices, performance, and commercial terms of its broadband Internet access services sufficient for consumers to make informed choices regarding use of such services."[938] In providing guidance regarding effective disclosure models, the Commission indicates that among the types of information that might be included in an effective disclosure are pricing terms such as monthly prices, usage-based fees, and fees for early termination or additional network services.[939]

C. Surveys of Consumer Satisfaction with Service Providers

316. In January 2011, *Consumer Reports* published the results of its annual survey on service quality for mobile wireless service providers in 23 metropolitan areas.[940] For each city, the service providers received a numerical "reader score" based on overall customer satisfaction.[941] In addition to providing city-specific ratings, *Consumer Reports* also provided summary ratings, for both "conventional (contract)" and "no-contract" service providers in all cities surveyed.[942] In the summary ratings for

[935] *See* http://www.fcc.gov/blog/new-fcc-website-help-consumers-beat-%E2%80%98bill-shock%E2%80%99 (visited Oct. 16, 2012). *See also* CTIA Consumer Code, http://www.ctia.org/content/index.cfm/AID/10352 (visited Nov. 1, 2012).

[936] "FCC Chairman Julius Genachowski Announces Major Progress in Usage-based Alert Program to Protect Mobile Customers from 'Bill Shock'; Wireless Carriers Meet and Beat Deadline to Provide Free Data, Voice, Text, & International Alerts," News Release, Federal Communications Commission, October 17, 2012.

[937] *See* http://www.fcc.gov/encyclopedia/bill-shock-wireless-usage-alerts-consumers (visited Oct. 16, 2012).

[938] *Open Internet Order* at ¶ 54.

[939] *Open Internet Order* at ¶ 56.

[940] *Best Phones and Plans*, Consumer Reports, Jan. 2011, at 36-37. *See* table entitled, "Ratings: Cell Service by City." The ratings published by *Consumer Reports* were based on 58,189 responses from ConsumerReports.org subscribers surveyed in September 2010. Ratings by city include responses by customers with "conventional (contract)" and "no-contract" service. Only providers with sufficient data for ratings were included.

[941] *Best Phones and Plans*, Consumer Reports, Jan. 2011, at 36-37. The reader score scale is from zero to 100, with a score of 100 indicating that "all respondents were completely satisfied." Furthermore, the reader score category reflects respondents' overall satisfaction with their mobile wireless service, *i.e.*, the reader score category is not limited to specific aspects of mobile wireless service related to network quality and could include other factors such as value and customer support. In addition to a reader score, providers were also rated, using a "better-worse" scale, in several specific categories, including voice problems (*e.g.*, "no service" and "dropped calls"), texting, and data services. As noted in paragraph 308 we summarize other third party reports on service quality.

[942] *Best Phones and Plans*, Consumer Reports, Jan. 2011, at 37. *See* tables entitled, "Ratings: Cell-Phone Service with a Contract" and "Ratings: No-Contract Service." Separate analyses were conducted of overall ratings for contract and no-contract providers.

overall satisfaction among conventional (contract) providers, scores varied by provider, but four out of five providers scored between 60 ("fairly well satisfied") and 80 ("very satisfied") on the *Consumer Reports* "reader score" scale.[943] In addition, the highest rated conventional (contract) provider – U.S. Cellular – received a score of 82.[944] By comparison, among the six no-contract providers included in the survey results, four received ratings between 60 and 80, while two others – Consumer Cellular and TracFone – received ratings of 87 and 82, respectively.[945]

317. In January 2012, *Consumer Reports* updated the results of its survey on mobile wireless service quality conducted in September 2011 for major service providers in 22 metropolitan areas based on 66,315 responses from ConsumerReports.org subscribers.[946] Among the conventional (contract) major providers, U.S. Cellular received a summary score of 84 compared to 82 from the previous year and Verizon Wireless, Sprint Nextel, T-Mobile USA and AT&T received summary scores of 73, 72, 67 and 59, respectively, with differences in score of less than five points not being statistically meaningful. Among the eight no-contract service providers included in the survey, TracFone ranked highest with a score of 82 and others' scores ranged from 67 to 78.[947] ConsumerReports.org asserts that U.S. Cellular, Verizon Wireless and Sprint Nextel are the overall best major mobile wireless service providers for full-featured conventional service and TracFone, Straight Talk, T-Mobile USA and Virgin Mobile are the overall best prepaid mobile wireless service values.

318. The American Consumer Satisfaction Index (ACSI) recently released its findings on customer satisfaction with wireless telephone service. The ACSI combines customer interviews with econometric modeling in its methodology for measuring customer satisfaction. Its findings are presented in Table 43.[948]

Table 43
American Consumer Satisfaction Index, Mobile Wireless Industry, 2008--2012

Service Provider	2008	2009	2010	2011	2012
AT&T Mobility	71	67	69	66	69
T-Mobile	71	71	73	70	69
Sprint Nextel	56	63	70	72	71

[943] *Best Phones and Plans*, Consumer Reports, Jan. 2011, at 37. *See* table entitled, "Ratings: Cell-Phone Service with a Contract."

[944] *Id.*

[945] *Id.*

[946] *Best Phones and Plans*, Consumer Reports.org, *available at* http://www.consumerreports.org/cro/electronics-computers/phones-mobile-devices/cell-phones-services/cell-phone-service-buying-advice/guide-to-cell-phone-carriers/cell-phone-service-ratings/cell-phone-service-ratings.htm (visited Oct. 16, 2012).

[947] *Id.*

[948] *ACSI*, "The American Customer Satisfaction Index, Scores By Industry, Wireless Telephone Service" (2012), *available at* http://www.theacsi.org/index.php?option=com_content&view=article&id=147&catid=&Itemid=212&i=Wireless+Telephone+Service (visited Oct. 16, 2012). ACSI releases industry results monthly and updates the national index quarterly. The "All Others" score represents the remainder of the total industry market share, less the market shares of the ACSI-measured companies. It is an aggregate of a representative number of customer interviews from each of potentially hundreds of smaller companies within the industry. As noted in paragraph 308 we summarize other third party reports on service quality.

Verizon Wireless	72	74	73	72	70
All Others[949]	71	73	76	77	76
Industry Average	68	69	72	71	70

VII. INPUT AND DOWNSTREAM SEGMENTS OF THE MOBILE WIRELESS ECOSYSTEM

A. Non-Spectrum Input Segments

319. In the following sections, we consider key factors in the production of mobile wireless services. We examine whether and how such "upstream" or input segments, including spectrum, infrastructure and backhaul facilities, affect market performance. As we observe below, these critical input segments may affect competition in the provision of mobile wireless services.

1. Infrastructure Facilities

a. Background

320. Infrastructure facilities are a major input into the provision of mobile wireless services. These facilities are comprised mainly of cellular base stations and towers or other structures on which the base stations are situated. A base station generally consists of radio transceivers, antennas, coaxial cable, a regular and backup power supply, and other associated electronics. These base stations are generally placed atop a purpose-built communications tower, or on a tall building, water tower, church steeple, or other structure providing sufficient height above the surrounding area. Some cell sites are located inside buildings to fill indoor coverage gaps. In addition, cell sites may be located at the lower levels of taller towers built to support other communications services, such as broadcast or public safety services.

321. An alternative to the use of tall structures for cell sites are distributed antenna systems (DAS). DAS are comprised of a relatively dense network of small cells that are connected by fiber optic cable and can be placed on such locations as utility poles, buildings, or traffic signal poles. DAS may have advantages in geographic areas where constructing towers is not feasible or wireless traffic demands are too great to be met with fewer, large cells. Because DAS sites are less visible than tower structures, they may be particularly desirable in areas with stringent siting regulations, such as historic districts.

322. The number of cell sites in use by wireless providers continues to grow in order to satisfy the increased demand for mobile wireless services, to expand geographic service area coverage, to improve coverage in existing service areas, and to accommodate newer technologies. According to CTIA, the total number of cell sites in use by CTIA's members was 283,385 as of year-end 2011.[950] This represents an increase in the number of cell sites of 12 percent since December 31, 2010, of 15 percent since December 31, 2009, of 54 percent since December 31, 2005, and of 61 percent since December 31, 2004.[951]

323. A communications tower industry has developed to provide and support the cell sites required by mobile wireless service providers. This industry includes companies that own large numbers of towers on which they lease space to mobile wireless service providers. In recent years, tower

[949] ACSI states that "The "All Others" score for an industry represents the remainder of the total industry market share, less the market shares of the ACSI-measured companies. It is an aggregate of a representative number of customer interviews from each of potentially hundreds of smaller companies within the industry." Individual company scores within the "All Others" category cannot be derived without additional data collection.

[950] *See* CTIA, *2011 Semi-Annual Wireless Industry Survey Results*, at 163 (2012).

[951] *Id*.

companies have expanded their portfolio of service offerings to DAS.[952] Providers of DAS in 2011 included most of the major tower companies, as well as companies specializing in DAS such as ExteNet. There are also companies that help mobile wireless service providers identify available tower or building space in particular geographic areas and arrange the construction of new towers.[953]

324. The ownership of communications towers by independent companies rather than mobile wireless service providers may facilitate entry of new or existing providers into new geographic markets. Independent tower companies have an incentive to increase their business by leasing space to as many service providers as possible. The availability of leased space on established towers may eliminate the need to build new towers and reduce the capital requirements of network deployments.

b. Demand for Infrastructure Facilities

325. Analyst reports about the communications tower industry indicate that the business of the tower industry is dependent to a large extent on business from wireless service providers, including whether they expand service to new geographic areas or enhance the quality of service in current service areas. Continued growth in consumer demand for wireless data services[954] is expected to create demand for tower space for the future cell-splitting plans of mobile wireless providers.[955]

326. American Tower Corporation had an average of 2.1 tenants per tower as of December 31, 2011.[956] As of June 2012, TowerCo's sites had an average of 1.8 tenants, with the ability to add up to two additional tenants per site.[957] Sprint Nextel is the largest tenant on TowerCo sites, followed by AT&T.[958] American Tower reported that its revenue increased 19.3 percent from December 31, 2010 to December 31, 2011;[959] Crown Castle and SBA both reported increases in their revenues between December 31, 2010 and December 31, 2011 of 8 percent[960] and 11 percent,[961] respectively.

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[952] Dan Meyer. *American Tower scores DAS deal with racetrack owner*. RCRWireless.com. July 31, 2012. http://www.rcrwireless.com/article/20120731/das/american-tower-scores-das-deal-racetrack-owner/ (visited Oct. 16, 2012).

[953] As of January 2012, the five largest independent US tower operators by number of towers owned were American Tower (21,000), Crown Castle (22,200), SBA Communications (9,400), Global Tower Partners (5,700), and TowerCo (3,300), Data 2012, A Primer and Outlook on Telecom Services, Towers, and Datacenter/Hosting Infrastructure, RBC Capital Markets, January 19, 2012.

[954] For example, Clearwire's network usage increased 705 percent in 2011. See *Clearwire: Usage on our network increased 705 percent year-over-year*, by Sue Marek, fiercewireless.com, March 22, 2012. http://www.fiercewireless.com/story/clearwire-usage-our-network-increased-705-year-over-year/2012-03-22 (visited Oct. 16, 2012).

[955] Dan Meyer. *SBA to acquire TowerCo for $1.45 billion*. RCRWireless.com. June 26, 2012. http://www.rcrwireless.com/article/20120626/tower/sba-to-acquire-towerco-for-1-45b/ (visited Oct. 16, 2012).

[956] American Tower 2011 Annual Report at 5.

[957] Dan Meyer. *SBA to acquire TowerCo for $1.45 billion*. RCRWireless.com. June 26, 2012. http://www.rcrwireless.com/article/20120626/tower/sba-to-acquire-towerco-for-1-45b/ (visited Oct. 16, 2012).

[958] Dan Meyer. *SBA to acquire TowerCo for $1.45 billion*. RCRWireless.com. June 26, 2012. http://www.rcrwireless.com/article/20120626/tower/sba-to-acquire-towerco-for-1-45b/ (visited Oct. 16, 2012).

[959] *American Tower Corporation Reports Fourth Quarter and Full Year 2011 Financial Results*, Press Release, American Tower, Feb. 23, 2012, available at http://www.americantower.com/atcweb/irpages/irearningsreport.asp (visited Oct. 16, 2012).

[960] Crown Castle International Corp, 2011 Form 10-K, p. 20.

[961] SBA Communications Corporation, 2011 Form 10-K, p. 36.

327. T-Mobile is planning to raise $2 to $3 billion by selling the 7,000 towers that it owns.[962] Crown Castle has been reported to be the leading bidder, and American Tower and Global Tower Partners are also interested parties.[963] SBA Communications plans to acquire TowerCo for $1.45 billion.[964] TowerCo owns 3,252 sites across 47 states and Puerto Rico, which will be added to SBA's more than 12,000 owned and 5,000 managed sites.[965] In 2012, SBA Communications paid $1.1 billion for select assets of Mobilite, including more than 2,300 tower sites in the United States.[966]

c. Infrastructure Costs

328. Two significant constraints faced by wireless services providers that need to add or modify cell sites are obtaining the funds needed to finance the capital expenditure, and obtaining the necessary regulatory and zoning approvals from state and local authorities.[967]

329. *Facilities Siting Costs.* Excessive delays in the zoning approval process were the subject of a Petition for Declaratory Ruling filed by CTIA in 2008. CTIA sought Commission assistance to alleviate unnecessary delays in the process of obtaining approval to construct a new cell site, or to modify an existing site.[968] On November 18, 2009, the Commission adopted a Declaratory Ruling which, among other things, defined presumptively reasonable time parameters for state or local zoning authorities to decide whether or not to approve a cell site application.[969]

330. In its comments to the Sixteenth Report *Public Notice*, PCIA argues that there continue to be significant burdens on wireless infrastructure deployment at the state and local levels.[970] PCIA notes that some jurisdictions utilize a review process for collocations or modifications that requires the same amount of documentation and review as an entirely new tower.[971] PCIA further notes that DAS deployments face particular delays in many areas due to a lack of familiarity with the nature and benefits of a DAS system as well as the fact that a single system may cross jurisdictional boundaries or utilize

[962] *Report: Crown Castle emerges as top bidder for T-Mobile's towers*, by Phil Goldstein, August 1, 2012. Available at: http://www.fiercewireless.com/story/report-crown-castle-emerges-top-bidder-t-mobiles-towers/2012-08-01 (visited Oct. 16, 2012).

[963] *Report: Crown Castle emerges as top bidder for T-Mobile's towers*, by Phil Goldstein, August 1, 2012. Available at: http://www.fiercewireless.com/story/report-crown-castle-emerges-top-bidder-t-mobiles-towers/2012-08-01 (visited Oct. 16, 2012).

[964] Dan Meyer. *SBA to acquire TowerCo for $1.45 billion*. RCRWireless.com. June 26, 2012. http://www.rcrwireless.com/article/20120626/tower/sba-to-acquire-towerco-for-1-45b/ (visited Oct. 16, 2012).

[965] Dan Meyer. *SBA to acquire TowerCo for $1.45 billion*. RCRWireless.com. June 26, 2012. http://www.rcrwireless.com/article/20120626/tower/sba-to-acquire-towerco-for-1-45b/ (visited Oct. 16, 2012).

[966] Dan Meyer. *SBA to acquire TowerCo for $1.45 billion*. RCRWireless.com. June 26, 2012. http://www.rcrwireless.com/article/20120626/tower/sba-to-acquire-towerco-for-1-45b/ (visited Oct. 16, 2012).

[967] There is no evidence that shortages of transmission equipment, including antennas, to install at cell sites act as a barrier to cell site deployment.

[968] Petition for Declaratory Ruling to Clarify Provisions of Section 332(c)(7)(B) to Ensure Timely Siting Review and to Preempt under Section 253 State and Local Ordinances that Classify All Wireless Siting Proposals as Requiring a Variance, WT Docket No. 08-165, *Petition for Declaratory Ruling*, filed July 11, 2008.

[969] Petition for Declaratory Ruling to Clarify Provisions of Section 332(c)(7)(B) to Ensure Timely Siting Review and to Preempt Under Section 253 State and Local Ordinances that Classify All Wireless Siting Proposals as Requiring a Variance, *Declaratory Ruling*, WT Docket No. 08-165, 24 FCC Rcd 13994, 14021 ¶ 71 (2009), *pet. for recon. denied*, 25 FCC Rcd 11157 (2010), *pet. for review denied sub nom. City of Arlington, Texas v. FCC*, 668 F.3d 229 (5th Cir. 2012); *cert granted* 133 S.Ct. 524 (Oct 5, 2012), oral argument Jan 16, 2013.

[970] *See PCIA Comments at 11.*

[971] *See PCIA Comments at 11.*

multiple rights of way with fragmented government responsibility, necessitating compliance with a patchwork of requirements.[972] PCIA argues that, although the Commission has taken significant steps to reduce barriers to wireless infrastructure deployment and investment (including the Shot Clock Ruling[973] and the Pole Attachment Order[974]), more needs to be done.[975]

331. *Tower Costs.* Collocating base station equipment on existing structures is often the most efficient and economical solution for mobile wireless service providers that need new cell sites, either to expand their existing coverage area, increase their capacity, or deploy 4G broadband services. PCIA estimates that the average cost to build a new tower is between $250,000 and $300,000, whereas the average deployment cost for a collocation is between $25,000 and $30,000.[976] Collocation is also commonly encouraged by zoning authorities to reduce the number of new communications towers.[977] Due to the high cost of constructing new towers, and the often considerable delay in obtaining approvals from state and local authorities, wireless service providers will typically look first for existing towers or other suitable structures for new cell sites. Collocation is particularly useful in areas in which it is difficult to find locations to construct new towers. American Tower Corporation, a large independent tower owner, states that even for its towers that are currently at or near full structural capacity, the vast majority can be upgraded or augmented to meet future tenant demand with relatively modest capital investment.[978] Recent legislation requiring state and local governments to approve eligible requests for modification of existing wireless towers or base stations may further enhance the advantages of collocation for wireless service providers.[979]

2. Backhaul Facilities

a. Background

332. Backhaul connections are an integral component of a wireless service provider's network. Backhaul facilities link a mobile wireless service provider's cell sites to the mobile switching centers that provide connections to the mobile wireless service provider's core network, the public switched telephone network, or the Internet, carrying wireless voice and data traffic for routing and onward transmission. Mobile backhaul needs will keep increasing as wireless carriers continue to deploy LTE technology in their networks.[980] In addition, the growing use of small-cell technologies (e.g. microcells, picocells, and femtocells) will increase demand for mobile backhaul.[981] Average macrocell backhaul requirements were 10 Mbps in 2008. In less than three years, they have more than tripled to 35 Mbps in 2011, and by 2015 they will reach 100 Mbps.[982] The overall size for the backhaul market is expected to increase significantly.[983] One study estimates that the size of the backhaul market will grow from $3 billion

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[972] *See PCIA Comments at 11.*

[973] *See Shot Clock Ruling*, 24 FCC Rcd at 14021 ¶ 71.

[974] Implementation of Section 224 of the Act*; A National Broadband Plan for Our Future, Report and Order on Reconsideration, Pole Attachment Order*. 26 FCC Rcd 5240. April 7, 2011.

[975] *See* PCIA Comments at 12.

[976] *See* PCIA Comments at 7.

[977] *See, e.g.*, http://www.loyalsocktownshipbos.com/Documents/Telecommunications%20Towers%20Ordinance.pdf (visited Oct. 16, 2012).

[978] American Tower 2011 Annual Report at 5.

[979] Middle Class Tax Relief and Job Creation Act of 2012, P.L. 112-96, § 6409(a).

[980] *Storming the Cell Tower: MSOs Move Wireless Backhaul to the Forefront, Heavy Reading*, at 3 (July 2011).

[981] *Id*.

[982] See Verizon Wireless Comments at 99.

[983] Verizon Wireless Comments, Docket No. 09-66, at 95-96 (citing a study by Raymond James).

annually to $8 to $10 billion in the next three to five years, driven in large part by increases in wireless data traffic. Infonetics Research projects that telecom service providers will collectively spend at least $8.2 billion annually to deploy backhaul infrastructure for mobile wireless networks by 2014.[984]

333. Currently, there are three major physical mediums for backhaul transmission links: copper, microwave radio, and optical fiber links.[985] Traditional copper-based T1[986] or DS3[987] backhaul facilities that were built for voice communications are increasingly strained and less efficient or cost-effective for packet-based data communications or video streaming.[988] Although copper transmission remains critical to the operations of wireless carriers, reliance on copper is declining due to the growth in mobile subscribers, smartphones, and wireless broadband data services.[989] Today's data-centric wireless broadband services demand higher capacity, scalable, and cost-efficient backhaul links such as fiber and microwave links, where available.[990] Optical fiber links may be deployed in urban and suburban locations characterized by high traffic density, whereas microwave radio (and even satellite) links may be used where fiber links are hard to deploy. The expected mass deployment of small cells will likely drive demand for new radio-based backhaul technologies.[991] For example, one study estimated that 44 percent of backhaul traffic in 2012 would be carried via copper, 13 percent via fiber, and 40 percent via microwave.[992] In comparison, in 2005, 85.5 percent of backhaul traffic was carried via copper, 5.8 percent via fiber, and 8.7 percent via fixed wireless.[993] Another study projects that in North America, microwave radio's share of backhaul connections will increase from about 15 percent in 2011 to at least 25 percent in 2015.[994]

b. Demand for Backhaul

334. Several recent trends in the mobile wireless industry have led to increased demands on

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[984] *Storming the Cell Tower: MSOs Move Wireless Backhaul to the Forefront*, *Heavy Reading* citing Infonetics Research, at 3 (July 2011).

[985] Different protocols for data transmission (*e.g.*, TDM, Ethernet) can run over each type of physical facility.

[986] *See* "T-carrier" (T1 means any data circuit with the 1.544 Mega-bits per second or Mbps line rate), *available at* http://en.wikipedia.org/wiki/T-carrier (visited August 10, 2012).

[987] *See* "Digital Signal 3" (means a transmission line with the 44.736 Mega-bits per second or Mbps line rate), available at http://en.wikipedia.org/wiki/DS3 (visited August 10, 2012).

[988] *See* Gene Bell, *Broadband Backhaul* ("For comparison to T1 lines, fiber and microwave based backhaul can provide more than twice the capacity at half of the cost."), at 1, *available at* http://www.mobilitie.com/Downloads/BROADBAND_BACKHAUL_WP_WEB.pdf (visited August 10, 2012); *See also* Sue Marek, *Sprint: Ethernet backhaul gives us 20 times more bandwidth* (stating that the Ethernet based backhaul is 95% cheaper than the traditional backhaul in putting through a bit of data), August 15, 2012, *available at* http://www.fiercebroadbandwireless.com/story/sprint-ethernet-backhaul-gives-us-20-times-more-bandwidth/2012-08-15 (visited August 15, 2012).

[989] *See*, e.g., Letter from Christopher J. Wright, Counsel to Sprint Nextel Corp., to Marlene H. Dortch, Secretary, FCC, WC Docket No. 05-25 (filed June 19, 2012) (Sprint Nextel June 19, 2012 ex parte) ("Sprint also discussed its Network Vision initiative and explained that notwithstanding the initiative lower-capacity services, such as DS 1 and DS3 level services, will continue to be critical to Sprint's wireline and wireless operations.").

[990] *See* Gene Bell, *Broadband Backhaul* ("For comparison to T1 lines, fiber and microwave based backhaul can provide more than twice the capacity at half of the cost."), at 4, available at http://www.mobilitie.com/Downloads/BROADBAND_BACKHAUL_WP_WEB.pdf (visited August 10, 2012).

[991] *Storming the Cell Tower: MSOs Move Wireless Backhaul to the Forefront*, *Heavy Reading*, at 4 (July 2011).

[992] See Verizon Wireless Comments at 100.

[993] *Wireless Backhaul Market Study*, New Paradigm Resources, Oct. 2008. This study estimated that as of mid-2009, there were about 530,000 backhaul lines, for 230,000 cell sites in the United States.

[994] *Id* at 5.

backhaul capacity, making access to sufficient backhaul an increasingly central component of a mobile wireless provider's overall performance. First, the increased adoption of Internet-connected mobile computing devices, incorporating such advanced functionalities as video and Internet browsing, is consuming greater amounts of bandwidth. As the smartphone penetration rate increases, bandwidth-consuming data services are becoming an increasing percentage of a mobile wireless provider's overall traffic.[995] It is estimated that mobile data traffic more than doubled from 226.5 billion MB in the last six months of 2010 to 525.7 billion MB in the second half of 2011.[996] Second, the proliferation of fixed-rate mobile Internet access plans facilitates increased consumption of services and bandwidth.[997] AT&T reported that its wireless data traffic doubled from 2010 to 2011 and that it has grown 20,000 percent over the past five years.[998] Apple Inc. has doubled the sale of its iPhones each year since 2008.[999] Third, mobile wireless network data speeds have increased as new technologies have been deployed, with current and future launches of LTE networks supporting even higher data throughput rates and lower latencies. As wireless data traffic increases, it consumes greater bandwidth.

335. Mobile wireless providers must have access to sufficient backhaul, in terms of capacity and speed, to avoid creating communications bottlenecks.[1000] Although copper transmission remains critical to the operations of wireless carriers, mobile wireless carriers are often supplementing or replacing traditional TDM-over-copper facilities with fiber and microwave links, where available.[1001] For example, AT&T has upgraded its backhaul from T1- or DS3-based facilities to Ethernet-based facilities and almost 90 percent of its data traffic is on enhanced backhaul as of the second quarter of 2012.[1002] T-Mobile has enhanced backhaul covering 100 percent of its 4G network, 95 percent of which (over 32,000 cell sites) is fiber backhaul.[1003] In connection with its Network Vision Plan, Sprint is changing its backhaul architecture from microwave to a more cost-effective fiber backhaul.[1004] C Spire has integrated Ethernet backhaul at more than 70 percent of its 360 plus cell sites slated for 4G LTE service as of July

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[995] According to *Heavy Reading*, due largely by the success of Apple's iPhone, the number of active smartphones in the U.S. rose 57 percent from 49.8 million at the end of 2009, to 78.2 million by the end of 2010. *See* "Storming the Cell Tower: MSOs Move Wireless Backhaul to the Forefront," *Heavy Reading*, at 6 (July 2011).

[996] *See* CTIA, 2011 *Semi-Annual Wireless Industry Survey Results*, at 10 (2011).

[997] Recent moves by some wireless carriers toward tiered pricing for data may slow the rate of growth of data usage from those that were projected based on unlimited data usage packages.

[998] See "Wireless Data Volume on Our Network Continues to Double Annually," AT&T press release, Feb. 14, 2012. http://www.att.com/gen/press-room?pid=22372&cdvn=news&newsarticleid=33858&mapcode=corporate|wireless-networks-general (visited Oct. 16, 2012).

[999] *See* "Backhaul: The Elephant in the HetNet Room," by Sharon Armbrust, SNL Kagan Wireless Investor, November 15, 2011, p. 1. http://www.snl.com/InteractiveX/ArticleAbstract.aspx?id=13669076 (visited Oct. 16, 2012).

[1000] Service providers must provide backhaul for increasing numbers of cell sites and ensure that the backhaul solutions they employ provide sufficient capacity to support increasing use of wireless data services.

[1001] *See*, e.g., Sprint Nextel June 19, 2012 ex parte, supra n. 10.

[1002] *See* AT&T's Management Discusses Q2 2012 Results - Earnings Call Transcript, July 24, 2012, *available at* http://seekingalpha.com/article/743221-at-amp-t-s-management-discusses-q2-2012-results-earnings-call-transcript (visited July 25, 2012).

[1003] *See* Dave Mayo, "T-Mobile's Backhaul Strategy Key to a Competitive 4G Experience," T-Mobile blog post, Aug. 1, 2012, *available at* http://blog.t-mobile.com/2012/08/01/t-mobiles-backhaul-strategy-key-to-a-competitive-4g-experience/ (visited Aug. 2, 2012).

[1004] *See* Sprint 10-Q for the first quarter of 2012, at 9.

2012.[1005] Clearwire uses primarily microwave backhaul that significantly reduces its overall backhaul expenses and improves the scalability of its backhaul network.[1006]

c. Supply of Backhaul

336. Providers of backhaul services include incumbent local exchange carriers (ILECs) such as AT&T, Verizon, and CenturyLink; competitive local exchange carriers (CLECs) such as Level 3, tw telecom inc., Cbeyond, Inc., and XO Communications, LLC; competitive fiber and microwave wholesalers such as Level 3, FPL FiberNet, IP Networks, and Zayo; cable providers such as Charter Communications, Comcast Business, Cox Carrier Services, and Time Warner Cable Business Class; independent backhaul operators, including backhaul specialists such as Telecom Transport Management, and Tower Cloud, and potentially some tower operators.[1007]

d. Costs

337. Backhaul constitutes a significant cost to mobile wireless service providers.[1008] Estimates of average monthly backhaul costs range from hundreds of dollars (for a T1 line) to several thousand dollars per month.[1009] Based on estimates from Exalt Communications, a microwave backhaul equipment manufacturer and application provider, T1/E1 circuits provide 1.544/2.048 Mbps in each direction, with typical leasing prices ranging from US$150 to US$750 per month, depending upon location, and with a one-time set-up charge averaging US$625 per T1. The North American average price per T1 was US$337 per month in 2008.[1010] A 10 Mbps Ethernet-over-copper link, at distances of up to ~1.5 miles from the central office, was typically priced from US$950 to US$1,100 per month in 2008, with higher prices for guaranteed 99.999 percent availability.[1011] Typical lease rates for fiber OC-3[1012] are US$4,000 to US$7,500 per month, with a North American average of US$5,536 per month and one time set-up charges averaging US$7,300 per OC-3 in 2008. Fiber optical transmission links with a data rate between 20 Mbps and 50 Mbps can be purchased for about $1,000 per month, and microwave backhaul links can be even cheaper than fiber on a per-megabit basis,[1013]

[1005] *See* C Spire News release, "C Spire Wireless Using Alcatel-Lucent To Deploy Next-Generation High-Speed 4G LTE Mobile Broadband Network," July 2, 2012, *available at* http://www.cspire.com/company_info/about/news_detail.jsp?entryId=14500004 (visited Oct. 16, 2012).

[1006] *See* Clearwire 2011 Annual Report, at 12.

[1007] Telco Backhaul Strategies, FierceTelecom.com, November 2011, at 1-2.

[1008] A backhaul report by Infonetics Research claims that globally backhaul operations can account for up to 30 percent of a wireless provider's total operations costs. *See* Dan Meyer, *Backhaul options diverse for 4G networks*, RCR Wireless, Mar. 1, 2010, *available at* http://www.rcrwireless.com/ARTICLE/20100301/INFRASTRUCTURE/100309990/backhaul-options-diverse-for-4g-networks (visited Sept. 2, 2010).

[1009] *See MSV 700 MHz Comments* (hundreds of dollars for a T1 line to $2,000 for a DS3 connection); Space Data Corporation Comments, WT Docket No. 06-150, PS Docket No. 06-229, Exhibit A (filed June 20, 2008) (backhaul cost ranging from $2,500 to $6,000).

[1010] *See* Economics of Backhaul, *available at* http://www.exaltcom.com/Economics-of-Backhaul.aspx (visited July 31, 2012).

[1011] *Id*.

[1012] *See* "Optical Carrier transmission rates" (a fiber optical transmission line with a data rate up to 155 Mega-bits per second or Mbps), *available at* http://en.wikipedia.org/wiki/Optical_Carrier_transmission_rates (visited August 10, 2010).

[1013] *See* Gene Bell, *Broadband Backhaul* ("For comparison to T1 lines, fiber and microwave based backhaul can provide more than twice the capacity at half of the cost."), at 4, *available at* http://www.mobilitie.com/Downloads/BROADBAND_BACKHAUL_WP_WEB.pdf (visited August 10, 2012).

338. The cost of owning fiber ranges from US$40,000 to more than US$250,000 per mile, depending upon geography, soil characteristics and whether it is buried underground or strung overhead.[1014] To reduce the deployment cost and speed up the deployment, fiber backhaul providers often partner with local power companies and use the power company's infrastructure to deploy fiber.[1015] Fiber deployed along a utility's infrastructure provides a redundant path to the incumbent local phone company (ILEC) fiber.[1016] The cost for microwave backhaul ranges from $13,000 for single bridge applications to $73,000 for ultra-high capacity, redundant installations.[1017] Another study estimates that the average microwave backhaul cost ranges from $16,000 for a single link to $30,000 for dual links (one of which is backup) and to $40,000 for a trunk (long haul) microwave link.[1018]

e. Recent FCC Initiatives on Backhaul

339. The Commission has recently examined issues related to backhaul including special access services and the use of microwave spectrum for backhaul services. Special access services employ dedicated facilities provided by incumbent local exchange carriers (ILECs), connecting directly between two discrete end user locations (such as a mobile wireless service provider's cell site and its mobile switching center).[1019] Wireless service providers often buy special access services from ILECs.[1020] Very often, wireless service providers have to buy special access services from an ILEC against whose wireless affiliates they compete. One wireless service provider has claimed that over 98 percent of all T1 circuits are purchased from ILECs, as are the vast majority of DS3 connections.[1021] Since 1991, special access services are generally governed by price cap regulation, which focuses primarily on the prices that an ILEC may charge and the revenues it may generate from interstate access services.[1022] In January 2005, the Commission started a proceeding to broadly examine the regulatory framework for local exchange

[1014] *Id*.

[1015] *See* Tower Cloud news release, "Tower Cloud Launches New Fiber Optic based Backhaul Network in Columbus and LaGrange, Georgia," June 26, 2012. *See also* IP Networks, Fiber Network and Ethernet Transport Services (Installing fiber optic cable in the existing utility infrastructure minimizes costs while providing a highly reliable and safe environment for telecommunication infrastructure), *available at* http://ipnetworksinc.com/ethernet/ (visited Aug. 1, 2012).

[1016] *See* IP Networks, Fiber Network and Ethernet Transport Services, *available at* http://ipnetworksinc.com/ethernet/ (visited Aug. 1, 2012).

[1017] *Id*. (including microwave radio equipment cost, antenna, cable and power cost, installation cost, and annual maintenance costs, antenna space leasing cost, and license and coordination fees in the case of licensed link.)

[1018] *See* Tzvika Naveh, "Case Study Analyzing Various Backhaul Technology Strategies," Ceragon Networks, Oct. 2009.

[1019] *See* Special Access Rates for Price Cap Local Exchange Carriers; AT&T Corp. Petition for Rulemaking to Reform Regulation of Incumbent Local Exchange Carrier Rates for Interstate Special Access Services, WC Docket No. 05-25, RM-l 0593, Order and Notice of Proposed Rulemaking, 20 FCC Red. 1994 (reI. Jan. 31, 2005) (*2005 Special Access NPRM*), at 7.

[1020] *See* Sprint 2011 Annual Report at 9, Leap Wireless 2011Annual Report, at 16, and MetroPCS 2011 Annual Report, at 49.

[1021] Sprint Nextel Comments, WC Docket No. 05-25 (filed Jan. 19, 2010).

[1022] *See 2005 Special Access NPRM*, at 5. We note that the Commission modified its price cap rules in 1999 to provide pricing flexibility where ILECs met certain competitive showings. Access Charge Reform; Price Cap Performance Review for Local Exchange Carriers; Interexchange Carrier Purchases of Switched Access Services Offered by Competitive Local Exchange Carriers; Petition of U.S. West Communications, Inc. for Forbearance from Regulation as a Dominant Carrier in the Phoenix, Arizona MSA, CC Docket Nos. 96-262, 94-1, 98-157, CCB/CPD File No. 98-63, Fifth Report and Order and Further Notice of Proposed Rulemaking, 14 FCC Rcd 14221, 14224, para. 1 (1999) (Pricing Flexibility Order).

carriers' (LECs) interstate special access services.[1023]

340. The National Broadband Plan includes several recommendations to facilitate the more efficient and economic installation of fiber facilities that may be used to meet the rapidly increasing demand for additional backhaul capacity.[1024] The National Broadband Plan, recognizing the importance of backhaul for providing wireless broadband services, also recommends that the Commission take action to ensure that sufficient microwave spectrum is available to meet current and future demand for backhaul, especially in the bands below 12 GHz.[1025] The National Broadband Plan recommends that the Commission take further actions to enhance the flexibility and speed with which companies can obtain access to spectrum to use for backhaul, which is critical to the deployment of wireless broadband and other wireless services.[1026]

341. On August 9, 2011, the Commission released a *Report and Order* that addressed a number of the National Broadband Plan recommendations to remove regulatory barriers to the use of microwave spectrum for backhaul.[1027] In particular, the *Report and Order* allows FS operators to share, under certain circumstances, the 6875-7125 MHz and 12700-13100 MHz bands with Fixed and Mobile Broadcast Auxiliary Service (BAS) and Cable TV Relay Service (CARS).[1028] In addition, the *Second Report and Order*, released on August 3, 2012, removed regulatory barriers to make better use of FS spectrum and provide additional flexibility to enable FS licensees to reduce operational costs and facilitate the use of backhaul in rural areas.[1029] In particular, *Second Report and Order* liberalized the Commission's rules to allow smaller antennas in the 6, 18, and 23 GHz bands without materially increasing interference.[1030] The Second Report and Order also updated efficiency standards to specify those rates in terms of bits/second/Hertz rather than outdated specifications from the circuit-switched era and defined payload capacity in Part 101 rules to account for Internet protocol radio systems.[1031] Finally, the Second Report and Order allows microwave operators to create higher capacity links by licensing 60 and 80 megahertz channels in the 6 and 11 GHz microwave bands, respectively.[1032] In October of 2012, the Commission modified a rule adopted in the Second Report and Order to align the center frequencies across various channel sizes and allow for more efficient channelization and utilization.[1033]

[1023] *See 2005 Special Access NPRM*.

[1024] *National Broadband Plan*, at 48-49, 139.

[1025] *National Broadband Plan*, at 93.

[1026] *National Broadband Plan*, at 93.

[1027] Amendment of Part 101 of the Commission's Rules to Facilitate the Use of Microwave for Wireless Backhaul and Other Uses and to Provide Additional Flexibility to Broadcast Auxiliary Service and Operational Fixed Microwave Licensees, et al., WT Docket No. 10-153, et al., *First Report and Order, Further Notice of Proposed Rulemaking, and Memorandum Opinion and Order* (2011).

[1028] *Id.*

[1029] Amendment of Part 101 of the Commission's Rules to Facilitate the Use of Microwave for Wireless Backhaul and Other Uses and to Provide Additional Flexibility to Broadcast Auxiliary Service and Operational Fixed Microwave Licensees, et al., WT Docket No. 10-153, et al., *Second Report and Order, Second Further Notice of Proposed Rulemaking,Second Notice of Inquiry, Order on Reconsideration, and Memorandum Opinion and Order* at 3 (2012).

[1030] *Id.*

[1031] *Id.*

[1032] *Id.*

[1033] Amendment of Part 101 of the Commission's Rules to Facilitate the Use of Microwave for Wireless Backhaul and Other Uses and to Provide Additional Flexibility to Broadcast Auxiliary Service and Operational Fixed Microwave Licensees, et al., WT Docket No. 10-153, et al., *Order*, FCC 12-122 (2012).

B. Downstream Segments

1. Mobile Wireless Handsets/Devices and Operating Systems

342. Handsets and devices are a central part of consumers' mobile wireless experience. In 2011, smartphone adoption increased, with 46 percent of mobile wireless consumers reported to have smartphones, and 60 percent of consumers who purchased a new mobile device during the fourth quarter selecting a smartphone over a feature phone.[1034] By June, 2012, 55 percent of mobile wireless consumers reported using smartphones, and 67 percent of new phone purchases were smartphones.[1035] Since Apple entered the smartphone business with the iPhone in June 2007, many handset manufacturers have introduced competing products with similar features such as touch screens, mobile web browsing capabilities, and current-generation operating systems. During 2011, the iPhone exclusive handset arrangement between Apple and AT&T ended, and multiple service providers began offering the iPhone on their networks.[1036] In 2012, Verizon Wireless, Sprint and other providers are also selling the iPhone 4s and iPhone 5. Innovative smartphones that are not subject to exclusive arrangements are widely available. Popular smartphone operating systems such as the Android and the Apple iOS are available from multiple service providers, permitting consumers to pair their preferred operating systems with different service providers.

a. Handsets/Devices and Operating Systems

343. *Number of Manufacturers*. From 2006 to 2012, the number of mobile wireless handset manufacturers that distribute in the U.S. market increased from eight to 23 (see Table 44). During June 2012, these 23 handset manufacturers offered a total of 266 handset models to mobile wireless service providers in the United States.[1037] Nine of these handset manufacturers offered at least 10 handset models each.

[1034] Nielsenwire, The Nielsen Company, *40 Percent of U.S. Mobile Users Own Smartphones; 40 Percent are Android*, September 1, 2011. *See also* http://blog.nielsen.com/nielsenwire/consumer/more-us-consumers-choosing-smartphones-as-apple-closes-the-gap-on-android/ (visited Oct. 16, 2012).

[1035] Nielsenwire, The Nielsen Company, *Two Thirds of New Mobile Buyers Now Opting for Smartphones*, July 12, 2012. See also http://blog.nielsen.com/nielsenwire/online_mobile/two-thirds-of-new-mobile-buyers-now-opting-for-smartphones/ (visited Nov. 19, 2012).

[1036] Prior to 2011, Apple distributed its iPhone through AT&T (and its affiliates) only. An exclusive handset arrangement (EHA) is an arrangement in which a handset manufacturer or vendor agrees to sell a particular handset model to only one wireless service provider, usually for a specified period of time. See *Fifteenth Report*, 26 FCC Rcd at 9853 ¶ 332.

[1037] *See* C.F.R 47, § 20.19a(3)(ii) for the definition of handset model used here (a distinct handset model is a model that has different designations such as form, features, or capabilities from other models). Starting in July 2010, handset manufacturers are required to file their hearing aid compatibility status reports annually on July 15 for the twelve month reporting period from July 1 of the prior year to June 30th of the reporting year. For the purposes of the analysis of handset models in this section we report the data for the last month of the reporting period. See also http://wireless.fcc.gov/hac/index.htm?job=home (visited Oct. 16, 2012) for more details on these reports.

Table 44
Handset Manufacturers and Handset Models Offered, U.S., 2006-2012[1038]

Reporting Handset Manufacturers	2006 (Nov.)	2007 (Nov.)	2008 (Dec.)	2009 (June)	2010 (June)	2011 (June)	2012 (June)
Total Number	*8*	*12*	*12*	*16*	*21*	*20*	*23*
Total Number Offering Ten or More Handset Models	5	8	8	9	11	8	9
Total Number of Handset Models Offered	124	168	346	260	302	297	266

344. Nineteen handset manufacturers offered a total of 160 smartphones in June 2012, compared to 166 in June 2011.[1039] Table 45 lists the top five smartphone and handset manufacturers, by number of models offered, that distributed in the United States in June 2011. Tables 43 and 44 show that in June 2012, Samsung and LG offered the most smartphone models as well as the most handset models.[1040]

Table 45
Smartphone Manufacturers by Number of Smartphone Models U.S., June 2012

Top Five Smartphone Manufacturers	Number of Smartphone Models
Samsung	39
LG	34
Research in Motion	13
HTC	10
Huawei	10
Total	96

Table 46
Handset Manufacturers by Number of Handset Models U.S., June 2012

Top Five Handset Manufacturers	Number of Handset Models
Samsung	65
LG	35
Motorola	24
Kyocera	21
Pantech	17
Total	162

[1038] These figures based on data from hearing aid compatibility reports filed by handset manufacturers from 2006 to 2012. For reports prior to July 2009, see FCC Docket 07-250; for reports after July 2009, see the FCC Hearing Aid Compatibility status reporting site at http://wireless.fcc.gov/hac/index.htm?job=home (visited Oct. 16, 2012). For the purposes of the analysis of handset models in this section, we report information for the last month of the reporting period. Device manufacturers file their annual HAC reports by July 15 of each year covering the reporting period from July 1 of the previous year to June 30 of the current year.

[1039] Based on data from hearing aid compatibility status reports filed by handset manufacturers in July 2011 and July 2012, *available at* http://wireless.fcc.gov/hac/index.htm?job=home (visited Oct. 16, 2012).

[1040] Based on data from hearing aid compatibility status reports filed by handset manufacturers July 2011, *available at* http://wireless.fcc.gov/hac/index.htm?job=home (visited Oct. 16, 2012).

345. *Share of Mobile Devices by Manufacturer*. ComScore, a marketing information company, estimates that in September 2012 the top five handset manufacturers in the United States accounted for 78.3 percent of mobile devices currently in use, and all other manufacturers accounted for the remaining 21.7 percent (Table 47).[1041]

Table 47
Share of Mobile Devices in Use, U.S., 2009-2012

Handset Manufacturer	December 2009[1042]	August 2010[1043]	September 2011[1044]	September 2012[1045]
Samsung	21.2%	23.6%	25.3%	26.0%
LG	21.9%	21.2%	20.6%	17.7%
Motorola	23.5%	18.8%	13.8%	10.9%
Apple	NA	NA	10.2%	17.5%
RIM	7.0%	9.0%	7.1%	NA
HTC	NA	NA	NA	6.2%
Nokia	9.2%	7.6%	NA	NA
All Others	17.2%	19.8%	23%	21.7%

346. *Share of Smartphones by Operating System*. The operating system of a smartphone is one of the major factors that determine the smartphone's ability to support mobile applications and Internet-based services. Apple's iOS and Google's Android have emerged as the two leading mobile operating systems.[1046] According to comScore, Android's share of the smartphone operating system grew from three percent in May 2009 to 51 percent in March 2012, while iOS's market share increased from 20 percent to 32 percent over the same period.[1047] Over essentially the same period, RIM's market share has declined from the top position to one of less than ten percent of the market. In September 2012, 99.4 percent of smartphones in use had an operating system from a top-five mobile operating system

[1041] *See comScore Reports September 2012. U.S. Mobile Subscriber Market Share*, Press Release, comScore, Nov. 2, 2012, *available at* http://www.comscore.com/Insights/Press_Releases/2012/11/comScore_Reports_September_2012_U.S._Mobile_Subscriber_Market_Share (visited Nov. 19, 2012).

[1042] *See Fourteenth Report*, 25 FCC Rcd at 11586 ¶ 304.

[1043] *See Fifteenth Report*, 26 FCC Rcd at 9850 ¶ 329 Table 32.

[1044] *See comScore Reports September 2011. U.S. Mobile Subscriber Market Share*, Press Release, comScore, Nov. 4, 2011, *available at* http://www.comscore.com/Press_Events/Press_Releases/2011/11/comScore_Reports_September_2011_U.S._Mobile_Subscriber_Market_Share. (visited Oct. 16, 2012).

[1045] See comScore Reports September 2012. U.S. Mobile Subscriber Market Share, Press Release, comScore, Nov. 2, 2012, available at http://www.comscore.com/Press_Events/Press_Releases/2011/11/comScore_Reports_September_2011_U.S._Mobile_Subscriber_Market_Share (visited Nov. 19, 2012).

[1046] *See* Nathan Edd, *Android, iOS Mobile Market Share Growing: comScore*, eWeek, May 1, 2012, at http://www.eweek.com/c/a/Mobile-and-Wireless/Android-iOS-Mobile-Market-Share-Growing-comScore-344060/ (visited Oct 16, 2012) ; CTIA Reply at 6; Verizon Comments at 78-79.

[1047] Phil Goldstein, *What Were the Top U.S. Smartphone Operating Systems in May?*, FierceWireless, July 21, 2009 (citing comScore); Nathan Edd, *Android, iOS Mobile Market Share Growing: comScore*, eWeek, May 1, 2012, at http://www.eweek.com/c/a/Mobile-and-Wireless/Android-iOS-Mobile-Market-Share-Growing-comScore-344060/ (visited Oct 16, 2012); comScore, MobiLens Trend. comScore MobilLens U.S. data are derived from a monthly survey of over 13,000 respondents ages 13 and older who are recruited to represent U.S. Census demographics. The total universe size is estimated from data provided by CTIA and comScore's monthly subscriber studies.

provider, while the remaining 0.6 percent of smartphones in use have other operating systems (Table 48).[1048]

Table 48
Share of Smartphones in Use by Operating System, 2009-2012

Operating System Developer	Share of Smartphones in Use			
	December 2009[1049]	August 2010[1050]	September 2011[1051]	September 2012[1052]
Google	5.2%	19.6%	44.8%	52.5%
Apple	25.3%	24.2%	27.4%	34.3%
RIM	41.6%	37.6%	18.9%	8.4%
Microsoft	18.0%	10.8%	5.6%	3.6%
Palm	6.1%	4.6%	N/A	N/A
Symbian	N/A	N/A	1.8%	0.6%
All Others	3.8%	3.2%	1.5%	0.6%

[1048] *See comScore Reports September 2012. U.S. Mobile Subscriber Market Share,* Press Release, comScore, Nov. 2, 2012, *available at* http://www.comscore.com/Insights/Press_Releases/2012/11/comScore_Reports_September_2012_U.S._Mobile_Subscriber_Market_Share (visited Nov. 19, 2012).

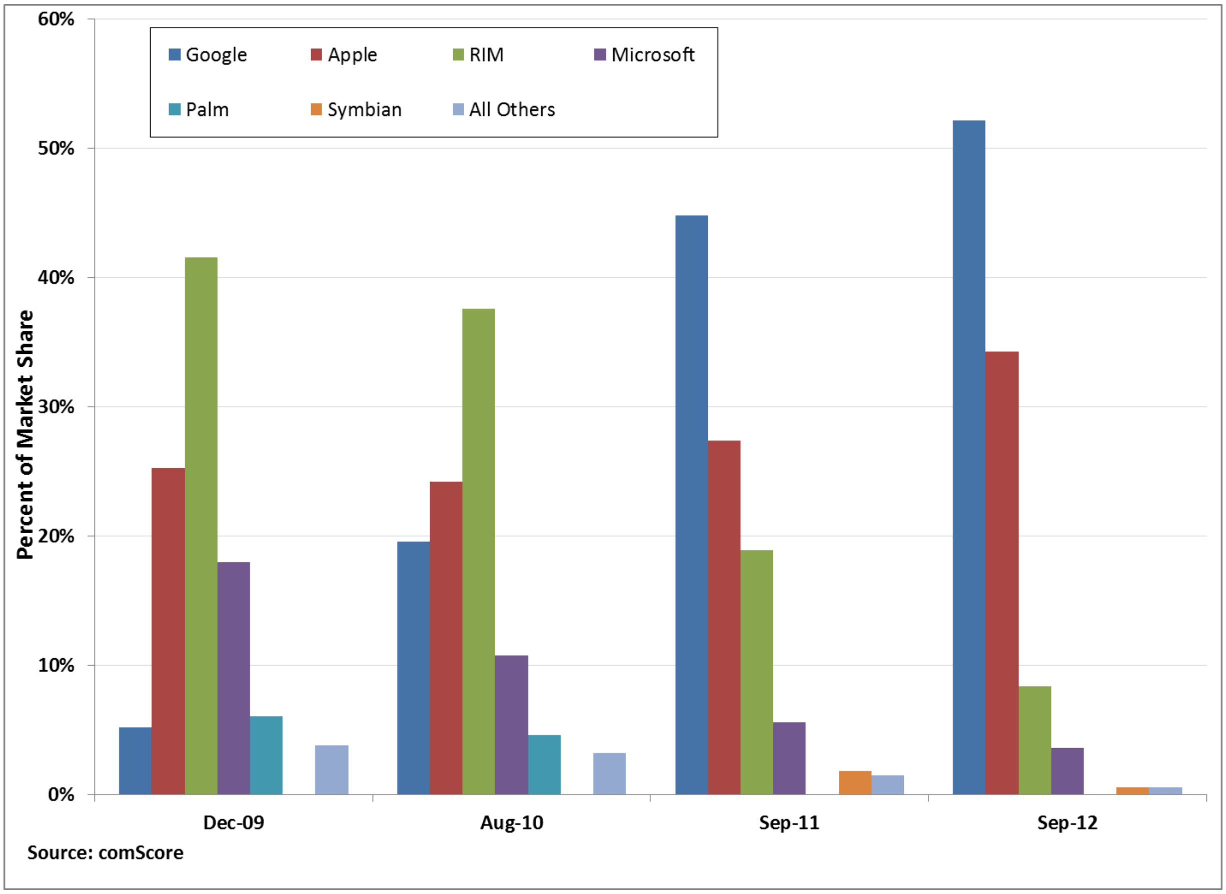
[1049] *See Fourteenth Report*, 25 FCC Rcd at 11588 ¶ 306 n. 819.

[1050] *See Fifteenth Report*, 26 FCC Rcd at 9852, ¶ 331, Table 35.

[1051] *See comScore Reports September 2011. U.S. Mobile Subscriber Market Share,* Press Release, comScore, Nov. 4, 2011, *available at* http://www.comscore.com/Press_Events/Press_Releases/2011/11/comScore_Reports_September_2011_U.S._Mobile_Subscriber_Market_Share. (visited Oct. 16, 2012).

[1052] *See comScore Reports September 2012. U.S. Mobile Subscriber Market Share*, Press Release, comScore, Nov. 2, 2012, *available at* http://www.comscore.com/Press_Events/Press_Releases/2011/11/comScore_Reports_September_2011_U.S._Mobile_Subscriber_Market_Share (visited Nov. 19, 2012).

Chart 42
Smartphone Operating System U.S. Market Share, 2009-2012[1053]



347. *Technological Standards*. As of June 2011, handsets are manufactured for each of the commonly used wireless families of air interface standards, including the CDMA family (including 1xRTT and EV-DO) and the GSM/WCDMA family (including GSM, GPRS, EDGE, WCDMA, HSDPA, and HSUPA). As the technical standards within each of these families progress, handsets are often built to support multiple air interfaces common to that family. This facilitates backwards compatibility with older technologies and migration to more efficient air interfaces over time. Handsets that are manufactured for one air interface family usually do not function on competing families of standards, although a few handsets have been designed to operate over more than one family. As of June 2011, handset variety was greatest for the GSM/WCDMA family, immediately followed by the CDMA 1xRTT/EV-DO family. Tables 47 and 48 show the number of handset and smartphone models, respectively, by air interface. These tables do not have data for LTE handsets, because there were no reporting requirements for LTE handsets for the purpose of Hearing Aid Compatibility as of June 2011.

[1053] comScore, Press Release, *comScore Reports July 2012 U.S. Mobile Subscriber Market Share*, Sept. 4 2012, *available at* http://www.comscore.com/Press_Events/Press_Releases/2012/9/comScore_Reports_July_2012_U.S._Mobile_Subscriber_Market_Share (visited Oct. 16, 2012).

Table 49
Handset Models Offered by Air Interface, U.S., 2007-2012

	Total Handset Models Offered by Reporting Handset Manufacturers					
Air Interface	**2007 (Nov.)**	**2008 (Dec.)**	**2009 (June)**	**2010 (June)**	**2011 (June)**	**2012 (June)**
CDMA/1xRTT/ EV-DO[1054]	118	146	115	134	136	117
CDMA/WCDMA	0	0	0	1	2	0
GSM/WCDMA[1055]	42	177	129	148	137	131
GSM/CDMA	0	0	2	3	4	2
GSM/CDMA/WCDMA	0	0	0	0	0	4
iDEN	8	21	14	16	18	12
Total	168	346	260	302	297	266

Table 50
Smartphone Models Offered by Handset Manufacturers by Air Interface, U.S., 2009-2012

Air Interface Type	**Estimated Smartphone Models**			
	June 2009	**June 2010**	**June 2011**	**June 2012**
CDMA/1xRTT/EV-DO	19	67	76	68
GSM/WCDMA[1056]	35	80	86	88
GSM/CDMA	0	0	0	1
GSM/CDMA/WCDMA	0	0	0	2
iDEN	1	2	3	1
Total	55	149	165	160

348. *Handset Availability by Service Providers.* Service providers offer their customers a wide selection of handsets. Chart 43 shows the number of handset models and smartphone models offered by each of the top eight facilities-based service providers in December 2011.[1057] Table 51 shows the number of service providers (including resellers) offering a particular manufacturer's smartphone models.

[1054] Our data currently cannot separate 1xRTT with EV-DO handsets from 1xRTT only handsets.

[1055] The number of handset models with WCDMA was 3 in November 2006, 9 in Nov. 2007, 52 in Dec. 2008, 50 in June 2009, 88 in June 2010, 103 in June 2011, and 113 in June 2012.

[1056] The number of smartphone models with WCDMA was 25 in June 2009, 65 in June 2010, 77 in June 2011, and 85 in June 2012.

[1057] These figures are based on data from hearing aid compatibility status reports filed by service providers in January 2012, for the reporting period from January 1, 2011 to December 31, 2011. Service providers file their annual hearing aid compatibility reports on a different schedule than handset manufacturers: They are required to file by January 15th of each year covering the reporting period of the previous calendar year. See more details at the FCC Hearing Aid Compatibility status reporting site at http://wireless.fcc.gov/hac/index.htm?job=reports_sp (visited Oct. 16, 2012) Handset information for the last month of the reporting period for service providers is presented here.

Chart 43
Total Handset and Smartphone Models Offered by the Top Eight Facilities-Based Service Providers, December 2011[1058]

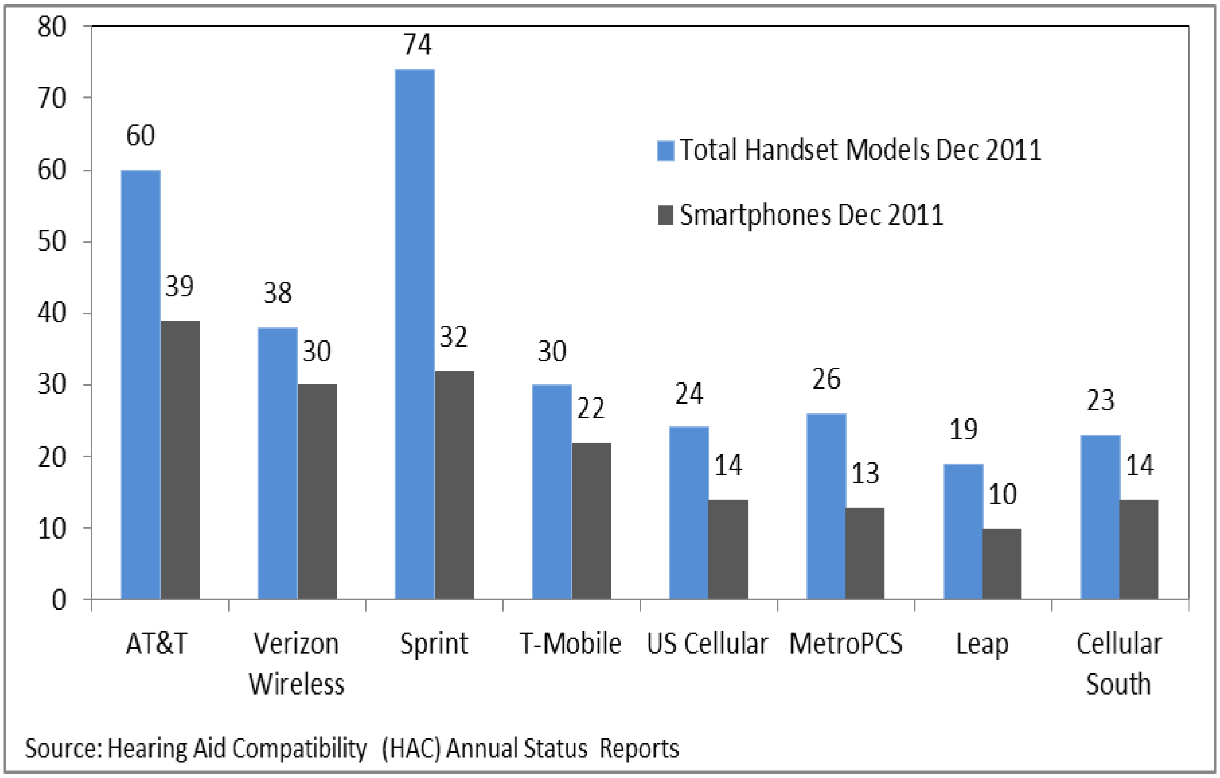


Table 51
Number of Service Providers (including Resellers) Offering a Manufacturer's Smartphones in US, December 2011[1059]

Smartphone Manufacturer List	Number of Service Providers (including Resellers)
Research in Motion	178
Samsung	170
HTC	162
Motorola	157
LG	102
Kyocera	50
Sony Ericsson	38
Apple	36
Hewlett-Packard	35

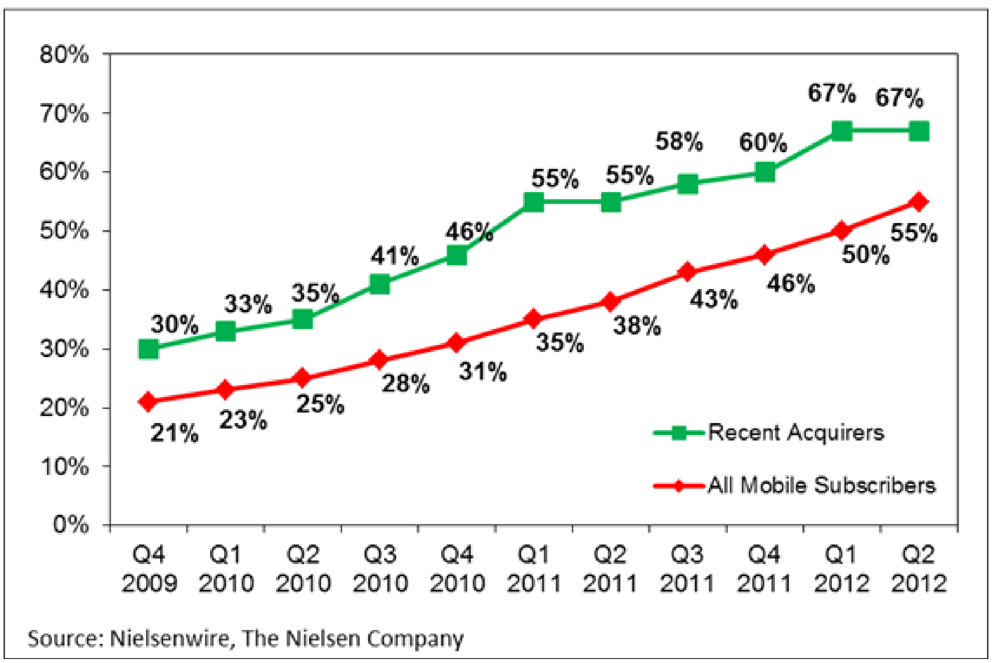
[1058] Hearing aid compatibility annual status reports filed by Jan. 15, 2012. Service providers file their annual HAC reports by Jan. 15 of each year covering the reporting period of the previous calendar year. 286 service providers offered at least one handset model in December 2011.

[1059] Hearing aid compatibility annual status reports filed by Jan. 15, 2012. Service providers file their annual HAC reports by Jan. 15 of each year covering the reporting period of the previous calendar year. 286 service providers offered at least one handset model in December 2011.

Huawei	22
Pantech	19
Nokia	17
NEC Casio	11
Acer	5
ZTE	5
Dell	4

349. *Smartphone Penetration*. Smartphone penetration has accelerated in the last two years. According to recent Nielson reports, among those who acquired a new cell phone in the second quarter of 2012, 67 percent opted for a smartphone, up from 30 percent in the fourth quarter of 2009. As of the second quarter of 2012, 55 percent of U.S. mobile subscribers now own smartphones (see Chart 44).[1060] A survey by Pew Research Center estimated that 46 percent of American adults owned a smartphone in February 2012, up from 35 percent in May 2011.[1061] The Pew study concludes that smartphone ownership has increased across many demographic groups in this time period, including race/ethnicity groups, household income groups, education attainment groups, and urban/rural groups. For instance, by race/ethnicity, smartphone ownership increased from 30 to 45 percent for White-non-Hispanics, and from 44 to 49 percent for both Black-non-Hispanics and Hispanics. By geographic groups, smartphone ownership increased from 38 to 50 percent in urban areas, from 38 to 46 percent in suburban areas, and from 21 to 34 percent in rural areas.

Chart 44
Smartphone Penetration Rates in the United States, Q4 2009 – Q2 2012[1062]



[1060] Nielsenwire, The Nielsen Company, *Two Thirds of New Mobile Buyers Now Opting for Smartphones*, July 12, 2012. See also http://blog.nielsen.com/nielsenwire/online_mobile/two-thirds-of-new-mobile-buyers-now-opting-for-smartphones/ (visited Nov. 19, 2012).

[1061] Aaron Smith, Pew Internet, Pew Internet and American Life Project, 46% of American adults are smartphone owners, March 2012, available at http://pewinternet.org/reports/2012/smartphone-update-2012.aspx.

[1062] *Id.*

b. Factors Affecting Mobile Wireless Competition

(i) Bundling of Wireless Service Subscriptions with the Purchase of Handsets

350. The prevailing model for the distribution of handsets to U.S. consumers is a provider-as-retailer model in which manufacturers sell handsets in bulk quantities to service providers and then service providers sell them to consumers in handset-service bundles, either in pre-paid service plans or post-paid subscription service plans.[1063] In a bundling contract a provider conditions the sale of a handset upon the consumer's agreement to purchase a multi-month wireless service subscription, typically for a minimum of one or two years in a postpaid service plan.[1064] Under this arrangement, the wireless handset and wireless service plan are effectively sold as a single bundled product, with the price distributed over the length of the subscription. Service providers typically enforce these contracts by "locking" subsidized devices, so that they cannot be easily ported to a competitor's network during the contract period, and by charging early termination fees for subscribers who exit the contract early.[1065]

351. These bundles have both disadvantages and advantages for consumers. Some of the disadvantages of buying a handset-service subscription bundle are "buyer's remorse" at having entered a multi-month contract after the commitment was made, opaqueness surrounding how the handset price and the monthly subscription price are aggregated to obtain the price of the bundle, and monthly subscription prices that are seemingly independent of how long the customer has been paying off the initial discount on the handset price.[1066] Some of the advantages of buying a handset-service subscription bundle are the conveniences of one-stop shopping, access to better technical support for handsets supported by the provider as compared to handsets that are not in the provider's handset portfolio, obtaining a discount on the price of the handset, and distributing the price of expensive handsets over the course of the subscription.

352. Mobile wireless service plans are generally available without bundled contracts, but there are incentives to purchase devices bundled with service plans, and this is still the overwhelming U.S. industry practice, despite recent growth in the prepaid segment. Many service providers generally unlock phones at the customer's request when the service terms have been fulfilled, subject to a certain number of conditions, e.g., a limit on the number of devices that can be unlocked, a minimum number of days of activitation, and that the device has not been reported lost or stolen.[1067] Unlocked devices are available in

[1063] There are other distribution channels for mobile wireless handsets, such as third-party retailers. *See* Section III.B.2, Resale and MVNO Providers, *supra.*

[1064] *See Antitrust Law and Economics*, at 326 ("Under a tying arrangement, the seller of a product conditions the sale of one product upon the buyer's agreement to purchase a second product.") In particular, the sale of the handset is conditioned on the subsequent purchase of the multi-month wireless service subscription.

[1065] Many handsets sold in the United States are "locked," meaning that they normally will operate only on a single wireless network for the duration that the handset is locked. Locking can prevent a consumer from taking a handset from one service provider to another, unless the handset is reprogrammed. In October 2012, the Librarian of Congress modified an existing exemption to the Digital Millennium Copyright Act (DMCA) that had permitted consumers to "unlock" handsets (by modifying the handsets' software) without violating the DMCA. *See* Exemption on Prohibition of Copyright Protection Systems for Access Control Technologies, 77, Fed. Reg. 65260, 65265-266 (Oct, 26, 2012). Under the new exemption for unlocking, consumers are permitted to unlock legacy handsets without violating the DMCA, but may not unlock handsets purchased after a 90-day transition period following the new exemption. *Id.*

[1066] *See, e.g.*, David Pogue, *The Irksome Cell Phone Industry*, The New York Times, July 22, 2009, at B1.

[1067] *See* Joan Marsh, "Bottom line: We Unlock Our Customers' Devices," AT&T Public Policy blog post, March 8, 2013, available at http://attpublicpolicy.com/wireless/bottom-line-we-unlock-our-customers'-devices (last visited Mar. 13, 2013); Verizon Wireless, Customer Agreement, available at
(continued….)

some stores and through some manufacturer websites (*e.g.*, Motorola, Nokia, and Apple).[1068] Increasingly most service providers will allow customers to bring an unlocked device to a postpaid plan, but customer may not receive a lower-priced service plan that would reflect the fact that the provider does not have to recoup the cost of the subsidy. T-Mobile offers a discount on the monthly service charge of some plans to customers who bring their own unlocked handset.[1069]

(ii) Handset Interoperability

353. A handset that functions on one network may not be compatible with a network using the same air interface technology if the networks operate on different spectrum bands. For example, T-Mobile's WCDMA handsets operate in the AWS-1 spectrum (1.7/2.1 GHz band) while AT&T's WCDMA handsets operate in the Cellular (850 MHz band) and PCS (1.9 GHz band) spectrum. Similarly, service providers are deploying LTE on different spectrum bands. For example, AT&T has launched LTE using Lower 700 MHz B and C block spectrum while Verizon Wireless has launched LTE using the Upper 700 MHz C block spectrum.[1070] We note that in September 2009, an alliance comprised of four Lower 700 MHz Band A Block licensees filed a petition for rulemaking asking the Commission to require that all mobile units for the 700 MHz band be capable of operating over all frequencies in the band.[1071] The licensees assert that the absence of such a requirement raises various competitive issues.[1072] In recognition of the industry's attention to this issue, in April 2011, the Commission held a workshop on the interoperability of mobile devices across commercial spectrum blocks of the 700 MHz band.[1073] Panelists at the workshop explored a number of topics related to promoting the development and availability of equipment for the 700 MHz band, including the technical feasibility of an interoperability condition and how an interoperability requirement might affect such factors as device cost and performance.[1074] On March 21, 2012, the Commission released a Notice of Proposed Rulemaking to

(Continued from previous page)
http://www.verizonwireless.com/b2c/globalText?textName=CUSTOMER_AGREEMENT&jspName=footer/customerAgreement.jsp (last visited March 19, 2013); Sprint, Standardized Wireless Service Checklist, available at http://www.sprint.com/landings/ctiachecklist/docs/ctia-transparency-postpaid.pdf (last visited March 19, 2013); and T-Mobile Support blog post, "Unlock Your Phone with a SIM Unlock Code," updated on March 8, 2013, available at http://support.t-mobile.com/docs/DOC-1588 (last visited March 19, 2013).

1068 *See*, *e.g.*, Best Buy at www.bestbuy.com (selling 103 unlocked handsets on March 5, 2012). *See also*, the online stores of handset manufacturers Motorola and Nokia at http://www.motorola.com/Consumers/US-EN/Home (visited Oct. 16, 2012) and http://www.nokiausa.com/ (visited Oct. 16, 2012), respectively. Apple sells the iPhone 4S unlocked (for GSM networks only); *See* http://store.apple.com/us/browse/home/shop_iphone/family/iphone/iphone4s?afid=p219%7CGOUS&cid=AOS-US-KWG (visited Oct. 16, 2012).

1069 *See* T-Mobile, Shop Plans, Value Plans, *available at* http://www.tmobile.com/shop/Packages/ValuePackages.aspx (visited Aug. 20, 2012) (selling a 200 MB data plan for $54.99 per month when a customer provides her own handset, and for $69.99 as an individual postpaid plan in which the consumer purchases a handset-plan bundle from T-Mobile; *supra* Section IV.A.1, Postpaid Plans.

1070 *See* Section IV.B.1.a, Service Provider Technology Deployments, *supra*

1071 *700 MHz Block A Good Faith Purchaser Alliance Petition for Rulemaking Regarding the Need for 700 MHz Mobile Equipment to be Capable of Operating on All Paired Commercial 700 MHz Frequency Blocks*, filed Sept. 29, 2009 (*700 MHz Equipment Petition*), at iii, 12.

1072 *700 MHz Equipment Petition* at 2, 4.

1073 "Federal Communications Commission Announces Agenda for Workshop on the Interoperability of Customer Mobile Equipment Across Commercial Spectrum Blocks in the 700 MHz Band," RM 11592, *Public Notice*, DA 11-714 (WTB rel. Apr. 22, 2011).

1074 *Id.* at 1-2; *see* FCC, 700 MHz Interoperability Workshop (video), Apr. 26, 2011, http://www.fcc.gov/events/700-mhz-interoperability-workshop (visited Oct. 16, 2012).

promote interoperability and encourage the efficient use of spectrum in the 700 MHz band.[1075] The 700 MHz Interoperability NPRM noted that there is agreement that a unified band class across the Lower 700 MHz band has the potential to yield benefits for all licensees, but that parties dispute whether a unified band class would result in harmful interference to Lower 700 MHz licensees in the B and C Blocks and whether, if harmful interference exists, it reasonably can be mitigated.[1076] Accordingly, the 700 MHz Interoperability NPRM indicated that the Commission would evaluate the potential interference concerns and explore options to help promote interoperability.[1077] Under applicable Commission rules, lower 700 MHz A Block licensees must provide signal coverage and offer service over at least 35 percent of their geographic license areas by June 13, 2013, or within four years of the initial license grant if granted after June 13, 2009. A number of lower 700 MHz A Block licensees filed requests for waiver and pointed to the lack of interoperability as a major factor in support of the requested extension. On February 13, 2013, the Wireless Telecommunications Bureau granted a limited waiver, citing review of the issues raised in the 700 MHz interoperability proceeding. The Bureau extended the interim construction benchmark deadline for the lower 700 MHz A Block licensees until December 13, 2013. [1078]

2. Mobile Applications

354. Many applications for mobile smartphones and other mobile devices are available pre-installed on mobile operating systems, through the mobile Internet, and through mobile application stores. Major categories of mobile applications include: web searching, news and information, e-mail and messaging, games, social networking, location-based services, photo sharing, music and video streaming, and VoIP. Thousands of niche applications have been designed for specific uses, hobbies, interests, and industries by various third-party application developers. The range of mobile applications is reflected in a recent survey by Pew Internet and American Life Project which found that 41 percent of cell phone users have used their phones to coordinate a meeting, 35 percent to solve an unexpected problem that they or someone else had, 30 percent to decide whether to visit a business, 27 percent to help settle an argument they were having, 23 percent to look up the score of a sporting event, 20 percent to get traffic or public transit information and 19 percent to get help for an emergency, all within the last 30 days. [1079]

355. Most mobile applications are available for download through mobile web browsers and/or through one or multiple mobile application stores, such as the Apple App Store, Google Play, or the Blackberry App World.[1080] Many applications require a mobile Internet connection in order to be downloaded to a mobile device. Once an application is installed on a mobile device, the application may or may not require a mobile broadband connection to function. Application stores are specific to particular mobile operating systems, and, in many cases, the application stores may be available only on devices running more recent versions of an operating system or on devices with certain hardware features.

[1075] *See* Promoting Interoperability in the 700 MHz Commercial Spectrum, WT Docket No. 12-69, *Notice of Proposed Rulemaking*, 27 FCC Rcd 3521 (2012) (*700 MHz Interoperability* NPRM).

[1076] Id. at 3522, ¶¶ 3-4.

[1077] Id. at 3522, ¶ 5.

[1078] *See* Wireless Telecommunications Bureau Extends 700 Mhz A Block Licensee Interim Construction Benchmark Deadline Until December 13, 2013, Public Notice, WT Docket 12-332, Feb. 13, 2013 (WTB).

[1079] See *Just-in-time Information through Mobile Connections, available at* http://pewinternet.org/Reports/2012/Just-in-time.aspx (visited Oct. 16, 2012).

[1080] In some cases, access controls installed on mobile devices limit consumers' ability to add certain applications to the devices, though some consumers may be able to circumvent such access controls through a process known as "jailbreaking." In October 2012, the Librarian of Congress retained an existing exemption to the Digital Millennium Copyright Act (DMCA) that permits consumers to "jailbreak" handsets without violating the DMCA. *See* Exemption on Prohibition of Copyright Protection Systems for Access Control Technologies, 77 Fed. Reg. 65260, 65264 (Oct. 26, 2012). The Librarian of Congress did not extend this exemption to tablets. *Id.*

356. The number of mobile applications launched and the number of applications downloaded by consumers has grown significantly over the past three years. According to BGR, a leading source for mobile news in the U.S., by the end of 2011 U.S. consumers had access to more than 989,863 applications, a number that has grown to over 1,000,000 by mid-2012.[1081] Application stores offer thousands of applications that can be downloaded to mobile devices that have mobile broadband connections (Table 52). By September 2012, there were over 700,000 applications available from the Apple App Store for the Apple iOS, a number that nearly doubled in less than a year. The number of applications downloaded from Apple's App Store grew from 100,000 in 2008 to 25 billion in 2012. By October 2012, Google Play for the Android operating system offered over 675,000 applications and had over 25 billion total downloads. Table 53 indicates that the top-5 downloaded applications are search, information, messaging, and social networking services. Table 54 shows the top categories of applications accessed by users.

[1081] See *Available apps across major mobile platforms approaching million-app milestone available at* http://www.bgr.com/2011/12/05/available-apps-across-major-mobile-platforms-approach-million-app-milestone/ (visited Oct. 16, 2012).

Table 52
Estimated Number of Applications Available[1082]

Application Store	2010	2011	2012
Apple App Store	250,000	425,000[1083]	700,000[1084]
Google Play[1085]	80,000	200,000[1086]	675,000[1087]
Blackberry App World	12,000	50,000[1088]	70,000[1089]
Nokia Ovi Store	13,000	30,000[1090]	50,000[1091]
Windows Mobile Marketplace	1,350	20,000[1092]	30,000[1093]

Table 53
Top-5 Applications Downloaded by Smartphone Users, May 2012[1094]

Application	Smartphone Users
Google	41%
Facebook	34%

1082 Estimates for 2010 are from the Fifteenth Report, ¶345.

1083 *See* Apple, Press Release http://www.apple.com/pr/library/2011/07/07Apples-App-Store-Downloads-Top-15-Billion.html (visited October 24, 2012).

1084 *See* Apple Insider. *Google Android store reaches 25 billion downloads, 675,000 apps*, Sept. 26th, 2012 http://appleinsider.com/articles/12/09/26/google-android-reaches-25-billion-downloads-675000-apps (last visited December 10, 2012).

1085 In March 2012, Android Market Place was renamed to Google Play. *See* CNet, Google Reboots Android Market http://news.cnet.com/8301-31001_3-57391350-261/google-reboots-android-market-launches-google-play/ (last visited November 2, 2012).

1086 *See* Android Market http://www.research2guidance.com/android-market-will-become-the-biggest-mobile-content-platform-in-the-world-by-august-2011/ (last visited October 24, 2012).

1087 *See* Apple Insider. *Google Android store reaches 25 billion downloads, 675,000 apps*, Sept. 26th, 2012 http://appleinsider.com/articles/12/09/26/google-android-reaches-25-billion-downloads-675000-apps (last visited December 10, 2012).

1088 *See* Mobile Apps http://gigaom.com/2011/12/30/by-the-numbers-mobile-apps-in-2011/ (last visited October 24, 2012).

1089 *See* BlackBerry, *Blackberry App World-Browse All Categories, http://appworld.blackberry.com/webstore/* (visited May 2012).

1090 *See* Nokia Ovi Store http://www.mobile88.com/news/read.asp?file=/2011/2/1/20110131122310&phone=Nokia-Ovi_Store-app (last visited October 24, 2012).

1091 *See* Nokia Store http://store.ovi.com/cotent/10683 (visited Nov.19, 2012).

1092 *See* Information Week Mobility. Ed Hansberry, October 25, 2011, http://www.informationweek.com/mobility/smart-phones/windows-phone-marketplace-hits-35000-app/231901571 (visited Nov.19,2012).

1093 *See* Windows Phone, *Windows Marketplace for Mobile: Shop Apps*, http://marketplace.windowsphone.com/Default.aspx (visited May 2012).

1094 comScore, Press Release, *comScore Reports May 2012U.S. Mobile Subscriber Market Share*, Jul. 2 2012. http://www.comscore.com/Press_Events/Press_Releases/2012/7/comScore_Reports_May_2012_U.S._Mobile_Subscriber_Market_Share (visited Oct. 16, 2012).

Yahoo!	30%
MSN/Bing/Windows Live	16%
Weather Channel	14%

Table 54
Categories of Applications Accessed By Smartphone Users, May 2012 [1095]

Category of Application	Smartphone Users
Social Networking	43%
Weather	41%
Maps	36%
News	21%
Search	21%
Photo/Video Sharing	17%
Restaurant Information	13%
Online Retail	10%
Traffic Reports	10%
Gaming Information	8%

3. Mobile Commerce

357. Mobile commerce refers to commercial transactions made using a mobile wireless device. Examples of mobile commerce include mobile payments, mobile banking, and mobile shopping.

358. *Mobile Payments.* Many mobile wireless handsets and devices can be used to make on-the-spot payments at physical retail locations with a technology commonly known as "Tap and Pay." Paying-by-phone is playing a growing role in transactions made by U.S. consumers.[1096] Making payments by mobile phone is not yet a mainstream payment method due to lack of awareness, skepticism of the benefits of mobile payments, and lack of consumer trust about the security and privacy of their personal and banking data.[1097] The widespread use of mobile payment applications requires development, coordination, and adoption by application developers, financial institutions, merchants, mobile wireless providers, and consumers in order to supply devices that are capable of making contactless mobile payments and terminals that accept such payments.[1098] Mobile payments technologies include SMS, operator billing, the mobile Internet, mobile wallets, and Near Field Communications (NFC).[1099]

[1095] comScore, Press Release, *comScore Reports May 2012U.S. Mobile Subscriber Market Share*, Jul. 2 2012. http://www.comscore.com/Press_Events/Press_Releases/2012/7/comScore_Reports_May_2012_U.S._Mobile_Subscriber_Market_Share (visited Oct. 16, 2012).

[1096] Matthew B. Gross, Jeanne M. Hogarth, and Maximilian D Schmeiser, *Consumers and Mobile Financial Services*, Federal Reserve Board, Division of Consumer and Community Affairs, March 2012. Penny Crosman, *Contactless Mobile Pay Transactions Seen Nearing 10B by 2016*, Mar. 6, 2012 http://www.americanbanker.com/issues/177_45/mobile-payments-npd-in-stat-1047243-1.html (visited Jun. 22, 2012).

[1097] Ovum, *Mapping Mobile Payments*, April 2012, at 2.

[1098] Agam Shah, *NFC Use Growing Outside Smartphones*, May 22, 2012. http://www.computerworld.com/s/article/9227389/NFC_use_growing_outside_smartphones (visited June 25, 2012).

[1099] International Business Times, Mobile Banking on the Rise, Aug. 15, 2012, available at http://www.ibtimes.com/articles/373841/20120815/mobile-banking-united-states-bank-account-holders.htm (visited Aug. 16, 2012) ; Ovum, *Mapping Mobile Payments*, April 2012, at 2.

Starbucks and McDonalds have launched mobile payments systems on a nationwide basis.[1100]

359. *Mobile Banking*. Mobile banking allows consumers to check account balances, pay bills, and transfer funds on a variety of mobile devices. Many banks offer consumers text banking, access to accounts via the mobile web, mobile banking applications, and mobile deposits for use on several platforms and devices.[1101] About 13 percent of U.S. bank account holders regularly use mobile banking services.[1102] As of August 2012, 61 percent of these mobile banking customers used their mobile devices to check transaction histories, 45 percent to check balances, and 31 percent to transfer money between accounts.[1103]

360. *Mobile Shopping*. According to research conducted by Nielsen in June 2012, 45 million smartphone owners accessed applications in the shopping and commerce category, an average of 17 times. During this same time period, the top applications in the shopping and commerce category were eBay and Amazon, attracting 13 million and 12 million unique users. According to eBay's Mobile Momentum analysis, eBay transacted $5 billion in 2011 through mobile devices, an overall increase of 150 percent from the previous year.[1104] Additionally, eBay expects to transact $8 billion by the end of 2012. Amazon's quarterly earnings report indicates that spending via smartphone represented almost $2 billion in 2011. [1105]

4. The Impact of Mobile Wireless Services on the U.S. Economy

361. The mobile wireless sector and its complementary industries, such as handset manufacturers, operating system providers, and application developers, play a significant role in the U.S. economy.[1106] These sectors create jobs, contribute to GDP, and improve productivity for firms in other industries outside telecommunications. According to CTIA, U.S. wireless providers directly employed 238,071 workers at the end of 2011, up from 184,449 in 2000, yielding an average job creation rate of around three percent per year.[1107] In addition, CTIA estimates that the mobile app economy employs an

[1100] Ovum, *Mapping Mobile Payments*, April 2012, at 2.

[1101] *See generally* Bank of America, *Mobile Banking*. http://www.bankofamerica.com/onlinebanking/index.cfm?template=mobile_banking (visited Aug. 13, 2012); Chase, *Chase Mobile Banking*, https://www.chase.com/index.jsp?pg_name=ccpmapp/shared/assets/page/Chase_Mobile_Banking (visited Aug. 13, 2012); Citibank, *Citi Mobile Banking*, https://online.citibank.com/US/JRS/pands/detail.do?ID=CitiMobile (visited Aug. 13, 2012); PNC Bank www.pnc.com (visited Aug. 13, 2012).

[1102] International Business Times, Mobile Banking on the Rise, Aug. 15, 2012, *available at* http://www.ibtimes.com/articles/373841/20120815/mobile-banking-united-states-bank-account-holders.htm (visited Aug. 16, 2012).

[1103] International Business Times, Mobile Banking on the Rise, Aug. 15, 2012, *available at* http://www.ibtimes.com/articles/373841/20120815/mobile-banking-united-states-bank-account-holders.htm (visited Aug. 16, 2012).

[1104] http://mobile.ebay.com/ (visited Oct. 16, 2012).

[1105] *See* Amazon Quarterly Report *available at* http://phx.corporate-ir.net/phoenix.zhtml?c=97664&p=irol-reportsother (visited Oct. 16, 2012).

[1106] *See* Roger Entner, *The Wireless Industry: The Essential Engine of US Economic Growth*, Recon Analytics, May 2012 http://apps.fcc.gov/ecfs/document/view;jsessionid=KKDdQLCSVmlSq66DvmdylQLdn1BKnfcs1K4HhQvy1RPzrFzFJQKs!1007083101!-224088840?id=7022009489 (visited Oct. 16, 2012) ; U.S. Department of Commerce, Economic Development Association, "Measuring Broadband's Economic Impact," 2006.

[1107] CTIA, "The U.S. Wireless Industry Overview," Apr. 25, 2012, *available at* http://files.ctia.org/pdf/042412_-_Wireless_Industry_Overview.pdf (visited Oct. 16, 2012).

additional 466,000 workers.[1108] Another source, Recon Analytics, estimates that the wireless industry was responsible for 3.8 million U.S. jobs in 2011, directly and indirectly, and accounted for 2.6 percent of all U.S. employment.[1109]

362. Recon Analytics also estimates that the wireless industry generated $195.5 billion in economic activity globally in 2011, of which $146.2 billion was retained as U.S. GDP.[1110] Wireless industry service revenues totaled $169.8 billion in 2011 (in nominal dollars), up from $52.5 billion in 2000, yielding an average annual growth rate of 20.4 percent.[1111] The wireless industry, based on value of retained GDP, is now larger than the agriculture, hotels and lodging, air transportation, and motor vehicle manufacturing industries, and rivals the computer systems design services and oil and gas extraction industries.[1112]

363. As noted above, mobile wireless providers have invested heavily in building out and improving their broadband networks in recent years.[1113] According to CTIA, total incremental capital investment was $25.3 billion in 2011 (15 percent of total industry revenue), and totaled $245.7 billion from 2001-2011.[1114] The U.S. Census Bureau estimated total annual capital expenditures by wireless providers to be $23 billion for 2010 (33 percent of all capital expenditures in the telecommunications industry).[1115]

364. As noted in the *Fifteenth Report,* investment in telecommunications infrastructure contributes positively to economic growth and labor productivity in the United States. One study, which analyzed 21 OECD countries over the period 1970-1990, found a positive causal relationship between telecommunications infrastructure and aggregate output. The authors found that the impact of increased investment in telecommunications infrastructure is a 0.6 percent increase in GDP, about a third of the average annual growth rate in industrialized nations.[1116]

365. As infrastructure improves, transaction costs for businesses fall, including the costs of ordering, gathering information, and searching for services. In addition, with a faster and more advanced digital infrastructure, employees and firms in all sectors are able to communicate more quickly and effectively, and to have better information about their suppliers and customers, thereby enabling them to

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[1108] CTIA, "The U.S. Wireless Industry Overview," Apr. 25, 2012, *available at* http://files.ctia.org/pdf/042412_-_Wireless_Industry_Overview.pdf (visited Oct. 16, 2012).

[1109] Roger Entner, *The Wireless Industry: The Essential Engine of US Economic Growth,* Recon Analytics, May 2012, at 1. http://apps.fcc.gov/ecfs/document/view;jsessionid=KKDdQLCSVmlSq66DvmdylQLdn1BKnfcs1K4HhQvy1RPzrFzFJQKs!1007083101!-224088840?id=7022009489 (visited Oct. 16, 2012).

[1110] Roger Entner, *The Wireless Industry: The Essential Engine of US Economic Growth,* Recon Analytics, May 2012, at 1. http://apps.fcc.gov/ecfs/document/view;jsessionid=KKDdQLCSVmlSq66DvmdylQLdn1BKnfcs1K4HhQvy1RPzrFzFJQKs!1007083101!-224088840?id=7022009489 (visited Oct. 16, 2012).

[1111] *CTIA Year-End 2011 Wireless Indices Report*, at 98-99.

[1112] Roger Entner, *The Wireless Industry: The Essential Engine of US Economic Growth,* Recon Analytics, May 2012, at 1. http://apps.fcc.gov/ecfs/document/view;jsessionid=KKDdQLCSVmlSq66DvmdylQLdn1BKnfcs1K4HhQvy1RPzrFzFJQKs!1007083101!-224088840?id=7022009489 (visited Oct. 16, 2012).

[1113] *See* Section IV.B, Non-Price Rivalry, *supra.*

[1114] *CTIA Year-End 2011 Wireless Indices Report*, at 141, 145.

[1115] *See* U.S. Census Bureau, *Annual Capital Expenditures Survey*, http://www.census.gov/econ/aces/index.html, (visited July 23, 2012) [NAICS code 5172].

[1116] Roeller, L.H. and Waverman, L., "Telecommunications Infrastructure and Economic Development: A Simultaneous Approach," American Economic Review, 2001, 909-923.

anticipate and respond to changes and variations in consumer demand faster and at a lower cost. Recon Analytics estimates that, in 2011, the wireless industry accounted for $33 billion in productivity gains for U.S. businesses.[1117]

366. Moreover, economists expect significant positive externalities to result from a strong telecommunications sector, whereby "society as a whole benefits from a nationwide wireless network."[1118] These additional indirect benefits include enhancing health care, education, energy, and public safety services; increasing opportunities for entrepreneurial activity; and helping U.S. consumers more efficiently gather information on goods, services, and employment opportunities.[1119] In the education sector, for example, CTIA reports that access to mobile technology in classrooms has tripled over the past three years.[1120] Examples of how mobile devices and network technologies improve education include student access to digital textbooks on tablets and e-readers, the development of numerous mobile learning apps covering a wide range of subject areas, and increased interaction and collaboration among students, parents, tutors, and teachers.[1121]

VIII. INTERMODAL DEVELOPMENTS

A. Voice Services

367. The number of adults who rely exclusively on mobile wireless for voice service has increased significantly in recent years. According to the National Health Interview Survey (NHIS), approximately 34.0 percent of all adults in the U.S. lived in wireless-only households during the first half of 2012 (see Chart 45 below).[1122] This compares to 27.8 percent of all adults in the second half of 2010 and 22.9 percent in the second half of 2009.[1123] The percentage of households that were wireless-only has been steadily increasing as well. In the first half of 2012, approximately 36 percent of all U.S. households were wireless only, up from 29.7 percent in the second of 2010 and 24.5 percent in the second half of 2009.[1124]

368. Approximately 50 percent of all adults aged 18-24, and 55 percent of all adults aged 30-34 lived in wireless-only households in the first half of 2012, while 60 percent of adults aged 25-29 did so.[1125] The percentage of adults who lived in households with only wireless telephones decreased as age

[1117] Roger Entner, *The Wireless Industry: The Essential Engine of US Economic Growth*, Recon Analytics, May 2012, at 33. http://apps.fcc.gov/ecfs/document/view;jsessionid=KKDdQLCSVmlSq66DvmdylQLdn1BKnfcs1K4HhQvy1RPzrFzFJQKs!1007083101!-224088840?id=7022009489 (visited Oct. 16, 2012).

[1118] Pearce, A. and Pagano, M, "Accelerated Wireless Broadband Infrastructure Deployment: The Impact on GDP and Employment," 2009, Media Law and Policy, 11-34.

[1119] *Id.* at 12. Pearce and Pagano estimate that a $17.4 billion investment in wireless broadband investments would generate a direct increase in GDP of 0.23%–0.30%, and an indirect increase in GDP of 0.65% - 0.98% over a two-year period.

[1120] CTIA, *Mobile Education & the Wireless Industry – Anytime, Anywhere Learning*, attached to Letter from Krista Witanowski, CTIA, to Marlene H. Dortch, WT Docket No. 11-186 (July 12, 2012).

[1121] CTIA, *Mobile Education & the Wireless Industry – Anytime, Anywhere Learning*, attached to Letter from Krista Witanowski, CTIA, to Marlene H. Dortch, WT Docket No. 11-186 (July 12, 2012).

[1122] Stephen J. Blumberg and Julian V. Luke, *Wireless Substitution: Early Release of Estimates from the National health Interview Survey, January- June 2012*, National Center for Health Statistics, Centers for Disease Control, December 2012, *available at* http://www.cdc.gov/nchs/data/nhis/earlyrelease/wireless201212.PDF (visited Jan. 30, 2012).

[1123] *Id*.

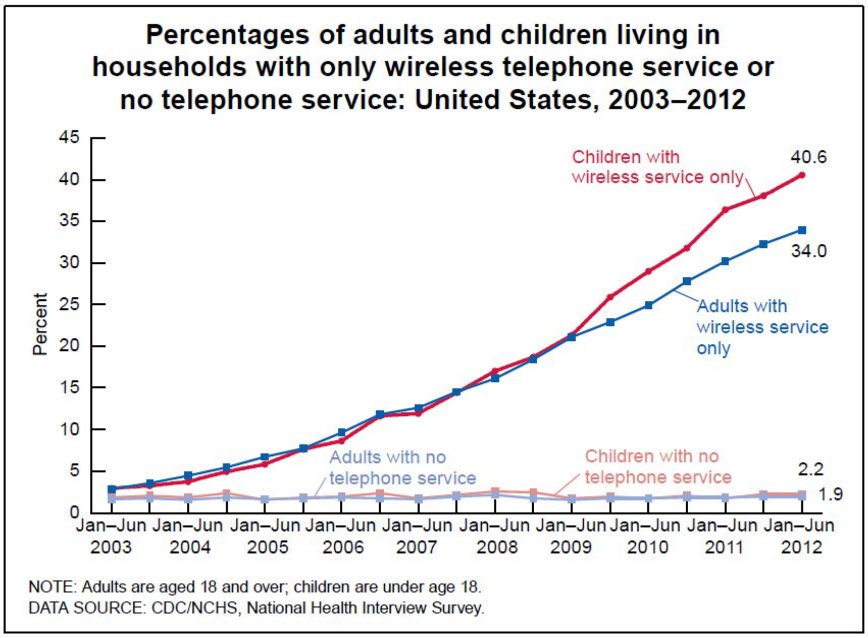
[1124] *Id*.

[1125] *Id*.

increased beyond 35 years.[1126] Nevertheless, the percentage of older adults living in wireless-only households has been gradually increasing over time. The percentage of 35- to 44-year-olds that were wireless only rose from 23.9 percent in the second half of 2009 to 39.1 percent in the first half of 2012, while the percentage of 45- to 64-year-olds that were wireless only rose from 14.9 percent to 25.8 percent during the same period.[1127]

369. Adults who the U.S. Census Bureau classified as poor were more likely to live in wireless-only households than adults who were near poor or not poor. Approximately 52 percent of all adults who were poor, 42 percent who were near poor, and 31 percent who were not poor lived in wireless-only households in the first half of 2012.[1128] Adults who lived in metropolitan areas were more likely to live in wireless only households than adults who did not live in metropolitan areas. Approximately 36 percent of adults who lived in metropolitan areas lived in wireless-only households, and 27 percent of adults who did not live in metropolitan areas did so.[1129]

Chart 45
Wireless-Only Households, 2003-2012[1130]



B. Broadband Services

370. As noted previously in this *Report*, the Commission estimates that there were approximately 142.1 million subscribers to terrestrial mobile wireless Internet access services with data speeds exceeding 200 kbps in at least one direction at the end of 2011.[1131] Mobile wireless connections

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[1126] *Id*.

[1127] *Id*.

[1128] *Id* page 8 Table 2.

[1129] *Id* page 3.

[1130] *Wireless Substitution: Early Release of Estimates From The Data from the National Health Interview Survey, January--June 2012*). Adults and children with "no telephone service" include those in households with neither wireline nor wireless service.

[1131] *See* Section V.A.1, Industry Wide Connections, *supra*. Other Commission reports consider alternative speed categories for mobile broadband. The *Eighth Broadband Progress Report* presents data on Americans without (continued….)

represented approximately 62 percent of the 230.4 million data connections with speeds exceeding 200 kbps in the United States in December 2011. In addition, at the end of 2011, there were an estimated 184 million mobile devices in use capable of sending or receiving information at speeds exceeding 200 kbps in at least one direction, up from an estimated 152 million at the end of 2010.

371. The Commission's *Eighth Broadband Progress Report* indicated that the efforts to bring broadband to all Americans are significant and wireless and wireline broadband providers have made progress.[1132] The *Eighth Broadband Progress Report* also noted that in addition to various wireline broadband providers offering faster speeds with new technologies, mobile wireless providers have made substantial progress in upgrading their networks with higher-speed technologies and expanding coverage with these technologies.[1133] In some cases mobile broadband networks are being used as a replacement for wireline last-mile solutions, where location makes deployment of wireline facilities inefficient. For example, Verizon began marketing its HomeFusion service using its 4G LTE mobile network to provide residential services that deliver average download speeds of 5-12 Mbps.[1134]

C. Small Area Wireless Coverage Technologies

372. Wireless coverage is being increased with the use of network technologies that create small or local wireless coverage areas. These network technologies typically are designed to provide wireless coverage in a specific small or local area, such as a commercial or residential building, or a neighborhood. They offer consumers and service providers a convenient means to extend or improve wireless coverage at targeted indoor and outdoor locations. For example, some wireless network users can access primary voice and data networks through fixed broadband access points instead of mobile wireless networks. Some of these technologies employ unlicensed spectrum (discussed below), that can operate independently of a mobile wireless service network, complement a mobile wireless service network's coverage, or serve as capacity enhancements for a mobile wireless service network in areas with capacity constraints. The networks created by these technologies may also be used by some customers as primary network choices for heavy data applications such as video streaming, and potentially create new competition to mobile wireless service providers.

373. When deployed to complement mobile wireless networks, these small area coverage technologies may offer solutions to network congestion problems that mobile wireless providers are facing with increasing frequency. Rapid growth in mobile data traffic, an estimated 40 percent of mobile wireless usage occurring in the home,[1135] and a large demand for wireless data by mobile users sojourning at public locations give incentives for service providers to find means, potentially intermodal, to reduce congestion on their mobile wireless networks. Small area wireless coverage technologies that access data and voice through fixed broadband access points enable mobile wireless service providers to offload mobile traffic onto non-mobile wireless networks.

374. In September, 2010, the Commission finalized rules to make unused spectrum in the TV bands (TV "white spaces") available for unlicensed broadband wireless devices. The Commission found that access to this spectrum could enable more powerful public Internet connections – "super Wi-Fi" hot spots – with extended range, fewer dead spots, and improved individual speeds resulting from reduced

(Continued from previous page)
access to mobile broadband for three speed categories, at least 768 kbps/200 kbps, at least 3 Mbps/768 kbps and at least 6 Mbps/ 1.5 Mbps. *2012 Eighth Broadband Progress Report*, GN Docket No, 11-121 (rel. Aug. 21, 2012) ¶ 86.

[1132] *2012 Eighth Broadband Progress Report*, GN Docket No, 11-121 (rel. Aug. 21, 2012) ¶ 2.

[1133] *Id.* For a comparison of Wireless and Wireline Broadband deployment, *see 2012 Eighth Broadband Progress Report*.

[1134] *See*, http://www.verizonwireless.com/b2c/homefusion/hf/main.do (visited Nov 14, 2012).

[1135] *See*, W. Gerhardt and R. Medcalf, *Femtocells: Implementing a Better Business Model to Increase SP Profitability*, Cisco, March 2010.

congestion on existing networks. The Commission observed that many other applications are possible in the TV white spaces, such as broadband access to schools particularly in rural areas, campus networks that are better able to keep pace with user's increasing demands for bandwidth, home networks that are better able to support real time streaming video applications, remote sensing of water supplies by municipalities and support for the smart grid.[1136] Since finalizing the rules, the Commission has conditionally designated ten parties as TV White Space database administrators.[1137] Two of those parties have received Commission approval to begin offering service to the public on a limited basis. Spectrum Bridge, Inc. has been offering service since January 2012 in Wilmington, NC, and Telcordia Technologies, Inc. began offering service in Nottoway County, VA in April 2012.[1138] In addition, Commission staff has certificated fixed TV bands devices from two manufacturers. Finally, in September 2012, the Commission launched its Unlicensed Wireless Microphone Registration System in the U.S. East Coast Region with plans to expand the registration system nationwide soon thereafter.[1139]

375. Two small and local wireless network technologies, wireless local area networks (WLANs) that use unlicensed devices and femtocells that use licensed spectrum, are discussed below.

376. *WLANs*. WLANs operate on an unlicensed basis and provide high-speed (fixed) wireless Internet connections within a range of 150 to 250 feet from a wireless access point. Peak WLAN data transfer rates range from speeds of up to 11 Mbps for 802.11b, up to 54 Mbps for 802.11a and 802.11g, and up to 600 Mbps for 802.11n. The most prevalent WLAN technology is equipment manufactured in accordance with the IEEE 802.11 family of standards, commonly known as "Wi-Fi". Wi-Fi networks can access the internet through telecommunication cables or cellular networks. Users can access Wi-Fi networks with a wide variety of Wi-Fi enabled devices, such as wireless handsets, notebook and netbook computers, tablets, portable electronic games, media players, e-readers, televisions, and cameras.

377. WLAN networks are being deployed by mobile wireless companies, cable companies, businesses, universities, municipalities, households and other institutions. WLAN networks, sometimes called "hotspots," have proliferated in places accessible to the public such as restaurants, coffee shops, malls, train stations, hotels, airports, convention centers, and parks.[1140] Many places of businesses offer Wi-Fi hotspots to their customers.[1141] Amtrak offers free Wi-Fi access on all of its Acela Express trains

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[1136] Unlicensed Operation in the TV Broadcast Bands, *Second Memorandum Opinion and Order*, ET Docket Nos. 04-186, 02-380, 25 FCC Rcd 18661 ¶ 1 (2010).

[1137] *See* Unlicensed Operation in the TV Broadcast Bands, *Order*, ET Docket No. 04-186, 02-380, 25 FCC Rcd 554 (2010) which conditionally designates nine entities as TV bands device database administrators. *See also*, Unlicensed Operation in the TV Broadcast Bands, *Order*, ET Docket No. 04-186, 02-380, 26 FCC Rcd 10599 (2011) which added Microsoft to the list of conditionally designated TV bands device database coordinators.

[1138] *See* Office of Engineering and Technology Announces the Approval of Spectrum Bridge, Inc.'s TV Bands Database System for Operation, *Public Notice*, ET Docket No. 04-186, 26 FCC Rcd 16924 (2011). *See also* Office of Engineering and Technology Announces the Approval of Telcordia Technologies, Inc.'s TV Bands Database System for Operation, *Public Notice*, ET Docket No. 04-186, 27 FCC Rcd 2934 (2012) and Office of Engineering and Technology Permits Telcordia Technologies, Inc. to Provide TV Bands Database Service in Nottoway County, Virginia, *Public Notice*, ET Docket No. 04-186, 27 FCC Rcd 4146 (2011).

[1139] *See* Office of Engineering and Technology and Wireless Telecommunications Bureau Announce the Initial Launch of Unlicensed Wireless Microphone Registration System; Registration Open in East Coast Region: New York, New Jersey, Pennsylvania, Delaware, Maryland, Washington DC, Virginia, and North Carolina, *Public Notice*, ET Docket No. 04-186, 27 FCC Rcd 11163 (2012).

[1140] *See Seventh Report*, 17 FCC Rcd at 13062-13063. Hot spots typically rely on high-speed landline technologies, such as T-1 lines, DSL, or cable modems, to connect to the Internet.

[1141] *See Wi-Fi Hotspots Stay Hot In 2008,* Cellular-News.com, July 17, 2008. ABI Research Vice President and Research Director, Stan Schatt stated, "Starbucks' decision to go to a virtually free Wi-Fi hotspot model is having a profound impact. Hotspot owners are beginning to see Wi-Fi as a cost of doing business and an operation expense, rather than as a profit center." *Id.*

between Washington, DC and Boston, as well as in a number of stations in the eastern U.S.[1142] In-flight Wi-Fi broadband deployments will surpass 6,100 planes worldwide in 2015, up from 1,835 planes in 2011.[1143] Online Wi-Fi directories are available to help consumers find public Wi-Fi hot spots.[1144]

378. Many cable companies have deployed cable-owned hot spots in an increasing number of public locations, allowing their broadband subscribers to access the Internet through the use of a Wi-Fi enabled handset or other device.[1145] In May 2012, Bright House Networks, Cablevision, Comcast, Cox Communications, and Time Warner Cable announced that they would create a unified and simplified system of Wi-Fi access called CableWiFi, under which the companies will provide Wi-Fi access to each other's broadband subscribers.[1146]

379. Some mobile wireless service providers use WLANs to complement the coverage of their mobile wireless networks. AT&T, T-Mobile, and Verizon Wireless each currently offer wireless internet access at thousands of publicly accessible Wi-Fi hotspot locations.[1147] AT&T owns more than 29,000 Wi-Fi hotspots[1148] in the United States and reported that users made more than 20 million connections every four days using the AT&T Wi-Fi network in 2011.[1149] Through agreements with AT&T, national chains such as Starbucks, McDonald's, and Barnes & Noble offer complimentary Wi-Fi access in their establishments.[1150] AT&T, T-Mobile, and Verizon Wireless include Wi-Fi hot spot access with some

[1142] Amtrak, *AmtrakConnect Wi-Fi*, http://www.amtrak.com/servlet/ContentServer/AM_Content_C/1246044325520/1237405732514 (visited Sept. 14, 2012).

[1143] *See* Tammy Parker, *In-Stat: Market for in-flight Wi-Fi primed for takeoff*, Feb. 9, 2012, *available at* http://www.fiercebroadbandwireless.com/story/stat-market-flight-wi-fi-primed-takeoff/2012-02-09 (visited Sept. 14, 2012).

[1144] *See* Jiwire, *Global Wi-Fi Finder*, *available at* http://v4.jiwire.com/search-hotspot-locations.htm (visited Sept. 14, 2012) (98,877 hot spots in the United States); Hotspotr, *WiFi Cafes and Hotspots*, *available at* http://hotspotr.com/wifi (18,319 hot spots) (visited Sept. 14, 2012).

[1145] *See*, *e.g.*, *Q: What is Xfinity WiFi?How do I connect to an XFINITY WiFi hotspot?*, Xfinity.com, http://www.comcast.com/wifi/faqs.htm?SCRedirect=true (last visited Sept 14, 2012). Some of the Cable Companies, such as Comcast and TWC, also offer non-subscribers access for a charge. Shalini Ramachandran, *Cable Firms to Share Wi-Fi*, Wall St. J., May 21, 2012, available at http://allthingsd.com/20120521/five-cable-firms-to-share-wi-fi-hot-spots/. (visited Oct. 16, 2012).

[1146] *See Major U.S. Cable Companies Join Forces on WiFi, Business Wire*, May 21, 2012, available at http://www.businesswire.com/news/home/20120521005484/en/Major-U.S.-Cable-Companies-Join-Forces-WiFi. (visited Oct. 16, 2012).

[1147] *See* AT&T, News Release, *AT&T Wi-Fi Usage Soars With 301.9 Million Connections Made in Third Quarter 2011*,Sept. 14, 2012, available at http://www.att.com/gen/press-room?pid=21806&cdvn=news&newsarticleid=33140&mapcode=consumer|mk-att-wi-fi (visited Sept. 14, 2012). (announcing that its Wi-Fi network consists of over 29,000 locations in the U.S.); Verizon Wireless, *Verizon Wi-Fi Hotspot Directory*, http://vzw.jiwire.com/ (visited Sept. 14, 2012) (noting the availability of thousands of Verizon Wi-Fi hot spots across the United States, Canada, and Mexico); T-Mobile, *T-Mobile HotSpot Locations*, https://selfcare.hotspot.t-mobile.com/locations/viewLocationMap.do (visited Sept.14, 2012) (advertising over 45,000 locations worldwide).

[1148] *See* News Release. AT&T, *AT&T Wi-Fi Usage Soars With 301.9 Million Connections Made in Third Quarter 2011*,Oct. 24, 2011, available at http://www.att.com/gen/press-room?pid=21806&cdvn=news&newsarticleid=33140&mapcode=consumer|mk-att-wi-fi (visited Sept. 14, 2012).

[1149] *See* AT&T 2011 Annual Report, at 6.

[1150] *See* Starbucks, *Wireless Internet*, http://www.starbucks.com/coffeehouse/wireless-internet (visited Sept. 14, 2012) (advertising free, unlimited Wi-Fi access, with no username or password required, at all Starbucks company-owned stores in the United States); McDonald's, *Free Wi-Fi*, http://www.mcdonalds.com/us/en/services/free_wifi.html (visited Sept. 14, 2012) (advertising free Wi-Fi hot spot (continued….)

mobile wireless service plans.[1151] Whereas Verizon Wireless's free hot spot access requires a monthly broadband plan, AT&T and T-Mobile offer Wi-Fi hot spot access on a per session or per day basis.[1152]

380. WLANs are also increasingly being used to off-load traffic from mobile wireless networks by mobile wireless service providers. One report estimates that total mobile data traffic offload from mobile wireless network to local networks will increase from 11 percent (72 petabytes/month) in 2011 to 22 percent (3.1 exabytes/month) in 2016.[1153]

381. To facilitate access of mobile wireless users to their Wi-Fi hotspots, many mobile wireless providers now offer dual-mode handsets that operate on both cellular and Wi-Fi networks.[1154] Nearly all smartphones will be Wi-Fi enabled by 2014.[1155] Some service providers also encourage their subscribers to use Wi-Fi networks whenever possible for data applications like streaming video,

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access at more than 11,500 locations in the United States); Barnes & Noble, *AT&T Wi-Fi*, http://www.barnesandnoble.com/u/Wi-fi-at-Barnes-and-Noble/379001240/?cds2Pid=27242&linkid=1594157 (visited Sept. 14, 2012).

[1151] *See* AT&T, *AT&T Wi-Fi: At a Glance*, http://www.att.com/Common/about_us/files/pdf/wifi/Wi-Fi_at_a_Glance.pdf (visited Sept. 14, 2012) (stating that "[u]nlimited access to AT&T Wi-Fi hotspots in the U.S. is included for millions of residential, small business and enterprise customers with select AT&T High Speed Internet, LaptopConnect, and smartphone plans"); T-Mobile, *T-Mobile Hotspot – Service Plans*, https://selfcare.hotspot.t-mobile.com/services_plans.do (visited Sept. 14, 2012) (advertising $9.99 per month as a "discount for T-Mobile voice plan customers only"); Verizon Wireless, *Hit the Hotspots with Verizon Wi-Fi*, http://www.verizonwireless.com/b2c/mobilebroadband/?page=wifiaccess (visited Sept. 14, 2012) (stating that Verizon Wi-Fi is "included for our Mobile Broadband customers.").

[1152] *See* Verizon Wireless, *Hit the Hotspots with Verizon Wi-Fi*, http://www.verizonwireless.com/b2c/mobilebroadband/?page=wifiaccess (visited Sept. 14, 2012); AT&T, *AT&T Wi-Fi: At a Glance*, http://www.att.com/Common/about_us/files/pdf/wifi/Wi-Fi_at_a_Glance.pdf (visited Sept. 14, 2012) (stating that "[o]ne-time hot spot connections are available for as low as $2.95 for two hours"); T-Mobile, *T-Mobile Hotspot – Service Plans*, https://selfcare.hotspot.t-mobile.com/services_plans.do (visited Sept. 14, 2012) (advertising a "DayPass" plan with no term commitment).

[1153] *See* Cisco white paper, *Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2011–2016*, Feb. 14, 2012, at 12, available at http://www.cisco.com/en/US/solutions/collateral/ns341/ns525/ns537/ns705/ns827/white_paper_c11-520862.html (last visited Sept. 14, 2012).

[1154] *See Wi-Fi in Mobile Phones: Dual Mode Becomes the Thing*, In-Stat, Nov. 2009. *See, e.g.*, AT&T, *Cell Phones & Devices – Wireless from AT&T*, http://www.wireless.att.com/cell-phone-service/cell-phones/cell-phones.jsp?feacondition=allphones&feapaytype=standard&startFilter=%20false&allTypes=on&feawifiCapable=wifiCapable&allManus=on (visited Sept. 14, 2012) (listing a large number of Wi-Fi capable phones or devices available from AT&T); T-Mobile, *HotSpot Phones: Talk Away!*, http://www.t-mobile.com/templates/ListAllPhones.aspx/?features=4ce9c948-6b53-4b76-a3f7-9116f33bd25b&WT.mc_n=TMHSDevice_WiFiLP&WT.mc_t=Offsite (visited Sept. 14, 2012) (listing handsets available to use with T-Mobile's Unlimited HotSpot Calling service, which allows for unlimited nationwide calls over Wi-Fi); US Cellular, *US Cellular – Phones*, http://www.uscellular.com/uscellular/zipCode.jsp?type=phones&call=0 (visited Sept. 14, 2012) (Wi-Fi capable handsets from US Cellular can be found by entering a zip code for a valid service area and applying the filter for "Wi-Fi" to the list of available handsets); Cincinnati Bell Wireless, *Cincinnati Bell Wireless Phones and Devices*, http://www.cincinnatibell.com/consumer/wireless/phones_and_devices/?view=fusionwifi (visited Sept. 14, 2012). (listing handsets available for use with Cincinnati Bell Wireless' Fusion WiFi service). According to one report, the number of Wi-Fi equipped mobile phones that shipped in 2009 increased to 139.3 million, up from 92.5 million in 2008. *See* Stephen Lawson, *Wi-Fi Spreading Fast Among Phones*, PCWORLD, Mar. 23, 2010, *available at* http://www.pcworld.com/article/192106/wifi_spreading_fast_among_phones.html (visited Oct. 16, 2012).

[1155] *See* Fierce Wireless, *Study: Easier Wi-Fi access could lure smartphones, tablet users*, Sept. 14, 2012, available at http://www.fiercewireless.com/ctialive/story/study-easier-wi-fi-access-could-lure-smartphones-tablet-users/2012-05-10. (visited Oct. 16, 2012).

downloading files, or surfing the web.[1156] In February 2012, 38 percent of smartphones accessed internet through both mobile and Wi-Fi networks. [1157] The wireless industry is currently developing standards and technologies to facilitate seamless roaming between Wi-Fi and 3G/4G networks.[1158] The initiative between GSMA and Wireless Broadband Alliance (WBA) aimed at simplifying Wi-Fi hotspot access for smartphones and tablets users is expected to be ready for commercial use by early 2013.[1159]

382. As Wi-Fi networks are deployed in more locations, especially in urban areas and public venues such as libraries, schools, shopping malls, office buildings, and residential homes, consumers are increasingly taking advantage of wide availability of free or low cost Wi-Fi networks for their data applications. One recent survey by Localytics shows that about 89.7 percent of all iPads sold can only connect to Wi-Fi networks, 8.8 percent can connect to 3G networks, and 1.5 percent can connect to LTE networks. The survey also found that, of all iPad data sessions, just 6 percent are transmitted over a cellular network.[1160] Another recent report by NPD Group indicated that, 65 percent of U.S. tablet buyers only connect via Wi-Fi, up from 60 percent in April.[1161] In January 2012, 88 percent of smartphone users were active Wi-Fi users.[1162]

383. Some mobile virtual network operators (MVNOs) are beginning to use Wi-Fi networks to provide wireless broadband services to their customers while relying on 3G/4G services to bridge the gap between local Wi-Fi networks.[1163] This potentially disruptive business model may significantly reduce the MVNOs' operating costs.[1164] These MVNOs, primarily relying on local Wi-Fi networks for customers' voice and data services, may bring significant competition to traditional mobile wireless operators.

384. *Small Cell Technologies.* Small cell technologies generally refer to femtocells, picocells, metrocells and microcells – broadly increasing in size from femtocells (the smallest) to microcells (the largest), A small cell is a small low-power wireless base station that functions like a cell in a mobile

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[1156] AT&T FAQs on 3G MicroCell "*Should I use my 3G MicroCell for data instead of Wi-Fi*," available at http://www.att.com/shop/wireless/devices/3gmicrocell.jsp?fbid=RDVYpCwGpf5 (visited Sept. 14, 2012).

[1157] *See* ComScore press release, *iPhones Have Significantly Higher Rates of Wi-Fi Utilization than Android Phones in the U.S. and U.K.* Apr. 2, 2012. http://www.comscore.com/Insights/Press_Releases/2012/4/iPhones_Have_Significantly_Higher_Rates_of_Wi-Fi_Utilization. (visited Nov. 19, 2012).

[1158] *See* Fierce Wireless, *GSMA, WBA partner to ease roaming between mobile, Wi-Fi networks*, at http://www.fiercebroadbandwireless.com/story/gsma-wba-partner-ease-roaming-between-mobile-wi-fi-networks/2012-03-20. (visited Oct. 16, 2012).

[1159] *See* Fierce Wireless, *Boingo CTO: Cellular-to-Wi-Fi roaming to be ready by early 2013*, at http://www.fiercebroadbandwireless.com/story/boingo-cto-cellular-wi-fi-roaming-be-ready-early-2013/2012-03-23. (visited Oct. 16, 2012).

[1160] *See* Fierce Wireless, *Localytics: Only 6% of iPad data sessions are on cellular networks* http://www.fiercewireless.com/story/localytics-only-6-ipad-data-sessions-are-cellular-networks/2012-03-23?utm_medium=nl&utm_source=internal (visited Oct. 16, 2012).

[1161] *See* Fierce Wireless, *NPD: Tablet users increasingly favor Wi-Fi over cellular connections*, http://www.fiercewireless.com/story/npd-tablet-users-increasingly-favor-wi-fi-over-cellular-connections/2011-12-12. (visited Oct. 16, 2012).

[1162] *See* Informa Telecoms & Media white paper, *Understanding today's smartphone user: Demystifying data usage trends on cellular & Wi-Fi networks*, 2012, at 2.

[1163] Republic Wireless, a new Sprint MVNO, structures its service to route traffic primarily over Wi-Fi, and to only fall back on cellular if no Wi-Fi is available. *See* http://republicwireless.com/how-it-works (visited Sept. 14, 2012).

[1164] Republic Wireless, a new Sprint MVNO, is planning to offer unlimited voice and data services for $19.99 per month. *See* http://republicwireless.com/how-it-works (visited Sept. 14, 2012).

wireless network. Operating in licensed spectrum, it is operator-managed and feature edge-based intelligence. Small cells provide improved cellular coverage, capacity and applications for homes and enterprises as well as metropolitan and rural public spaces.[1165] Small cells can be installed in a consumer's premises. They are compatible with the same mobile handsets and other wireless devices that consumers use on the service provider's mobile wireless network. Small cells are intended to improve coverage in buildings and areas that may experience service quality issues with the service provider's existing mobile wireless network. Three nationwide service providers distribute and support small cells in selected markets. Sprint Nextel's femtocell service, called Airave™, was introduced in 2008 and allows subscribers to make unlimited wireless calls from their femtocell network for a monthly service fee.[1166] The Verizon Wireless Network Extender, unveiled in January 2009, is designed to enhance indoor coverage and be used with a customer's existing service plan.[1167] The AT&T 3G MicroCell, introduced in late 2009, is also used with a customer's existing service plan.[1168] Growth in the use of small cells in the U.S. has been slower than expected by some industry analysts, but has been accelerating.[1169] As of July 2012, Sprint has 950,000 femtocells operating on its network, up from 250,000 units in 2011.[1170]

385. In October 2011, the Commission hosted a workshop to explore the potential of small cells to expand coverage and increase capacity in order to address rising demand in the face of spectrum shortages.[1171] The workshop presented an overview of small cell technologies and explored the business opportunities and challenges involved with expanding wireless data coverage. The NTIA Fast-Track report's[1172] identification of the 3550-3600 MHz band for reallocation to non-federal use has spurred proposals for a dedicated small-cell band. A report released by the President's Council of Advisors on Science and Technology (PCAST), released in July 2012, noted that "[d]edicating the 3550-3650 MHz band to small cell, low power use could allow for significant reduction or even elimination of the exclusion zones."[1173] The PCAST Report observed that the use of small cells in this band could augment lower frequency spectrum used for wider area coverage.[1174] In December 2012, the Commission proposed to make available 100 megahertz of shared spectrum in the 3.5 GHz Band (3550-3650 MHz)

[1165] *See* Small Cell Forum, *What is a small cell*, available at http://www.smallcellforum.org/aboutsmallcells-small-cells-what-is-a-small-cell (last visited Sept. 14, 2012).

[1166] *See* Sprint Nextel, *Sprint Airave*, http://support.sprint.com/support/device/Sprint/AIRAVE_by_Sprint-dvc1230001prd/?id16=airave (visited Sep. 21, 2012).

[1167] *See* Verizon Wireless, *Verizon Wireless Network Extender, http://www.verizonwireless.com/verizon-network-extender.shtml* (visited Sep. 21, 2012). Customers pay $249.99 for the Network Extender base station but pay no additional monthly access fee. *Id.*

[1168] *See* AT&T, *AT&T 3G MicroCell*, http://www.att.com/shop/wireless/devices/3gmicrocell.jsp?fbid=Mui8G_gJmU- (visited Sep. 21, 2012).

[1169] *See* Paul Rasmussen, *Femtocells still on the sidelines, but new opportunities beckon*, Fierce Wireless Europe, June 22, 2011, available at http://www.fiercewireless.com/europe/special-reports/femtocells-still-sidelines-new-opportunities-beckon (visited Sept. 14, 2012). According to this article, there are differing opinions about the role of femtocells and how important they are likely to be in the evolving wireless ecosystem.

[1170] See Phil Goldstein, Sprint boots femtocell count to 950,000, July 26, 2012, available at http://www.fiercewireless.com/story/sprint-boosts-femtocell-count-950000/2012-07-26.

[1171] *See* http://www.fcc.gov/events/forum-indoor-deployments-small-cell-sites (visited Sept. 24, 2012).

[1172] *See* http://www.ntia.doc.gov/files/ntia/publications/fasttrackevaluation_11152010.pdf (visited Oct. 16, 2012).

[1173] *See* PCAST, Report to the President: Realizing the Full Potential of Government-Held Spectrum to Spur Economic Growth (rel. July 20, 2012) ("PCAST Report") *available at* http://www.whitehouse.gov/sites/default/files/microsites/ostp/pcast_spectrum_report_final_july_20_2012.pdf. at p. 51(visited Oct. 16, 2012).

[1174] PCAST Report at 17.

using small cell and database technologies.[1175] The *Small Cell NPRM* broadly reflects the innovative thinking of the President's Council of Advisors on Science and Technology (PCAST), which issued a report this past summer recommending spectrum sharing and small cell use in the 3.5 GHz Band.

IX. URBAN-RURAL COMPARISONS

386. Since the release of the *Sixth Report*,[1176] the Commission has attempted to obtain a better understanding of the state of competition below the national level, and particularly in rural areas. The Communications Act does not include a statutory definition of what constitutes a rural area.[1177] The Commission used Rural Services Areas (RSAs) as a proxy for rural areas for certain purposes, such as the former cellular cross-interest rule and the former CMRS spectrum cap, stating that "other market designations used by the Commission for CMRS, such as [EAs], combine urbanized and rural areas, while MSAs and RSAs are defined expressly to distinguish between rural and urban areas."[1178] Since its 2004 *Report and Order* concerning deployment of wireless services in rural areas, however, the Commission has adopted a "baseline" definition of rural as a county with a population density of 100 persons or fewer per square mile.[1179] For this reason, we adopt this same definition to analyze service availability in rural areas in this *Report*.

387. By this definition, roughly 59 million people, or 19 percent of the U.S. population, live in rural counties. These counties comprise 3.1 million square miles, or 86 percent of the geographic area of the United States.[1180] The distribution of rural counties across the United States can be seen in Map 5 below. Approximately 81 percent of the U.S. population lives on 15 percent of the land, while 19 percent live on the remaining 85 percent of the land.

[1175] *See* Amendment of the Commission's Rules with Regard to Commercial Operations in the 3550-3650 MHz Band, *Notice of Proposed Rulemaking*¸GN Docket No. 12-354, FCC 12-148 (rel. Dec 12, 2012)

[1176] *Sixth Report*, 16 FCC Rcd at 13350.

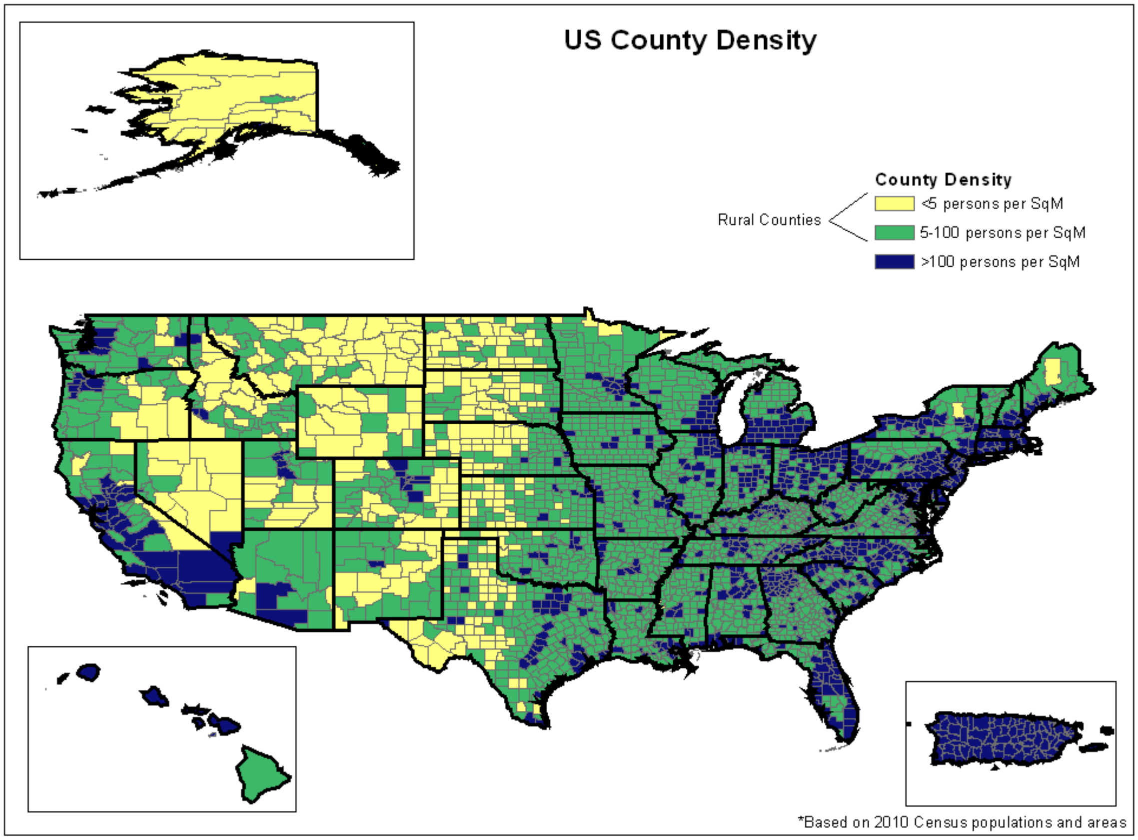
[1177] The federal government has multiple ways of defining rural, reflecting the multiple purposes for which the definitions are used. *Eighth Report*, 18 FCC Rcd at 14834; Facilitating the Provision of Spectrum-Based Service to Rural Areas and Promoting Opportunities for Rural Telephone Companies to Provide Spectrum-Based Services, *Notice of Proposed Rulemaking*, 18 FCC Rcd 20802, 20808-11 (2003).

[1178] 1998 Biennial Regulatory Review, Spectrum Aggregation Limits for Wireless Telecommunications Carriers, *Report and Order*, 15 FCC Rcd 9219, 9256 ¶ 84, n.203 (1999).

[1179] Facilitating the Provision of Spectrum-Based Services to Rural Areas and Promoting Opportunities for Rural Telephone Companies To Provide Spectrum-Based Services, *Report and Order*, 19 FCC Rcd. 19078, 19087-88 (2004) ("We recognize, however, that the application of a single, comprehensive definition for 'rural area' may not be appropriate for all purposes. . . . Rather than establish the 100 persons per square mile or less designation as a uniform definition to be applied in all cases, we instead believe that it is more appropriate to treat this definition as a presumption that will apply for current or future Commission wireless radio service rules, policies and analyses for which the term 'rural area' has not been expressly defined. By doing so, we maintain continuity with respect to existing definitions of 'rural' that have been tailored to apply to specific policies, while also providing a practical guideline").

[1180] Based on 2010 Census data. Includes the population of Puerto Rico.

Map 5
County Density in the United States, 2010[1181]



A. Mobile Wireless Coverage and Service Provision in Rural Areas

1. Mobile Voice Network Coverage

388. Using Mosaik data, we have analyzed mobile wireless network coverage in rural and non-rural census blocks.[1182] These estimates of coverage represent mobile network deployment and may not indicate the extent to which providers actually offer service in the covered areas or have customers residing in those areas. While recognizing that this analysis likely overstates the coverage actually experienced by consumers because of limitations of the Mosaik data, we find that this analysis is useful because it provides a general baseline that can be compared over time across network types, technologies, and providers. We present estimated coverage in terms of road miles in addition to population and square miles.

389. Tables 55-58 and Charts 46-47 below show that a larger percentage of the non-rural population is covered by a greater number of providers than the rural population. As of October 2012,

[1181] A larger version of this map may be found in Appendix C.

[1182] There are 11 million census blocks in the United States, where a census block is the smallest geographic area for which population data are available. We consider a census block to be covered if the centroid, or center point, of the block has mobile wireless coverage. The data do not expressly account for factors such as signal strength, bit rate, or in-building coverage, and may convey a false sense of consistency across geographic areas and service providers but nonetheless are useful for benchmarking mobile network deployment across the United States, especially over time. *National Broadband Plan*, at 39 (Chapter 4).

99.3 percent of the U.S. rural population has coverage by at least one mobile voice provider, compared to nearly 100 percent of the population in non-rural areas. This is slightly higher than the 99.2 percent of the rural population covered by at least one provider as of July 2010, according to the *Fifteenth Report*.[1183] We note that just over 400,000 people in rural areas had no mobile wireless coverage, while approximately 58,000 in non-rural areas had no mobile wireless coverage as of October 2012. The percentage of the rural population covered by at least two providers remained flat at just over 96 percent from July 2010 to October 2012, and was lower than the 99.9 percent of the non-rural population covered by at least two providers.[1184] Further, 87 percent of the rural population was covered by at least three providers and 69 percent by at least four providers, compared to 99.5 percent and 98 percent, respectively, of the non-rural population. In comparison, the *Fifteenth Report* indicates that, as of July 2010, 88.4 percent of the rural population was covered by at least three providers, and 77.4 percent by at least four providers.[1185]

390. As of October 2012, one or more providers cover 92.6 percent of the rural road miles and 99.2 percent of the non-rural road miles.[1186] The percentage of rural road miles covered by at least two providers is 81.9 percent, while 97.8 percent of non-rural road miles are covered by at least two providers. Finally, 61.3 percent of rural road miles are covered by at least three providers and 39.6 percent by at least four providers, compared to 94.9 and 88.1 percent, respectively, of non-rural road miles.

[1183] *Fifteenth Report*, 26 FCC Rcd at 9879-9880 ¶ 380.

[1184] *See Thirteenth Report*, 24 FCC Rcd at 6239 ¶ 104.

[1185] *Fifteenth Report*, 26 FCC Rcd at 9879-9880 ¶ 380.

[1186] Our analysis of road miles includes the following road miles categories from census: Primary Road (S1100), Secondary Road (S1200), Local Neighborhood Road, Rural Road, City Street (S1400), Vehicular Trail [4WD] (S1500), Service Drive usually along a limited access highway (S1640), and Private Road for service vehicles (S1740) as defined in MAF/TIGER Feature Class Code (MTFCC) Definitions, pages F-186 and F-187 at http://www.census.gov/geo/www/tiger/tgrshp2010/documentation.html (last visited Sep 26, 2012). In calculating the number of road miles associated with each census block, we also used two tables ("Faces" and "Edges"), published by the US Census Bureau as part of the TIGER database. A description of these relationship tables can be found at http://www.census.gov/geo/www/tiger/rel_file_desc.pdf (visited Oct. 16, 2012). The datasets themselves are available in the FACES and EDGES directories at ftp://ftp2.census.gov/geo/tiger/TIGER2010/ (visited Oct. 16, 2012).

Table 55
Estimated Mobile Voice Coverage in *Rural Areas* by Census Block, Jan. 2012[1187]

Total Number of Providers with Coverage in a Block	Number of Rural Census Blocks (Thousands)	POPs Contained in Rural Census Blocks (Thousands)	% of Total U.S. POPs	Square Miles Contained in Those Blocks (Thousands)	% of Total U.S. Square Miles (Thousands)	Road Miles Contained in Those Blocks (Thousands)	% of Total U.S. Road Miles
Total for Rural U.S.	**5,387**	**59,152**	**18.9%**	**3,214**	**84.5%**	**4,591**	**67.3%**
			% of Total Rural U.S. POPs		**% of Total Rural U.S. Square Miles**		**% of Total Rural U.S. Road Miles**
1 or More	5,160	58,717	99.3%	2,237	69.6%	4,248	92.5%
2 or More	4,807	57,187	96.7%	1,831	57.0%	3,748	81.7%
3 or More	3,964	51,563	87.2%	1,251	38.9%	2,808	61.7%
4 or More	2,828	41,213	69.7%	729	22.7%	1,810	39.4%
5 or More	1,462	24,285	41.1%	313	9.7%	846	18.4%

Table 56
Estimated Mobile Voice Coverage in *Rural Areas* by Census Block, Oct. 2012[1188]

Total Number of Providers with Coverage in a Block	Number of Rural Census Blocks (Thousands)	POPs Contained in Rural Census Blocks (Thousands)	% of Total U.S. POPs	Square Miles Contained in Those Blocks (Thousands)	% of Total U.S. Square Miles (Thousands)	Road Miles Contained in Those Blocks (Thousands)	% of Total U.S. Road Miles
Total for Rural U.S.	**5,387**	**59,152**	**18.9%**	**3,214**	**84.5%**	**4,591**	**67.3%**
			% of Total Rural U.S. POPs		**% of Total Rural U.S. Square Miles**		**% of Total Rural U.S. Road Miles**
1 or More	5,165	58,743	99.3%	3,214	69.9%	4,252	92.6%
2 or More	4,814	57,164	96.6%	2,245	57.4%	3,762	81.9%
3 or More	3,955	51,444	87.0%	1,845	39.0%	2,813	61.3%
4 or More	2,780	40,884	69.1%	1,253	22.4%	1,790	39.0%
5 or More	1,433	24,090	40.7%	719	9.6%	839	18.3%

[1187] The Commission estimates in this Table are based on census block analysis of Mosaik CoverageRight coverage maps, January 2012. Population data are from the 2010 Census, and the square miles include the United States and Puerto Rico.

[1188] The Commission estimates in this Table are based on census block analysis of Mosaik CoverageRight coverage maps, October 2012. Population data are from the 2010 Census, and the square miles include the United States and Puerto Rico. There are approximately 11 million census blocks and 312 million people in the entire United States (based on the 2010 Census). This Table includes Federal lands.

Table 57
Estimated Mobile Voice Coverage in *Non-Rural Areas* by Census Block, Jan. 2012[1189]

Total Number of Providers with Coverage in a Block	Number of Non-Rural Census Blocks (Thousands)	POPs Contained in Non-Rural Census Blocks (Thousands)	% of Total U.S. POPs	Square Miles Contained in Those Blocks (Thousands)	% of Total U.S. Square Miles	Road Miles Contained in Those Blocks (Thousands)	% of Total U.S. Road Miles
Total for Non-Rural U.S.	**5,768**	**253,319**	**81.1%**	**588**	**15.5%**	**2,230**	**32.7%**
			% of Total Non-Rural U.S. POPs		**% of Total Non-Rural U.S. Square Miles**		**% of Total Non-Rural U.S. Road Miles**
1 or More	5,752	253,265	100.0%	547	92.9%	2,214	99.3%
2 or More	5,723	253,050	99.9%	525	16.3%	2,185	98.0%
3 or More	5,645	252,156	99.5%	485	15.1%	2,116	94.9%
4 or More	5,467	249,055	98.3%	423	13.2%	1,986	89.1%
5 or More	4,444	217,497	85.9%	271	8.4%	1,482	66.5%

Table 58
Estimated Mobile Voice Coverage in *Non-Rural* Areas by Census Block, Oct. 2012[1190]

Total Number of Providers with Coverage in a Block	Number of Non-Rural Census Blocks (Thousands)	POPs Contained in Non-Rural Census Blocks (Thousands)	% of Total U.S. POPs	Square Miles Contained in Those Blocks (Thousands)	% of Total U.S. Square Miles	Road Miles Contained in Those Blocks (Thousands)	% of Total U.S. Road Miles
Total for Non-Rural U.S.	**5,768**	**253,319**	**81.8%**	**588**	**15.5%**	**2,230**	**32.7%**
			% of Total Non-Rural U.S. POPs		**% of Total Non-Rural U.S. Square Miles**		**% of Total Non-Rural U.S. Road Miles**
1 or More	5,751	253,261	100.0%	546	92.8%	2,213	99.2%
2 or More	5,719	253,017	99.9%	522	88.7%	2,181	97.8%
3 or More	5,629	251,952	99.5%	479	81.4%	2,104	94.4%
4 or More	5,427	248,357	98.0%	415	70.5%	1,965	88.1%
5 or More	4,461	218,995	86.5%	273	46.4%	1,498	67.2%

1189 The Commission estimates in this Table are based on census block analysis of Mosaik CoverageRight coverage maps, January 2012. Population data are from the 2010 Census, and the square miles include the United States and Puerto Rico.

1190 The Commission estimates in this Table are based on census block analysis of Mosaik CoverageRight coverage maps, October 2012. Population data are from the 2010 Census, and the square miles include the United States and Puerto Rico.

Chart 46
***Percentage of Population* Covered by Mobile Voice Providers in Rural vs. Non-Rural Areas, Oct. 2012**

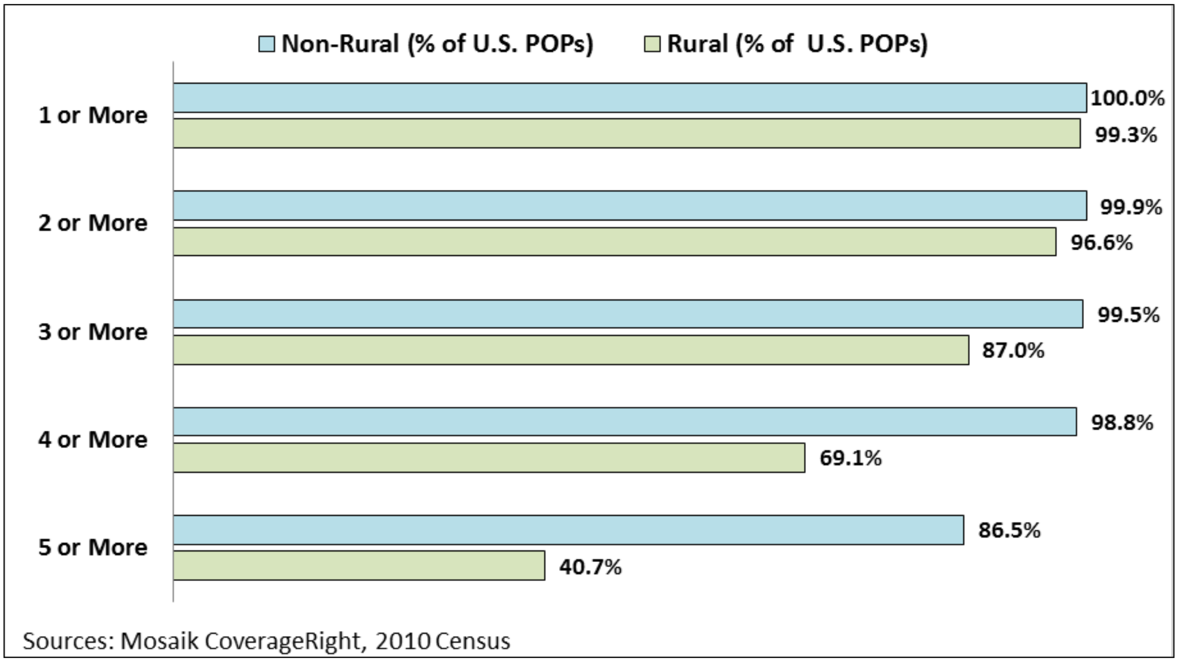
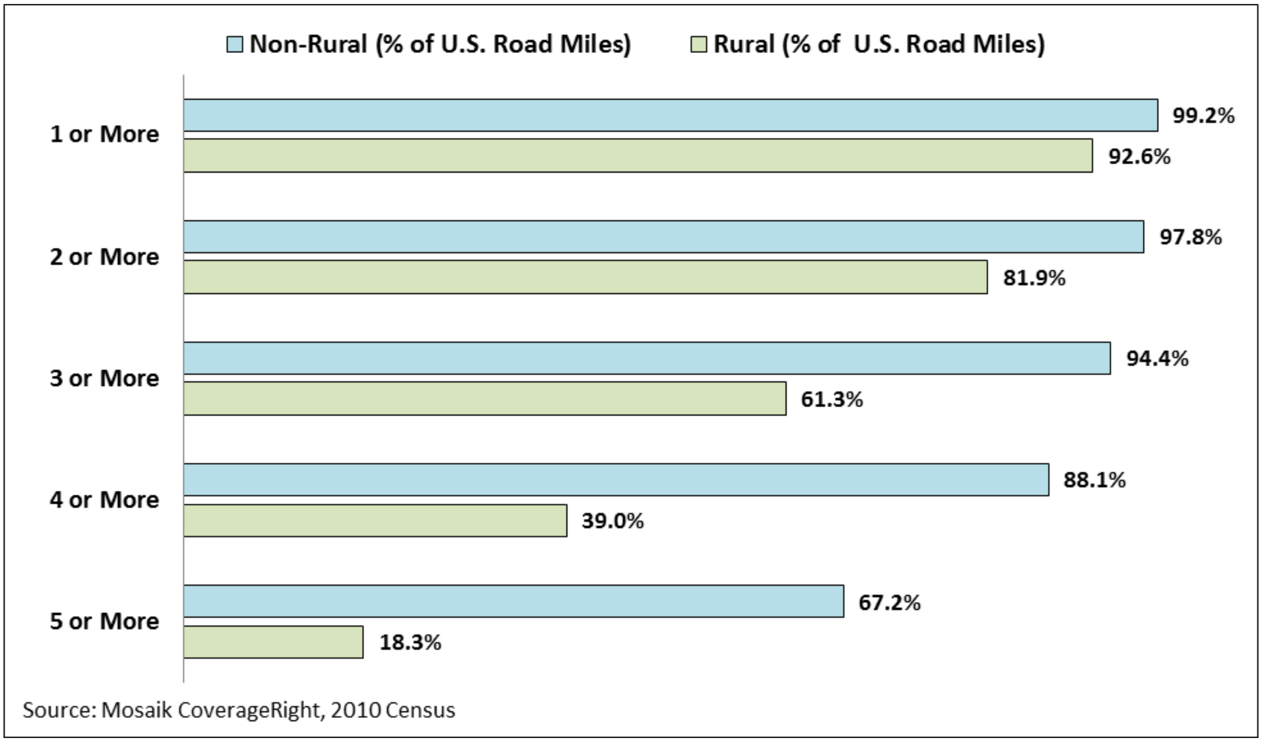


Chart 47
***Percentage of Road Miles* Covered by Mobile Voice Providers in Rural vs. Non-Rural Areas, Oct. 2012**



2. Mobile Broadband Network Coverage

391. This *Report* provides data from the Form 477 on the number of mobile wireless Internet access connections exceeding 200 kbps, and therefore using 3G or 4G technologies.[1191] Tables 59-62 and Charts 48-49 below show the extent of mobile broadband network coverage in rural areas and the disparity between coverage in rural areas versus non-rural areas of the United States.[1192] As stated above, although these estimates likely overstate the coverage actually experienced by consumers because of limitations of the Mosaik data, we find that this analysis is useful because it provides a general baseline that can be compared over time across network types, technologies, and providers.

392. As shown below, the U.S. population in rural areas is not covered by as many mobile broadband providers as in non-rural areas of the country. Based on October 2012 Mosaik data, 97 percent of the U.S. rural population has coverage by at least one mobile wireless broadband provider, up from 92 percent in November 2009. In contrast, 99.9 percent of the non-rural population is covered by at least one mobile broadband provider. While rural mobile broadband coverage has improved, 1.3 million people in rural areas have no mobile broadband access. In addition, while 97.7 percent of the population in non-rural areas was covered by two or more mobile broadband providers, only 89.7 percent of the rural population was covered by two or more providers as of October 2012, up from 69.1 percent as of August 2010, according to the *Fifteenth Report*.[1193] Furthermore, 65.4 percent of the rural population was covered by at least three providers and 37.4 percent by at least four providers, compared to 97.7 percent and 92.4 percent, respectively, for the non-rural population as of October 2012. This represents an increase in coverage to the rural population since August 2010 when only 38.1 percent of the rural population was covered by three or more providers and only 17.1 percent was covered by four or more providers, according to the *Fifteenth Report*.[1194]

393. With regard to rural road miles, 87.3 percent are covered by at least one mobile broadband provider, compared to 98.7 percent of non-rural road miles. In addition, while only 67.7 percent of rural road miles are covered by at least two mobile broadband providers, 95.8 percent of non-rural road miles are covered by at least two mobile broadband providers. In addition, only 35.7 percent of rural road miles are covered by at least three mobile broadband providers and only 14.2 percent by four mobile broadband providers compared to 86.6 and 71.8 percent, respectively, of non-rural road miles.

[1191] Other Commission reports consider alternative speed categories for mobile broadband. The *Eighth Broadband Progress Report* presents data on Americans without access to mobile broadband for three speed categories, at least 768 kbps/200 kbps, at least 3 Mbps/768 kbps and at least 6 Mbps/ 1.5 Mbps. *2012 Eighth Broadband Progress Report*, GN Docket No. 11-121 (rel. Aug. 21, 2012) ¶ 86.

[1192] *See also*, NTIA and FCC, National Broadband Map - Broadband Statistics Report, *Broadband Availability in Urban versus Rural Areas, available at* http://www.broadbandmap.gov/download/reports/national-broadband-map-broadband-availability-in-rural-vs-urban-areas.pdf, (visited Jan. 23, 2012).

[1193] *Fifteenth Report*, 26 FCC Rcd at 9881-9882 ¶ 381.

[1194] *Id*.

Table 59
Estimated Mobile Broadband Coverage in *Rural Areas* by Census Block, Jan. 2012[1195]

Total Number of Providers with Coverage in a Block	Number of Rural Census Blocks (Thousands)	POPs Contained in Rural Census Blocks (Thousands)	% of Total Rural U.S. POPs	Square Miles Contained in Those Blocks (Thousands)	% of Total Rural U.S. Square Miles	Road Miles Contained in Those Blocks (Thousands)	% of Total Rural U.S. Road Miles
1 or More	4,891	57,424	97.1%	1,986	61.8%	3,922	85.4%
2 or More	3,948	50,876	86.0%	1,303	40.5%	2,850	62.1%
3 or More	2,178	34,531	58.4%	512	15.9%	1,315	28.6%
4 or More	868	17,584	29.7%	144	4.5%	438	9.5%
5 or More	233	6,110	10.3%	28	0.9%	106	2.3%

Table 60
Estimated Mobile Broadband Coverage in *Rural Areas* by Census Block, Oct. 2012[1196]

Total Number of Providers with Coverage in a Block	Number of Rural Census Blocks (Thousands)	POPs Contained in Rural Census Blocks (Thousands)	% of Total Rural U.S. POPs	Square Miles Contained in Those Blocks (Thousands)	% of Total Rural U.S. Square Miles	Road Miles Contained in Those Blocks (Thousands)	% of Total Rural U.S. Road Miles
1 or More	4,970	57,850	97.8%	2,043	63.6%	4,009	87.3%
2 or More	4,221	53,156	89.9%	1,453	45.2%	3,109	67.7%
3 or More	2,581	38,656	65.4%	662	20.6%	1,638	35.7%
4 or More	1,194	22,122	37.4%	228	7.1%	650	14.2%
5 or More	389	9,370	15.8%	56	1.7%	184	4.0%

Table 61
Estimated Mobile Broadband Coverage in Non-Rural Areas by Census Block, Jan. 2012[1197]

Total Number of Providers with Coverage in a Block	Number of Non-Rural Census Blocks (Thousands)	POPs Contained in Non-Rural Census Blocks (Thousands)	% of Total Non-Rural U.S. POPs	Square Miles Contained in Those Blocks (Thousands)	% of Total Non-Rural U.S. Square Miles	Road Miles Contained in Those Blocks (Thousands)	% of Total Non-Rural U.S. Road Miles
1 or More	5,730	253,095	99.9%	531	90.2%	2,192	98.3%
2 or More	5,621	251,744	99.4%	483	82.0%	2,104	94.3%

[1195] The Commission estimates in this Table are based on census block analysis of Mosaik CoverageRight coverage maps, January 2012. Population data are from the 2010 Census, and the square miles include the United States and Puerto Rico.

[1196] The Commission estimates in this Table are based on census block analysis of Mosaik CoverageRight coverage maps, October 2012. Population data are from the 2010 Census, and the square miles include the United States and Puerto Rico.

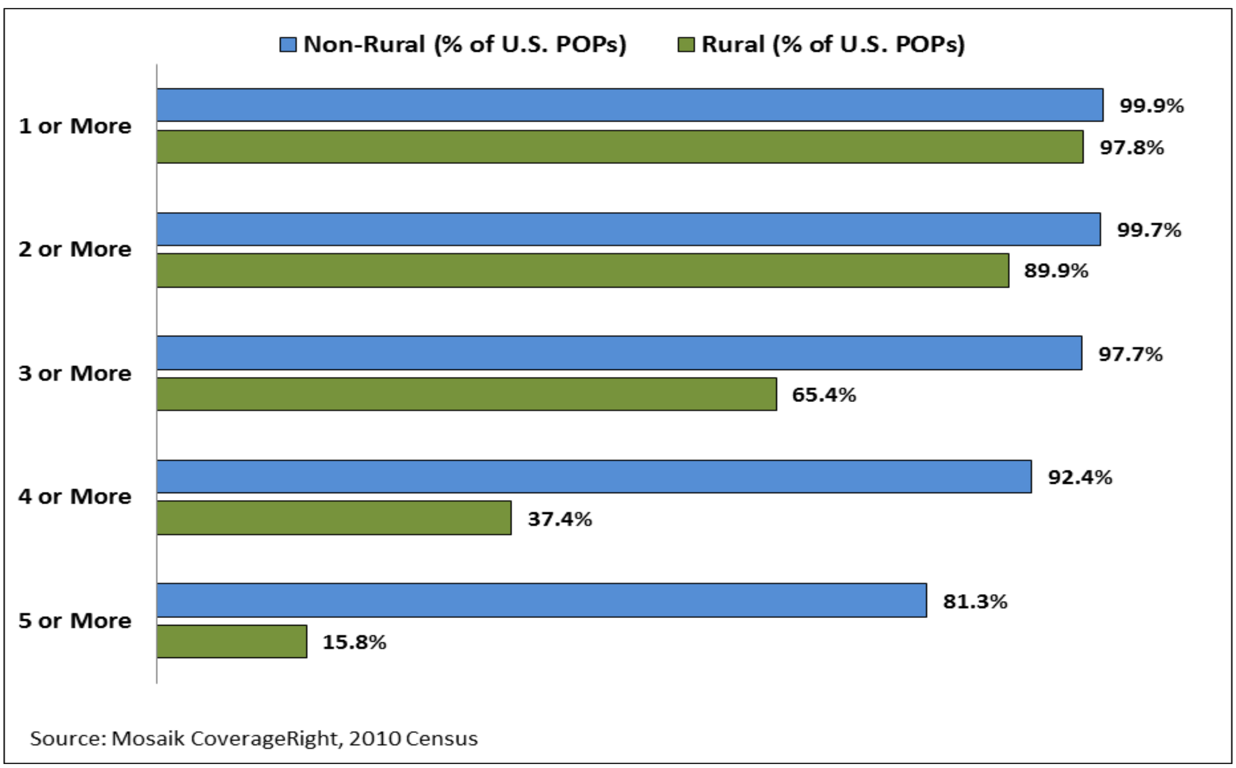
[1197] The Commission estimates in this Table are based on census block analysis of Mosaik CoverageRight coverage maps, January 2012. Population data are from the 2010 Census, and the square miles include the United States and Puerto Rico.

3 or More	5,281	245,572	96.9%	383	65.1%	1,871	83.9%
4 or More	4,576	228,595	90.2%	252	42.8%	1,481	66.4%
5 or More	2,862	159,081	62.8%	111	18.9%	904	40.5%

Table 62
Estimated Mobile Broadband Coverage in *Non-Rural* Areas by Census Block, Oct. 2012[1198]

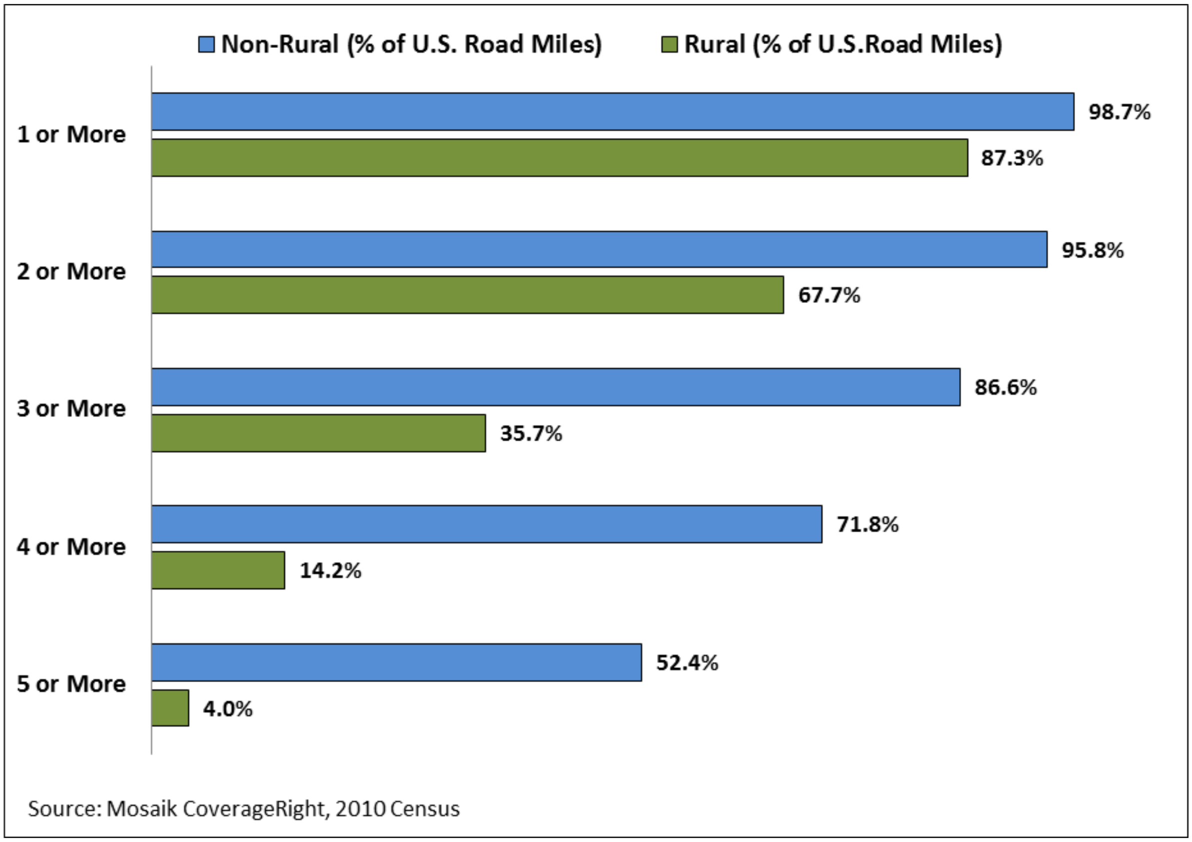
Total Number of Providers with Coverage in a Block	Number of Non-Rural Census Blocks (Thousands)	POPs Contained in Non-Rural Census Blocks (Thousands)	% of Total Non-Rural U.S. POPs	Square Miles Contained in Those Blocks (Thousands)	% of Total Non-Rural U.S. Square Miles	Road Miles Contained in Those Blocks (Thousands)	% of Total Non-Rural U.S. Road Miles
1 or More	5,738	253,175	99.9%	535	90.9%	2,200	98.7%
2 or More	5,668	252,435	99.7%	497	84.4%	2,136	95.8%
3 or More	5,373	247,465	97.7%	408	69.4%	1,932	86.6%
4 or More	4,783	234,069	92.4%	293	49.7%	1,602	71.8%
5 or More	3,833	206,005	81.3%	172	29.3%	1,168	52.4%

Chart 48
***Percentage of Population* Covered by Mobile Broadband Providers in Rural vs. Non-Rural Areas, Oct. 2012**



[1198] The Commission estimates in this Table are based on census block analysis of Mosaik CoverageRight coverage maps, October 2012. Population data are from the 2010 Census, and the square miles include the United States and Puerto Rico.

Chart 49
***Percentage of Road Miles* Covered by Mobile Broadband Providers in Rural vs. Non-Rural Areas, Oct. 2012**



a. Efforts to Improve Mobile Broadband Network Deployment

394. Mobile wireless providers and the Commission have taken steps over the past year to improve mobile broadband network coverage in rural areas. As part of the *USF/ICC Transformation Order* adopted in October 2011, the Commission created Mobility Fund Phase I, a universal service support mechanism dedicated to the deployment of mobile broadband networks.[1199] Mobility Fund Phase I will accelerate new mobile infrastructure deployment by awarding up to $300 million in one-time support to recipients that commit to provide 3G or better mobile voice and broadband services in census blocks that currently lack such services.[1200] Phase I of the Mobility Fund assigned support using a reverse

[1199] *Connect America Fund; A National Broadband Plan for Our Future; Establishing Just and Reasonable Rates for Local Exchange Carriers; High-Cost Universal Service Support; Developing an Unified Intercarrier Compensation Regime; Federal-State Joint Board on Universal Service; Lifeline and Link-Up; Universal Service Reform—Mobility Fund*, WC Docket Nos. 10-90, 07-135, 05-337, 03-109, GN Docket No. 09-51, CC Docket Nos. 01-92, 96-45, WT Docket No. 10-208, Report and Order and Further Notice of Proposed Rulemaking, 26 FCC Rcd 17663 (2011) (*USF/ICC Transformation Order*), *available at* http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-11-161A1_Rcd.pdf (visited Oct. 16, 2012), *pets. for review pending sub nom. In re* FCC 11-161, No. 11-9900 (10th Cir. filed Dec. 8, 2011); Order on Reconsideration, 26 FCC Rcd 17633 (2011); Second Order on Reconsideration, 27 FCC Rcd 4648 (2012); Third Order on Reconsideration, 27 FCC Rcd 5622 (2012).

[1200] "Mobility Fund Phase I Auction Scheduled for September 27, 2012, Notice and Filing Requirements and Other Procedures for Auction 901," *Public Notice*, AU Docket No. 12-25, DA 12-641 (WTB rel. May 2, 2012).

auction, which took place on September 27, 2012.[1201] In Phase II of the Mobility Fund, the Commission will provide up to $500 million per year in ongoing support to expand deployment and sustain mobile voice and broadband services in areas in which such service would be unavailable absent USF support.[1202] The Commission's proposed methodology and operational details for distributing ongoing support in Mobility Fund Phase II are the subject of an ongoing proceeding.[1203]

395. As noted above, in 2010, Verizon Wireless launched the LTE in Rural America Program to expand LTE coverage in rural areas. Under this program, Verizon Wireless leases portions of its 700 MHz Upper C Block spectrum licenses to facilities-based mobile wireless service providers in rural areas where Verizon Wireless currently lacks coverage and does not intend to build out.[1204] The rural providers use this spectrum to build out an LTE network in those areas and market service under their own brand name and pricing plans.[1205] The program includes reciprocal roaming rights; the LTE customers of the rural providers can roam on Verizon Wireless's nationwide LTE network, while Verizon Wireless's customers can roam on the rural providers' LTE networks when traveling in such areas.[1206] As of September 2012, the program included 18 small, rural providers that planned to launch LTE to areas covering 2.7 million people across 14 states.[1207] In April 2012, Pioneer Cellular became the first rural provider to launch LTE service, to six counties in Oklahoma, as part of the program.[1208]

3. Service Provision in Rural CMAs

396. As discussed above, we can examine mobile wireless service provision at the CMA level

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[1201] For further information on the Mobility Fund Phase I auction, *see* Auction 901, Mobility Fund Phase I, *available at* http://wireless.fcc.gov/auctions/default.htm?job=auction_summary&id=901 (visited Oct. 16, 2012). In the USF/ICC Transformation Order, the Commission also designated an additional $50 million in Phase I of the Mobility Fund for one-time support targeted exclusively for mobile service on Tribal lands, which will be awarded by auction in 2013. *See USF/ICC Transformation Order*, 26 FCC Rcd at 17819-20, ¶ 481.

[1202] *USF/ICC Transformation Order*, 26 FCC Rcd at 17824, ¶¶ 493-494.

[1203] *See USF/ICC Transformation Order*, 26 FCC Rcd at 18069-85, ¶¶ 1121-1188.

[1204] Verizon Comments at 33; Bernie Arnason, *Nemont Partners with Verizon for Rural LTE Program*, Telecompetitor, Mar. 22, 2012, http://www.telecompetitor.com/nemont-partners-with-verizon-for-rural-lte-program/ (visited Oct. 16, 2012).

[1205] Verizon Comments at 33; Dan Meyer, *LTE N.A. 2011: Verizon Wireless Set for Rural LTE Launches in 2012*, RCR Wireless News, Nov. 9, 2011, *available at* http://www.rcrwireless.com/article/20111109/devices/lte-n-a-2011-verizon-wireless-set-for-rural-lte-launches-in-2012/ (visited Oct. 16, 2012).

[1206] Kevin Fitchard, *Pioneer Launches Rural LTE Over Verizon Spectrum*, GigaOm, May 3, 2012, http://gigaom.com/broadband/pioneer-launches-rural-lte-over-verizon-spectrum/ (visited Oct. 16, 2012); *Two Verizon Rural LTE Partners Nearing Launch; Scheme Gains Two New Operators*, TeleGeography, Mar. 28, 2012, http://www.telegeography.com/products/commsupdate/articles/2012/03/28/two-verizon-rural-lte-partners-nearing-launch-scheme-gains-two-new-operators/ (visited Oct. 16, 2012); Dan Meyer, *Verizon Wireless Adds Chariton to Rural LTE Program*, RCR Wireless, Sept. 12, 2011, http://www.rcrwireless.com/article/20110912/carriers/verizon-wireless-adds-chariton-to-rural-lte-program/ (visited Oct. 16, 2012).

[1207] Communications Daily, September 19, 2012, at 11. Joan Engecretson, *Pioneer Cellular Is First Verizon Rural Partner to Launch 4G LTE*, Telecompetitor, Apr. 30, 2012, http://www.telecompetitor.com/pioneer-cellular-is-first-verizon-rural-partner-to-launch-4g-lte/ (visited Oct. 16, 2012); Bernie Arnason, *Nemont Partners with Verizon for Rural LTE Program*, Telecompetitor, Mar. 22, 2012, http://www.telecompetitor.com/nemont-partners-with-verizon-for-rural-lte-program/ (visited Oct. 16, 2012).

[1208] Kevin Fitchard, *Pioneer Launches Rural LTE Over Verizon Spectrum*, GigaOm, May 3, 2012, http://gigaom.com/broadband/pioneer-launches-rural-lte-over-verizon-spectrum/ (visited Oct. 16, 2012); Joan Engecretson, *Pioneer Cellular Is First Verizon Rural Partner to Launch 4G LTE*, Telecompetitor, Apr. 30, 2012, http://www.telecompetitor.com/pioneer-cellular-is-first-verizon-rural-partner-to-launch-4g-lte/ (visited Oct. 16, 2012).

using NRUF data.[1209] Using these data, we compare the number of wireless service providers offering service in rural and non-rural CMAs (see Table 63 and Table 64 below). For this purpose, we consider a CMA to be rural if it has a population density less than or equal to 100 persons per square mile.[1210] Under this definition, 392 CMAs are rural and 324 CMAs are non-rural.

397. We estimate the number of people living in a CMA with a certain number of mobile wireless providers offering service in that CMA, although these estimates are likely to overestimate the number of facilities-based providers available for selection by any individual customer living in that CMA. Because many CMAs are made up of several counties and a facilities-based service provider may offer service in only part of a CMA,[1211] many consumers, especially in rural areas, likely have fewer service provider choices where they live or work than the total number of providers offering service somewhere in their CMA.[1212]

398. We estimate the number of providers serving at least portions of each of the 716 CMA in the U.S. (excluding territories). In this *Report*, we consider a provider to be a competitor if it has market share above a particular threshold, and have made estimates based on two alternative thresholds. Specifically, to estimate the number of providers serving a CMA, we include a provider if it has a greater than two percent market share in Table 63. Alternatively, we include providers with at least a five percent market share in Table 64, which provides greater assurance of a meaningful choice for consumers of mobile wireless connections based on NRUF data within the CMA.[1213]

399. Table 63 and Table 64 show that non-rural CMAs generally have more providers offering service than rural CMAs. One rural CMA is served by only one provider and 13 percent of rural CMAs are served by only two providers, whereas all non-rural CMAs have more than two providers. Similarly, 31 percent of rural CMAs have three providers offering service somewhere in the CMA, as compared to only 9 percent of non-rural CMAs. Thus, consumers in 45 percent of rural CMAs have a choice of at most three facilities-based service providers, compared to only 9 percent of non-rural CMAs. Conversely, 91 percent of non-rural CMAs, as opposed to 55 percent of rural CMAs, have at least four providers offering service somewhere in the CMA.

[1209] Section III.C, Mobile Wireless Network Coverage, *supra.*

[1210] We have applied the definition of rural discussed earlier, as a county with a population density of 100 persons or fewer per square mile, to CMA boundaries. Because of the limitations of NRUF data, as discussed above, it would be inaccurate to analyze the number of service providers at the county level. Therefore we have analyzed the number of service providers at the CMA level and consider a CMA to be rural if it has a population density less than or equal to 100 people per square mile.

[1211] *See Fifteenth Report*, 26 FCC Rcd at 9707 ¶ 47.

[1212] Because mobile providers generally screen the eligibility of potential customers by zip code, a more accurate estimation of the competitive choices available to individual consumers would be based on zip codes. Another depiction of the choices effectively available to a consumer would be based on an assessment of a service provider's retail presence in an area.

[1213] Because NRUF includes data on the number of telephone numbers that have been assigned to end-user devices by mobile wireless providers, this analysis does not include providers whose data-only devices are not assigned a mobile telephone number. *See also* Section V.A, Numbers of Mobile Wireless Connections and Customers, *supra.*

Table 63
Estimated Mobile Wireless Providers Offering Service Anywhere In Rural and Non-Rural CMAs, Excluding Territories, Jan. 2012 (Two Percent Market Share Threshold) [1214]

	Non-Rural CMAs		*Rural CMAs*	
Number of Providers Offering Service Anywhere in a CMA	***Number of CMAs***	***Percent of Total CMAs***	***Number of CMAs***	***Percent of Total CMAs***
Total for U.S. excluding territories	*324*	*100%*	*392*	*100%*
1 provider	0	0%	1	0.3%
2 providers	0	0%	51	13.0%
3 providers	29	9.0%	123	31.4%
4 providers	106	32.7%	104	26.5%
5 providers	189	58.3%	113	28.8%

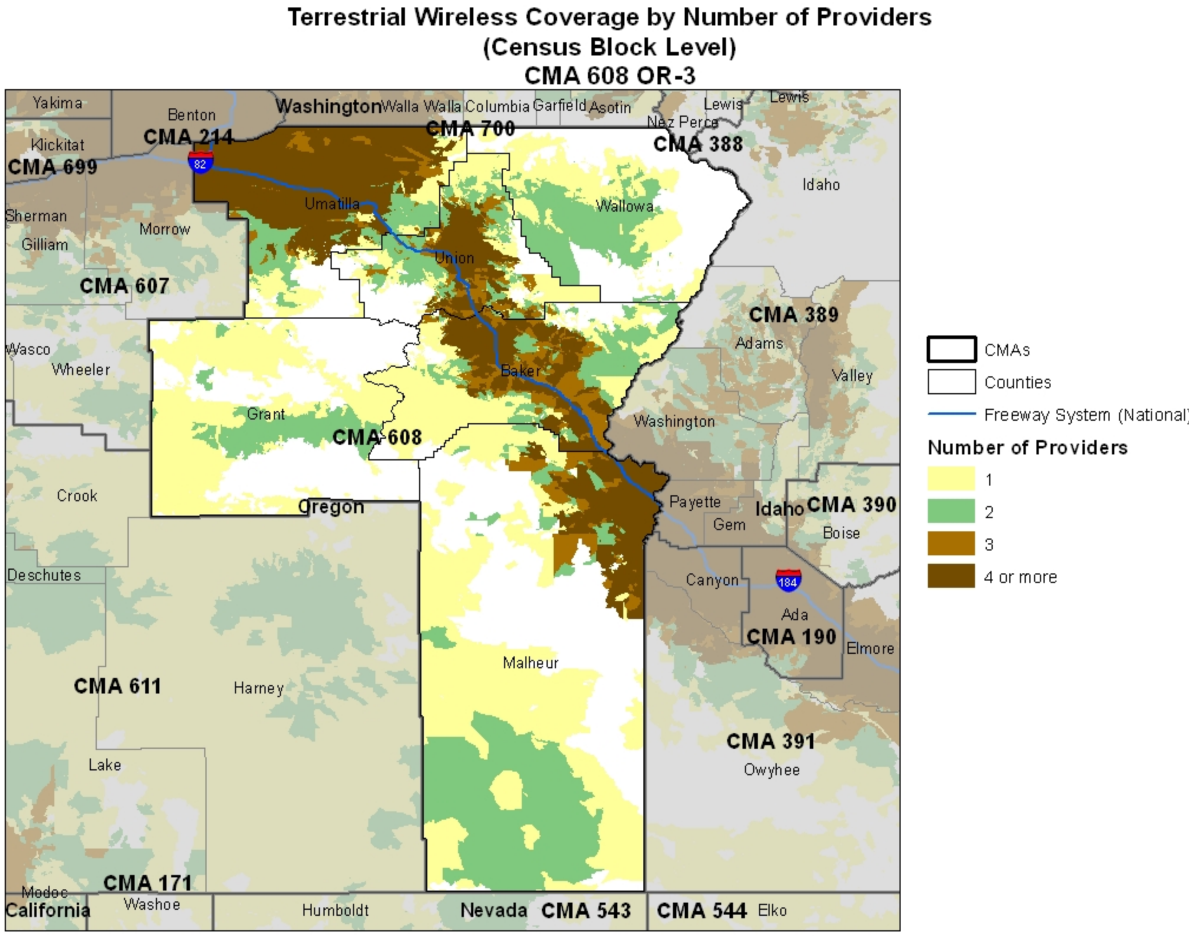
Table 64
Estimated Mobile Wireless Providers Offering Service Anywhere In Rural and Non-Rural CMAs, Excluding Territories, Jan. 2012 (Five Percent Market Share Threshold) [1215]

	Non-Rural CMAs		*Rural CMAs*	
Number of Providers Offering Service Anywhere in a CMA	***Number of CMAs***	***Percent of Total CMAs***	***Number of CMAs***	***Percent of Total CMAs***
Total for U.S. excluding territories	*324*	*100%*	*392*	*100%*
1 provider	0	0.0%	2	0.5%
2 providers	7	2.2%	113	28.8%
3 providers	73	22.5%	140	35.7%
4 providers	147	45.4%	99	25.3%
5 providers	97	30.0%	38	9.7%

[1214] Although Table 63 estimates the number of providers offering service in rural and non-rural CMAs, Map 6 below estimates mobile network deployment and may not indicate the extent to which providers actually offer service in the covered areas.

[1215] Although Table 64 estimates the number of providers offering service in rural and non-rural CMAs, Map 6 below estimates mobile network deployment and may not indicate the extent to which providers actually offer service in the covered areas.

Map 6
Service Provider Coverage in an Illustrative Rural CMA, Jan. 2012



Source: Federal Communications Commission, Census Bureau, and Mosaik Solutions (CoverageRight January 2012)

B. Spectrum in Rural Areas

400. As discussed above, key inputs for the provision of mobile wireless services include spectrum, infrastructure, and backhaul, and access to such inputs can affect entry into the mobile wireless services market in both urban and rural areas.[1216] Areas with low population density, such as rural areas, tend to have fewer facilities-based competitors than areas with higher population densities because the market may not be large enough for a potential entrant to recoup its network deployment costs over time from service revenues.[1217] In the 2011 State of the Union address, President Obama detailed an initiative to expand wireless coverage to 98 percent of Americans within five years. On Feb 10, 2011, the White House released a statement which proposed a one-time $5 billion investment supporting the 4G build out in rural areas.[1218]

401. Spectrum below 1 GHz can be crucial for the deployment of mobile wireless service in

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[1216] *See* Section III.E.2, Non-Regulatory Entry and Exit Conditions, *supra*.

[1217] *See Id.*

[1218] *See* "President Obama Details Plan to Win the Future through Expanded Wireless Access", *available at* http://www.whitehouse.gov/the-press-office/2011/02/10/president-obama-details-plan-win-future-through-expanded-wireless-access (visited Sept. 10, 2012).

rural areas because its propagation characteristics allow providers to cover a relatively large geographic area with a relatively small number of cell sites. Therefore, we have examined the current spectrum holdings of service providers in rural versus non-rural areas across the various frequency bands (700 MHz, Cellular, PCS, AWS, BRS, and EBS)). Table 65 below shows that the two largest service providers combined hold more than half of the rural MHz-POPs in both the 700 MHz and the Cellular bands. In the spectrum above 1 GHz (PCS, AWS, and 2.5 GHz), however, these two providers combined hold less than half of the MHz-POPs in both the PCS and AWS bands. And in the 2.5 GHz BRS/EBS bands, the majority of the MHz-POPs currently suitable and available to provide mobile broadband service are held by Sprint/Clearwire. In urban areas, the 700 MHz and Cellular holdings are even more concentrated among the top two providers. Combined, they hold more than 80 percent of the MHz-POPs of both of these bands.

Table 65
Percentage Spectrum Holdings in Rural Areas on a MHz-POPs Basis by Provider and Frequency Band, Aug. 15, 2012

Licensee	700 MHz	Cellular (850 MHz)	PCS (1.9 GHz)	AWS (1.7/2.1 GHz)	BRS (2.5 GHz)	EBS (2.5 GHz)
Verizon Wireless	36.3%	43.8%	13.8%	33.0%	0.0%	0.0%
AT&T	22.1%	34.6%	25.6%	9.4%	0.0%	0.0%
Sprint Nextel	0.0%	0.0%	26.7%	0.0%	0.0%	0.0%
Clearwire	0.0%	0.0%	0.0%	0.0%	70.4%	26.9%
T-Mobile	0.0%	0.1%	17.2%	26.1%	0.0%	0.0%
MetroPCS	0.1%	0.0%	0.6%	3.7%	0.0%	0.0%
US Cellular	7.7%	10.2%	2.8%	3.2%	0.0%	0.0%
Leap	0.1%	0.0%	2.4%	5.8%	0.0%	0.0%
Other	33.8%	11.4%	11.0%	18.8%	29.6%	73.1%
Grand Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

* Estimates include all transactions consummated as of August 15, 2012, as well as the transactions approved in the *Verizon Wireless-SpectrumCo Order*. Estimates do not include WCS spectrum that was added in the spectrum screen in December 2012.

Table 66
Percentage Spectrum Holdings in Non-Rural Areas on a MHz-POPs Basis by Provider and Frequency Band

Licensee	700 MHz	Cellular (850 MHz)	PCS (1.9 GHz)	AWS (1.7/2.1 GHz)	BRS (2.5 GHz)	EBS (2.5 GHz)
Verizon Wireless	43.2%	49.2%	16.2%	36.0%	0.0%	0.0%
AT&T	39.0%	45.7%	26.6%	5.5%	0.0%	0.0%
Sprint Nextel	0.0%	0.0%	27.2%	0.0%	0.0%	0.0%
Clearwire	0.0%	0.0%	0.0%	0.0%	88.7%	68.5%
T-Mobile	0.0%	0.1%	20.0%	36.4%	0.0%	0.0%
MetroPCS	0.5%	0.0%	3.1%	6.6%	0.0%	0.0%

US Cellular	1.8%	2.8%	1.9%	1.7%	0.0%	0.0%
Leap	0.7%	0.0%	2.3%	6.8%	0.0%	0.0%
Other	14.7%	2.3%	2.8%	7.0%	11.3%	31.5%
Grand Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

* Estimates include all transactions consummated as of August 15, 2012, as well as the transactions approved in the *Verizon Wireless-SpectrumCo Order*. Estimates do not include WCS spectrum that was added in the spectrum screen in December 2012.

402. *NTCA Survey of Rural Wireless Providers*. In the spring of 2011, the National Telecommunications Cooperative Association (NTCA) surveyed its members regarding their provision of wireless services.[1219] Population density in most NTCA member service areas is extremely rural, between one and five persons per square mile.[1220] According to the survey report, 61 percent of survey respondents are offering wireless service to their customers.[1221] Among those respondents, 75 percent indicated that "competition from national carriers" was a major concern, and the average respondent indicated that their company competes with between two to five other providers.[1222] Over two-thirds of survey respondents reported that they plan to deploy a next generation network technology within the next one to three years, with 43 percent stating that they plan to deploy LTE.[1223] In addition, the percentage of respondents who claim that obtaining financing is "very difficult" or "virtually impossible" was 55 percent in 2011, compared to 33 percent in 2009.[1224] The percentage of respondents who reported that obtaining financing is "very easy" or "relatively easy" declined from 43 percent in 2009 to 18 percent in 2011.[1225]

403. When looking at the features and services offered to wireless customers, the percentage of the NTCA survey respondents that offer Internet access rose from 73 percent to 74 percent from the winter of 2009 to the spring of 2011, the percentage that offer email rose from 63 percent to 68 percent, and the percentage offering unlimited local calling rose from 70 percent to 77 percent during the same period.[1226] On the other hand, the percentage offering family plans declined from 80 percent to 77 percent, while the percentage offering prepaid fell from 50 percent to 48 percent.[1227]

X. INTERNATIONAL COMPARISONS

404. This section compares mobile market structure and performance in the United States, Western Europe, and Asia-Pacific countries of comparable income levels.[1228] To ensure that a consistent

[1219] *See* NTCA, *NTCA 2011 Wireless Survey Report*, *2011 NTCA Wireless Survey* Aug. 2011, at 3, *available at* https://www.ntca.org/images/stories/Documents/Advocacy/SurveyReports/2011ntcawirelesssurveyreport.pdf (visited Oct. 16, 2012).

[1220] *2011 NTCA Wireless Survey*, at 5.

[1221] *2011 NTCA Wireless Survey*, at 8.

[1222] *2011 NTCA Wireless Survey*, at 13-14.

[1223] *2011 NTCA Wireless Survey*, at 11-12.

[1224] *2011 NTCA Wireless Survey*, at 10.

[1225] *2011 NTCA Wireless Survey*, at 10.

[1226] *2011 NTCA Wireless Survey*, at 14; NTCA, *NTCA 2009 Wireless Survey Report*, Apr. 2010, at 14.

[1227] *Id*.

[1228] In accordance with established practice in using international benchmarking to assess effective competition in mobile markets, the comparison of mobile market performance is restricted to Western Europe and parts of the Asia-Pacific in order to ensure that the countries being compared are roughly similar to the United States with regard to (continued….)

methodology is used to compile the data for different countries, the comparison is based on international cross-section data compiled by Bank of America Merrill Lynch.[1229] Consequently, the estimates of mobile penetration, minutes of use (MOUs), average revenue per minute (RPM), and concentration (as measured by HHI) for the U.S. mobile market cited in this section differ somewhat from estimates provided in previous sections of the *Report* because they come from different sources. In general, the comparison shows the following: (1) market structure is converging to three or four national competitors per market in most countries; (2) the calling party pays system used in most other countries tends to result in lower average voice usage (MOUs) and higher revenue per minute of voice service than the receiving party pays system used in the United States;[1230] and (3) international differences in regulatory policy and business environment have produced a wide variety of successful models for the mobile sector, with no one model dominating on all dimensions of market performance.

Table 67
Mobile Market Performance in Selected Countries, 2011[1231]

Country	Penetration (% of Pops)	Prepaid (% of Subs)	MOUs	RPM ($) Voice Only	ARPU ($)	Data (% of ARPU)
Receiving Party Pays						
USA	106	29	945	0.033	50.88	39.9
Canada	77	19	372	0.091	56.32	34.7
Singapore	148	48	352	0.064	36.85	39.1
Calling Party Pays						
UK	123	50	192	0.083	27.07	37.0
Germany	139	56	130	0.092	19.81	40.4
Italy	152	86	162	0.093	23.30	31.9
Sweden	146	31	242	0.085	32.05	31.8
France	99	30	235	0.101	35.23	28.0
Finland	171	13	205	0.093	26.65	30.1
Japan	99	1	134	0.205	59.70	56.5
South Korea	107	0	303	0.069	30.81	32.3
Australia	132	39	268	0.106	47.97	44.4

A. Average RPM (Voice Only)

405. As noted above, some analysts regard voice RPM as a good proxy for mobile pricing.[1232]

(Continued from previous page)
their level of economic and telecommunications infrastructure development. *See, for example*, UK regulator Oftel's review of effective competition in the mobile market: *Effective Competition Review: Mobile*, Office of Telecommunications, Feb. 2001, at 7.

[1229] *See* Glen Campbell *et al.*, *Global Wireless Matrix 4Q10,* Bank of America Merrill Lynch, Global Equity Research, Apr. 28, 2011 (*Global Wireless Matrix 4Q10*); Glen Campbell *et al.*, *Global Wireless Matrix 4Q11*, Bank of America Merrill Lynch, Global Equity Research, Apr. 19, 2012 (*Global Wireless Matrix 4Q11*). The Merrill Lynch HHI calculations are used in this Report only for the purposes of the international comparison. The HHI calculation for the United States in Section III.D.2, *supra*, differs from the Merrill Lynch estimate discussed in Section X.D, Concentration, *infra*.

[1230] *See Thirteenth Report,* 24 FCC Rcd at 6290 ¶ 223.

[1231] *Global Wireless Matrix 4Q11.*

[1232] *See* Section V.E.1, Price Metrics, *supra*. Average RPM is calculated by dividing monthly voice-only ARPU by MOUs. Service revenues included in ARPU reflect the fees mobile operators collect from other network operators for terminating incoming calls on their networks as well as monthly service charges and usage fees paid by mobile subscribers. Merrill Lynch has noted that these data have certain limitations for comparing countries that use calling party pays (CPP) versus mobile party pays (also known as receiving party pays). The figures for MOUs may be (continued….)

RPM in Western Europe averaged about $0.11 in the fourth quarter of 2011, and ranged from a low of $0.08 (in Austria) to a high of $0.296 (Switzerland).[1233] This compares with an estimated U.S. RPM of $0.033, or less than one third of the European average.[1234] RPM in Japan, at $0.205, was more than five times the U.S. figure at the end of 2011.[1235]

B. Usage

406. Bank of America Merrill Lynch estimates that U.S. mobile subscribers talked an average of 945 minutes per month on their mobile phones in the fourth quarter of 2011.[1236] This compares with 134 MOUs in Japan and an average across Western Europe of 170 MOUs, with estimated MOUs in individual European countries ranging from a low of 122 (Switzerland) to a high of 247 (Norway).[1237]

C. Penetration Rates

407. According to Bank of America Merrill Lynch, mobile penetration in the United States rose to 106 percent in the fourth quarter of 2011.[1238] In comparison, Japan finished 2011 with mobile penetration at 99 percent, while mobile penetration averaged an estimated 130 percent in Western Europe at the end of 2011 and ranged from 99 percent in France to 171 percent in Finland.[1239] Estimated mobile penetration continued to exceed 100 percent in most of Western Europe at the end of 2011, due in part to a high percentage of prepaid subscribers and ownership of multiple devices or subscriber identity module (SIM) cards.[1240]

(Continued from previous page)
somewhat understated, and the revenue figures used to calculate ARPM may be somewhat overstated, in markets where CPP is used relative to non-CPP markets. MOUs figures may be somewhat understated in CPP markets due to the double-counting of same-network (“on-net”) mobile-to-mobile minutes in non-CPP markets such as the U.S., i.e. each minute of an on-net call is billed to both the caller and the receiver under the mobile party pays system, whereas under CPP each on-net minute is billed only to the calling party, and therefore counted only once. *See Tenth Report*, 20 FCC Rcd at 15976, n.457. In addition, the revenue figures used to calculate ARPU may be somewhat overstated in CPP markets relative to non-CPP markets (due to double-counting of mobile termination revenues for off-net mobile-to-mobile calls in CPP markets). Consequently, the RPM figures (ARPU divided by MOUs) probably overstate the difference between RPM in the United States and CPP markets. The potential for service revenues to be somewhat overstated in CPP markets was brought to the Commission’s attention by Professor Stephen Littlechild, and confirmed by Merrill Lynch through e-mail correspondence.

[1233] *Global Wireless Matrix 4Q11*, at 2.

[1234] *Global Wireless Matrix 4Q11*, at 2. In e-mail correspondence, Merrill Lynch has indicated that RPM figures may overstate the difference between RPM in CPP and non-CPP markets by about 15 percent due to the two factors mentioned above.

[1235] *Global Wireless Matrix 4Q11*, at 2.

[1236] *Global Wireless Matrix 4Q11*, at 2. This is higher than the 696 average monthly MOUs estimated by CTIA for the second half of 2009. *See* Section V.D.1, Mobile Voice, *supra*. For purposes of comparing metrics in different countries, average MOUs include both incoming and outgoing minutes, and usually exclude traffic related to mobile data services.

[1237] *Global Wireless Matrix 4Q11*, at 2.

[1238] *Global Wireless Matrix 4Q11*, at 2.

[1239] *Global Wireless Matrix 4Q11*, at 2.

[1240] *Global Wireless Matrix 4Q11*, at 2. Reported mobile subscriber figures and penetration may be overstated in some countries, particularly those with a high percentage of prepaid subscribers, due in part to a combination of factors: (1) slow clearing out of inactive users (for example, subscribers who have switched service providers) from their former provider’s subscriber base; (2) multiple device ownership (for example, users of a Blackberry plus a mobile phone); and (3) multiple SIM card ownership (for example, users who switch between operators in order to take advantage of different tariffs at different times of the day or week). *See* Jeff Kvaal *et al.*, *Wireless Equipment Industry Update: Strong Net Adds Drive Higher Phone Units*, Lehman Brothers, Equity Research, Jan. 16, 2007, at (continued….)

D. Concentration

408. The Bank of America Merrill Lynch's *Global Wireless Matrix* provides a cross-country comparison of industry concentration using HHIs calculated at national level.[1241] This methodology can produce estimates of concentration that differ from estimates obtained when the geographic market is assumed to be local and the number of local competing providers is not uniform throughout the country. The U.S. mobile wireless services market, for instance, is characterized by significant regional variation in the choice of competing providers. The United States uses exclusively regional spectrum licensing schemes, so that service providers must aggregate multiple regional licenses to build a nationwide footprint. In contrast, the nationwide licensing scheme used in most Western European mobile service markets precludes the entry of strictly regional or multi-regional service providers. The methodology used by Bank of America Merrill Lynch to calculate the U.S. national market HHI is different from the one implemented earlier in this *Report*.[1242]

409. As shown in Table 68 below, Bank of America Merrill Lynch suggests that the United Kingdom had the least concentrated mobile market at the end of 2011, with an estimated HHI of 2210.[1243] However, this estimate does not reflect that a merger between Orange UK and T-Mobile UK (the third and fourth largest UK providers) was approved by the European Commission in March 2010, and completed on April 1, 2010.[1244] Orange UK and T-Mobile UK became brands operated by a single parent company.[1245] Nevertheless, the Bank of America Merrill Lynch estimate of the HHI for the UK continues to treat Orange UK and T-Mobile UK as two separate providers, with the subscribers of the merged entity divided equally between them.[1246] The HHI for the UK increases to 2850 if it is re-estimated treating Orange UK and T-Mobile UK as a single provider, in which case the United States had the least concentrated mobile market at the end of 2011, with an estimated HHI of 2440. As discussed above, we estimated an average HHI for the United States of 2873 at the end of 2011, based on EA subscriber market shares.[1247]

(Continued from previous page)
4. As noted in previous reports, carriers have widely different policies to determine when to cut off inactive subscribers and to remove them from their reported subscriber base. In addition, it is becoming more prevalent for people to subscribe to multiple mobile service providers. *See, e.g.*, *Eleventh Report*, 21 FCC Rcd at 11021, ¶ 190 n.506; *Tenth Report*, 20 FCC Rcd at 15976, n.452; *Seventh Report*, 17 FCC Rcd at 13033, and *Sixth Report*, 16 FCC Rcd at 13391.

[1241] *See Global Wireless Matrix 4Q11*, at 2-3.

[1242] *See* Section III.D, Horizontal Concentration, *supra.* For the U.S., the Bank of America Merrill Lynch study calculates the HHI at the national level by summing the squares of the subscriber market shares of the four nationwide operators and the residual subscriber market share of all remaining regional and local operators combined. This methodology essentially treats all regional and local operators as if they comprised a single fifth competing nationwide operator. Since a certain percentage of the U.S. population lives in areas with more than five competing operators and a certain percentage lives in areas with less than five, the Merrill Lynch estimate of HHI at the national level overstates concentration in some local geographic markets, while understating concentration in others.

[1243] *See Global Wireless Matrix 4Q11*, at 2.

[1244] *See Merger of T-Mobile UK and Orange UK Cleared by EU Commission*, Orange, http://newsroom.orange.co.uk/2010/03/01/merger-of-t-mobile-uk-and-orange-uk-cleared-by-eu-commission/ (visited Oct. 14, 2011). *See* Deutsche Telekom, SEC Form 6-K, For the month of May 2010, at 32.

[1245] *See* Everything Everywhere, http://everythingeverywhere.com/vision/ (visited Oct. 14, 2011), stating that Everything Everywhere is the parent company of both Orange and T-Mobile in the UK. *See* also *Global Wireless Matrix 4Q10*, at 9. Orange reports that the T-Mobile and Orange UK brands will continue to operate in the UK for at least 18 months after the completion of the transaction. *See* footnote 1244.

[1246] *See Global Wireless Matrix 4Q11*, Table 1 at 2 and Table 174 at 230.

[1247] *See* Section III.D, Horizontal Concentration, *supra.*

Table 68
Mobile Market Structure in Selected Countries (Merrill Lynch Calculation), Year-end 2011[1248]

Country	Nationwide HHI	Number of Competitors[1249]
UK	2210	4
USA	2440	5
Germany	2700	4
Canada	2840	5
Italy	2880	4
France	3230	4
Sweden	3260	3
Finland	3450	3
Japan	3480	4
Australia	3550	3

XI. CONCLUSION

410. Promoting competition is a fundamental goal of the Commission's policymaking. Competition has played and must continue to play an essential role in the mobile wireless industry – leading to lower prices and higher quality for American consumers, and producing innovation and investment in wireless networks, devices, and services. This *Report* analyzes competition in the mobile wireless industry pursuant to section 332(c)(1)(C) of the Communications Act and highlights several key trends in the industry. As with past reports, this *Report* examines various facets of the mobile wireless industry including market concentration, the conduct and rivalry of service providers, industry performance and outcomes, and consumer responses to mobile wireless service offerings. It also analyzes competition in other segments of the mobile wireless ecosystem, including spectrum, backhaul facilities, and handsets/devices and mobile applications.

[1248] *Global Wireless Matrix 4Q11*. As noted above, HHI is calculated based on national market share. The weighted average HHI in the U.S. was 2811 at the end of 2009 as described in Section III.C, Horizontal Concentration, *supra*.

[1249] While there are four nationwide mobile providers in the United States, the HHI for the United States, as described above, is calculated by summing the squares of the subscriber market shares of the four nationwide operators and the residual subscriber market share of all remaining regional and local operators combined, treating all regional and local operators as if they comprised a single fifth competing operator. For countries other than the United States, the HHI generally is calculated by summing the squares of all of the mobile operators, regardless of whether the operator's network covers a nationwide footprint. If this same methodology were used for the United States, our expectation is that the U.S. HHI would be lower, given the large number of regional and local mobile operators in the United States with sub-national footprints.

XII. PROCEDURAL MATTERS

411. This S*ixteenth Report* is issued pursuant to authority contained in Section 332(c)(1)(C) of the Communications Act of 1934, as amended, 47 U.S.C. § 332(c)(1)(C).

412. It is ORDERED that copies of this *Report* be sent to the appropriate committees and subcommittees of the United States House of Representatives and the United States Senate.

413. It is FURTHER ORDERED that the proceeding in the WT Docket No. 11-186 IS TERMINATED.

FEDERAL COMMUNICATIONS COMMISSION

Marlene H. Dortch
Secretary

APPENDIX A

Spectrum Bands Available for Mobile Wireless Service

1. Currently, mobile wireless service providers primarily use spectrum licenses to provide mobile voice and data services. These licenses are assigned using a competitive bidding process and configured for a range of predefined spectrum blocks (*e.g*., 10 megahertz, 20 megahertz or some other amount) over a defined geographic area (*e.g*., a Major Economic Area as outlined in section 27.6 of the Rules). Initially, the Commission authorized two licenses in the 800 MHz Cellular Band in every geographical area of the country.[1] However, over time, additional services have been created that allow similar operations in different bands – including broadband PCS, SMR, 700 MHz, AWS-1, BRS/EBS, WCS, and 1670-1675 MHz – that are licensed under the Commission's flexible Part 90, Part 27 or Part 24 rules and can be used to provide mobile wireless services.[2] Under Commission rules, licensees may lease spectrum resources to a third party for a period of time; or may disaggregate (divide the spectrum into smaller amounts of bandwidth) and/or partition (divide the license into smaller geographical areas) their licenses to other entities.[3] Many licensees hold more than one license in a particular market.[4] We discuss in more detail below spectrum bands potentially available for terrestrial CMRS. Band plan diagrams for each spectrum band depict where the frequencies are located. Spectrum described in this section may be used for a variety of mobile wireless services, including voice, broadband data, and video services. In addition to the terrestrial spectrum described in this section, 157.7 megahertz of mobile satellite spectrum is available for mobile voice and data services.

A. Cellular

2. The Commission began licensing commercial cellular providers in 1982 and completed licensing the majority of operators by 1991. The Commission divided the United States and its possessions into 734 cellular market areas (CMAs), including 305 Metropolitan Statistical Areas (MSAs), 428 Rural Service Areas (RSAs), and a market for the Gulf of Mexico.[5] Two cellular systems were

[1] The Commission divided the 40 megahertz of spectrum into two, 20 megahertz channel blocks , awarding one to a local incumbent wireline carrier and another to a different entity to promote competition. *See* Inquiry Into the Use of the Bands 825-845 MHz and 870-890 MHz for Cellular Communications Systems; and Amendment of Parts 2 and 22 of the Commission's Rules Relative to Cellular Communications Systems, CC Docket No. 79-318, *Report and Order*, 86 FCC 2d 469, 488-92 ¶¶ 38-43 (1981).

[2] The discussion in this *Appendix* is to be distinguished from the identification of the relevant spectrum input markets in the context of Commission review of individual wireless license transfers and assignments. For example, in wireless transactions, the Commission includes, in its evaluation of potential competitive harm, spectrum in particular bands that is "suitable" for the provision of services in a relevant product market. *See AT&T-Dobson Order* 22 FCC Rcd 20295, 20307-08 ¶ 17; *Sprint Nextel-Clearwire Order* 23 FCC Rcd 17570, 17599 ¶ 72; *Verizon Wireless-Alltel Order*, 23 FCC Rcd at 17460 ¶ 26; *Mobile Spectrum Holdings NPRM* FCC 12-119, at ¶ 8.

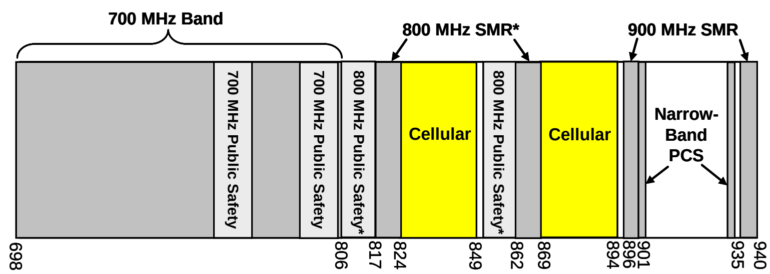
[3] *See* 47 C.F.R. §§ 1.948(e), (f), 22.948, 24.104, 27.15, 24.714, 27.904, 90.813, 90.911.

[4] While no longer in operation, at one time the Commission's CMRS spectrum cap restricted the distribution of certain spectrum licenses. In 2012, the Commission released a notice of proposed rulemaking to review its policies governing mobile spectrum holdings. *See Mobile Spectrum Holdings NPRM*, FCC 12-119, at ¶ 8.

[5] Under the original cellular licensing rules, one of the two cellular channel blocks in each market (the B block) was awarded to a local wireline carrier, while the other block (the A block) was awarded competitively to a carrier other than a local wireline incumbent. After awarding the first 30 MSA licenses pursuant to comparative hearing rules, the Commission adopted rules in 1984 and 1986 to award the remaining cellular MSA and RSA licenses through lotteries. By 1991, lotteries had been held for every MSA and RSA, and licenses were awarded to the lottery winners in most instances. In some RSA markets, however, the initial lottery winner was disqualified from (continued….)

licensed in each market area. The Commission designated 50 megahertz of spectrum in the 800 MHz frequency band for the two competing cellular systems in each market (25 megahertz for each system). Initially, cellular systems offered service using analog technology, but today cellular systems use digital modulation technologies for increased capacity and service options. On February 15, 2012, the Commission proposed to revise the licensing model for the cellular service from a site-based model to a geographic-based model to provide a more flexible licensing scheme.[6]

698-940 MHz: Cellular Spectrum



B. Broadband PCS

3. The Broadband PCS was established in the mid-1990s to expand spectrum options and the competitive marketplace for mobile services beyond the Cellular service. Broadband PCS systems operate in different spectrum bands and have been designed from the beginning to use a digital format. Broadband PCS licenses have been assigned through auction, beginning in 1995.[7] The Commission has set aside spectrum between 1850 MHz and 1990 MHz for Broadband PCS. While this spectrum (120 megahertz total) originally accommodated voice and limited messaging services, many licensees have evolved their networks to now provide mobile broadband services, which include applications such as Internet access and media applications.

4. This spectrum was originally divided into three blocks of 30 megahertz each (blocks A,

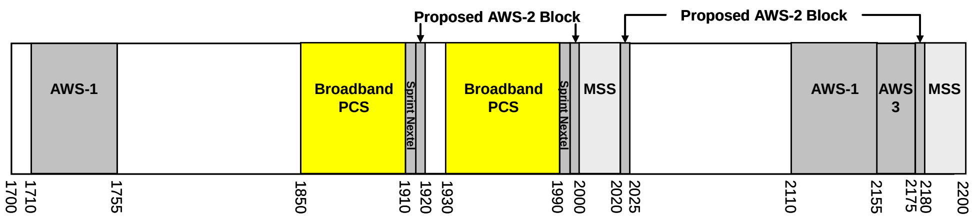
(Continued from previous page)
receiving the license because of a successful petition to deny or other Commission action. Implementation of Competitive Bidding Rules to License Certain Rural Service Areas, *Report and Order*, 17 FCC Rcd 1960, 1961-62 (2002). In 1997, the Commission auctioned cellular spectrum in areas unbuilt by the original cellular licensees. *See* FCC, *Auction 12: Cellular Unserved*, http://wireless.fcc.gov/auctions/12 (visited Mar. 16, 2010). In 2002, the Commission auctioned three RSA licenses where the initial lottery winner had been disqualified. *See* FCC, *Auction 45: Cellular RSA*, http://wireless.fcc.gov/auctions/45 (visited Mar. 16, 2010). In 2008, the Commission held a closed auction for unserved cellular spectrum that was the subject of two groups of pending mutually exclusive long-form applications. *See* FCC, *Auction 77: Closed Cellular Unserved*, http://wireless.fcc.gov/auctions/477 (visited Mar. 16, 2010).

[6] Amendment of Parts 1 and 22 of the Commission's Rules with Regard to the Cellular Service, Including Changes in Licensing of Unserved Areas, WT Docket No. 12-40, RM No. 11510, Amendment of the Commission's Rules with Regard to Relocation of Part 24 to Part 27, Interim Restrictions and Procedures for Cellular Service Applications, *Notice of Proposed Rulemaking*, 27 FCC Rcd 1745 (2012). The proposal is to issue a geographic "overlay" license for each cellular market and corresponding channel block in two stages using a "Substantially Licensed" test for the first stage. The Commission also proposes to streamline the cellular rules.

[7] The first auction was for two license blocks of 30 megahertz each in 51 Major Trading Areas (MTAs). FCC Grants 99 Licenses for Broadband Personal Communications Services in Major Trading Areas, *News Release*, FCC, June 23, 1995. However, in New York, Washington/Baltimore, and Los Angeles/San Diego, only one license block was auctioned, because one license in each market was awarded as part of a pioneer preference program in 1994. Three Pioneer Preference PCS Applications Granted, *News Release*, FCC, Dec. 14, 1994. The Commission has since had numerous additional broadband PCS auctions. *See* FCC, *Auctions Home*, http://wireless.fcc.gov/auctions/ (visited September 24, 2012).

B, and C) and three blocks of 10 megahertz each (blocks D, E, and F).[8] Two of the 30 megahertz blocks (A and B blocks) are assigned on the basis of 51 Major Trading Areas (MTAs).[9] One of the 30 megahertz blocks (C block)[10] and all three of the 10 megahertz blocks are assigned on the basis of 493 Basic Trading Areas (BTAs).[11]

1700-2200 MHz: Broadband PCS Spectrum



C. SMR

5. The Commission first established SMR in 1979 to provide for land mobile communications on a commercial basis. The Commission initially licensed spectrum in the 800 and 900 MHz bands for this service, in non-contiguous bands, on a site-by-site basis.[12] The Commission has since licensed additional SMR spectrum through auctions.[13] In total, the Commission has licensed 19 megahertz of SMR spectrum, plus an additional 7.5 megahertz of spectrum that is available for SMR as well as other services.[14] While Commission policy permits flexible use of this spectrum, including the

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[8] Initially, the Commission's broadband PCS allocation included 20 megahertz of spectrum at 1910 MHz - 1930 MHz for unlicensed broadband PCS. Ten megahertz has since been allocated on a nationwide basis to Sprint Nextel. *See* Improving Public Safety Communications in the 800 MHz Band, *Report and Order, Fifth Report and Order, Fourth Memorandum Opinion and Order*, 19 FCC Rcd 14969, 15083 (2004).

[9] Major Trading Areas are Material Copyright (c) 1992 Rand McNally & Company. Rights granted pursuant to a license from Rand McNally & Company through an arrangement with the FCC. Rand McNally's MTA specification contains 47 geographic areas covering the 50 states and the District of Columbia. For its spectrum auctions, the Commission has added three MTA-like areas: Guam and the Northern Mariana Islands, Puerto Rico and the U.S. Virgin Islands, and American Samoa. In addition, Alaska was separated from the Seattle MTA into its own MTA-like area. MTAs are combinations of two or more Basic Trading Areas.

[10] The Commission also has reconfigured returned C block licenses. *See Tenth Report*, 20 FCC Rcd at 15935 ¶ 71 n.150.

[11] Basic Trading Areas (BTAs) are Material Copyright (c) 1992 Rand McNally & Company. Rights granted pursuant to a license from Rand McNally & Company through an agreement with the FCC. BTAs are geographic areas drawn based on the counties in which residents of a given BTA make the bulk of their shopping goods purchases. Rand McNally's BTA specification contains 487 geographic areas covering the 50 states and the District of Columbia. For its spectrum auctions, the Commission added additional BTA-like areas for: American Samoa; Guam; Northern Mariana Islands; San Juan, Puerto Rico; Mayagüez/Aguadilla-Ponce, Puerto Rico; and the U.S. Virgin Islands.

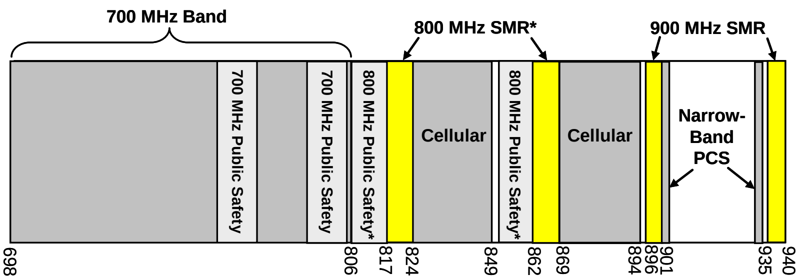
[12] The "900 MHz" SMR band refers to spectrum allocated in the 896-901 and 935-940 MHz bands; the "800 MHz" band refers to spectrum allocated in the 806-824 and 851-869 MHz bands. *See* 47 C.F.R. § 90.603; *see also* 47 C.F.R. § 90.7 (defining "specialized mobile radio system").

[13] The Commission has held multiple auctions for SMR licenses. *See* FCC, *Auctions Home*, http://wireless.fcc.gov/auctions/ (visited September 24, 2012).

[14] There are five megahertz in the 900 MHz band (200 paired channels x 12.5 kHz/channel). *See* 47 C.F.R. § 90.617, Table 4B. There are 21.5 megahertz in the 800 MHz band: 14 megahertz in the 800 SMR Service (280 paired channels x 25 kHz/channel) and 7.5 megahertz in the 800 MHz General Category (150 paired channels x 25 kHz/channel). *See* 47 C.F.R. § 90.615, Table 1 (SMR General Category) and 47 C.F.R. § 90.617, Table 4A (SMR Service). In 2000, the Commission amended its rules to allow Business and Industrial/Land Transportation (continued….)

provision of paging, dispatch, mobile voice, mobile data, facsimile, or combinations of these services,[15] the primary use for SMR traditionally was dispatch services.[16] With the development of digital technologies that increased spectral efficiency, SMR providers such as Sprint Nextel (on its iDEN network[17]) and SouthernLINC Wireless, a unit of the energy firm Southern Company, became more significant competitors in mobile telephony, while also maintaining dispatch functionality as a part of their service offerings. Furthermore, in apparent response to the dispatch functionality of SMR services, many cellular and broadband PCS providers now offer push-to-talk (PTT) functionality on their networks, including Verizon Wireless and AT&T. SMR spectrum is also used for certain data-only networks.

698-940 MHz: SMR Spectrum



* Post-800 MHz Band Reconfiguration

6. *800 MHz Band Reconfiguration and 1.9 GHz Spectrum Exchange*. On July 8, 2004, the Commission adopted a new band plan for the 800 MHz band to resolve the problem of interference to public safety radio systems operating in the band from CMRS providers operating systems on channels in close proximity to those utilized by public safety entities.[18] The new band plan addresses the root cause of the interference problem by separating generally incompatible technologies, with the costs of

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licensees in the 800 MHz band to use their spectrum for CMRS operations under certain conditions. Implementation of Sections 309(j) and 337 of the Communications Act of 1934 as Amended Promotion of Spectrum Efficient Technologies on Certain Part 90 Frequencies; Establishment of Public Service Radio Pool in the Private Mobile Frequencies Below 800 MHz; Petition for Rule Making of The American Mobile Telecommunications Association, *Report and Order and Further Notice of Proposed Rule Making*, 15 FCC Rcd 22709, 22760-61 (2000). This could make up to five megahertz of additional spectrum available for digital SMR providers: 2.5 megahertz in the Industrial/Land Transportation Category (50 paired channels x 25 kHz/channel) and 2.5 megahertz in the Business Category (50 paired channels x 25 kHz/channel). *See* 47 C.F.R. § 90.617, Tables 2A and 3A. As discussed in Section I.C.1, *800 MHz Band Reconfiguration and 1.9 GHz Spectrum Exchange*, *infra*, the configuration of the 800 MHz band is changing as a result of a new band plan adopted by the Commission.

[15] Principles for Reallocation of Spectrum to Encourage the Development of Telecommunications Technologies for the New Millennium, *Policy Statement*, 14 FCC Rcd 19868 (1999); *see also* Applications of Various Subsidiaries and Affiliates of Geotek Communications, Inc., Debtor-In-Possession, Assignors, and Wilmington Trust Company or Hughes Electric Corporation, Assignees, For Consent to Assignment of 900 MHz Specialized Mobile Radio Licenses, *Memorandum Opinion and Order*, 15 FCC Rcd 790, 802 (2000).

[16] Dispatch services allow two-way, real-time, voice communications between fixed units and mobile units (*e.g.*, between a taxicab dispatch office and a taxi) or between two or more mobile units (*e.g.*, between a car and a truck). *See Fifth Report*, 15 FCC Rcd at 17727-28, for a detailed discussion. Dispatch and SMR are often used interchangeably, although SMR refers to specific spectrum ranges.

[17] Sprint, the largest SMR licensee, has announced that it is in the process of repurposing its 800 MHz SMR spectrum for CDMA-based technology and that it will shut down its iDEN network as early as June 30, 2013. *See Sprint to Cease Service on its iDEN Network as Early as June 30, 2013*, News Release, Sprint Newsroom, May 29, 2012, *available at* http://newsroom.sprint.com/article_display.cfm?article_id=2296&ECID=vanity:nextelnetwork (visited September 17, 2012).

[18] FCC Adopts Solution to Interference Problem Faced by 800 MHz Public Safety Radio Systems, *News Release*, FCC, July 8, 2004.

relocating 800 MHz incumbents to be paid by Sprint Nextel. To accomplish the reconfiguration, the Commission required Sprint Nextel to give up rights to certain of its licenses in the 800 MHz band and all of its licenses in the 700 MHz band. In exchange, the Commission modified Sprint Nextel's licenses to provide the right to operate on two five-megahertz blocks in the 1.9 GHz band – specifically 1910-1915 MHz and 1990-1995 MHz – conditioned on Sprint Nextel fulfilling certain obligations specified in the Commission's decision. As a new entrant in the 1.9 GHz band, Sprint Nextel is also obligated to fund the transition of incumbent users to comparable facilities. The Commission determined that the overall value of the 1.9 GHz spectrum is $4.8 billion, less the cost of relocating incumbent users. In addition, the Commission decided to credit to Sprint Nextel the value of the spectrum rights that Sprint Nextel is relinquishing and the actual costs Sprint Nextel incurs to relocate all incumbents in the 800 MHz and 1.9 GHz bands. To the extent that the total of these combined credits is less than the assessed value of the 1.9 GHz spectrum rights, Sprint Nextel will make an anti-windfall payment equal to the difference to the United States Department of the Treasury at the conclusion of the relocation process.

7. In May 2012, the Commission amended a legacy regulatory requirement in its rules and provided certain spectrum licensees with increased flexibility to deploy advanced wireless services in portions of the 800 MHz band.[19] The revised rules allow geographically-based SMR licensees to operate across contiguous channels without a rigid channel spacing requirement or bandwidth limitation.

8. Significant progress has been made reconfiguring licensees to the new 800 MHz band plan in non-border regions of the country. As of June 2012, 99.3 percent of Stage 1 non-border licensees and 80.6 percent of non-border public safety licensees have relocated to their new spectrum.[20] On June 8, 2012, the Commission announced that the United States and Mexico signed a new Protocol for sharing spectrum in the 800 MHz band plan along the U.S.-Mexico border.[21] In August 2012, the Public Safety and Homeland Security Bureau released a Notice of Proposed Rulemaking seeking comment on proposals for establishing and implementing the reconfigured 800 MHz channel plan along the U.S.-Mexico border.[22]

D. 700 MHz Band

9. The 698-806 MHz band (the "700 MHz band") was reclaimed from use by broadcast services in connection with the transition of the analog television service to digital television (DTV).[23] The Digital Television Transition and Public Safety Act of 2005 (DTV Act)[24] set a deadline of February 17, 2009 for the 700 MHz band spectrum to be cleared of analog transmissions and made available for public safety and commercial services as part of the DTV transition. This deadline subsequently was extended to June 12, 2009.[25] This spectrum was made available for wireless services, including public

[19] Improving Spectrum Efficiency Through Flexible Channel Spacing and Bandwidth Utilization for Economic Area-based 800 MHz Specialized Mobile Radio Licensees, WT Docket No. 12-64, Request for Declaratory Ruling that the Commission's Rules Authorize Greater than 25 kHz Bandwidth Operations in the 817-824/862-869 MHz Band, WT Docket No. 11-110, *Report and Order*, 27 FCC Rcd 6489 (2012).

[20] *See* 800 MHz Transition Administrator, LLC Quarterly Progress Report For The Quarter Ended June 30, 2012, filed September 25, 2012, in WT Docket 02-55 at 5.

[21] *See* "FCC Announces Two Spectrum-Sharing Agreements With Mexico Enabling Advanced Public Safety And Commercial Communications In The Mexico Border Area," June 8, 2012.

[22] *See* Improving Public Safety Communications in the 800 MHz Band; New 800 MHz Band Plan for U.S.-Mexico Sharing Zone, WT Docket No. 02-55, *Fourth Further Notice of Proposed Rulemaking*, 27 FCC Rcd 9563 (2012).

[23] *See 700 MHz Second R&O*, 22 FCC Rcd at 15291 ¶ 1.

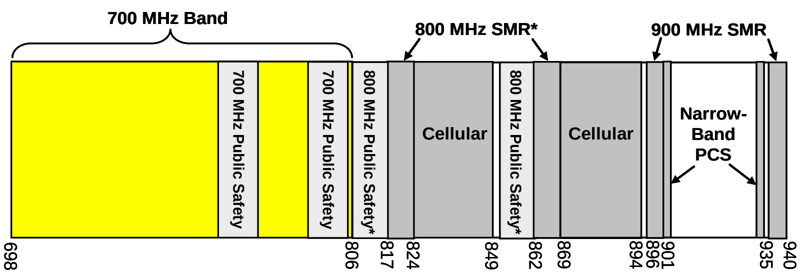
[24] Deficit Reduction Act of 2005, Pub. L. No. 109-171, 120 Stat. 4 (2006) (DRA). Title III of the DRA is the DTV Act.

[25] DTV Delay Act, S. 328, 111th Cong. (2009), amending 47 U.S.C. §§ 309, 337(3)(1) (DTV Delay Act).

safety and commercial services.[26]

10. The DTV Act also established two specific statutory deadlines for the auction of licenses for recovered spectrum in the 700 MHz band: (1) the auction was required to begin no later than January 28, 2008; and (2) the auction proceeds were required to be deposited in the Digital Television Transition and Public Safety Fund by June 30, 2008.[27] The Commission met both of these statutory deadlines.

698-940 MHz: 700 MHz Band Spectrum



11. Prior to holding the auction, the Commission revisited the rules governing the 700 MHz band in light of the DTV Act, recent developments in the market for commercial wireless communications, and the evolving needs of the public safety community for advanced broadband communications.[28] Specifically, in the *700 MHz Second Report and Order*, the Commission adopted a new band plan and revised certain of the service rules relating to both the commercial and public safety spectrum in the 700 MHz band.[29] The new band plan provided a balanced mix of geographic service area licenses and spectrum blocks sizes for the commercial spectrum to be auctioned.[30] Among other service rules, the Commission provided that licensees for one of the commercial blocks of spectrum in the 700 MHz band, the Upper 700 MHz C Block would be subject to an "Open Platform" condition.[31] Accordingly, licensees must "allow customers, device manufacturers, third-party application developers, and others to use or develop the devices and applications of their choosing in C Block networks, so long as they meet all applicable regulatory requirements and comply with reasonable conditions related to management of the wireless network (*i.e.*, do not cause harm to the network)."[32] In addition, C Block

[26] *See 700 MHz Second R&O*, 22 FCC Rcd at 15291 ¶ 1 & 15295-96 ¶ 14.

[27] *See* DRA. The DTV Act extended the Commission's auction authority to September 30, 2011, and the DTV Delay Act extended the authority to September 30, 2012. DTV Act § 3003(b).; DTV Delay Act § 5.

[28] *See* Service Rules for the 698-746, 747-762 and 777-792 MHz Bands; Revision of the Commission's Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems; and Section 68.4(a) of the Commission's Rules Governing Hearing Aid-Compatible Telephones, *Notice of Proposed Rule Making, Fourth Further Notice of Proposed Rule Making, and Second Further Notice of Proposed Rule Making*, 21 FCC Rcd 9345 (2006).

[29] *See 700 MHz Second R&O*, 22 FCC Rcd at 15291-95 ¶¶ 1-13; Service Rules for the 698-746, 747-762 and 777-792 MHz Bands, *Report and Order and Further Notice of Proposed Rulemaking*, 22 FCC Rcd 8064 (2007) (*700 MHz Report and Order*).

[30] The Commission changed the location of existing 700 MHz Guard Band licenses, provided for a 1-megahertz shift of the other commercial blocks in the Upper 700 MHz band and in the spectrum allocated to public safety, and reduced the size of the Guard Band B Block to make two additional megahertz of commercial spectrum available for auction. *700 MHz Second Report and Order*, 22 FCC Rcd at 15292-93 ¶ 3. In addition, the Commission afforded all Guard Band A Block licensees the same technical rules that apply to the adjacent commercial spectrum and the ability to deploy cellular architectures. *Id*. at 15294 ¶ 9.

[31] *See 700 MHz Second R&O*, 22 FCC Rcd at 15361 ¶ 195.

[32] *See id.* at 15360 ¶ 206.

licensees "may not block, degrade, or interfere with the ability of end users to download and utilize applications of their choosing on the licensee's C Block network, subject to reasonable network management."[33]

12. The Commission also established a block in the commercial spectrum, the Upper 700 MHz D Block (D Block), to be licensed on a nationwide basis to a single entity, and required the winning bidder for the D Block to enter into a public/private partnership with the Public Safety Broadband Licensee to enable the construction of a nationwide network operating over the spectrum associated with both licenses and providing broadband services to both commercial and public safety users.[34]

13. The auction of the 700 MHz Band licenses, designated Auction 73, closed on March 18, 2008.[35] The auction concluded with provisionally winning bids covering 1091 licenses. While the bids for licenses associated with four of the five 700 MHz Band blocks (the A, B, C, and E Blocks) exceeded the applicable reserve prices, bids for the fifth block (the D Block) license did not meet the reserve price and thus, there was no winning bid in Auction 73 for that license. Accordingly, the Auction 73 winning bids totaled $19,120,378,000 and the net winning bids (reflecting bidders' claimed bidding credit eligibility) totaled $18,957,582,150.[36]

14. The commercial spectrum in the 700 MHz band is generally available for a broad range of flexible uses.[37] This spectrum has many permissible uses: Licensees may use the spectrum for fixed, mobile (including mobile wireless commercial services), and broadcast services.[38] Certain providers have begun rolling out advanced wireless networks, including LTE using 700 MHz Band. Verizon Wireless first launched LTE services using its 700 MHz Upper C Block licenses in December 2010 and is leasing portions of this spectrum to wireless service providers in rural areas where Verizon does not intend to build out.[39] AT&T launched its LTE network in September 2011 and has stated that it is using both 700 MHz and AWS spectrum for its LTE deployment.[40] AT&T also has announced plans to use the unpaired 700 MHz Lower D and E block licenses it acquired from Qualcomm in December 2011 as early as 2014

[33] *Id.*

[34] *See* Service Rules for the 698-746, 747-762 and 777-792 Bands; Implementing a Nationwide, Broadband, Interoperable Public Safety Network in the 700 MHz Band, *Second Further Notice of Proposed Rulemaking*, 23 FCC Rcd 8047, 8052 ¶¶ 8, 13 (2008) (*700 MHz Second Further Notice*).

[35] FCC, *Auction* 73, http://wireless.fcc.gov/auctions/73 (visited Sept. 18, 2008).

[36] "Auction of 700 MHz Band Licenses Closes," *Public Notice*, 23 FCC Rcd 4572, 4572-73 ¶ 2 (2008). Auction 92 in 2011 offered 16 licenses that were previously offered in Auction 73 but remained unsold or were licenses on which a winning bidder defaulted. *See* Auction of 700 MHz Band Licenses Scheduled for July 19, 2011, Notice and Filing Requirements, Minimum Opening Bids, Upfront Payments, and Other Procedures for Auction 92, *Public Notice*, 26 FCC Rcd 3342 (2011).

[37] *See Lower 700 MHz Report and Order*; Service Rules for the 746-764 and 776-794 MHz Bands, and Revisions to Part 27 of the Commission's Rules, *Third Report and Order*, 16 FCC Rcd 2703 (2001); Service Rules for the 746-764 and 776-794 MHz Bands, and Revisions to Part 27 of the Commission's Rules, *Second Memorandum Opinion and Order*, 16 FCC Rcd 1239 (2001); Service Rules for the 746-764 and 776-794 MHz Bands, and Revisions to Part 27 of the Commission's Rules, *Memorandum Opinion and Order and Further Notice of Proposed Rulemaking*, 15 FCC Rcd 20845 (2000); Service Rules for the 746-764 and 776-794 MHz Bands, and Revisions to Part 27 of the Commission's Rules, *Second Report and Order*, 15 FCC Rcd 5299 (2000) (*Upper 700 MHz Second Report and Order*); *700 MHz Second R&O*; *700 MHz Report and Order*. The 82 megahertz of spectrum does not include the reconfigured Guard Band B Block spectrum at 775-776/805-806 MHz. *See 700 MHz Second R&O*, 22 FCC Rcd at 15294 ¶ 9, 15388-89 ¶¶ 266-69.

[38] *See generally id.*

[39] *See* Section IV.B.1, Network Coverage and Technology Upgrades.

[40] *Id.*

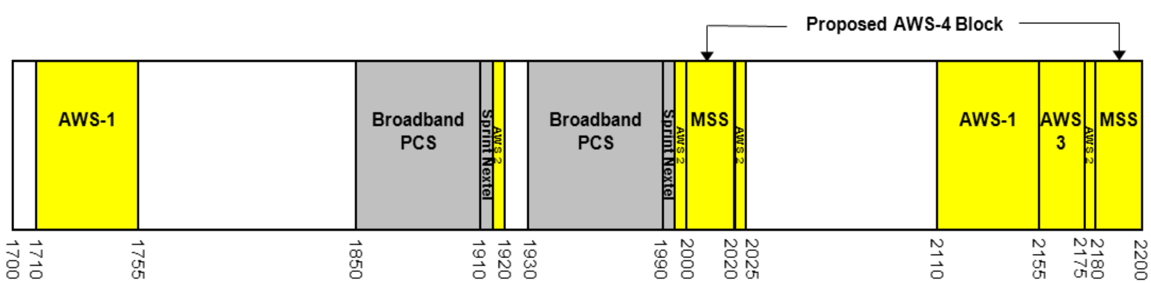
as a supplemental downlink for mobile broadband services.[41]

15. In early 2012, Congress enacted the Spectrum Act, which requires the Commission to reallocate the D block for use by public safety.[42] On September 7, 2012, the Public Safety and Homeland Security Bureau (PSHSB) implemented the directives of the Spectrum Act by reallocating the Upper 700 MHz D Block for public safety services, and adopting rules to license the D Block and the existing public safety broadband spectrum in the 700 MHz Band to FirstNet, an independent authority within NTIA, in order to establish "a nationwide, interoperable public safety broadband network."[43]

E. 1710 – 2180: Advanced Wireless Services

16. To further the goal of promoting the deployment of advanced services, the Commission has made efforts to allocate and license additional spectrum suitable for offering AWS.[44] As noted in the *Eleventh Report*, in 2002 the Commission, together with the National Telecommunications and Information Administration (NTIA), allocated 90 megahertz of spectrum in the 1710-1755 MHz and 2110-2155 MHz (AWS-1) bands that can be used to offer advanced wireless services, including mobile broadband services.[45]

1700-2200 MHz: Advanced Wireless Services Spectrum



17. Subsequently, the Commission completed the process of establishing service rules for the 1710-1755 MHz and 2110-2155 MHz bands. The Commission determined that this spectrum could be used for any wireless service that is consistent with the spectrum's fixed and mobile allocations and would be licensed under the Commission's flexible, market-oriented Part 27 rules,[46] and also a band plan that provided for a significant amount of the spectrum to be licensed on a small geographic basis to

[41] Application of AT&T Inc and Qualcomm Incorporated for Consent to Assign Licenses and Authorizations, WT Docket No. 11-18, *Order*, 26 FCC Rcd 17589, 17625 ¶ 89 (2011) (*AT&T-Qualcomm Order*).

[42] *See Spectrum Act* at § 6101(a).

[43] Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993, PS Docket No. 12-94, DA 12-1462, Report and Order (PSHSB, adopted September 7, 2012).

[44] 47 C.F.R. § 24.3. Advanced Wireless Services (AWS) is the collective term we use for new and innovative fixed and mobile terrestrial wireless applications using bandwidth that is sufficient for the provision of a variety of applications, including those using voice and data (such as Internet browsing, message services, and full-motion video) content.

[45] *Eleventh Report*, 21 FCC Rcd at 10977 ¶ 73. The Commercial Spectrum Enhancement Act, signed into law on December 23, 2004, establishes a Spectrum Relocation Fund to reimburse federal agencies operating on certain frequencies that have been reallocated to non-federal use, including the 1710-1755 MHz band, for the cost of relocating their operations. *See* Commercial Spectrum Enhancement Act, Pub. L. No. 108-494, 118 Stat. 3986, Title II (2004).

[46] *Eleventh Report*, 21 FCC Rcd at 10977-10978 ¶ 74; 47 C.F.R. § 27.

encourage the participation of small and rural providers in the AWS auction.[47]

18. The Commission held Auction 66 in 2006.[48] Of the 1,122 licenses offered, 104 winning bidders won 1,087 licenses, with net bids of more than $13.7 billion,[49] and all 1,087 licenses were awarded in 2007. In August 2008 the Commission's Auction 78 included the 35 AWS-1 licenses for which no winning bids were submitted in Auction 66.[50] Winning bids were submitted for all 35 AWS-1 licenses, with net winning bids for those licenses of $13,372,850.[51] As of early November 2010, the Commission has granted licenses to 9 out of 14 AWS applicants.

19. The Commission also has taken steps toward licensing other bands of spectrum for use by AWS. In 2004, the Commission allocated an additional 20 megahertz of spectrum in the 1915-1920 MHz, 1995-2000 MHz, 2020-2025 MHz and 2175-2180 MHz bands ("AWS-2")[52] and sought comment on appropriate service rules for these bands.[53]

20. In 2005, the Commission designated another 20 megahertz of spectrum for AWS, specifically the 2155-2175 MHz band ("AWS-3").[54] On September 19, 2007, the Commission sought comment on service rules for the AWS-3 spectrum.[55] On June 20, 2008, the Commission issued a Further Notice of Proposed Rulemaking (FNPRM), among other things proposing service rules that would apply to the 2155-2180 MHz band.[56]

21. The Spectrum Act requires the Commission, within three years of enactment, to allocate certain spectrum for commercial use and to assign new initial licenses for its use subject to flexible use service rules.[57] The spectrum subject to this requirement includes the frequencies between 1915-1920 MHz, 1995-2000 MHz, and 2155-2180 MHz, as well as an additional 15 megahertz between 1675-1710

[47] *Eleventh Report*, 21 FCC Rcd at 10978, ¶ 74.

[48] *See* "Auction of Advanced Wireless Services Closes: Winning Bidders Announced for Auction 66," Report AUC-06-66-F, *Public Notic*e, 21 FCC Rcd 10521 (2006).

[49] *Id.*

[50] *See* "Auction of AWS-1 and Broadband PCS Licenses Rescheduled for August 13, 2008," *Public Notice*, 23 FCC Rcd 7496 (2008).

[51] *See* "Auction of AWS-1 and Broadband PCS Licenses Closes," *Public Notice*, 23 FCC Rcd 12749 (2008).

[52] Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, Including Third Generation Wireless Systems, *Sixth Report and Order, Third Memorandum Opinion and Order and Fifth Memorandum Opinion and Order*, 19 FCC Rcd 20720 (2004).

[53] Service Rules for Advanced Wireless Services in the 1915-1920 MHz, 1995-2000 MHz, 2020-2025 MHz and 2175-2180 MHz Bands; Service Rules for Advanced Wireless Services in the 1.7 GHz and 2.1 GHz Bands, *Notice of Proposed Rulemaking*, 19 FCC Rcd 19263 (2004).

[54] *See* Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, Including Third Generation Wireless Systems, *Eighth Report and Order*, *Fifth Notice of Proposed Rule Making and Order*, 20 FCC Rcd 15866 (2005).

[55] Service Rules for Advanced Wireless Services in the 2155-2175 MHz Band, *Notice of Proposed Rulemaking*, 22 FCC Rcd 17035 (2007).

[56] Service Rules for Advanced Wireless Services in the 2155-2175 MHz Band; and Service Rules for Advanced Wireless Services in the 1915-1920 MHz, 1995-2000 MHz, 2020-2025 MHz and 2175-2180 MHz Bands, *Further Notice of Proposed Rulemaking*, 23 FCC Rcd 9859 (2008).

[57] *See Spectrum Act* at § 6401(b). Certain spectrum to be identified by NTIA (15 megahertz of spectrum between 1675 MHz and 1710 MHz) and certain spectrum to be identified by the Commission (15 megahertz of contiguous spectrum), will also be subject to this requirement. *Id.* at § 6401(a), (b).

MHz to be identified by NTIA, and another 15 megahertz of contiguous spectrum to be identified by the Commission. The Commission cannot allocate or auction the spectrum at 1915-1920 MHz or 1995-2000 MHz if it finds there would be harmful interference to commercial mobile service licensees in the frequencies between 1930-1995 MHz.[58]

22. The Commission has proposed to make spectrum currently authorized for the provision of mobile satellite service (MSS), available for the provision of terrestrial mobile broadband, including the 2 GHz MSS band (2000-2020 MHz and 2180-2200 MHz). In 2011, the Commission added co-primary Fixed and Mobile allocations to this spectrum, consistent with the International Table of Allocations.[59] In March 2012, the Commission proposed rules that would enable the provision of stand-alone terrestrial mobile broadband service in these frequencies, which it termed the "AWS-4" band and sought comment on a number of related issues.[60] On December 12, 2012, the Commission adopted the AWS-4 Report and Order that established terrestrial service, technical, and licensing rules that generally follow the Commission's Part 27 flexible use rules, modified as necessary to account for issues unique to the AWS-4 bands[61]

F. Broadband Radio Service and Educational Broadband Service

23. In 2004, the Commission transformed the 2496-2690 MHz band by providing licensees with greater flexibility and establishing a more functional band plan.[62] The Commission has taken several steps to restructure the BRS/EBS band and facilitate more efficient use of the spectrum. First, the Commission created a new BRS/EBS band plan for the 2496-2690 MHz band that eliminated the use of interleaved channels and created distinct band segments for high power operations, such as one-way video transmission, and low power operations, such as two-way fixed and mobile broadband applications. By grouping high and low power users into separate portions of the band, the new band plan reduced the likelihood of interference caused by incompatible uses. The new band plan also created incentives for the development of low-power, cellularized broadband operations, which were inhibited by the prior band plan.

24. In addition, the Commission provided licensees with the flexibility to employ the technologies of their choice in the band and to lease spectrum under the Commission's secondary market spectrum leasing policies and procedures. The Commission also implemented geographic area licensing

[58] *Id.* at § 6401(b)(4).

[59] Fixed and Mobile Services in the Mobile Satellite Service Bands at 1525-1559 MHz and 1626.5-1660.5 MHz, 1610-1626.5 MHz and 2483.5-2500 MHz, and 2000-2020 MHz and 2180-2200 MHz, *Report and Order*, ET Docket No. 10-142, *Report and Order,* 26 FCC Rcd 5710 (2011).

[60] Service Rules for Advanced Wireless Services in the 2000-2020 MHz and 2180-2200 MHz Bands, WT Docket No. 12-70, Fixed and Mobile Services in the Mobile Satellite Service Bands at 1525-1559 MHz and 1626.5-1660.5 MHz, 1610-1626.5 MHz and 2483.5-2500 MHz, and 2000-2020 MHz and 2180-2200 MHz, ET Docket No. 10-142, Service Rules for Advanced Wireless Services in the 1915-1920 MHz, 1995-2000 MHz, 2020-2025 MHz and 2175-2180 MHz Bands, WT Docket No. 04-356, *Notice of Proposed Rulemaking and Notice of Inquiry,* 27 FCC Rcd 3561 (2012) (*AWS-4 NPRM*).

[61] *See* Service Rules for Advanced Wireless Services in the 2000-2020 MHz and 2180-2200 MHz Bands, WT Docket No. 12-70, Fixed and Mobile Services in the Mobile Satellite Service Bands at 1525-1559 MHz and 1626.5-1660.5 MHz, 1610-1626.5 MHz and 2483.5-2500 MHz, and 2000-2020 MHz and 2180-2200 MHz, ET Docket No. 10-142, Service Rules for Advanced Wireless Services in the 1915-1920 MHz, 1995-2000 MHz, 2020-2025 MHz and 2175-2180 MHz Bands, WT Docket No. 04-356, *Report and Order and Order of Proposed Modification,* FCC 12-151 (rel. Dec. 17, 2012) *(AWS-4 Report and Order).*

[62] Amendment of Parts 1, 21, 73, 74, and 101 of the Commission's Rules to Facilitate the Provision of Fixed and Mobile Broadband Access, Educational, and Other Advanced Services in the 2150-2162 and 2500-2690 MHz Bands, *Report and Order and Further Notice of Proposed Rulemaking*, 19 FCC Rcd 14165 (2004). The rules for this band were initially established in 1963 but have evolved significantly since that time.

for all licensees in the band, which allow increased flexibility while reducing administrative burdens on both licensees and the Commission.

25. In April 2006, the Commission continued its transformation of the rules governing BRS and EBS by revising the mechanism for transition from the existing band configuration to the new band plan.[63] BRS and EBS licensees have largely completed the process of transitioning the 2.5 GHz band to the new band plan. As of June 20, 2012, the transition had been completed in 485 of the 493 BTAs.[64] In the remaining BTAs, virtually all other licensees are subject to a pending transition plan or have filed self-transition plans.

26. The Commission has continued to revise the rules relating to the 2.5 GHz band in 2008 and 2009 by clarifying its policies concerning leasing of EBS stations, setting forth auction rules for unassigned BRS spectrum, seeking further comment on how to license the available and unassigned "white spaces" in the EBS spectrum band, and issuing a Declaratory Ruling clarifying the "splitting-the-football" methodology that licensees should use to divide overlapping geographic service areas for licenses that expired and are later reinstated.[65] In 2010, the Commission gave new BRS licensees four years from the date of initial license grant to demonstrate substantial service.[66] The Commission held Auction 86, the auction of available BRS licenses, in the fourth quarter of 2009.[67] Of the 78 licenses offered in Auction 86, ten winning bidders won 61 licenses, with net bids of $19,426,600.[68]

27. The changes made to the 2496-2690 MHz band are facilitating the deployment of mobile broadband networks by Clearwire.[69] Moreover, the changes to this band have enabled BRS/EBS providers to use this spectrum in a more technologically and economically efficient manner.

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[63] Amendment of Parts 1, 21, 73, 74, and 101 of the Commission's Rules to Facilitate the Provision of Fixed and Mobile Broadband Access, Educational, and Other Advanced Services in the 2150-2162 and 2500-2690 MHz Bands, *Order on Reconsideration and Fifth Memorandum Opinion and Order and Third Memorandum Opinion and Order and Second Report and Order*, 21 FCC Rcd 5606 (2006).

[64] *See* WT Docket No. 06-136.

[65] Amendment of Parts 1, 21, 73, 74 and 101 of the Commission's Rules to Facilitate the Provision of Fixed and Mobile Broadband Access, Educational and Other Advanced Services in the 2150-2162 and 2500-2690 MHz Bands, *Third Order on Reconsideration and Sixth Memorandum Opinion and Order and Fourth Memorandum Opinion and Order and Second Further Notice of Proposed Rulemaking and Declaratory Ruling*, 23 FCC Rcd 5992 (2008); *Fifth Memorandum Opinion and Order and Third Further Notice of Proposed Rulemaking and Declaratory Ruling*, 24 FCC Rcd 12558 (2009).

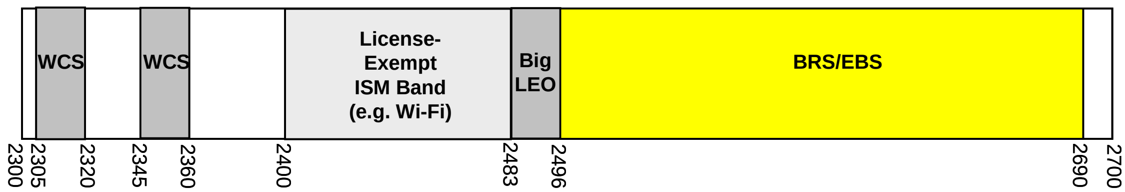
[66] Amendment of Parts 1, 21, 73, 74 and 101 of the Commission's Rules to Facilitate the Provision of Fixed and Mobile Broadband Access, Educational and Other Advanced Services in the 2150-2162 and 2500-2690 MHz Bands, *Third Report and Order*, 25 FCC Rcd 7743 (2010).

[67] The auction started on October 27, 2009 and closed on October 30, 2009. *See* "Auction of Broadband Radio Service Licenses Closes; Winning Bidders Announced for Auction No. 86," *Public Notice*, 24 FCC Rcd 13572 (WTB 2009).

[68] *Id*.

[69] Clearwire has announced plans to transition to LTE and is in the process of overlaying its WiMAX network with LTE, starting with 31 markets in H1 2013. *See* http://corporate.clearwire.com/releasedetail.cfm?ReleaseID=667820 (visited Sept. 25, 2012).

2300-2700 MHz: BRS/EBS Spectrum



G. Wireless Communications Service (WCS)

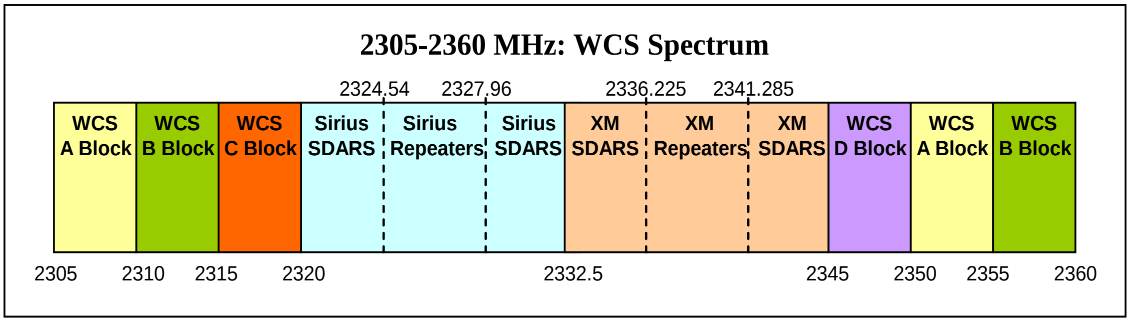
28. The Commission has licensed 30 megahertz of spectrum in the 2.3 GHz band, at 2305-2320 MHz and 2345-2360 MHz, for the Wireless Communications Service (WCS). The WCS spectrum was auctioned in 1997 and licensed on a Major Economic Area (MEA) and Regional Economic Area Grouping (REAG) basis.[70] The WCS spectrum is adjacent to and separated by the spectrum band for the Satellite Digital Audio Radio Service (SDARS), which is used by Sirius XM Radio Inc. to provide satellite radio service. While the service rules governing WCS allow for both fixed and mobile applications, the technical limits imposed to protect adjacent SDARS operations had not permitted the development of mobile equipment for the band. In May 2010, the Commission adopted final rules for WCS that modified the technical parameters governing the operation of WCS mobile and portable devices in 25 megahertz of spectrum in the 2.3 GHz band.[71] The revised rules were intended to enable WCS licensees to offer mobile broadband services, while limiting the potential for harmful interference to incumbent Satellite Digital Audio Radio Service licensees operating in adjacent bands.[72] In 2012 the Commission issued an Order on Reconsideration making further modifications to the technical and operating rules to enable LTE mobile broadband deployment in 20 megahertz of long-dormant WCS spectrum. In addition, it made an additional 10 megahertz of spectrum available for fixed broadband. It also provides greater certainty to Sirius XM by requiring WCS licensees to work cooperatively if WCS base or fixed stations cause harmful interference (*i.e.*, muting) to SDARS receivers on roadways, resolving longstanding interference concerns between the WCS and SDARS.[73]

[70] *See* "WCS Auction Closes; Winning Bidders in the Auction of 128 Wireless Communications Services Licenses (Auction No. 14)," Public Notice, 12 FCC Rcd 21653 (1997).

[71] *See* Amendment of Part 27 of the Commission's Rules to Govern the Operation of Wireless Communications Services in the 2.3 GHz Band, WT Docket No. 07-293, *Report and Order*, 25 FCC Rcd 11710 (2010). The WCS band has a total of 30 MHz spectrum at 2305-2320 MHz and 2345-2360 MHz. *Id.* However, WCS mobile and portable devices are not permitted to operate in the 2.5-megahertz portions of the WCS C and D blocks closest to the SDARS band (*i.e.*, 2317.5-2320 and 2345-2347.5 MHz). *Id.*

[72] *See* Amendment of Part 27 of the Commission's Rules to Govern the Operation of Wireless Communications Services in the 2.3 GHz Band, WT Docket No. 07-293, *Report and Order*, 25 FCC Rcd 11710 (2010).

[73] *See* Amendment of Part 27 of the Commission's Rules to Govern the Operation of Wireless Communications Services in the 2.3 GHz Band, WT Docket No. 07-293, Establishment of Rules and Policies for the Digital Audio Radio Satellite Service in the 2310-2360 MHz Frequency Band, IB Docket No. 95-91*Order on Reconsideration,* 27 FCC Rcd. 13651 (2012)



H. 1.4 GHz Bands

29. The Commission completed the auction of licenses in the paired 1392-1395 MHz and 1432-1435 MHz bands and in the unpaired 1390-1392 MHz band.[74] The paired spectrum was offered as two 3-megahertz blocks in the six REAGs.[75] The unpaired spectrum was auctioned as one 2-meghertz block in each MEA.[76] Like other spectrum bands under Part 27 of the Commission's rules, the service rules for the 1.4 GHz band are flexible. In the auction, two winning bidders won a total of 64 licenses, raising a total of $123,599,000.[77]

I. 1670-1675 MHz

30. In April 2003, the FCC auctioned five megahertz of unpaired spectrum in the 1670-1675 MHz band as a single, nationwide license. As with the other spectrum bands licensed under Part 27 of the Commission's rules, such as AWS and WCS, the service rules for the 1670-1675 MHz band are flexible, and licensees can use the spectrum to deploy a variety of fixed or mobile wireless services. The license was won at auction by Crown Castle. In July 2007, Crown Castle entered into a long-term agreement to lease the spectrum to a wholly-owned subsidiary of TVCC Holding Company, LLC (TVCC Holding).[78] In late 2008, control of TVCC Holding was transferred, so that 13.13 percent was held by a company wholly owned by Rajendra Singh and the Singh family; 11.86 percent by Columbia Capital IV, LLC, subsidiaries; and 75 percent by Harbinger-related entities.[79] On October 9, 2012, the licensee filed a request for an extension or waiver of the construction deadline. On November 5, 2012 the Commission issued a PN seeking comment on that request.[80]

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[74] *See* "Auction of 1.4 GHz Band Licenses Closes," *Public Notice*, 22 FCC Rcd 4714 (2007).

[75] *See* "Auction of 1.4 GHz Bands Licenses Scheduled for February 7, 2007," *Public Notice*, 21 FCC Rcd 9494 (2006).

[76] *Id.*

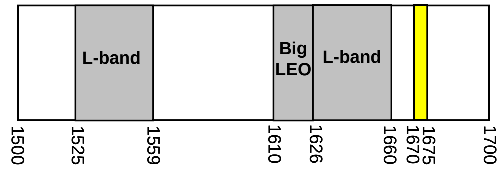
[77] *See* "Auction of 1.4 GHz Band Licenses Closes," *Public Notice*, 22 FCC Rcd 4714 (2007).

[78] Long-Term *De Facto* Transfer Lease Application, File No. 0003108073 (filed July 17, 2008). *Crown Castle Announces Long-Term Modeo Spectrum Lease*, Press Release, Crown Castle, July 23, 2007; ULS Lease ID L000002305.

[79] Transfer of Control of a Lessee Application, File No. 0003573463 (filed Sept. 10, 2008); TVCC Holding Company, LLC, Form 602, File No. 0003635816 (filed Nov. 3, 2008). In April 2010, a further lease application was approved. *De Facto* Transfer Lease, File No. 0004205653 (filed Apr. 13, 2010).

[80] *See* Wireless Telecommunications Bureau Seeks Comment On Request By Op Llc For Extension Or Waiver Of The Construction Deadline Concerning Its 1670-1675 Mhz Band License. WT Docket No. 12-327, Public Notice, DA 12-1776 (rel. Nov. 5, 2012).

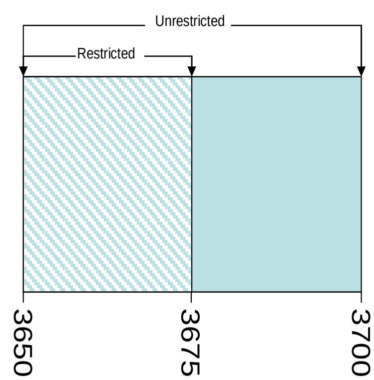
1500-1700 MHz: 1670-1675 MHz Spectrum



J. 3650-3700 MHz

31. The Commission adopted service rules for the 3650 – 3700 MHz band in June 2007[81] and began accepting applications licenses in the service in November 2007.[82] Terrestrial operations in the band are licensed on a nationwide, non-exclusive basis, with all licensees registering their fixed and base stations in a common data base (ULS) prior to operation. Licensees are subject to restrictions on their operations in geographic areas occupied by grandfathered Fixed Satellite Service (FSS) and Federal Government stations. The rules also provide that terrestrial licensees have the mutual obligation to cooperate and avoid harmful interference to one another, and are required to use one of two types of "contention-based" technologies (restricted or unrestricted) that accommodate shared use of the band by multiple users. Equipment using "restricted" contention-based protocols (i.e., equipment capable of avoiding interference only to other devices using the same protocol) is allowed to operate only on the lower 25 megahertz portion of the band (3650 – 3675 MHz). Unrestricted equipment (i.e., equipment capable of avoiding interference to other devices, even those that use a different protocol) is allowed to operate within the entire 50 megahertz of the band. Mobile stations are required to positively receive and decode an enabling signal transmitted by a base station. Devices certified by the FCC as mobiles or portables do not require a separate license or registration.[83]

3650 - 3700 MHz Service



[81] *See* Wireless Operations in the 3650-3700 MHz Band, ET Docket No. 04-151, Rules for Wireless Broadband Services in the 3650-3700 MHz Band, WT Docket No. 05-96, *Report and Order*, 20 FCC Rcd 6502 (2005) (*3650 MHz Order*), *recon. granted in part*, *Memorandum Opinion and Order*, 22 FCC Rcd 10421 (2007).

[82] *See* "Wireless Telecommunications Bureau Announces Start Date for Licensing and Registration Process for the 3650 – 3700 MHz Band," *Public Notice*, 22 FCC Rcd 19802 (WTB 2007).

[83] *See* 47 C.F.R. § 90.1307. Mobile and portable stations that operate with a peak EIRP of 1 Watt/25 megahertz and receive and decode an enabling signal from a base station are not required to be registered even if used in a fixed mode. *See 3650 MHz Order*, 20 FCC Rcd at 6513 ¶ 31, n.54; 47 C.F.R. § 90.1333.

K. MSS Spectrum Bands

32. The Commission has approved mobile satellite systems for operation in four MSS spectrum bands—the L-Band, Big LEO,[84] Little LEO, and 2 GHz bands—totaling 157.7 megahertz of spectrum. Voice and data services are permitted in the L-band, Big LEO and 2 GHz bands. The Little LEO band is limited to non-voice services only (and is not depicted in the band plans below). As explained elsewhere in this Appendix A, in December 2012, the Commission adopted the AWS-4 Report and Order that established terrestrial service, technical, and licensing rules that generally follow the Commission's Part 27 flexible use rules, modified as necessary to account for issues unique to the AWS-4 bands[85]

Table A-1

Spectrum Bands Available for MSS

Spectrum Band	Megahertz
L-Band	68.0
Big LEO	45.7
Little LEO	4.0
2 GHz	40.0
Total	157.7

33. *MSS Allocations*. In the United States, MSS L-Band allocation consists of downlinks in the 1525-1559 MHz bands and uplinks in the 1626.5-1660.5 MHz bands.[86] The L-Band was the first MSS band that was used for extensive commercial MSS offerings. The MSS Big LEO band refers to the 1.6/2.4 GHz bands, consisting of an uplink at 1610-1626.5 MHz and downlinks at 1613.8-1626.5 and 2483.5-2500 MHz.[87] The Commission allocated this spectrum in 1993 to permit two-way voice and data communications anywhere in the world. The MSS 2 GHz band allocation consists of an uplink at 2000-2020 MHz and a downlink at 2180-2200 MHz.[88] The Commission allocated this spectrum in 1997 for the provision of new and expanded regional and global data, voice and messaging MSS,[89] and in 2011 it added Fixed and Mobile as co-primary allocations in the band.[90] As discussed elsewhere in this Appendix A concerning Advanced Wireless Services, the Commission has established rules enabling the provision of terrestrial service in an additional 40 megahertz of spectrum for use by AWS, comprised of the spectrum at 2000-2020 MHz and 2180-2200 MHz bands (AWS-4).[91]

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[84] LEO refers to "Low-Earth Orbit."

[85] *See AWS-4 Report and Order.*

[86] *See* 47 C.F.R. § 2.106.

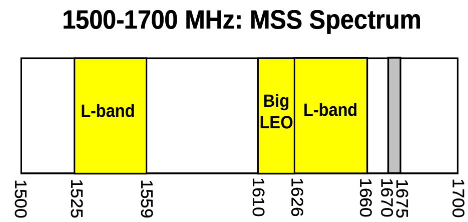
[87] *See* 47 C.F.R. § 2.106.

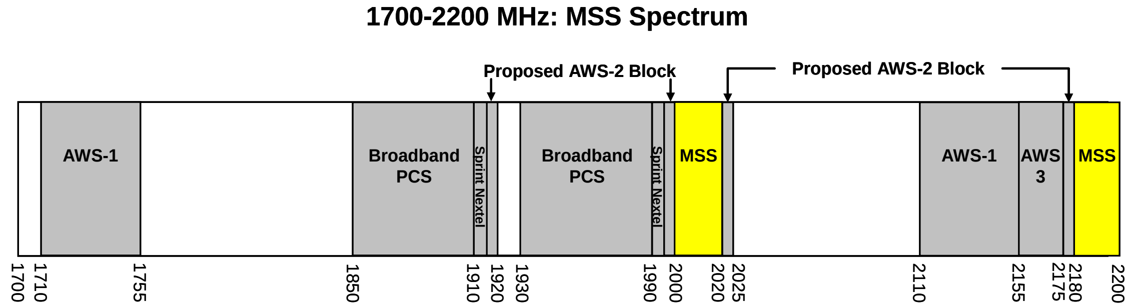
[88] *See* 47 C.F.R. § 2.106.

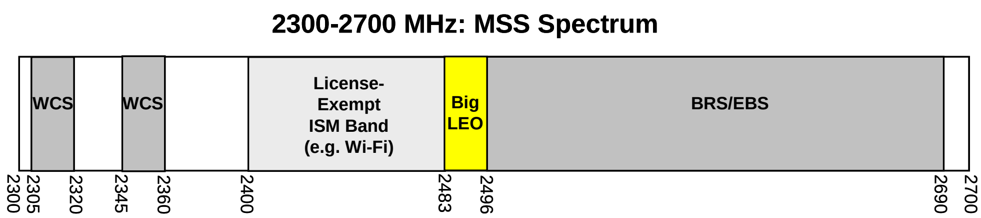
[89] Amendment of Section 2.106 of the Commission's Rules to Allocate Spectrum at 2 GHz for Use by the Mobile-Satellite Service, ET Docket No. 95-18, RM-7927, PP-28, *First Report and Order and Further Notice of Proposed Rulemaking*, 12 FCC Rcd 7388 (1997).

[90] *See* Fixed and Mobile Services in the Mobile Satellite Service Bands at 1525-1559 MHz and 1626.5-1660.5 MHz, 1610-1626.5 MHz and 2483.5-2500 MHz, and 2000-2020 MHz and 2180-2200 MHz, ET Docket No. 10-142, *Report and Order*, 26 FCC Rcd 5710 (2011).

[91] *See AWS-4 Report and Order.*

34. 

35. 



36. *Ancillary Terrestrial Component (ATC) and Terrestrial Broadband*. In 2003, the Commission adopted a Report and Order that permits MSS licensees (except in the Little LEO band) to provide ATC to their mobile satellite systems using spectrum in certain portions of the MSS bands.[92] ATC consists of terrestrial base stations and mobile terminals that re-use frequencies assigned for MSS operations. To obtain ATC authority, an MSS operator must first satisfy certain gating criteria.[93] To date, four MSS operators have obtained ATC authority.[94] Ninety (90) megahertz of MSS spectrum was

[92] *See* generally Flexibility for Delivery of Communications by Mobile Satellite Service Providers in the 2 GHz Band, the L-Band, and the 1.6/2.4 GHz Bands, *Report and Order and Notice of Proposed Rulemaking*, 18 FCC Rcd 1962 (2003) (*ATC Report and Order*), *modified sua sponte by Order on Reconsideration*, 18 FCC Rcd 13590 (2003), *reconsidered in part in Memorandum Opinion and Order and Second Order on Reconsideration*, 20 FCC Rcd 4616 (2005), *further recon. pending*.

[93] *ATC Report and Order*, 18 FCC Rcd at 1965 ¶ 3. The gating criteria require that the MSS licensee: (1) has launched and operates its own satellite facilities; (2) provides substantial satellite service to the public; (3) provides integrated satellite/terrestrial service; (4) observes existing satellite geographic coverage requirements; and (5) limits ATC operations only to the authorized satellite footprint. *Id*.

[94] *See* Fixed and Mobile Services in the Mobile Satellite Service Bands at 1525-1559 MHz and 1626.5-1660.5 MHz, 1610-1626.5 MHz and 2483.5-2500 MHz, and 2000-2020 MHz and 2180-2200 MHz, *Notice of Proposed Rulemaking and Notice of Inquiry*, ET Docket No. 10-142, 25 FCC Rcd 9481, 9483-85 ¶¶ 6-8 (2010). Part of Big LEO operator Globalstar's ATC authority has been suspended. Globalstar Licensee LLC Application for Modification of License to Extend Dates for Coming into Compliance with Ancillary Terrestrial Component Rules and Open Range Request for Special Temporary Authority, File No. SAT-MOD-20091214-00152, Call Sign: S2115; File No. SAT-STA-20100625-00147, *Order*, 25 FCC Rcd 13114-13115, 13112 ¶¶ 1, 18 (IB, WTB, OET 2010).

identified as potentially available for terrestrial broadband use via ATC authority.[95] In the *AWS-4 NPRM*, the Commission proposed eliminating the ATC rules for the 2 GHz band.[96] In December 2012, the Commission eliminated the ATC rules for the 2 GHz band, granted terrestrial authority to the existing MSS licensee, and adopted service and licensing rules for the AWS-4 band that generally follow the Commission's Part 27 flexible rules, modified as necessary to account for issues unique to that band.[97]

[95] *National Broadband Plan* at 87. The 90 megahertz is comprised of 40 megahertz from each of the L-Band and 2 GHz MSS allocations, and 10 megahertz from the Big LEO allocations. *Id.*

[96] *AWS-4 NPRM* at ¶ 136.

[97] See *AWS-4 Report and Order*.

APPENDIX B

Tables

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Table B-1
CTIA's Semi-Annual Mobile Wireless Industry Survey, 1985-2011

Date	Estimated Connections	Year End over Year End Connections Increase	12-Month Total Service Revenues (in $000s)	12-Month Roamer Services Revenues (in $000s)	Cell Sites	Direct Service Provider Employees	Average Local Monthly Bill (Dec. Survey Periods)
1985	340,213	248,613	$482,428	N/A	913	2,727	N/A
1986	681,825	341,612	$823,052	N/A	1,531	4,334	N/A
1987	1,230,855	549,030	$1,151,519	N/A	2,305	7,147	$96.83
1988	2,069,441	838,586	$1,959,548	N/A	3,209	11,400	$98.02
1989	3,508,944	1,439,503	$3,340,595	$294,567	4,169	15,927	$83.94
1990	5,283,055	1,774,111	$4,548,820	$456,010	5,616	21,382	$80.90
1991	7,557,148	2,274,093	$5,708,522	$703,651	7,847	26,327	$72.74
1992	11,032,753	3,475,605	$7,822,726	$973,871	10,307	34,348	$68.68
1993	16,009,461	4,976,708	$10,892,175	$1,361,613	12,805	39,775	$61.48
1994	24,134,421	8,124,960	$14,229,922	$1,830,782	17,920	53,902	$56.21
1995	33,785,661	9,651,240	$19,081,239	$2,542,570	22,663	68,165	$51.00
1996	44,042,992	10,257,331	$23,634,971	$2,780,935	30,045	84,161	$47.70
1997	55,312,293	11,269,301	$27,485,633	$2,974,205	51,600	109,387	$42.78
1998	69,209,321	13,897,028	$33,133,175	$3,500,469	65,887	134,754	$39.43
1999	86,047,003	16,837,682	$40,018,489	$4,085,417	81,698	155,817	$41.24
2000	109,478,031	23,431,028	$52,466,020	$3,882,981	104,288	184,449	$45.27
2001	128,374,512	18,896,481	$65,316,235	$3,752,826	127,540	203,580	$47.37
2002	140,766,842	12,392,330	$76,508,187	$3,895,512	139,338	192,410	$48.40
2003	158,721,981	17,955,139	$87,624,093	$3,766,267	162,986	205,629	$49.91
2004	182,140,362	23,418,381	$102,121,210	$4,210,331	175,725	226,016	$50.64
2005	207,896,198	25,755,836	$113,538,221	$3,786,331	183,689	233,067	$49.98
2006	233,040,781	25,144,583	$125,456,825	$3,494,294	195,613	253,793	$50.56
2007	255,395,599	22,354,818	$138,869,304	$3,742,014	213,299	266,782	$49.79
2008	270,333,881	14,938,282	$148,084,170	$3,739,274	242,130	268,528	$50.07
2009	285,646,191	15,312,310	$152,551,854	$3,061,344	247,081	249,247	$48.16
2010	296,285,629	10,639,438	$159,929,649	$3,026,009	253,086	250,393	$47.21
2011	315,963,848	19,678,219	$169,767,314	$3,314,895	385,071	238,071	$47.00

Source: CTIA

Table B-2
FCC's Semi-Annual Local Telephone Competition Data Collection: Mobile Telephone Subscribership, 2008-2011 (In thousands)

State	Dec 2011		2008		2009		2010		2011	
	Carriers	% Resold	Jun	Dec	Jun	Dec	Jun	Dec	Jun	Dec
Alabama	14	15 %	3,887	3,960	4,003	4,228	4,211	4,328	4,350	4,491
Alaska	14	5	480	383	544	586	590	608	619	634
American Samoa	2	*	*	*	*	*	*	*	*	*
Arizona	14	7	4,936	4,983	5,005	5,101	5,268	5,285	5,402	5,532
Arkansas	16	28	2,446	2,530	2,576	2,519	2,485	2,673	2,773	3,340
California	16	6	31,946	32,177	32,215	32,938	33,548	33,839	34,299	34,892
Colorado	16	8	4,066	4,311	4,357	4,503	4,647	4,687	4,705	4,767
Connecticut	11	7	2,959	3,030	3,047	3,123	3,192	3,230	3,305	3,360
Delaware	11	8	775	778	779	803	859	851	881	893
District of Columbia	11	8	1,047	1,096	1,116	1,183	1,227	1,249	1,273	1,347
Florida	14	8	15,809	16,158	16,425	16,744	16,895	17,251	17,613	17,923
Georgia	16	13	8,142	8,322	8,562	8,863	8,869	9,063	9,137	9,655
Guam	3	*	*	*	*	*	*	*	139	*
Hawaii	10	5	1,115	1,184	1,196	1,216	1,248	1,252	1,274	1,296
Idaho	17	6	1,125	1,167	1,180	1,221	1,269	1,277	1,293	1,323
Illinois	18	11	10,634	10,919	11,070	11,523	11,604	12,057	12,259	12,705
Indiana	15	10	4,824	4,956	4,983	5,205	5,289	5,410	5,496	5,580
Iowa	72	9	2,245	2,319	2,336	2,432	2,466	2,535	2,559	2,658
Kansas	17	15	2,326	2,421	2,430	2,466	2,491	2,560	2,570	2,653
Kentucky	16	12	3,343	3,445	3,439	3,631	3,654	3,726	3,754	3,813
Louisiana	19	22	3,896	4,012	4,053	3,993	3,953	4,340	4,876	5,676
Maine	10	24	972	1,012	1,006	1,065	1,040	1,124	1,090	1,179
Maryland	16	12	5,124	5,234	5,260	5,323	5,500	5,560	5,665	6,153
Massachusetts	11	10	5,624	5,749	6,027	6,171	6,367	6,316	6,419	6,534
Michigan	15	12	7,821	8,027	8,171	8,576	8,690	8,861	9,391	9,253
Minnesota	13	10	4,164	4,345	4,254	4,439	4,611	4,704	4,782	4,943
Mississippi	13	14	2,252	2,312	2,361	2,345	2,322	2,440	2,516	2,658
Missouri	19	14	4,835	4,940	4,985	5,129	5,141	5,309	5,458	5,650
Montana	13	14	723	748	707	802	783	846	803	864
Nebraska	16	8	1,451	1,496	1,508	1,515	1,566	1,523	1,542	1,648
Nevada	16	11	2,249	2,268	2,325	2,393	2,417	2,453	2,490	2,571
New Hampshire	11	12	1,045	1,080	1,075	1,125	1,141	1,170	1,171	1,207
New Jersey	12	6	7,834	8,008	8,036	8,158	8,624	8,601	8,786	8,926
New Mexico	13	6	1,555	1,536	1,550	1,624	1,668	1,689	1,662	1,691
New York	14	10	17,260	16,702	18,193	18,882	19,303	19,504	19,938	20,221
North Carolina	16	12	7,428	8,024	7,865	8,108	8,259	8,526	8,513	9,114
North Dakota	13	10	541	581	562	618	590	623	615	641
Northern Mariana Isl.	2	*	*	*	*	*	*	*	*	*
Ohio	15	11	9,357	9,565	9,456	10,059	10,236	10,511	10,936	11,134
Oklahoma	20	13	2,808	2,889	2,988	3,077	3,109	3,188	3,259	3,433
Oregon	13	8	3,007	3,084	3,112	3,235	3,297	3,340	3,355	3,427
Pennsylvania	18	11	9,895	10,214	10,455	10,867	11,070	11,424	11,401	11,595
Puerto Rico	7	6	2,502	2,624	2,706	2,807	2,879	3,014	3,004	2,989
Rhode Island	10	9	874	888	880	893	906	920	935	959
South Carolina	17	14	3,573	3,323	3,702	3,896	3,848	3,935	3,987	3,787
South Dakota	12	11	611	631	613	681	681	728	690	725
Tennessee	15	10	5,791	5,518	5,676	5,914	6,041	6,193	6,236	6,373
Texas	23	8	20,390	21,008	21,403	21,849	22,201	23,030	23,482	23,752
Utah	14	6	2,046	2,095	2,109	2,166	2,220	2,251	2,276	2,328
Vermont	10	18	421	435	398	463	431	485	471	509
Virgin Islands	4	13	*	*	*	*	*	*	117	117
Virginia	14	8	6,242	6,856	6,596	7,250	7,440	7,595	7,622	7,785
Washington	14	8	5,461	5,624	5,671	5,816	5,965	6,022	6,118	6,259
West Virginia	16	24	1,236	1,295	1,315	1,401	1,406	1,500	1,506	1,662
Wisconsin	16	12	3,966	4,265	4,317	4,546	4,599	4,730	4,895	4,939
Wyoming	13	11	457	484	429	517	501	526	514	533
Nationwide	192	10 %	255,729	261,284	265,332	274,283	278,918	285,118	290,318	298,293

Source: FCC Form 477.

* = Data withheld to maintain firm confidentiality. Some previously published data for June 2011 have been revised.

% Resold is the percentage of mobile telephony subscribers purchasing their service subscriptions from a mobile wireless reseller.

Table B-3
Economic Area Penetration Rates, 2010

Rank	EA	EA Name	2010 Subscribers	2010 Estimated EA Population	2010 Penetration Rate	2010 HHI	2009 HHI	2010 EA Density
1	57	Detroit-Ann Arbor-Flint, MI	8,144,570	6,827,726	119%	2797	2815	363.64
2	155	Farmington, NM-CO	243,546	221,760	110%	3968	4008	18.42
3	71	Nashville, TN-KY	3,086,681	2,856,296	108%	2543	2562	124.84
4	83	New Orleans, LA-MS (see note 1)	1,754,176	1,622,143	108%	3161	3188	208.68
5	89	Monroe, LA	364,766	338,416	108%	3962	4386	58.18
6	13	Washington-Baltimore, DC-MD-VA-WV-PA	10,169,094	9,515,921	107%	2695	2683	470.53
7	22	Fayetteville, NC	609,724	571,898	107%	2882	2826	179.53
8	20	Norfolk-Virginia Beach-Newport News, VA-NC	1,935,635	1,835,870	105%	2795	2760	332.78
9	10	New York-North New Jersey-Long Island, NY-NJ-CT-PA	27,618,277	26,663,330	104%	2549	2556	962.03
10	44	Knoxville, TN	1,155,704	1,106,120	104%	2681	2713	193.46
11	85	Lafayette, LA	663,359	638,768	104%	5230	4703	115.08
12	90	Little Rock-North Little Rock, AR	1,788,778	1,719,570	104%	4002	4174	50.25
13	97	Springfield, IL-MO	539,422	520,982	104%	3754	3824	59.25
14	55	Cleveland-Akron, OH-PA	4,715,781	4,583,408	103%	3905	3763	423.84
15	74	Huntsville, AL-TN (see note 2)	1,136,200	1,105,409	103%	3298	*	137.29
16	122	Wichita, KS-OK	1,241,722	1,210,018	103%	2837	2943	21.16
17	87	Beaumont-Port Arthur, TX	472,148	460,666	102%	3383	3303	94.06
18	141	Denver-Boulder-Greeley, CO-KS-NE	4,730,036	4,629,314	102%	2435	2387	61.37
19	31	Miami-Fort Lauderdale, FL	6,386,042	6,291,880	101%	2278	2238	604.61
20	73	Memphis, TN-AR-MS-KY	2,016,120	2,001,223	101%	2503	2585	112.64
21	161	San Diego, CA	3,120,589	3,095,313	101%	2545	2543	735.82
22	15	Richmond-Petersburg, VA	1,638,381	1,636,548	100%	3305	3216	144.19
23	40	Atlanta, GA-AL-NC	6,665,242	6,690,595	100%	2534	2452	307.26
24	78	Birmingham, AL	1,689,579	1,692,233	100%	3112	2568	149.68
25	79	Montgomery, AL	506,294	507,613	100%	3218	2654	71.58
26	80	Mobile, AL	723,113	724,956	100%	3217	3148	81.94
27	86	Lake Charles, LA	554,261	555,838	100%	4008	3397	57.51
28	88	Shreveport-Bossier City, LA-AR	591,037	591,759	100%	3578	3871	62.25
29	111	Minot, ND	115,956	116,439	100%	4611	4360	7.53
30	135	Odessa-Midland, TX	424,740	426,631	100%	3492	3521	11.16
31	12	Philadelphia-Wilmington-Atlantic City, PA-NJ-DE-MD	7,631,271	7,735,541	99%	2541	2498	854.00
32	45	Johnson City-Kingsport-Bristol, TN-VA	604,444	609,299	99%	3985	3801	154.77
33	51	Columbus, OH	2,570,369	2,594,734	99%	3334	3157	212.13
34	64	Chicago-Gary-Kenosha, IL-IN-WI	10,605,086	10,758,118	99%	2092	2070	585.21
35	81	Pensacola, FL	679,176	684,856	99%	2944	2732	188.36
36	82	Biloxi-Gulfport-Pascagoula, MS	408,698	411,066	99%	2611	2545	152.55
37	3	Boston-Worcester-Lawrence-Lowewell-Brockton, MA-NH	8,042,440	8,228,930	98%	2819	2752	454.10
38	50	Dayton-Springfield, OH	1,098,598	1,122,314	98%	2716	2607	317.23
39	127	Dallas-Fort Worth, TX-AR-OK	8,916,433	9,092,705	98%	2639	2614	145.29
40	131	Houston-Galveston-Brazoria, TX	6,817,107	6,949,709	98%	2311	2268	217.08
41	17	Roanoke, VA-NC-WV	853,591	882,328	97%	2406	2384	105.61

Rank	EA	EA Name	2010 Subscribers	2010 Estimated EA Population	2010 Penetration Rate	2010 HHI	2009 HHI	2010 EA Density
42	34	Tampa-St. Petersburg-Clearwater, FL	2,703,053	2,783,243	97%	2255	2257	1107.35
43	37	Albany, GA	479,234	496,206	97%	3651	2985	67.88
44	49	Cincinnati-Hamilton, OH-KY-IN	2,236,449	2,315,121	97%	2376	2287	315.95
45	93	Joplin, MO-KS-OK	272,286	280,505	97%	3404	3464	80.07
46	170	Seattle-Tacoma-Bremerton, WA	4,546,071	4,686,669	97%	2746	2702	223.72
47	29	Jacksonville, FL-GA	2,118,267	2,217,013	96%	2395	2342	139.32
48	53	Pittsburgh, PA-WV	2,793,348	2,912,497	96%	3273	3185	281.42
49	84	Baton Rouge, LA-MS	805,711	835,783	96%	4757	4896	165.71
50	99	Kansas City, MO-KS	2,590,795	2,693,265	96%	2297	2289	98.17
51	121	North Platte, NE-CO	59,377	61,592	96%	5232	5304	4.97
52	132	Corpus Christi, TX	551,484	571,987	96%	2259	2144	49.50
53	143	Casper, WY-ID-UT	451,160	467,797	96%	5362	5350	5.95
54	172	Honolulu, HI	1,305,368	1,360,301	96%	2435	2372	211.80
55	8	Buffalo-Niagara Falls, NY-PA	1,393,168	1,460,584	95%	3237	3240	207.96
56	23	Charlotte-Gastonia-Rock Hill, NC-SC	2,425,206	2,546,100	95%	3067	3044	306.74
57	35	Tallahassee, FL-GA	760,482	801,642	95%	3377	3116	73.33
58	42	Asheville, NC	486,196	512,200	95%	4337	4273	149.32
59	43	Chattanooga, TN-GA	759,055	797,154	95%	3765	3719	164.87
60	96	St. Louis, MO-IL	3,495,178	3,690,263	95%	2715	2669	134.20
61	130	Austin-San Marcos, TX	1,731,603	1,830,206	95%	2685	2633	215.23
62	133	McAllen-Edinburg-Mission, TX	1,207,080	1,264,091	95%	2947	2758	295.66
63	160	Los Angeles-Riverside-Orange County, CA-AZ	18,795,215	19,800,937	95%	2423	2365	317.78
64	163	San Francisco-Oakland-San Jose, CA	9,256,899	9,759,108	95%	2706	2662	295.35
65	27	Augusta-Aiken, GA-SC	616,354	658,679	94%	3394	3249	99.77
66	39	Columbus, GA-AL	501,769	532,508	94%	3453	3063	91.94
67	77	Jackson, MS-AL-LA	1,392,896	1,484,806	94%	3272	3451	52.27
68	95	Jonesboro, AR-MO	292,042	311,312	94%	4956	5041	53.15
69	107	Minneapolis-St. Paul, MN-WI-IA	4,600,520	4,895,391	94%	2776	2689	95.22
70	125	Oklahoma City, OK	1,774,072	1,882,087	94%	3170	3100	73.12
71	153	Las Vegas, NV-AZ-UT	2,257,403	2,403,936	94%	2139	2137	33.58
72	18	Greensboro-Winston-Salem-High Point, NC-VA	1,902,306	2,037,966	93%	2839	2751	210.33
73	26	Charleston-North Charleston, SC	651,296	703,499	93%	3048	3011	193.02
74	36	Dothan, AL-FL-GA	334,103	358,396	93%	3697	2709	58.91
75	38	Macon, GA	785,242	844,429	93%	4420	3884	70.12
76	56	Toledo, OH	1,192,460	1,279,418	93%	4833	4739	163.83
77	69	Evansville-Henderson, IN-KY-IL	819,557	878,433	93%	4265	4380	78.90
78	70	Louisville, KY-IN	1,444,207	1,558,777	93%	2505	2471	202.83
79	110	Grand Forks, ND-MN	207,425	222,571	93%	4872	4824	10.17
80	115	Rapid City, SD-MT-ND-NE	213,980	230,086	93%	4982	4954	5.44
81	124	Tulsa, OK-KS	1,380,839	1,478,165	93%	3124	3080	79.66
82	128	Abilene, TX	209,065	225,538	93%	3628	3539	20.76
83	134	San Antonio, TX	2,467,182	2,650,971	93%	2349	2162	103.71
84	142	Scottsbluff, NE-WY	85,300	91,571	93%	6512	6572	7.75
85	5	Albany-Schenectady-Troy, NY	1,127,732	1,222,542	92%	3505	3435	145.41
86	28	Savannah, GA-SC	730,792	796,055	92%	2650	2450	115.59

Rank	EA	EA Name	2010 Subscribers	2010 Estimated EA Population	2010 Penetration Rate	2010 HHI	2009 HHI	2010 EA Density
87	63	Milwaukee-Racine, WI	2,158,667	2,343,622	92%	2115	2100	394.30
88	101	Peoria-Pekin, IL	491,551	534,159	92%	3510	3512	93.32
89	103	Cedar Rapids, IA	392,928	426,881	92%	2624	2588	112.99
90	144	Billings, MT-WY	417,317	452,040	92%	5378	5408	5.49
91	171	Anchorage, AK	637,654	695,370	92%	3860	3604	1.24
92	2	Portland, ME	717,366	784,594	91%	2987	2852	109.86
93	6	Syracuse, NY-PA	1,756,216	1,922,300	91%	4048	4033	109.15
94	7	Rochester, NY-PA	1,379,028	1,509,579	91%	4348	4368	172.43
95	19	Raleigh-Durham-Chapel Hill, NC	2,106,083	2,307,548	91%	2868	2859	241.39
96	24	Columbia, SC	966,939	1,059,254	91%	3301	3218	148.75
97	25	Wilmington, NC-SC	955,950	1,054,975	91%	2958	2837	132.16
98	30	Orlando, FL	4,152,448	4,562,642	91%	2402	2426	372.58
99	41	Greenville-Spartanburg-Anderson, SC-NC	1,272,075	1,392,816	91%	3536	3367	211.23
100	67	Indianapolis, IN-IL	3,049,092	3,335,590	91%	3221	3135	187.73
101	116	Sioux Falls, SD-IA-MN-NE	506,574	558,647	91%	5275	5160	16.58
102	152	Salt Lake City-Ogden, UT-ID	2,316,352	2,558,128	91%	2453	2333	45.48
103	167	Portland-Salem, OR-WA	3,012,676	3,311,677	91%	2631	2546	88.54
104	9	State College, PA	731,279	808,730	90%	4202	4116	92.77
105	16	Staunton, VA-WV	324,384	360,886	90%	2833	2886	55.30
106	66	Fort Wayne, IN	673,186	748,680	90%	3653	3563	164.88
107	98	Columbia, MO	366,130	406,350	90%	3900	3991	64.65
108	102	Davenport-Moline-Rock Island, IA-IL	506,016	559,935	90%	2708	2640	110.49
109	106	Rochester, MN-IA-WI	307,686	341,710	90%	3550	3528	60.49
110	118	Omaha, NE-IA-MO	1,022,611	1,130,768	90%	3125	2950	68.03
111	137	Lubbock, TX	365,108	406,628	90%	2756	2750	29.57
112	154	Flagstaff, AZ-UT	426,658	474,774	90%	4317	4202	9.79
113	72	Paducah, KY-IL	204,419	230,924	89%	5235	5457	76.17
114	75	Tupelo, MS-AL-TN	565,813	633,772	89%	4923	5319	51.04
115	112	Bismarck, ND-MT-SD	166,270	186,962	89%	5058	5047	6.83
116	119	Lincoln, NE	363,816	410,339	89%	4985	4825	54.65
117	120	Grand Island, NE	256,147	287,927	89%	6182	6209	11.59
118	126	Western Oklahoma, OK	126,903	142,644	89%	2389	2306	12.36
119	138	Amarillo, TX-NM	453,408	511,635	89%	2705	2681	12.57
120	146	Missoula, MT	400,732	447,771	89%	6244	6359	12.26
121	156	Albuquerque, NM-AZ	956,395	1,078,891	89%	3016	2943	24.50
122	48	Charleston, WV-KY-OH	1,054,362	1,191,822	88%	3675	3575	85.66
123	61	Traverse City, MI	267,689	303,041	88%	4516	2951	55.43
124	139	Santa Fe, NM	240,530	274,264	88%	4388	4258	13.88
125	140	Pueblo, CO-NM	257,116	291,784	88%	3372	3202	9.12
126	148	Idaho Falls, ID-WY	320,730	365,056	88%	4546	4512	13.12
127	157	El Paso, TX-NM	983,351	1,112,036	88%	2303	2278	38.58
128	158	Phoenix-Mesa, AZ-NM	3,817,971	4,351,644	88%	2814	2792	120.37
129	159	Tucson, AZ	1,017,410	1,159,029	88%	2765	2732	69.86
130	164	Sacramento-Yolo, CA	2,382,826	2,722,415	88%	2706	2831	227.21
131	21	Greenville, NC	814,190	930,805	87%	2617	2599	109.57
132	59	Green Bay, WI-MI	597,505	687,392	87%	2496	2476	35.90

Rank	EA	EA Name	2010 Subscribers	2010 Estimated EA Population	2010 Penetration Rate	2010 HHI	2009 HHI	2010 EA Density
133	68	Champaign-Urbana, IL	558,652	644,865	87%	3634	3546	75.45
134	91	Fort Smith, AR-OK	309,357	356,101	87%	4091	4084	51.64
135	100	Des Moines, IA-IL-MO	1,526,765	1,755,021	87%	3070	2998	49.65
136	117	Sioux City, IA-NE-SD	220,132	252,009	87%	4332	4209	39.54
137	166	Eugene-Springfield, OR-CA	745,059	859,318	87%	2569	2454	47.11
138	1	Bangor, ME	467,927	543,767	86%	3816	4015	22.94
139	11	Harrisburg-Lebanon-Carlisle, PA	1,076,009	1,244,058	86%	3426	3297	327.56
140	52	Wheeling, WV-OH	268,549	312,837	86%	4465	4446	120.62
141	108	Wausau, WI	426,580	494,992	86%	1878	1903	35.78
142	109	Duluth-Superior, MN-WI	303,022	354,182	86%	4331	4179	19.96
143	113	Fargo-Moorhead, ND-MN	343,232	400,274	86%	4814	4470	18.17
144	123	Topeka, KS	411,462	476,322	86%	2775	2665	37.84
145	129	San Angelo, TX	183,002	212,086	86%	2018	2049	10.62
146	136	Hobbs, NM-TX	180,055	209,606	86%	3217	3144	12.38
147	145	Great Falls, MT	141,562	164,985	86%	5262	5104	4.21
148	147	Spokane, WA-ID	803,337	932,290	86%	3613	3553	26.90
149	151	Reno, NV-CA	680,074	786,501	86%	3131	2624	8.96
150	169	Richland-Kennewick-Pasco, WA	688,204	797,338	86%	2812	2757	33.02
151	4	Burlington, VT-NY	534,186	625,288	85%	4741	5443	63.18
152	14	Salisbury, MD-DE-VA	354,971	419,355	85%	5624	5769	151.96
153	32	FortMyers-Cape Coral, FL	801,899	940,274	85%	2407	2403	337.88
154	46	Hickory-Morganton, NC-TN	477,304	558,291	85%	2833	2795	143.29
155	60	Appleton-Oshkosh-Neenah, WI	400,503	469,566	85%	2473	2545	169.88
156	62	Grand Rapids-Muskegon-Holland, MI	1,670,535	1,962,250	85%	3017	2817	222.31
157	76	Greenville, MS	183,553	214,872	85%	3570	3941	35.93
158	94	Springfield, MO	840,787	987,431	85%	3677	3662	56.01
159	104	Madison, WI-IA-IL	867,440	1,019,465	85%	3262	3316	79.73
160	149	Twin Falls, ID	157,373	185,790	85%	4553	4400	16.17
161	65	Elkhart-Goshen, IN-MI	805,952	954,029	84%	3186	3022	192.92
162	150	Boise City, ID-OR	615,273	728,993	84%	3158	3050	17.46
163	165	Redding, CA-OR	303,630	361,652	84%	3171	3036	15.82
164	33	Sarasota-Bradenton, FL	747,214	897,121	83%	2667	2676	342.92
165	47	Lexington, KY-TN-VA-WV	1,603,636	1,936,486	83%	3678	3406	85.01
166	54	Erie, PA	425,121	513,834	83%	4280	4196	116.84
167	114	Aberdeen, SD	64,371	79,541	81%	4916	4914	5.34
168	92	Fayetteville-Springdale-Rogers, AR-MO-OK	423,161	527,374	80%	4621	4654	117.86
169	162	Fresno, CA	1,329,176	1,676,476	79%	2929	2926	117.16
170	105	La Crosse, WI-MN	197,899	257,376	77%	3955	3863	58.27
171	168	Pendleton, OR-WA	161,844	209,568	77%	3292	3068	9.08
172	58	Northern Michigan, MI	*	265,125	*	*	4229	29.42

Table B-4
Economic Area Penetration Rates, 2011

Rank	EA	EA Name	2011 Subscribers	2011 Estimated EA Population	2011 Penetration Rate	2011 HHI	2010 HHI	2010 EA Density
1	89	Monroe, LA	458,053	339,417	135%	3482	3962	58.18
2	83	New Orleans, LA-MS (see note 1)	2,075,641	1,646,884	126%	3189	3161	208.68
3	90	Little Rock-North Little Rock, AR	2,155,453	1,729,237	125%	3526	4002	50.25
4	57	Detroit-Ann Arbor-Flint, MI	8,274,351	6,812,289	121%	2800	2797	363.64
5	88	Shreveport-Bossier City, LA-AR	723,249	595,987	121%	3263	3578	62.25
6	84	Baton Rouge, LA-MS	968,574	841,074	115%	4114	4757	165.71
7	85	Lafayette, LA	738,132	642,623	115%	4512	5230	115.08
8	86	Lake Charles, LA	638,486	557,894	114%	3487	4008	57.51
9	13	Washington-Baltimore, DC-MD-VA-WV-PA	10,969,440	9,665,489	113%	2695	2695	470.53
10	55	Cleveland-Akron, OH-PA	5,137,545	4,567,276	112%	3948	3905	423.84
11	71	Nashville, TN-KY	3,187,570	2,891,926	110%	2584	2543	124.84
12	20	Norfolk-Virginia Beach-Newport News, VA-NC	2,002,123	1,843,290	109%	2823	2795	332.78
13	22	Fayetteville, NC	630,082	580,463	109%	2885	2882	179.53
14	44	Knoxville, TN	1,198,147	1,114,089	108%	2714	2681	193.46
15	95	Jonesboro, AR-MO	336,485	312,738	108%	4376	4956	53.15
16	97	Springfield, IL-MO	564,493	521,658	108%	3713	3754	59.25
17	10	New York-North New Jersey-Long Island, NY-NJ-CT-PA	28,714,909	26,794,978	107%	2582	2549	962.03
18	73	Memphis, TN-AR-MS-KY	2,147,974	2,009,670	107%	2507	2503	112.64
19	40	Atlanta, GA-AL-NC	7,167,905	6,785,467	106%	2570	2534	307.26
20	74	Huntsville, AL-TN	1,178,260	1,115,293	106%	3329	3298	137.29
21	135	Odessa-Midland, TX	459,810	434,245	106%	3474	3492	11.16
22	17	Roanoke, VA-NC-WV	927,256	883,035	105%	2375	2406	105.61
23	31	Miami-Fort Lauderdale, FL	6,717,750	6,402,630	105%	2286	2278	604.61
24	49	Cincinnati-Hamilton, OH-KY-IN	2,448,002	2,322,713	105%	2437	2376	315.95
25	64	Chicago-Gary-Kenosha, IL-IN-WI	11,289,855	10,799,171	105%	2120	2092	585.21
26	78	Birmingham, AL	1,776,279	1,697,065	105%	3035	3112	149.68
27	87	Beaumont-Port Arthur, TX	484,569	462,951	105%	3383	3383	94.06
28	111	Minot, ND	128,558	122,158	105%	5542	4611	7.53
29	122	Wichita, KS-OK	1,276,168	1,214,543	105%	2821	2837	21.16
30	15	Richmond-Petersburg, VA	1,718,120	1,649,259	104%	3338	3305	144.19
31	50	Dayton-Springfield, OH	1,165,155	1,124,990	104%	2722	2716	317.23
32	51	Columbus, OH	2,731,253	2,616,652	104%	3417	3334	212.13
33	80	Mobile, AL	756,410	727,775	104%	3150	3217	81.94
34	91	Fort Smith, AR-OK	373,264	357,614	104%	3628	4091	51.64
35	93	Joplin, MO-KS-OK	291,808	281,641	104%	3270	3404	80.07
36	155	Farmington, NM-CO	228,188	220,320	104%	3276	3968	18.42
37	81	Pensacola, FL	710,648	692,493	103%	2979	2944	188.36
38	82	Biloxi-Gulfport-Pascagoula, MS	430,428	416,301	103%	2491	2611	152.55
39	161	San Diego, CA	3,222,397	3,140,069	103%	2581	2545	735.82
40	3	Boston-Worcester-Lawrence-Lowewell-Brockton, MA-NH	8,425,112	8,269,599	102%	2841	2819	454.10

Rank	EA	EA Name	2011 Subscribers	2011 Estimated EA Population	2011 Penetration Rate	2011 HHI	2010 HHI	2010 EA Density
41	37	Albany, GA	508,306	500,696	102%	3801	3651	67.88
42	45	Johnson City-Kingsport-Bristol, TN-VA	621,925	610,979	102%	4182	3985	154.77
43	77	Jackson, MS-AL-LA	1,519,273	1,489,453	102%	3031	3272	52.27
44	79	Montgomery, AL	520,103	510,331	102%	3325	3218	71.58
45	96	St. Louis, MO-IL	3,755,425	3,695,280	102%	2728	2715	134.20
46	99	Kansas City, MO-KS	2,777,661	2,711,442	102%	2357	2297	98.17
47	124	Tulsa, OK-KS	1,511,369	1,488,465	102%	2926	3124	79.66
48	125	Oklahoma City, OK	1,951,310	1,909,018	102%	2988	3170	73.12
49	141	Denver-Boulder-Greeley, CO-KS-NE	4,877,827	4,771,435	102%	2479	2435	61.37
50	12	Philadelphia-Wilmington-Atlantic City, PA-NJ-DE-MD	7,815,137	7,769,167	101%	2619	2541	854.00
51	34	Tampa-St. Petersburg-Clearwater, FL	2,856,416	2,824,724	101%	2247	2255	1107.35
52	38	Macon, GA	857,647	846,727	101%	4358	4420	70.12
53	53	Pittsburgh, PA-WV	2,937,221	2,918,820	101%	3256	3273	281.42
54	127	Dallas-Fort Worth, TX-AR-OK	9,389,830	9,267,314	101%	2617	2639	145.29
55	131	Houston-Galveston-Brazoria, TX	7,153,583	7,096,831	101%	2318	2311	217.08
56	132	Corpus Christi, TX	579,417	575,767	101%	2306	2259	49.50
57	8	Buffalo-Niagara Falls, NY-PA	1,458,811	1,457,692	100%	3255	3237	207.96
58	27	Augusta-Aiken, GA-SC	664,143	662,073	100%	3426	3394	99.77
59	76	Greenville, MS	211,737	212,534	100%	2958	3570	35.93
60	170	Seattle-Tacoma-Bremerton, WA	4,757,382	4,759,995	100%	2763	2746	223.72
61	39	Columbus, GA-AL	537,726	540,988	99%	3553	3453	91.94
62	43	Chattanooga, TN-GA	794,677	804,277	99%	3755	3765	164.87
63	153	Las Vegas, NV-AZ-UT	2,392,703	2,427,997	99%	2139	2139	33.58
64	172	Honolulu, HI	1,360,047	1,374,810	99%	2497	2435	211.80
65	23	Charlotte-Gastonia-Rock Hill, NC-SC	2,531,358	2,585,168	98%	3068	3067	306.74
66	29	Jacksonville, FL-GA	2,194,684	2,235,272	98%	2440	2395	139.32
67	42	Asheville, NC	503,922	516,165	98%	4357	4337	149.32
68	48	Charleston, WV-KY-OH	1,169,639	1,189,978	98%	3618	3675	85.66
69	56	Toledo, OH	1,250,542	1,276,867	98%	4847	4833	163.83
70	107	Minneapolis-St. Paul, MN-WI-IA	4,814,650	4,935,666	98%	2815	2776	95.22
71	152	Salt Lake City-Ogden, UT-ID	2,547,432	2,607,105	98%	2460	2453	45.48
72	163	San Francisco-Oakland-San Jose, CA	9,660,732	9,878,548	98%	2720	2706	295.35
73	18	Greensboro-Winston-Salem-High Point, NC-VA	1,985,653	2,050,096	97%	2770	2839	210.33
74	63	Milwaukee-Racine, WI	2,277,706	2,350,437	97%	2119	2115	394.30
75	75	Tupelo, MS-AL-TN	615,545	632,748	97%	4375	4923	51.04
76	101	Peoria-Pekin, IL	518,825	534,320	97%	3474	3510	93.32
77	103	Cedar Rapids, IA	417,523	431,788	97%	2645	2624	112.99
78	126	Western Oklahoma, OK	138,170	142,868	97%	2512	2389	12.36
79	133	McAllen-Edinburg-Mission, TX	1,260,327	1,295,743	97%	2823	2947	295.66
80	143	Casper, WY-ID-UT	457,094	471,152	97%	5745	5362	5.95
81	160	Los Angeles-Riverside-Orange County, CA-AZ	19,434,044	20,030,472	97%	2415	2423	317.78
82	2	Portland, ME	755,563	785,578	96%	3036	2987	109.86
83	5	Albany-Schenectady-Troy, NY	1,178,650	1,221,867	96%	3524	3505	145.41
84	16	Staunton, VA-WV	346,555	362,494	96%	2740	2833	55.30
85	35	Tallahassee, FL-GA	776,081	804,577	96%	3540	3377	73.33

Rank	EA	EA Name	2011 Subscribers	2011 Estimated EA Population	2011 Penetration Rate	2011 HHI	2010 HHI	2010 EA Density
86	69	Evansville-Henderson, IN-KY-IL	844,377	880,549	96%	4190	4265	78.90
87	128	Abilene, TX	217,625	226,736	96%	3687	3628	20.76
88	142	Scottsbluff, NE-WY	88,210	91,930	96%	6618	6512	7.75
89	6	Syracuse, NY-PA	1,829,121	1,919,717	95%	3989	4048	109.15
90	7	Rochester, NY-PA	1,437,945	1,511,076	95%	4343	4348	172.43
91	28	Savannah, GA-SC	771,037	812,467	95%	2766	2650	115.59
92	67	Indianapolis, IN-IL	3,178,798	3,361,472	95%	3199	3221	187.73
93	70	Louisville, KY-IN	1,488,560	1,572,568	95%	2545	2505	202.83
94	134	San Antonio, TX	2,583,790	2,712,451	95%	2403	2349	103.71
95	171	Anchorage, AK	685,577	722,718	95%	3971	3860	1.24
96	19	Raleigh-Durham-Chapel Hill, NC	2,211,194	2,354,055	94%	2854	2868	241.39
97	24	Columbia, SC	1,005,951	1,067,909	94%	3260	3301	148.75
98	25	Wilmington, NC-SC	1,001,219	1,068,577	94%	2940	2958	132.16
99	26	Charleston-North Charleston, SC	678,671	720,732	94%	3076	3048	193.02
100	30	Orlando, FL	4,334,548	4,613,431	94%	2392	2402	372.58
101	41	Greenville-Spartanburg-Anderson, SC-NC	1,323,891	1,406,681	94%	3525	3536	211.23
102	102	Davenport-Moline-Rock Island, IA-IL	529,088	561,329	94%	2779	2708	110.49
103	130	Austin-San Marcos, TX	1,790,002	1,897,782	94%	2723	2685	215.23
104	52	Wheeling, WV-OH	289,486	310,497	93%	4169	4465	120.62
105	66	Fort Wayne, IN	698,716	751,382	93%	3551	3653	164.88
106	98	Columbia, MO	381,980	409,900	93%	3918	3900	64.65
107	118	Omaha, NE-IA-MO	1,058,891	1,142,021	93%	3558	3125	68.03
108	120	Grand Island, NE	268,856	288,672	93%	6397	6182	11.59
109	154	Flagstaff, AZ-UT	444,215	475,879	93%	4287	4317	9.79
110	158	Phoenix-Mesa, AZ-NM	4,091,966	4,421,655	93%	2778	2814	120.37
111	167	Portland-Salem, OR-WA	3,121,788	3,357,476	93%	2711	2631	88.54
112	59	Green Bay, WI-MI	636,127	690,592	92%	2478	2496	35.90
113	100	Des Moines, IA-IL-MO	1,625,406	1,763,455	92%	3046	3070	49.65
114	106	Rochester, MN-IA-WI	316,213	343,343	92%	3770	3550	60.49
115	119	Lincoln, NE	379,305	414,519	92%	5015	4985	54.65
116	137	Lubbock, TX	378,180	412,096	92%	2792	2756	29.57
117	1	Bangor, ME	491,109	542,610	91%	3783	3816	22.94
118	36	Dothan, AL-FL-GA	327,635	359,581	91%	4128	3697	58.91
119	72	Paducah, KY-IL	209,821	231,799	91%	5116	5235	76.17
120	110	Grand Forks, ND-MN	203,143	222,266	91%	5549	4872	10.17
121	112	Bismarck, ND-MT-SD	172,772	190,396	91%	5809	5058	6.83
122	116	Sioux Falls, SD-IA-MN-NE	511,142	564,258	91%	6028	5275	16.58
123	144	Billings, MT-WY	418,637	457,766	91%	6305	5378	5.49
124	148	Idaho Falls, ID-WY	336,424	368,259	91%	4534	4546	13.12
125	4	Burlington, VT-NY	562,739	625,909	90%	4704	4741	63.18
126	11	Harrisburg-Lebanon-Carlisle, PA	1,118,834	1,249,826	90%	3445	3426	327.56
127	14	Salisbury, MD-DE-VA	381,992	423,086	90%	5152	5624	151.96
128	21	Greenville, NC	843,035	939,700	90%	2602	2617	109.57
129	68	Champaign-Urbana, IL	580,227	644,710	90%	3682	3634	75.45
130	109	Duluth-Superior, MN-WI	318,459	354,104	90%	4464	4331	19.96
131	117	Sioux City, IA-NE-SD	227,061	252,468	90%	4532	4332	39.54

Rank	EA	EA Name	2011 Subscribers	2011 Estimated EA Population	2011 Penetration Rate	2011 HHI	2010 HHI	2010 EA Density
132	123	Topeka, KS	432,247	480,174	90%	2843	2775	37.84
133	129	San Angelo, TX	192,395	213,699	90%	2056	2018	10.62
134	146	Missoula, MT	404,844	450,512	90%	7178	6244	12.26
135	147	Spokane, WA-ID	843,659	938,472	90%	3586	3613	26.90
136	151	Reno, NV-CA	709,945	790,284	90%	3110	3131	8.96
137	156	Albuquerque, NM-AZ	982,346	1,093,971	90%	3006	3016	24.50
138	157	El Paso, TX-NM	1,019,582	1,138,294	90%	2309	2303	38.58
139	159	Tucson, AZ	1,056,388	1,170,534	90%	2792	2765	69.86
140	164	Sacramento-Yolo, CA	2,467,715	2,750,240	90%	2727	2706	227.21
141	9	State College, PA	716,047	808,608	89%	4648	4202	92.77
142	108	Wausau, WI	440,797	494,774	89%	2010	1878	35.78
143	138	Amarillo, TX-NM	459,052	518,396	89%	2857	2705	12.57
144	166	Eugene-Springfield, OR-CA	768,984	862,591	89%	2651	2569	47.11
145	32	FortMyers-Cape Coral, FL	842,445	959,464	88%	2402	2407	337.88
146	60	Appleton-Oshkosh-Neenah, WI	413,895	472,360	88%	2510	2473	169.88
147	65	Elkhart-Goshen, IN-MI	835,631	954,908	88%	3170	3186	192.92
148	94	Springfield, MO	875,097	992,056	88%	3641	3677	56.01
149	104	Madison, WI-IA-IL	907,679	1,028,366	88%	3276	3262	79.73
150	113	Fargo-Moorhead, ND-MN	353,547	403,738	88%	5354	4814	18.17
151	115	Rapid City, SD-MT-ND-NE	206,190	233,100	88%	5570	4982	5.44
152	139	Santa Fe, NM	243,841	275,926	88%	4544	4388	13.88
153	140	Pueblo, CO-NM	258,111	292,801	88%	3418	3372	9.12
154	149	Twin Falls, ID	164,476	187,012	88%	4504	4553	16.17
155	169	Richland-Kennewick-Pasco, WA	721,633	817,054	88%	2803	2812	33.02
156	54	Erie, PA	445,732	513,451	87%	4159	4280	116.84
157	62	Grand Rapids-Muskegon-Holland, MI	1,717,307	1,970,340	87%	3088	3017	222.31
158	150	Boise City, ID-OR	641,573	738,945	87%	3226	3158	17.46
159	165	Redding, CA-OR	315,001	361,698	87%	3299	3171	15.82
160	33	Sarasota-Bradenton, FL	780,194	904,760	86%	2640	2667	342.92
161	46	Hickory-Morganton, NC-TN	478,542	557,096	86%	2973	2833	143.29
162	145	Great Falls, MT	143,364	166,016	86%	6315	5262	4.21
163	92	Fayetteville-Springdale-Rogers, AR-MO-OK	459,143	538,075	85%	4428	4621	117.86
164	47	Lexington, KY-TN-VA-WV	1,615,365	1,944,706	83%	3548	3678	85.01
165	105	La Crosse, WI-MN	212,340	259,058	82%	4031	3955	58.27
166	162	Fresno, CA	1,376,621	1,698,847	81%	2953	2929	117.16
167	168	Pendleton, OR-WA	168,511	211,070	80%	3337	3292	9.08
168	136	Hobbs, NM-TX	168,033	211,473	79%	2966	3217	12.38
169	58	Northern Michigan, MI	*	264,490	*	*	*	29.42
170	61	Traverse City, MI	*	303,792	*	*	4516	55.43
171	114	Aberdeen, SD	*	80,144	*	*	4916	5.34
172	121	North Platte, NE-CO	*	61,527	*	*	5232	4.97

* = Data withheld to maintain firm confidentiality.
Source: Federal Communications Commission internal analysis based on year-end 2011 filings for Numbering Resource Utilization in the United States, adjusted for porting. Density is persons per square mile.

Table B-5
Mobile Wireless Devices Capable of Sending or Receiving Data at Speeds Above 200 kbps and Subscribers with Data Plans for Full Internet Access as of December 31, 2011 (in Thousands)

State	Capable Devices in Service	Subscribers with Full Internet Access
Alabama	2,417	1,839
Alaska	367	334
American Samoa	0	0
Arizona	3,418	2,618
Arkansas	1,611	1,214
California	22,945	18,369
Colorado	3,231	2,533
Connecticut	2,285	1,732
Delaware	565	424
District of Columbia	1,055	963
Florida	10,140	8,267
Georgia	5,636	4,435
Guam	*	*
Hawaii	894	720
Idaho	876	628
Illinois	8,097	6,231
Indiana	3,370	2,446
Iowa	1,474	933
Kansas	1,804	1,392
Kentucky	2,349	1,685
Louisiana	2,710	2,177
Maine	586	373
Maryland	3,780	2,992
Massachusetts	4,006	3,084
Michigan	5,332	4,036
Minnesota	3,135	2,367
Mississippi	1,541	1,245
Missouri	3,544	2,656
Montana	*	*
Nebraska	1,011	686
Nevada	1,703	1,388
New Hampshire	691	482
New Jersey	5,753	4,379
New Mexico	1,029	782
New York	11,789	9,301
North Carolina	5,153	3,830
North Dakota	426	298
Northern Mariana Isl.	*	*
Ohio	6,679	4,908
Oklahoma	2,136	1,620
Oregon	2,294	1,705
Pennsylvania	7,131	5,389
Puerto Rico	1,581	1,078
Rhode Island	607	447
South Carolina	2,192	1,607
South Dakota	*	*
Tennessee	3,743	2,766
Texas	16,252	13,613
Utah	1,580	1,209
Vermont	311	201
Virgin Islands	*	*

Virginia	5,133	3,896
Washington	4,284	3,297
West Virginia	788	567
Wisconsin	2,797	1,920
Wyoming	323	228
Nationwide	183,666	142,066

Source: FCC Form 477.

* = Data withheld to maintain form confidentiality.

Table B-6
Network Performance Results, Average Data Speeds for Laptops and Smartphones, PCWorld, March 2011[1]

Provider	Laptops		Smartphones	
	Average Download Speed (Mbps)	Average Upload Speed (Mbps)	Average Download Speed (Mbps)	Average Upload Speed (Mbps)
AT&T	2.48	1.05	1.45	0.97
Sprint Nextel	2.15	0.61	1.5	0.56
T-Mobile	2.83	0.85	2.28	0.95
Verizon Wireless	6.44	5	1.01	0.67

Table B-7
Network Performance Results, Average Data Speeds for 3G and 4G Networks, PCWorld, April 2012[2]

Provider	3G		4G	
	Average Download Speed (Mbps)	Average Upload Speed (Mbps)	Average Download Speed (Mbps)	Average Upload Speed (Mbps)
AT&T	2.62	0.85	9.12	4.91
Sprint Nextel	0.59	0.56	2.81	0.97
T-Mobile	3.84	1.44	5.53	1.32
Verizon Wireless	1.05	0.75	7.35	5.86

Notes: In March 2011, PCWorld published its sampling test results of the broadband data speeds of the nationwide service providers in thirteen cities using laptop modems and smartphones. Overall, PCWorld finds that the average wireless mobile broadband data speeds have increased by more than three times from the previous year as service providers have upgraded their networks from 3G to 4G technologies. Verizon Wireless laptop modems scored highest with an average data download speed of 6.44 Mbps in thirteen cities compared to the second ranked T-Mobile USA with a speed of 2.83 Mbps. For smartphones, T-Mobile USA smartphone download speeds were the fastest with an average of 2.28 Mbps, followed by Sprint smartphones which had an average of 1.5 Mbps. In April 2012, PCWorld updated its smartphone data speed test results in the thirteen cities. The 3G wireless data download speeds have mostly increased from the previous year's test results. PCWorld found that T-Mobile USA has the fastest average 3G data download speed of 3.84 Mbps and AT&T has the second fastest of 2.62 Mbps. For the average 4G data download speeds, AT&T was the fastest at 9.12 Mbps and Verizon Wireless was second with 7.35 Mbps.

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[1] *See* PCWorld, *4G Wireless Speed Tests: Which is Really the Fastest?*, March 13, 2011, *available at* http://www.pcworld.com/article/221931/4g_wireless_speed_tests_which_is_really_the_fastest.html (visited Oct. 16, 2012).

[2] *See* PCWorld, *3G and 4G Wireless Speed Showdown: Which Networks are Fastest?*, April 17, 2012, *available at* http://www.pcworld.com/article/253808/3g_and_4g_wireless_speed_showdown_which_networks_are_fastest.html (visited Oct. 16, 2012).

Table B-8
Network Performance Results, Average Data Speeds, PCMag, June 2011[3]

Provider	Download Speed (Mbps)		Upload Speed (Mbps)		3G Success (%)
	Average	Maximum	Average	Maximum	
AT&T	2.44	12.97	0.82	1.9	90.2
Cricket	0.6	2.15	0.45	1	75.85
MetroPCS	1.62	6.3	1.07	2.22	87.32
Sprint Nextel 3G	0.48	2.22	0.35	1.02	65.14
Sprint Nextel 4G	2.99	10.46	0.75	1.03	98.14
T-Mobile	3.7	15.23	1.09	3.04	87.13
Verizon Wireless 3G	0.7	2.49	0.58	1.02	85.41
Verizon Wireless 4G	9.46	37.66	1.35	2.33	87.41

Table B-9
Network Performance Results, Average Data Speeds, PCMag, June 2012[4]

Provider	Download Speed (Mbps)		Upload Speed (Mbps)		HTTP DL Success (%)
	Average	Maximum	Average	Maximum	
AT&T 3G	1.97	6.55	0.76	2.16	82.5
AT&T 4G LTE	13.71	56.07	2.87	4.98	74.63
MetroPCS	1.85	8.67	0.98	2.15	86.96
Sprint Nextel 3G	0.41	1.8	0.29	1.26	79.33
Sprint Nextel 4G	3.5	11.98	0.91	1.62	64.09
T-Mobile	6.84	22.71	1.14	3.31	79.61
Verizon Wireless 3G	0.91	2.52	0.66	1.31	90.38
Verizon Wireless 4G	8.89	49.22	6.46	17.24	90.9

Notes: In June 2011, PC Magazine published its 2011 broadband network test results for major mobile wireless service providers in 21 large U.S. cities. It drive-tested more than 6,000 miles of roads uses eight different smartphones simultaneously. In the tested cities, it found that the Verizon Wireless 4G LTE network had the best broadband data speeds and that T-Mobile USA was the second best. In June 2012, PC Magazine updated its 2012 broadband network test results of five major mobile wireless service providers in 30 large U.S. cities.[5]

[3] PCMag, *The Fastest Mobile Networks 2011*, June 27, 2011, *available at* http://www.pcmag.com/Fastest-Mobile-Networks-2011 (visited Oct. 16, 2012).

[4] PCMag, *Fastest Mobile Networks 2012*, June 18, 2012, *available at* http://www.pcmag.com/article2/0,2817,2405597,00.asp (visited Oct. 16, 2012).

[5] PCMag, *Fastest Mobile Networks 2012*, June 18, 2012, *available at* http://www.pcmag.com/article2/0,2817,2405596,00.asp (visited Oct. 16, 2012).

Table B-10
Network Performance Results, Average Data Speeds, RootMetrics, 2012[6]

City		AT&T	Sprint	T-Mobile	Verizon
Chicago (5/2012)	Down (Mbps)	7.6	3.2	7.1	15.9
	Up (Mbps)	4	0.8	1.4	8.5
Dallas (3/3012)	Down (Mbps)	17.2	3.7	5.1	13.8
	Up (Mbps)	9	0.8	1.1	6.5
Los Angeles (3/2012)	Down (Mbps)	5.9	2.6	6.2	16.3
	Up (Mbps)	2.5	0.9	1.2	8.2
New York City (5/2012)	Down (Mbps)	6.6	1.6	6.2	12.3
	Up (Mbps)	2.5	0.6	1.1	6.2
San Francisco (3/2012)	Down (Mbps)	15.8	1.6	1.9	16.7
	Up (Mbps)	8	0.8	0.5	8.5
San Diego (1/2012)	Down (Mbps)	14.4	0.8	7.8	12.1
	Up (Mbps)	6.5	0.6	1.3	5.5

Notes: RootMetrics, a mobile wireless network performance testing company, enables consumers to interactively check for mobile wireless service coverage, to report their mobile wireless data speeds, and to compare the quality of different mobile wireless networks. It offers a free smartphone broadband data speed testing application, *Cell Phone Coverage Map*, for both the Apple's iOS and the Google Android operating systems to test users' data speeds at their locations and report their performance data to RootMetrics.[7] RootMetrics also conducts drive tests of mobile wireless networks performance around the country; the drive test results are combined with the crowd-sourcing test results to create its proprietary wireless coverage and network performance scores. [8] It also provides mobile wireless network performance comparison RootScore reports for some major US cities that compare and rank network data speeds, dropped calls, blocked calls, and text messages delivery speeds.[9]

[6] RootMetrics, *RootScore reports*, *available at* http://www.rootmetrics.com/compare-carriers/ (visited Oct. 16, 2012).

[7] RootMetrics, *CoverageMap app*, *available at* http://www.rootmetrics.com/app/ (visited Oct. 16, 2012.)

[8] RootMetrics, *How it works*, *available at* http://www.rootmetrics.com/how-it-works/ (visited Oct. 16, 2012).

[9] RootMetrics, *RootScore reports*, *available at* http://www.rootmetrics.com/compare-carriers/ (visited Oct. 16, 2012).

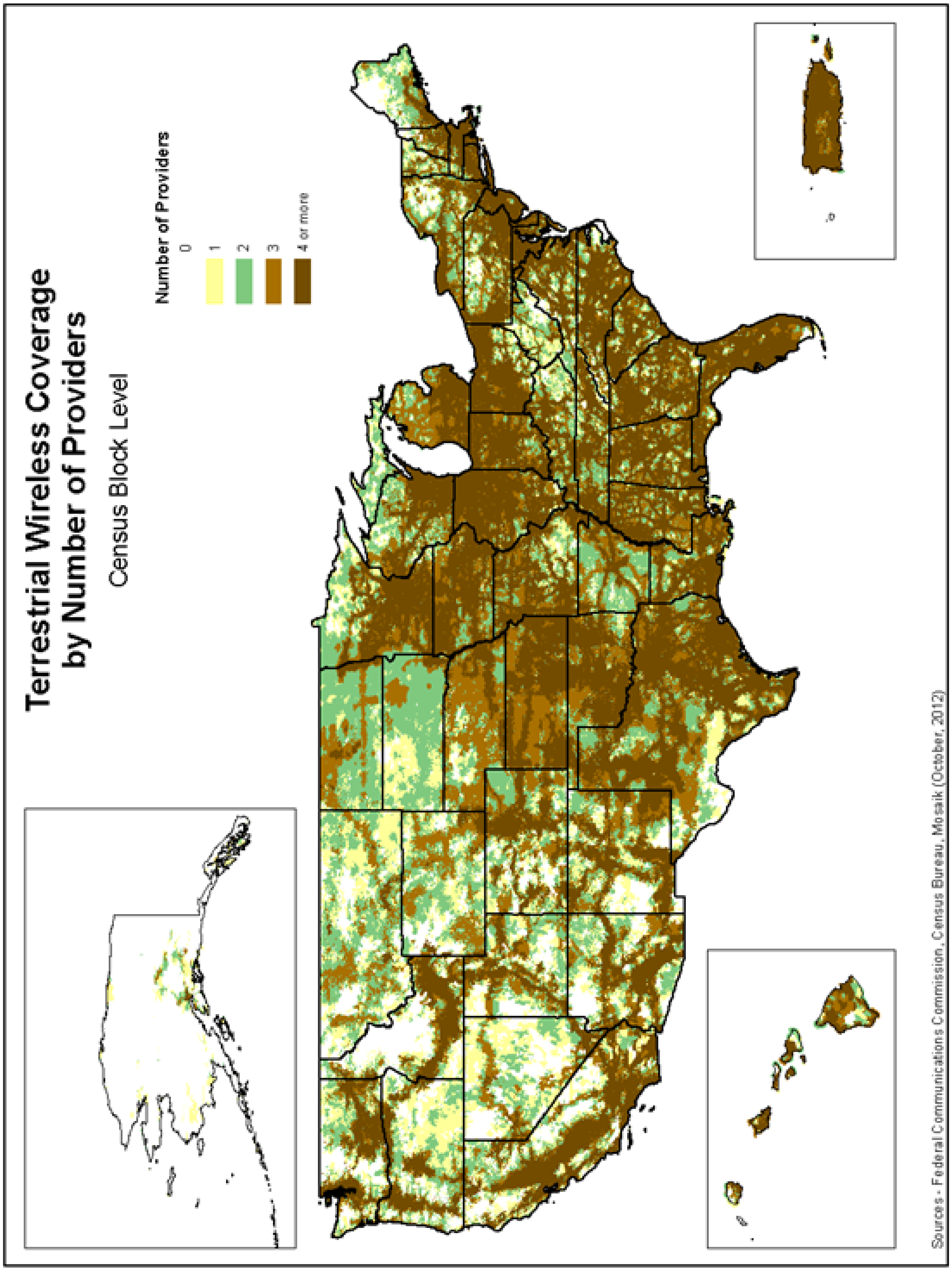
APPENDIX C

Maps

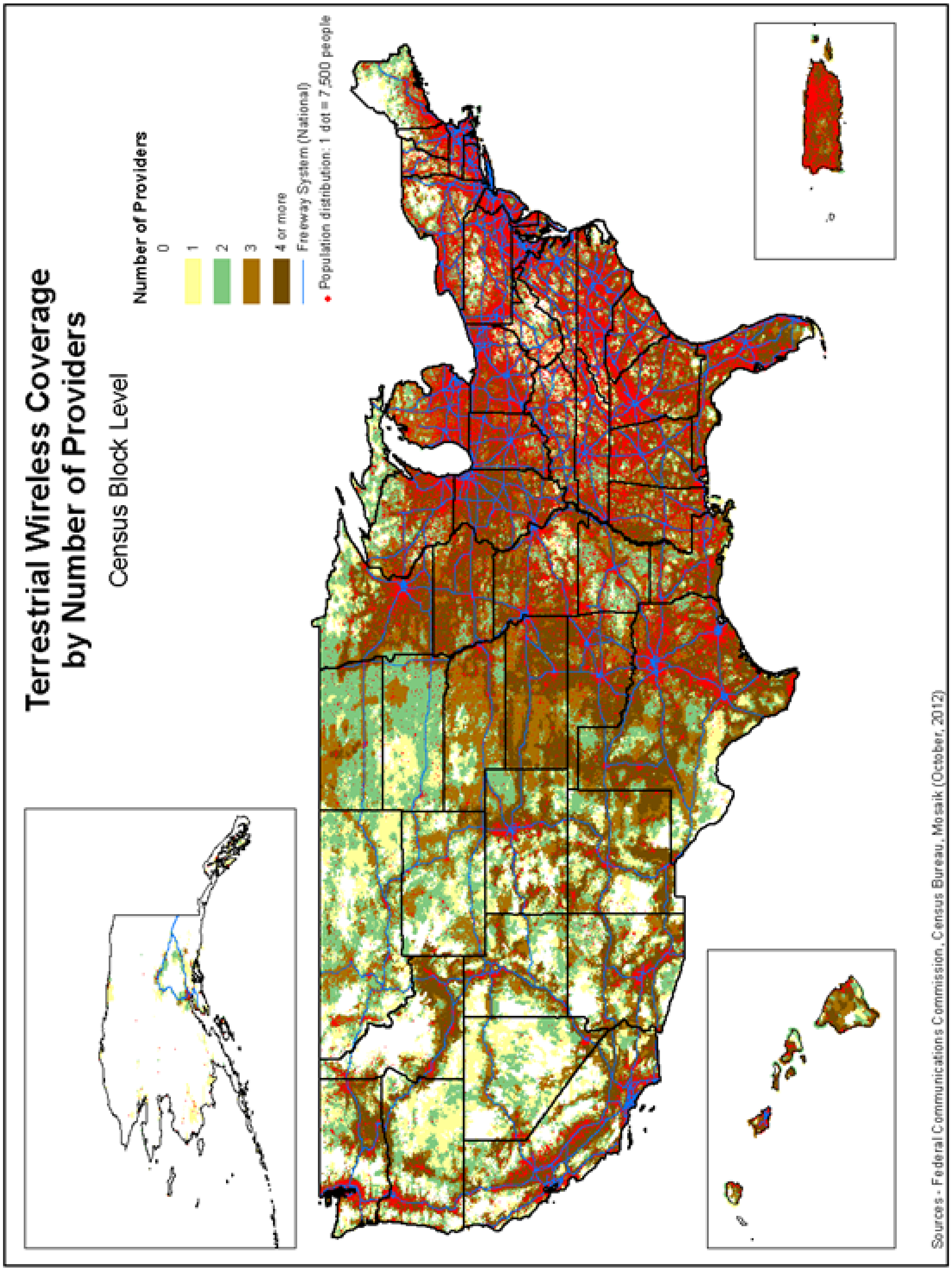
Table of Contents

Note: Additional maps of the existing spectrum holdings of many mobile wireless service providers and licensees are now accessible through the Commission's online Spectrum Dashboard tool, available at http://www.fcc.gov/spectrumdashboard. The Spectrum Dashboard provides a public means of reviewing how spectrum bands are allocated and for what uses, and who holds licenses and in what areas. It provides basic, plain language information about frequencies generally deemed appropriate for most commercial mobile wireless services in the 225 MHz to 3700 MHz band range. In addition, it contains detailed information, mapping, and research capabilities for the spectrum bands where most mobile wireless services, in particular broadband services, are either already available or potentially could be provided. These bands include, among others, 700 MHz, 800 MHz Cellular, AWS, Broadband PCS, BRS/EBS, WCS.

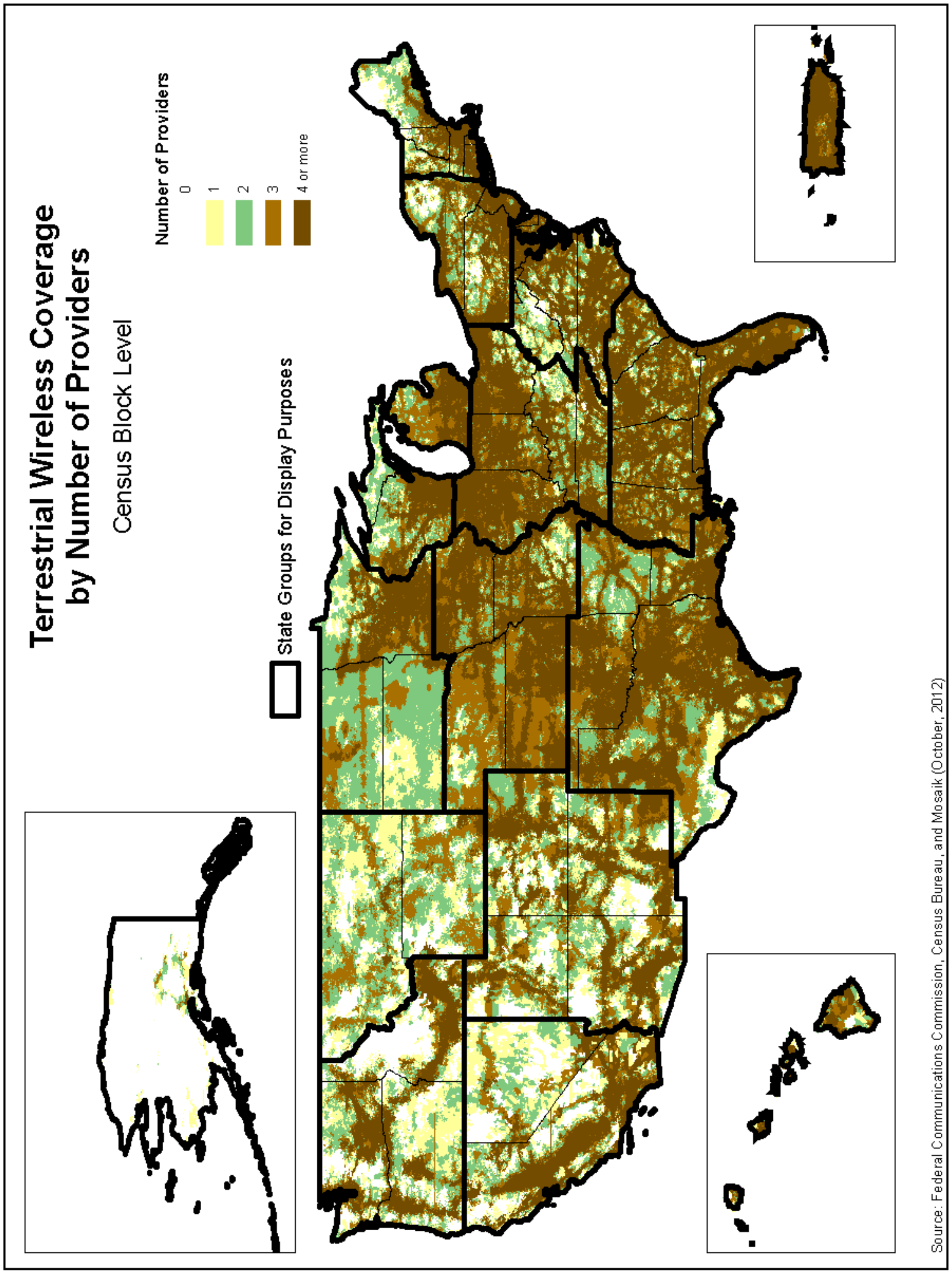
Map C-1
Mobile Wireless Coverage by Number of Providers, 2012



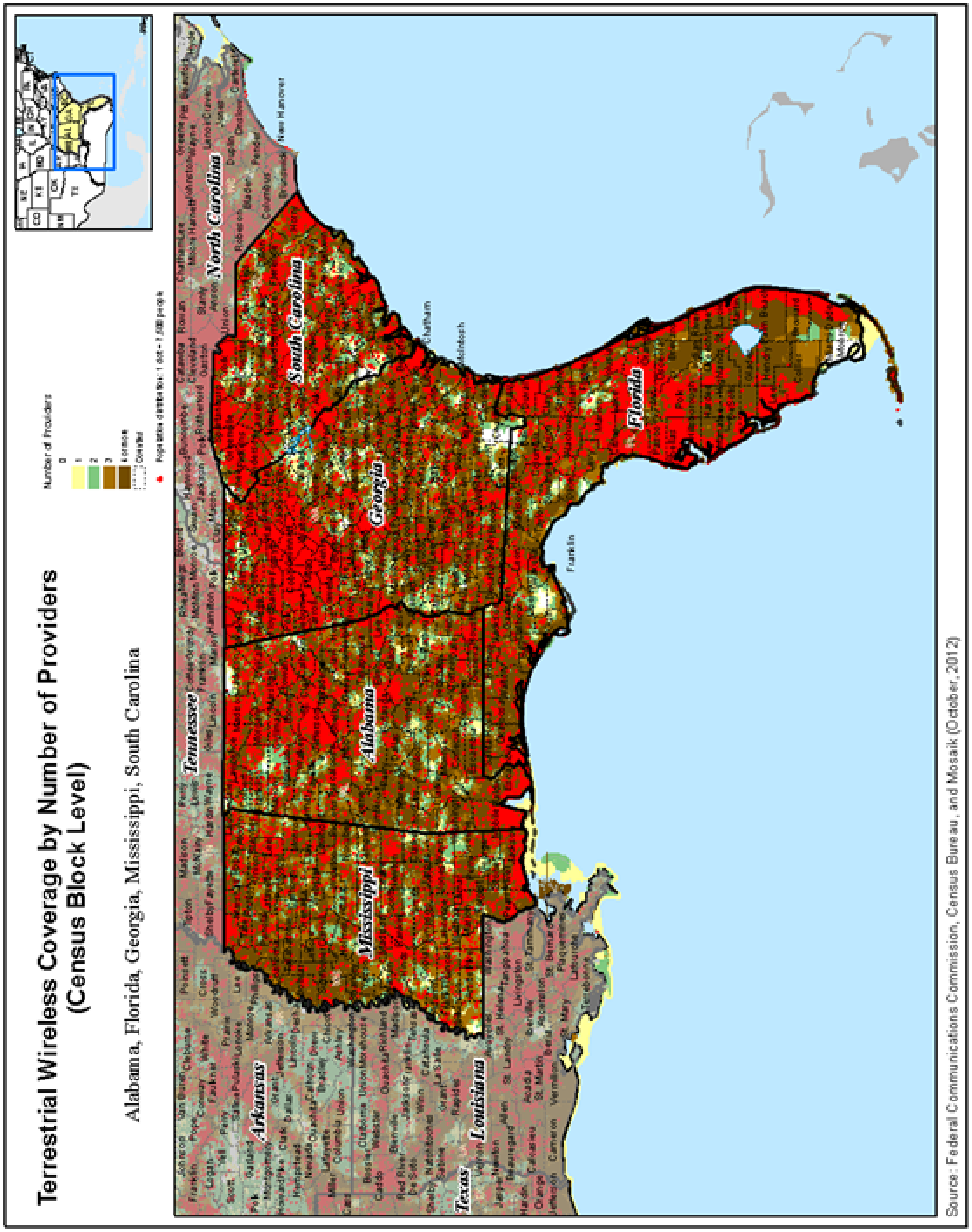
Map C-2
Wireless Coverage by Number of Providers (2), 2012



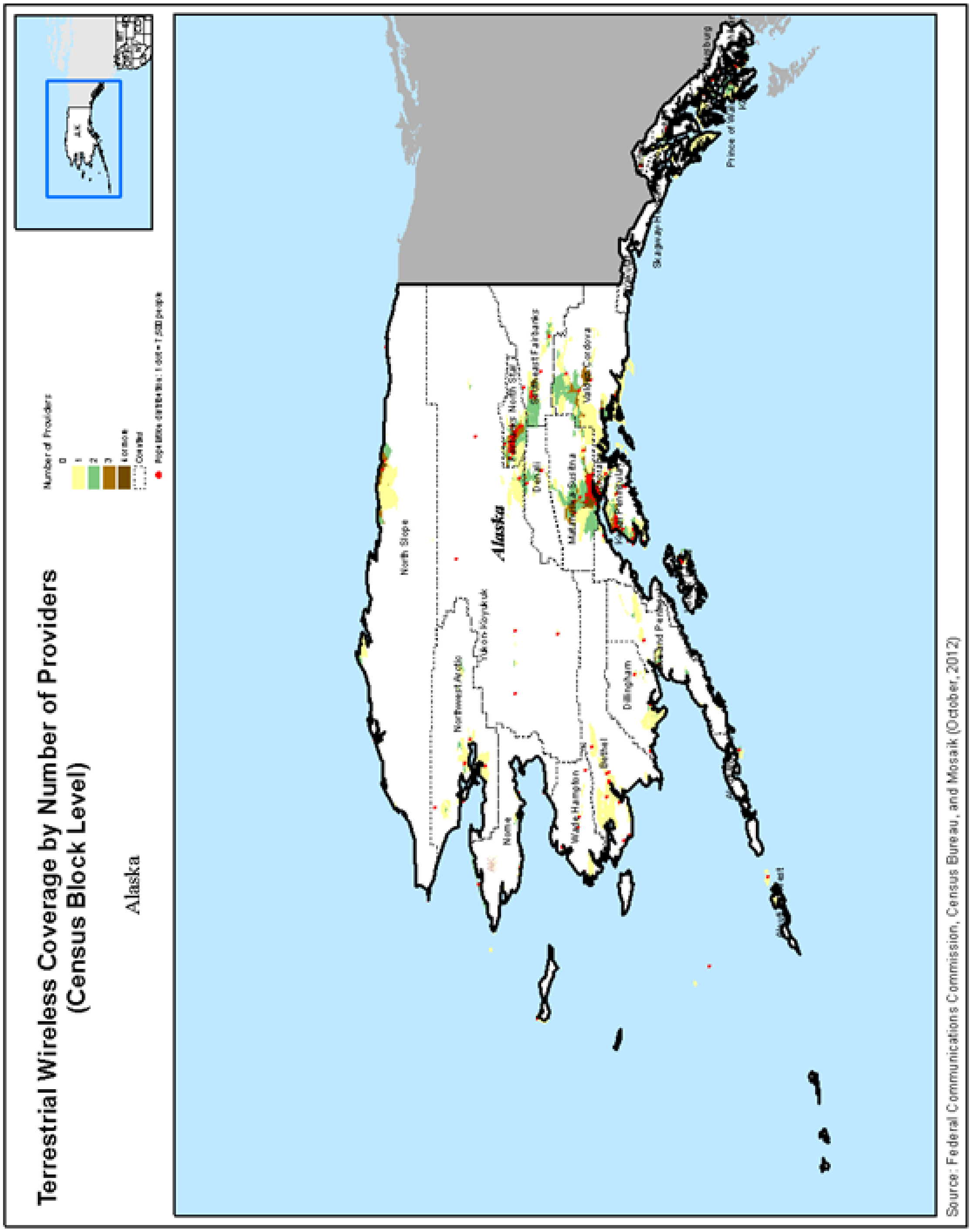
Map C-3
Wireless Coverage by Number of Providers by Region (Overview), 2012



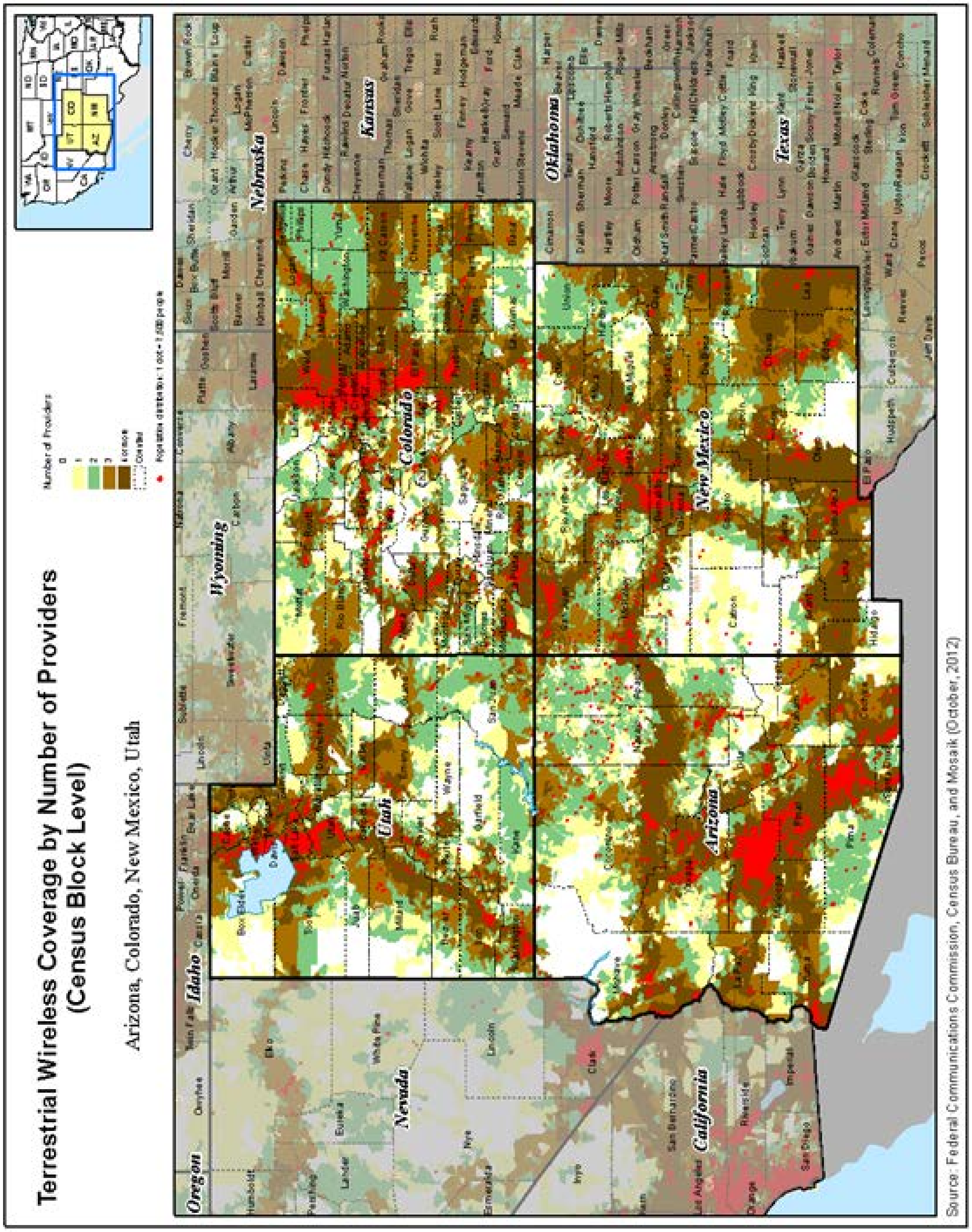
Map C-4
Wireless Coverage by Number of Providers by Region (1), 2012



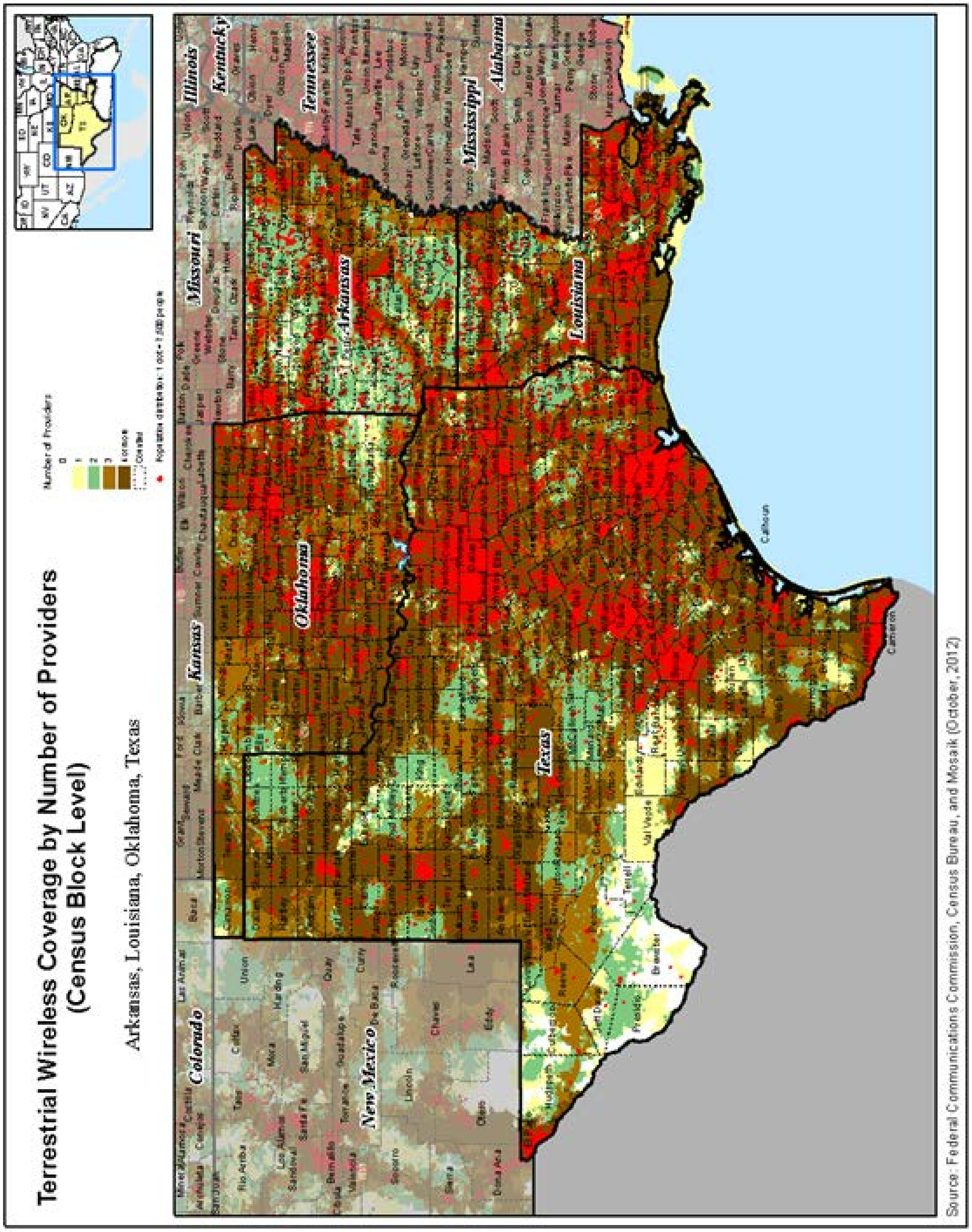
Map C-5
Wireless Coverage by Number of Providers by Region (2), 2012



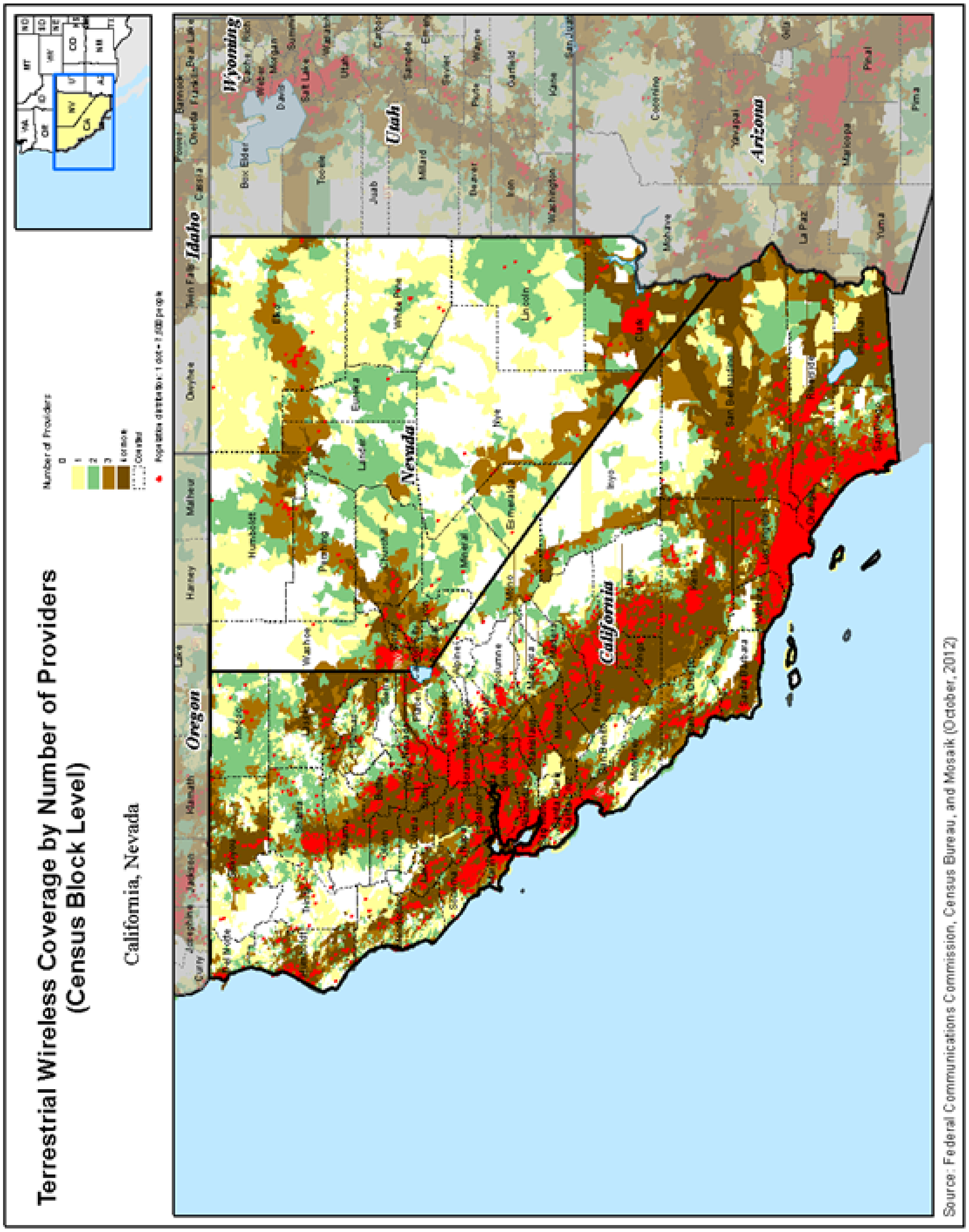
Map C-6
Wireless Coverage by Number of Providers by Region (3), 2012



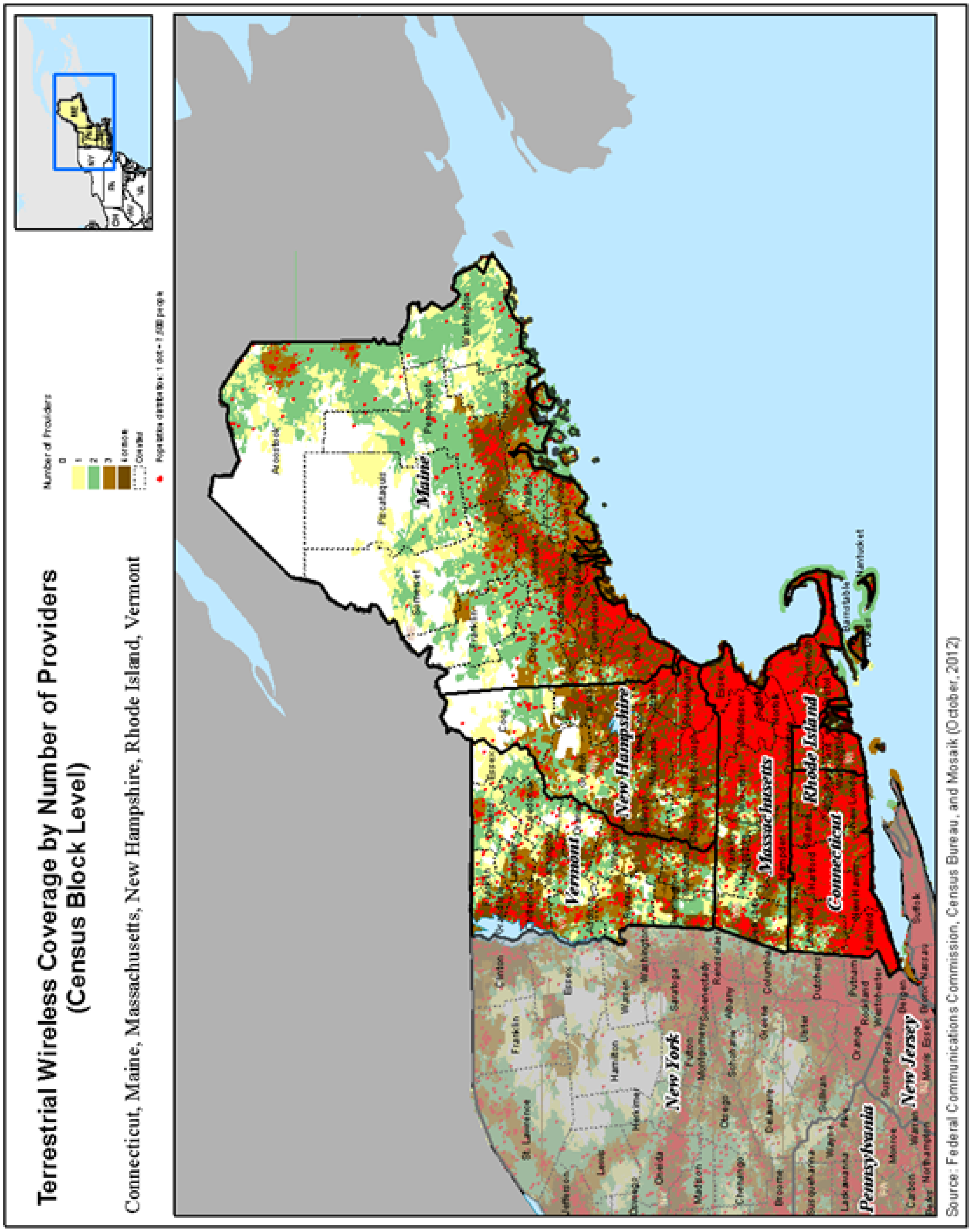
Map C-7
Wireless Coverage by Number of Providers by Region (4), 2012



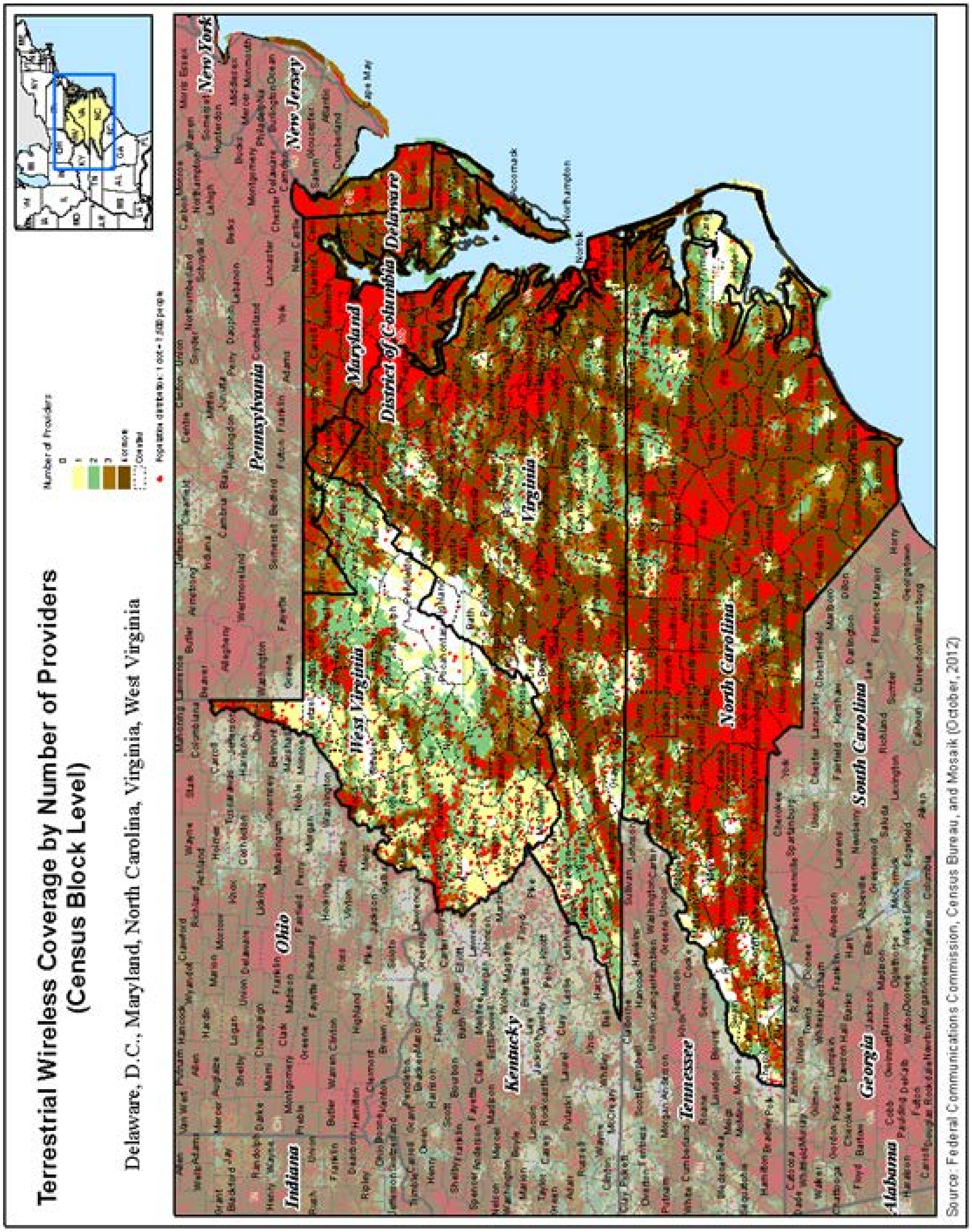
Map C-8
Wireless Coverage by Number of Providers by Region (5), 2012



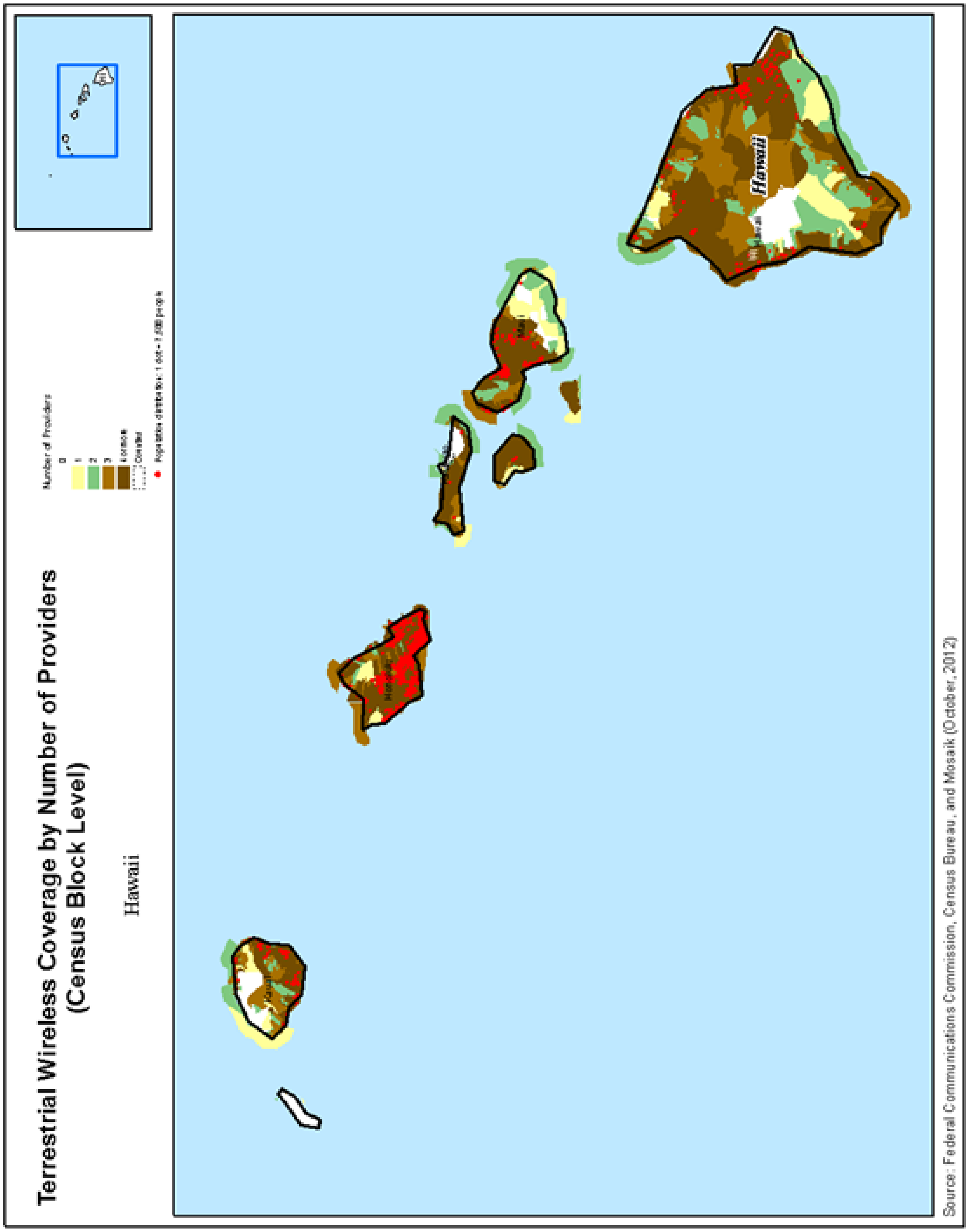
Map C-9
Wireless Coverage by Number of Providers by Region (6), 2012



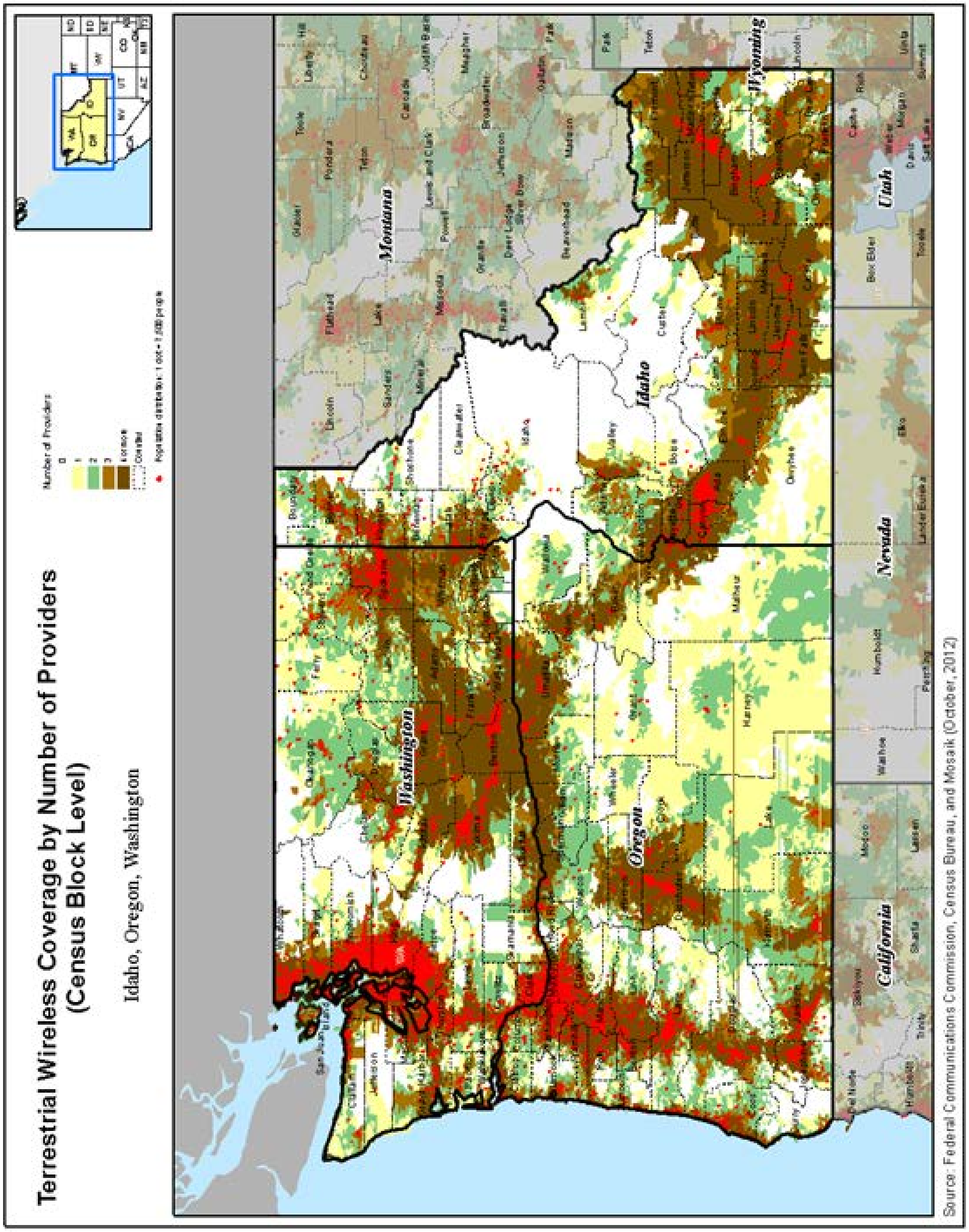
Map C-10
Wireless Coverage by Number of Providers by Region (7), 2012



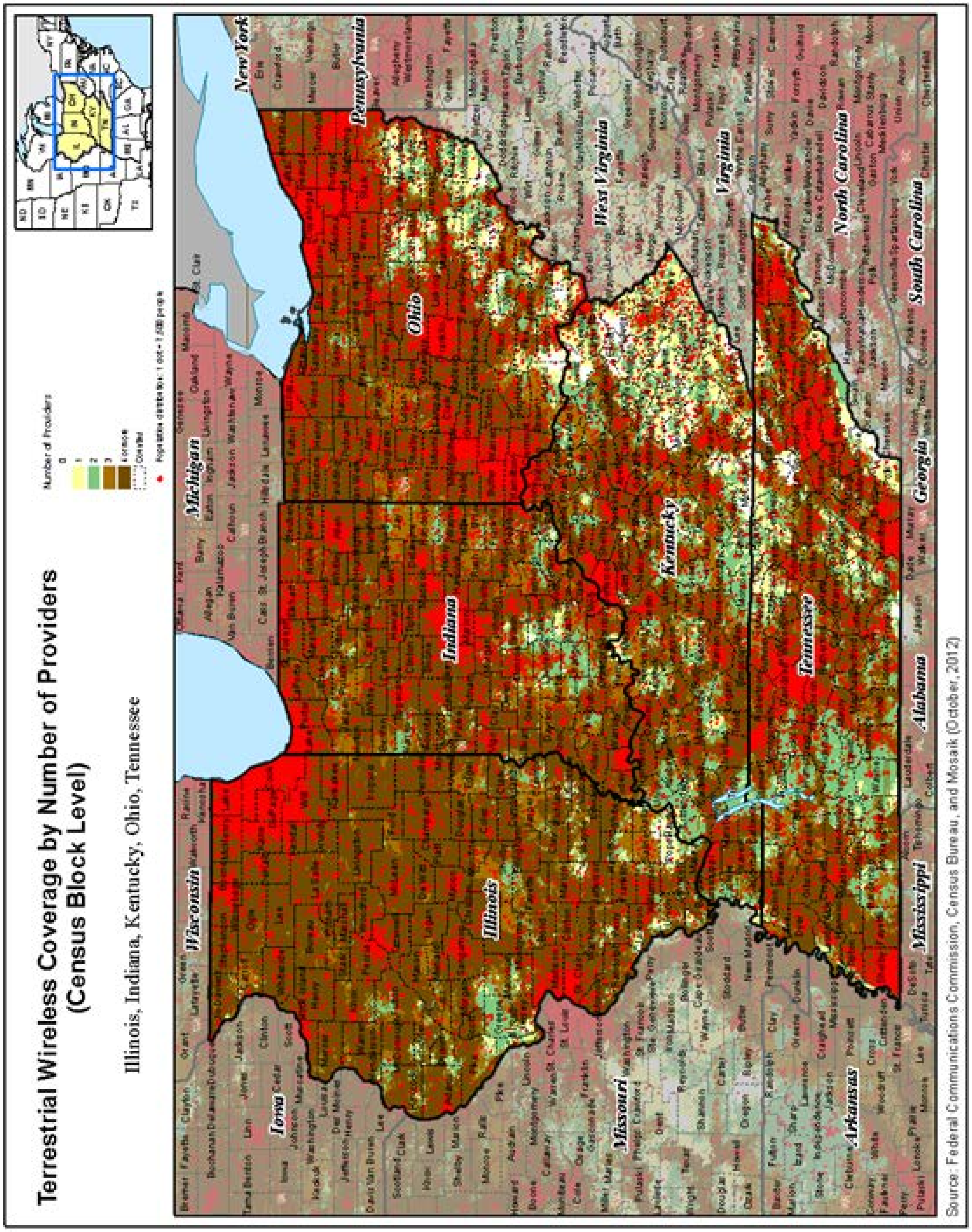
Map C-11
Wireless Coverage by Number of Providers by Region (8), 2012



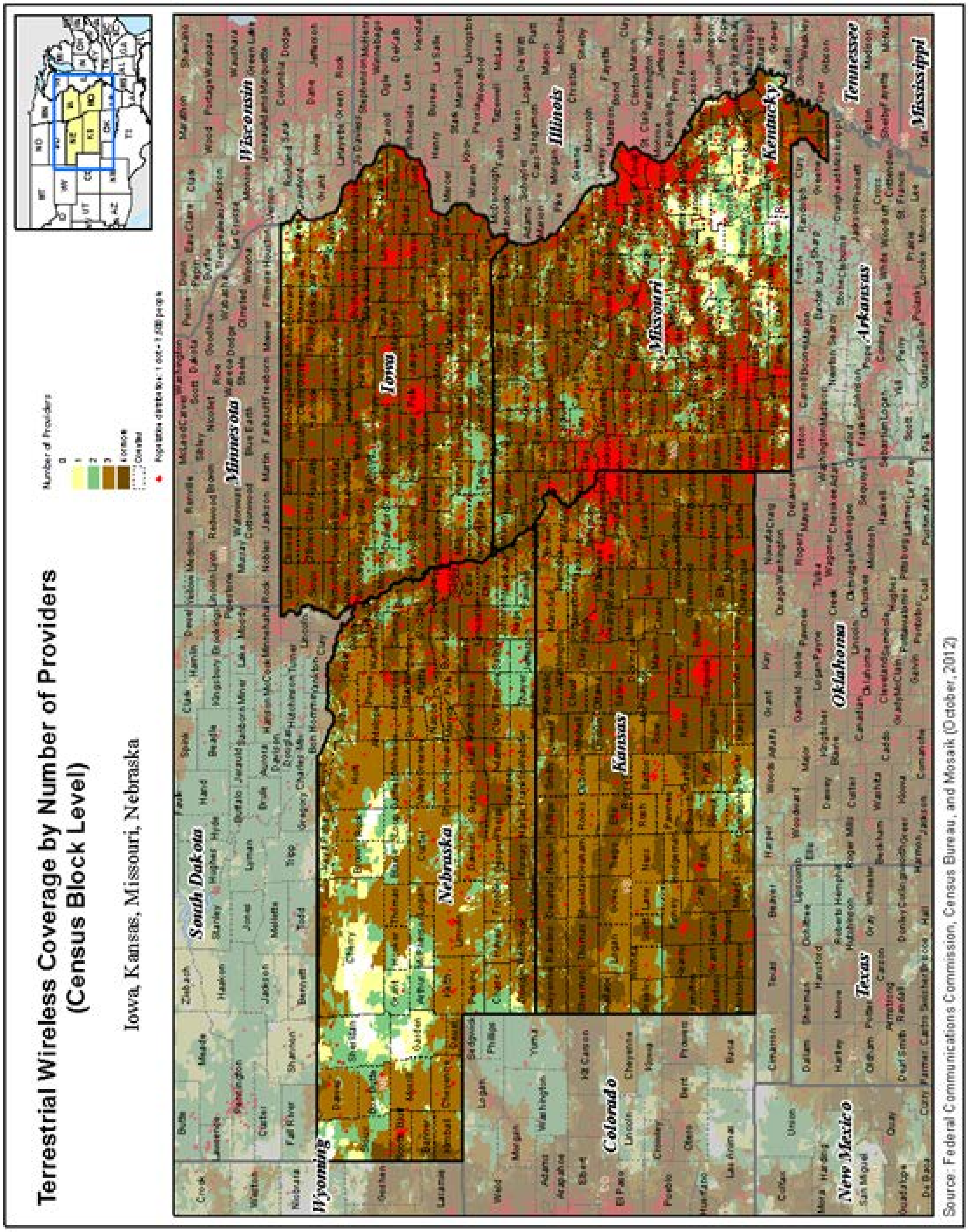
Map C-12
Wireless Coverage by Number of Providers by Region (9), 2012



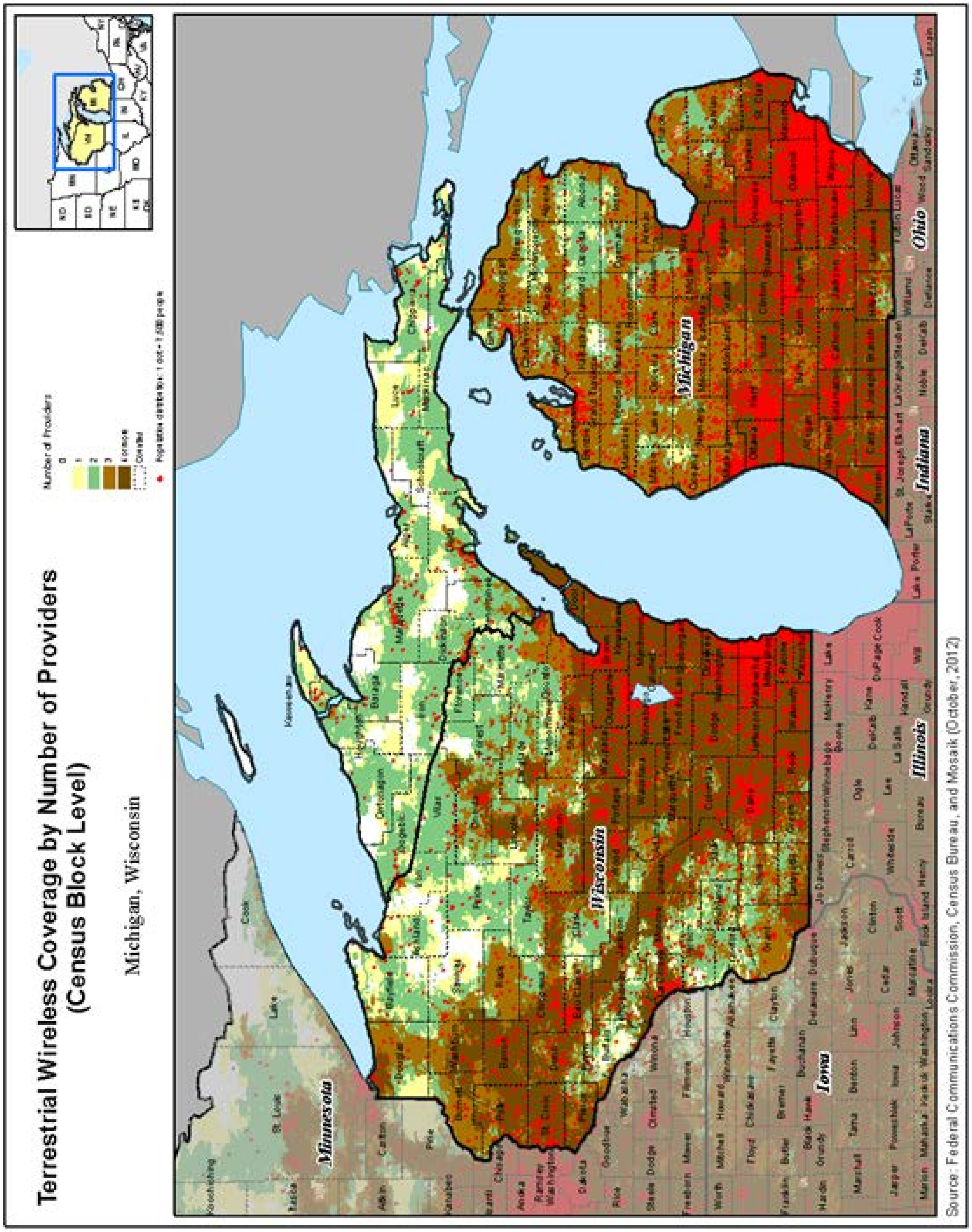
Map C-13
Wireless Coverage by Number of Providers by Region (10), 2012



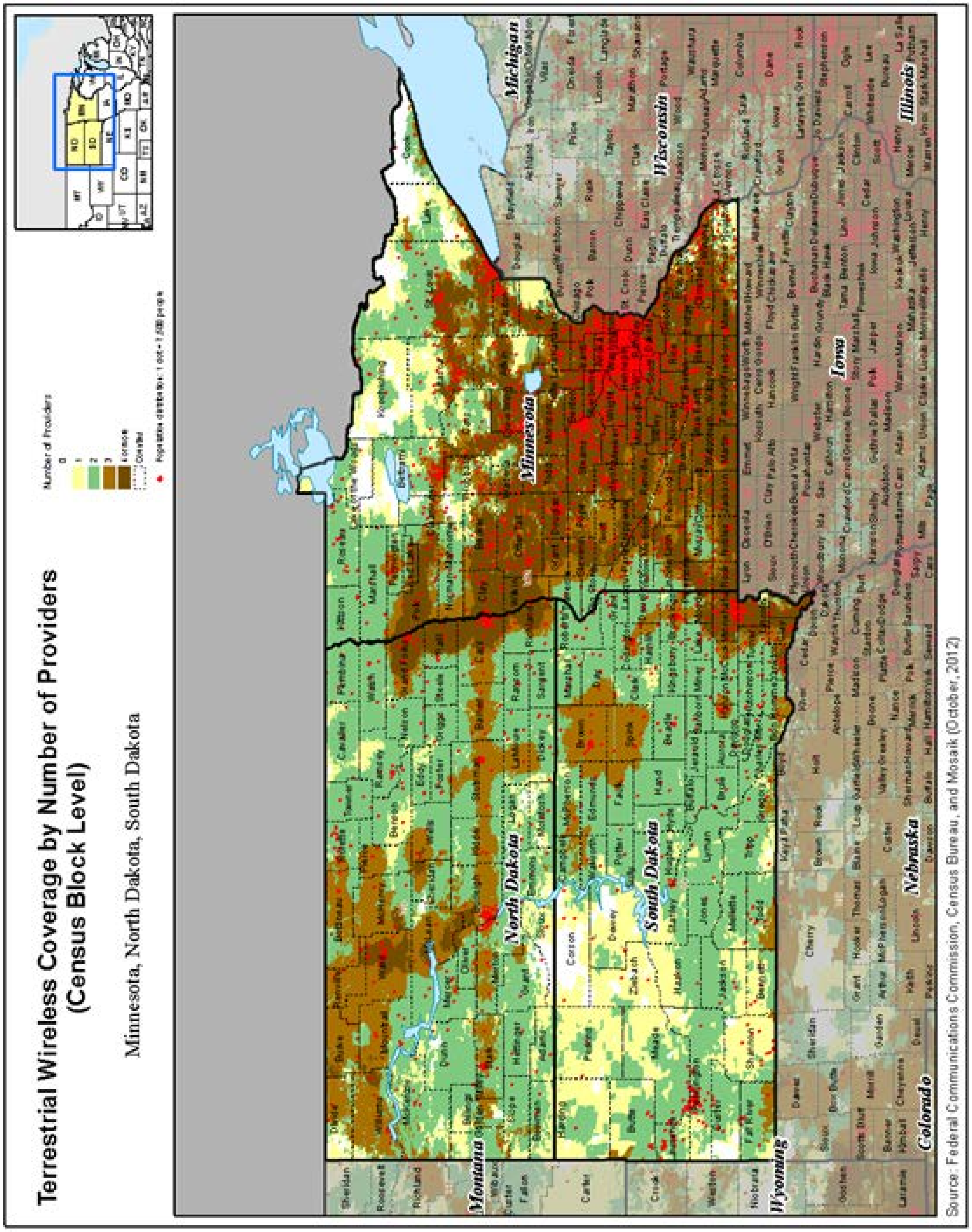
Map C-14
Wireless Coverage by Number of Providers by Region (11), 2012



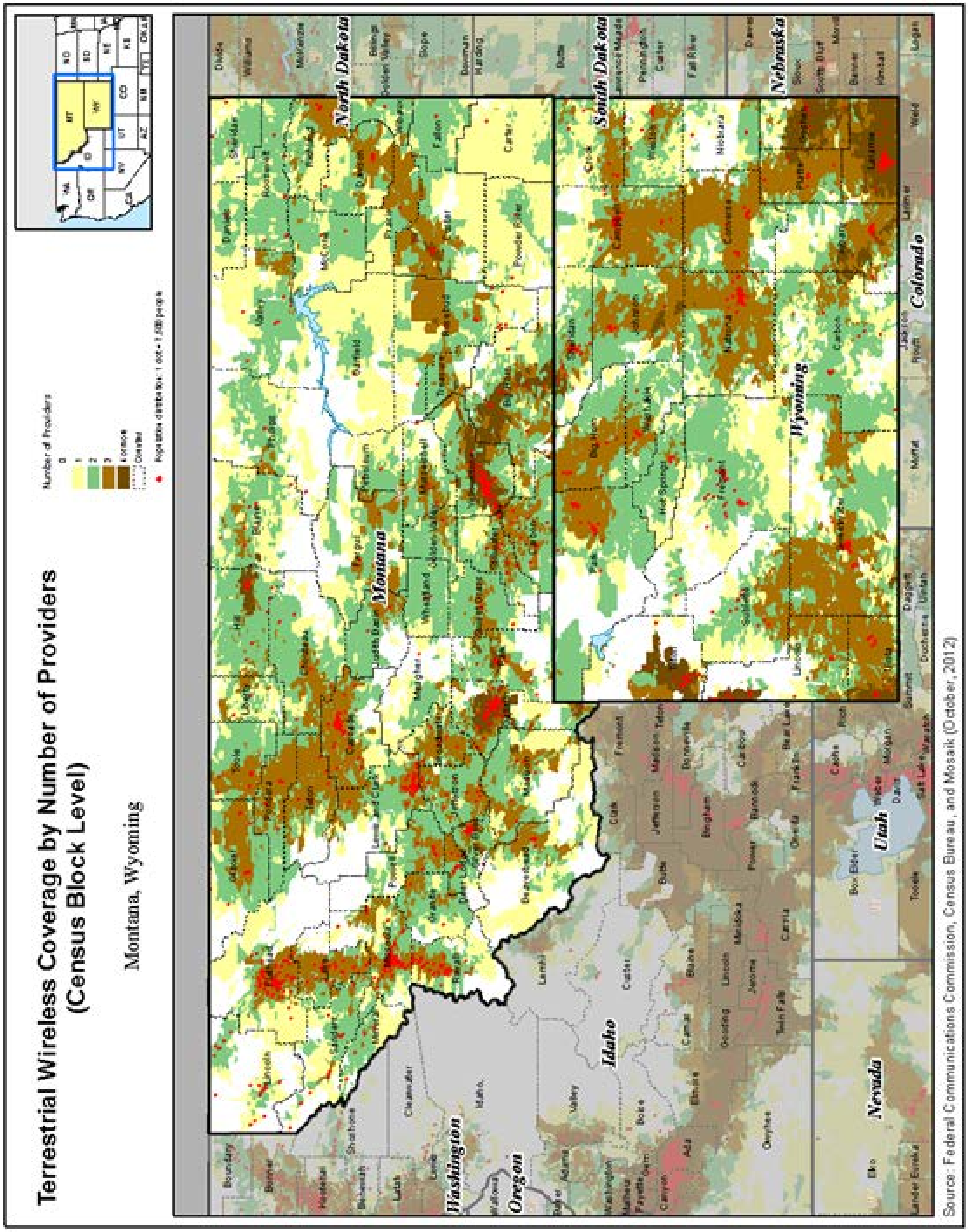
Map C-15
Wireless Coverage by Number of Providers by Region (12), 2012



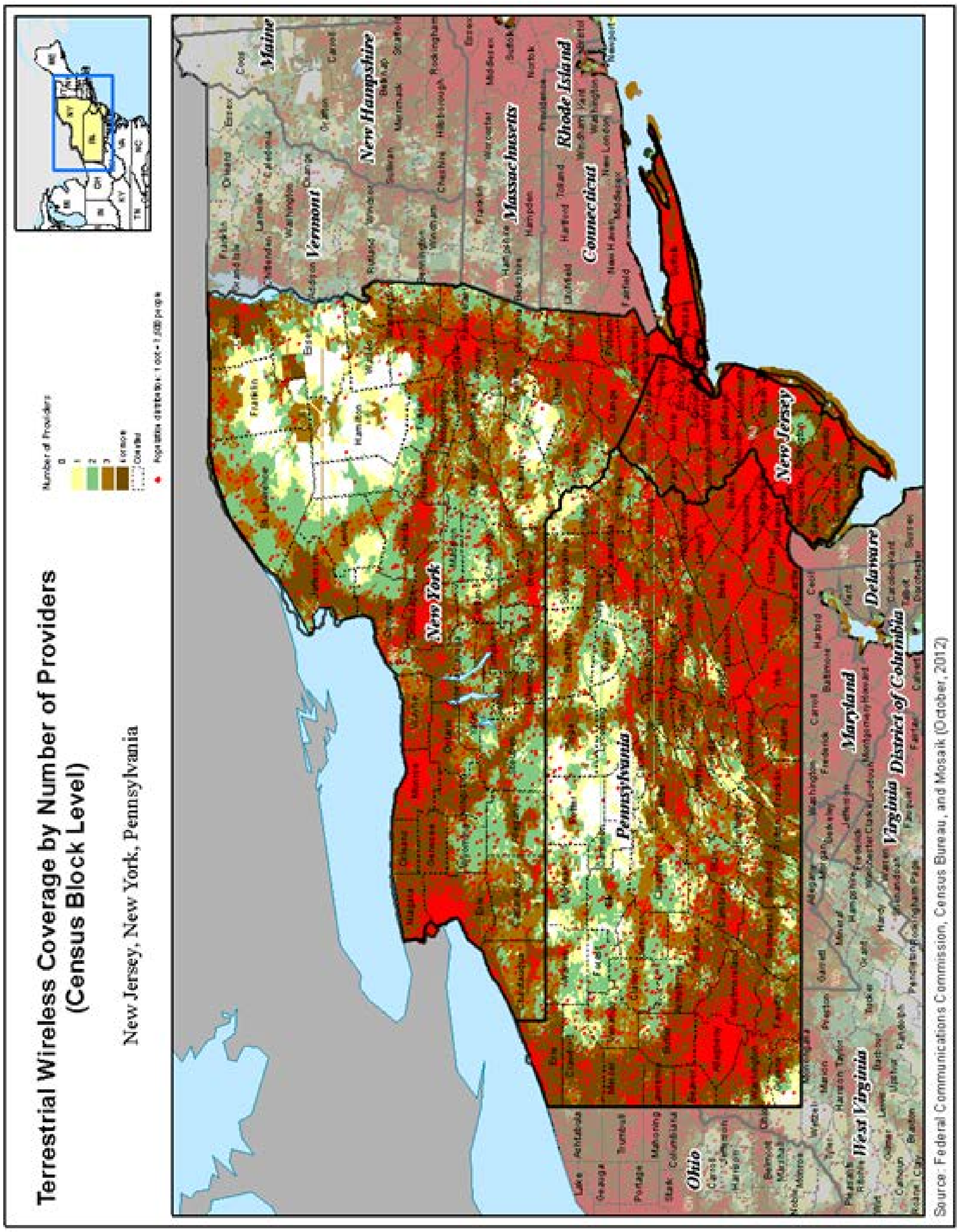
Map C-16
Wireless Coverage by Number of Providers by Region (13), 2012



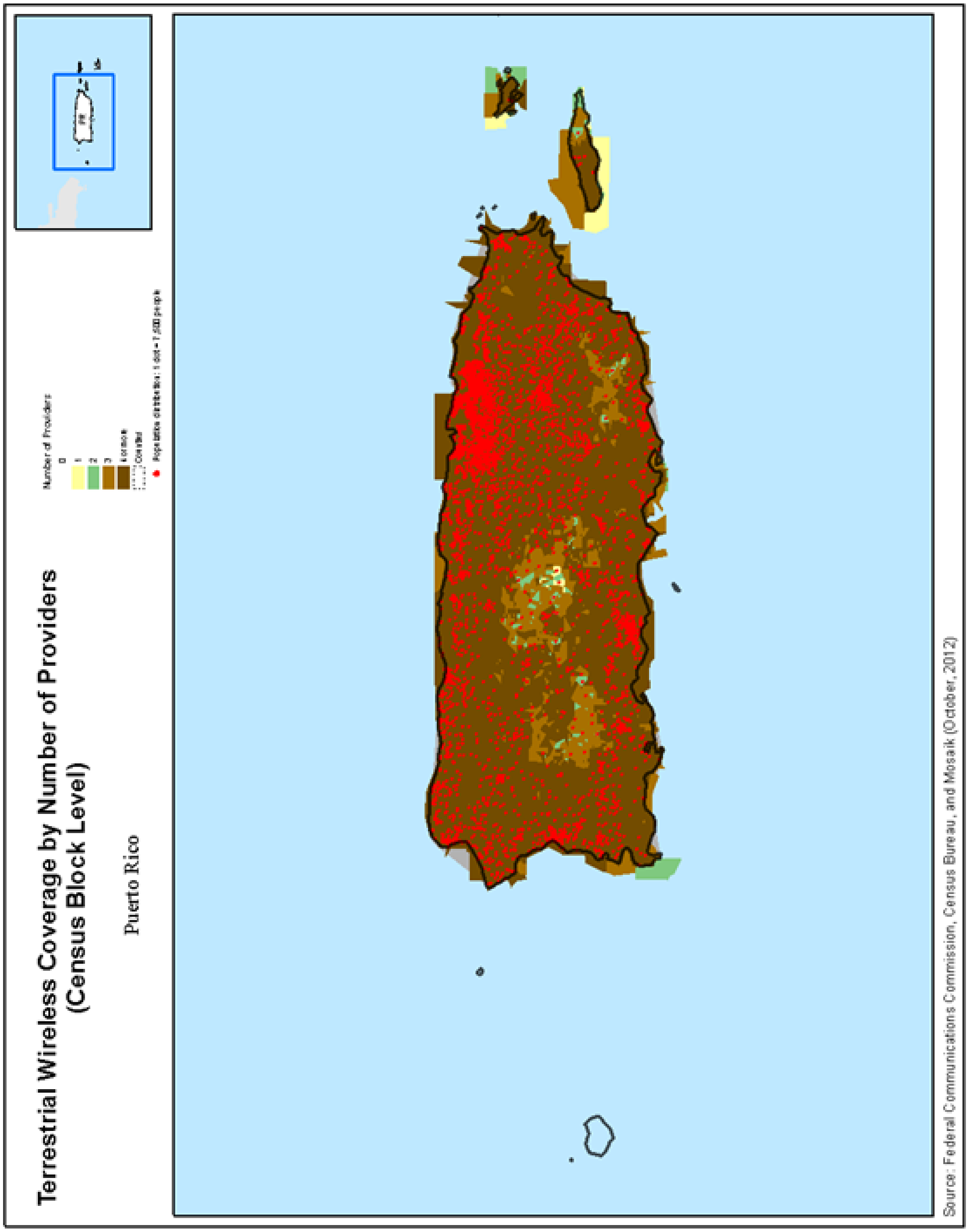
Map C-17
Wireless Coverage by Number of Providers by Region (14), 2012



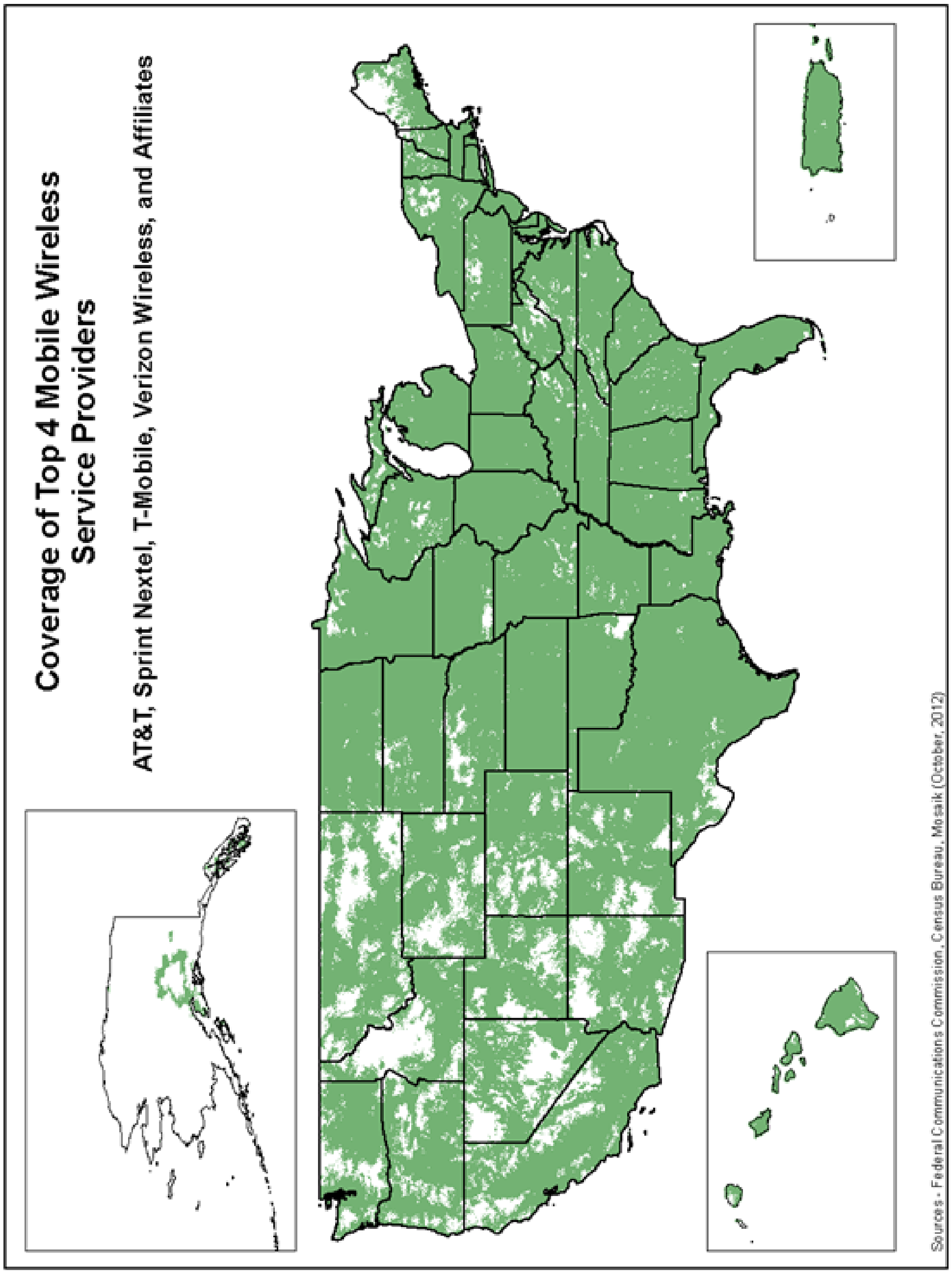
Map C-18
Wireless Coverage by Number of Providers by Region (15), 2012



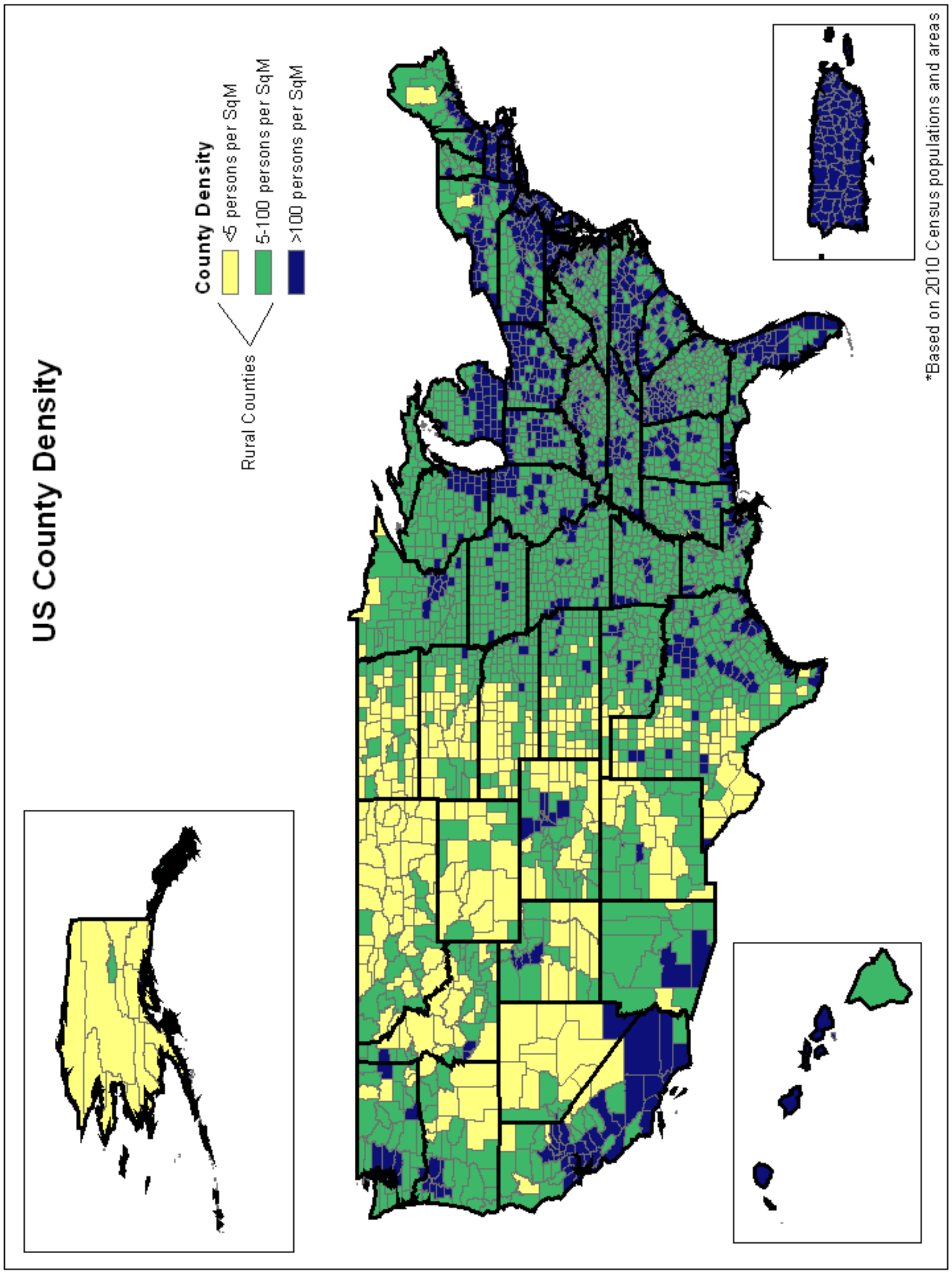
Map C-19
Wireless Coverage by Number of Providers by Region (16), 2012



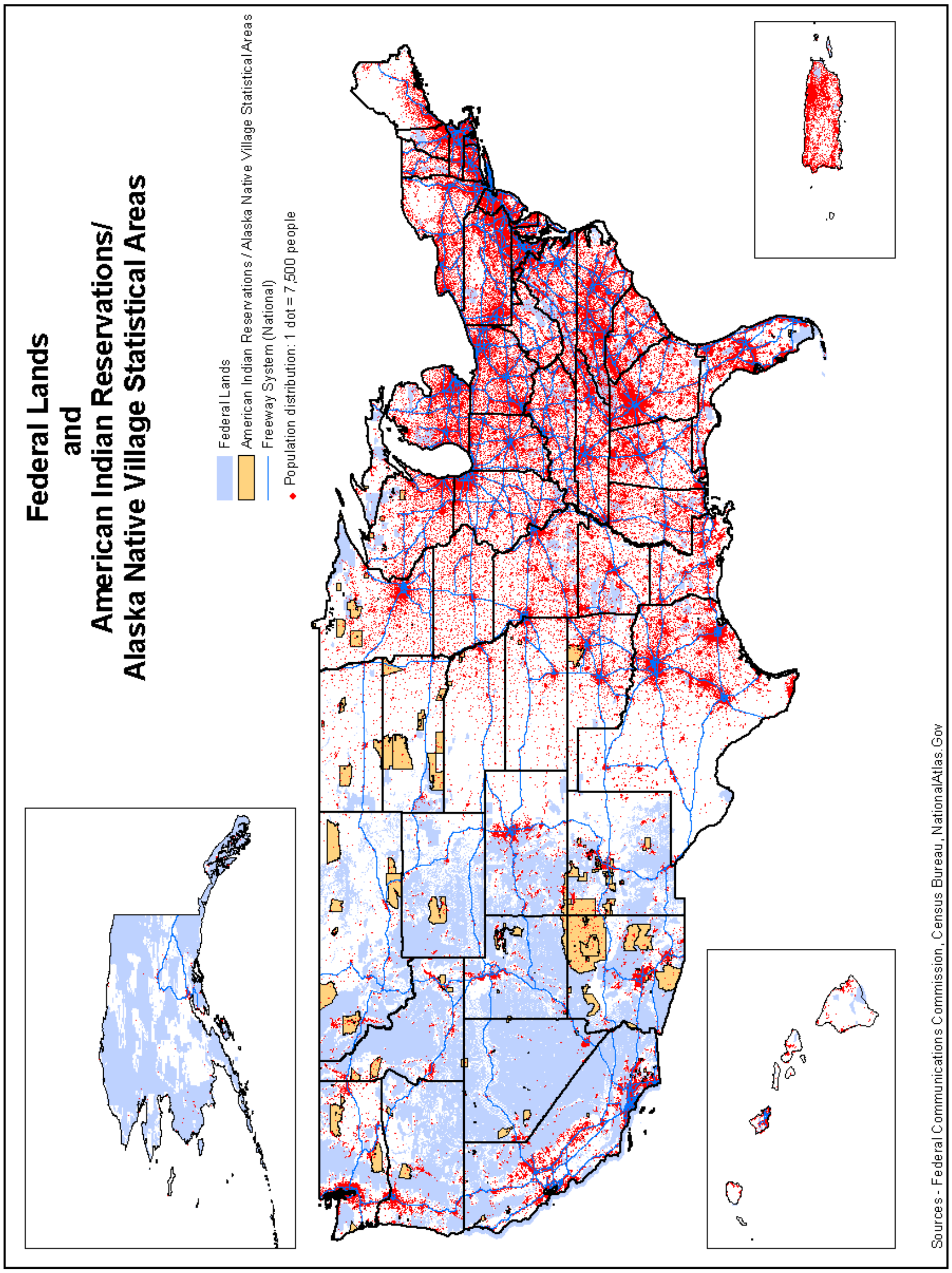
Map C-20
Coverage of the Top 4 Mobile Wireless Service Providers, 2012



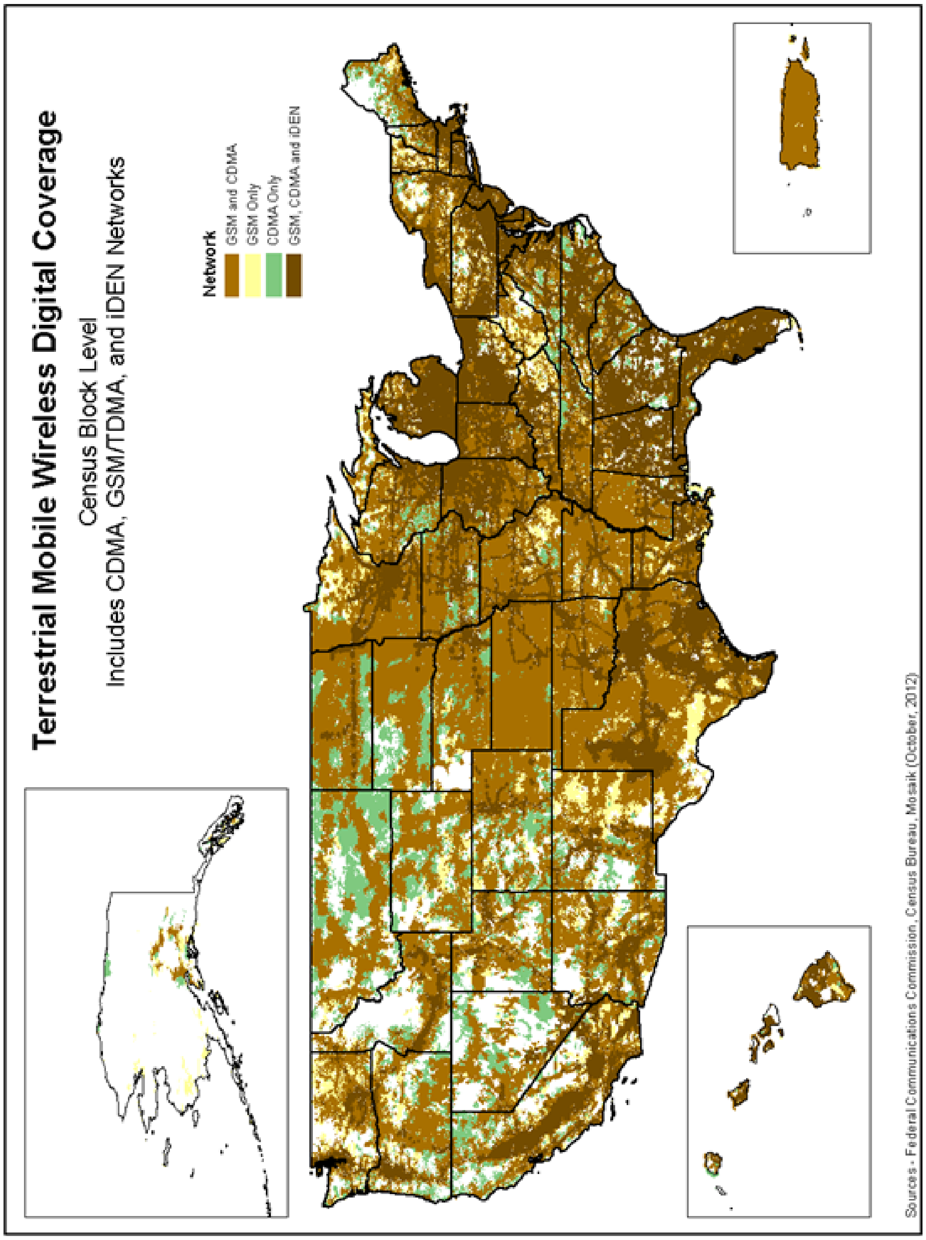
Map C-21
U.S. County Density



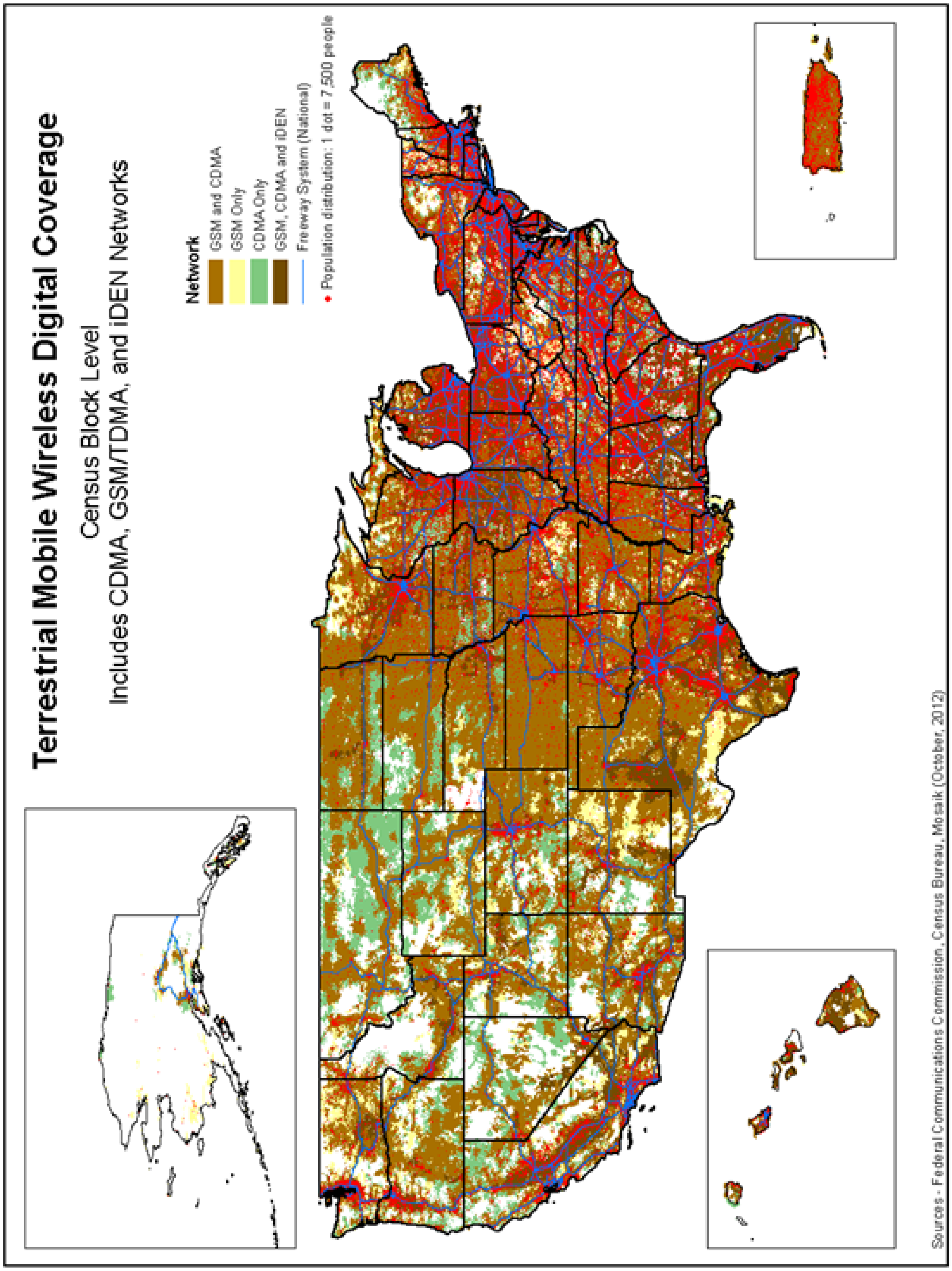
Map C-22
U.S. Federal Lands, 2012



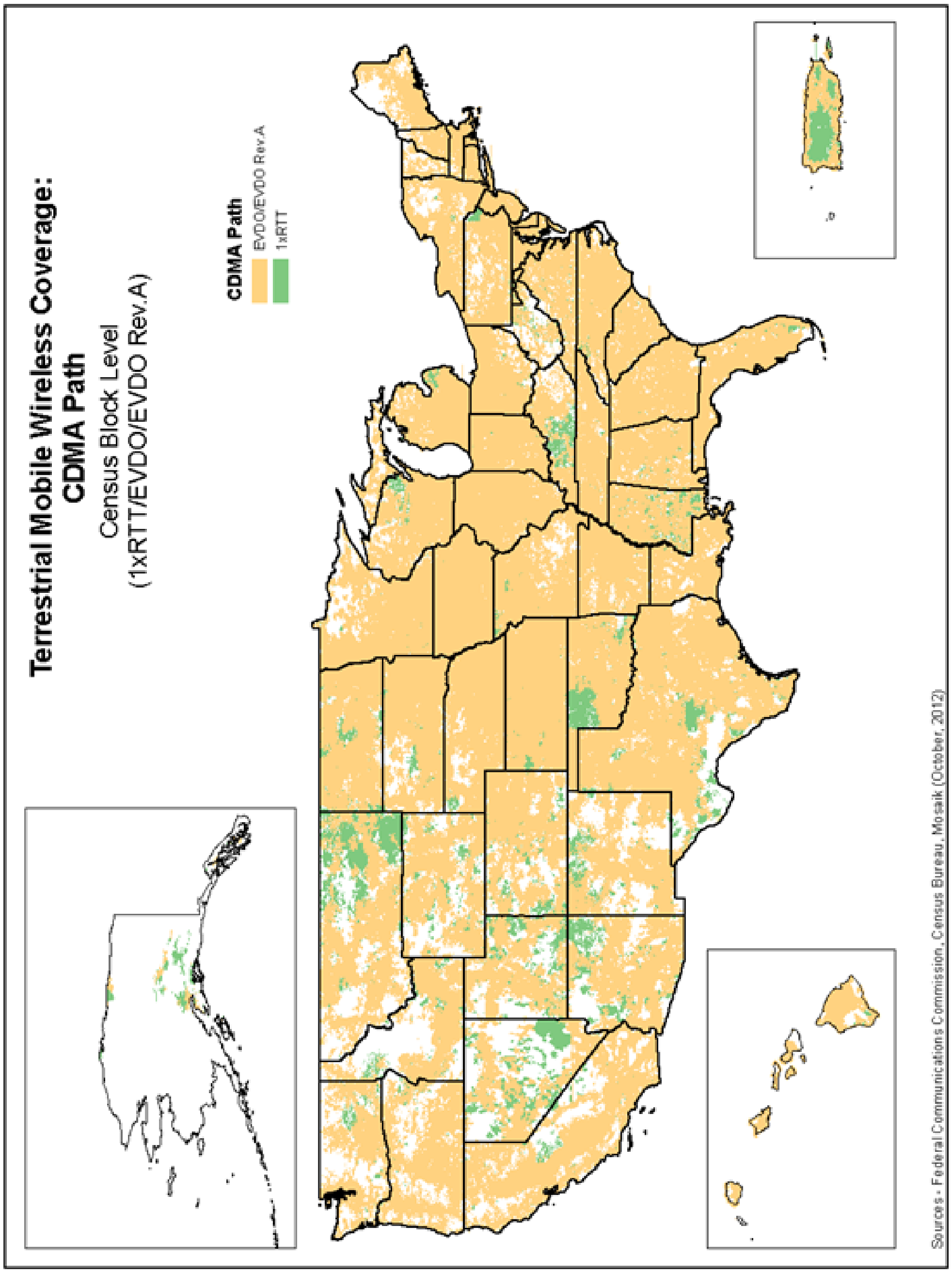
Map C-23
Mobile Wireless Digital Coverage, 2012



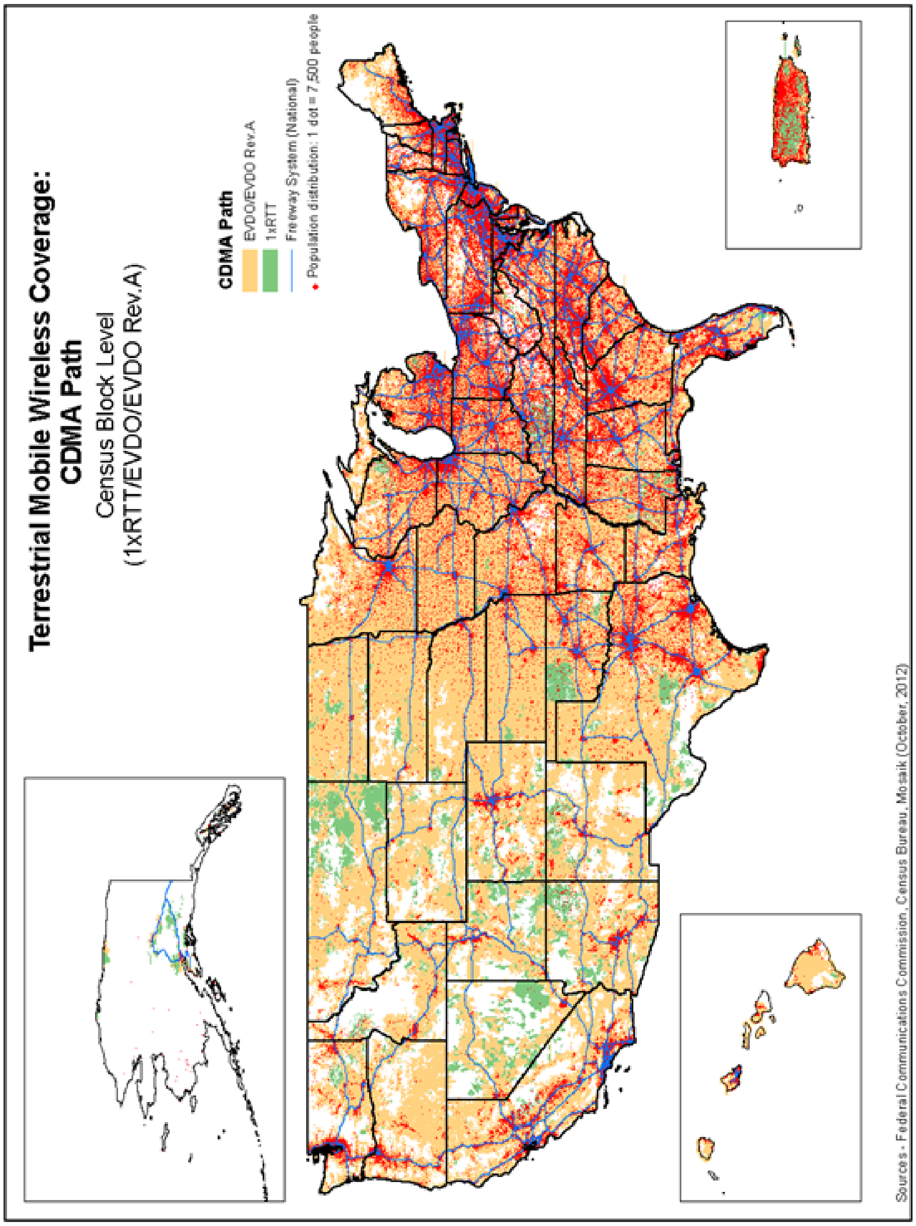
Map C-24
Mobile Wireless Digital Coverage (2), 2012



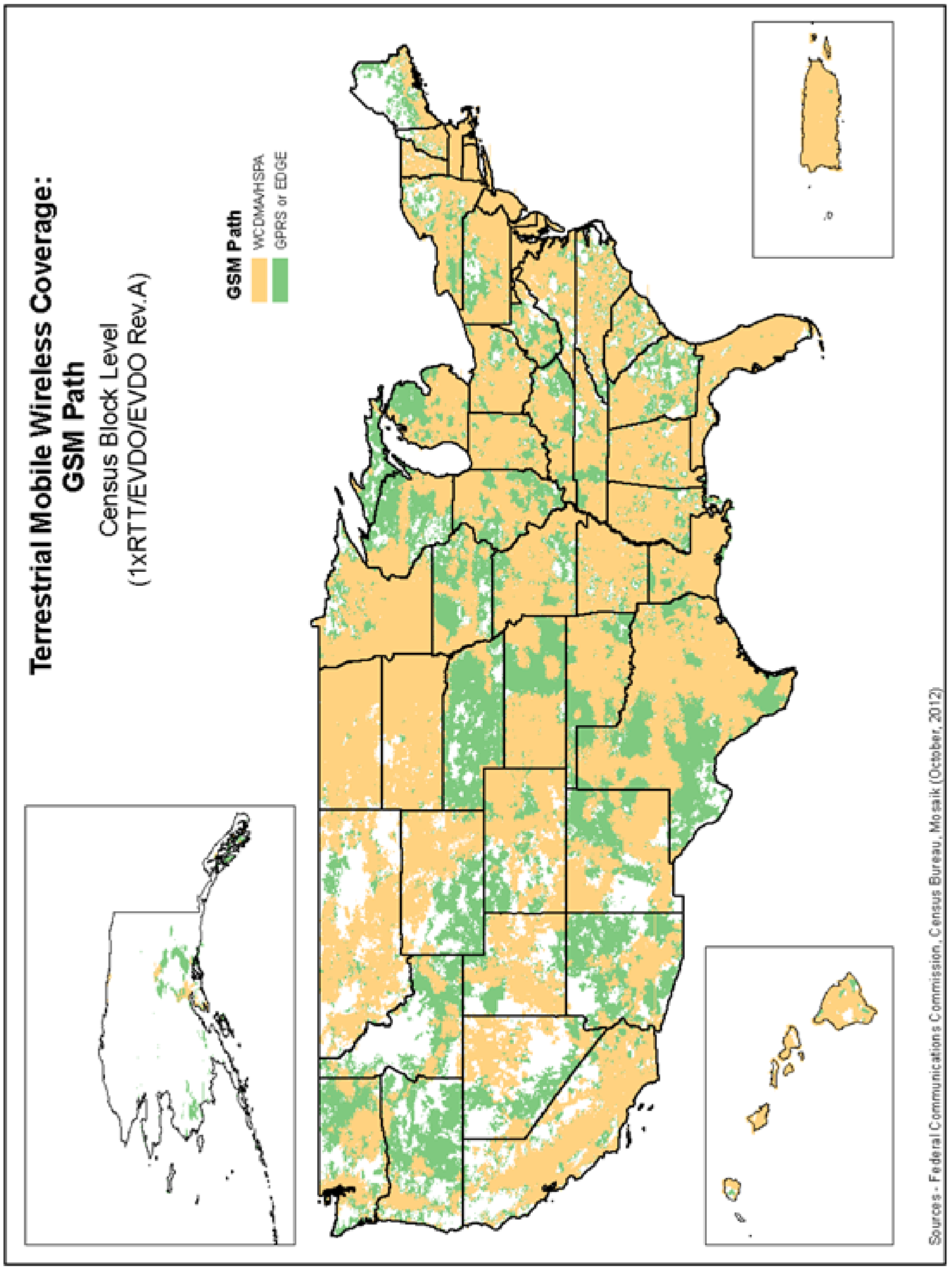
Map C-25
Mobile Wireless Coverage: CDMA Path, 2012



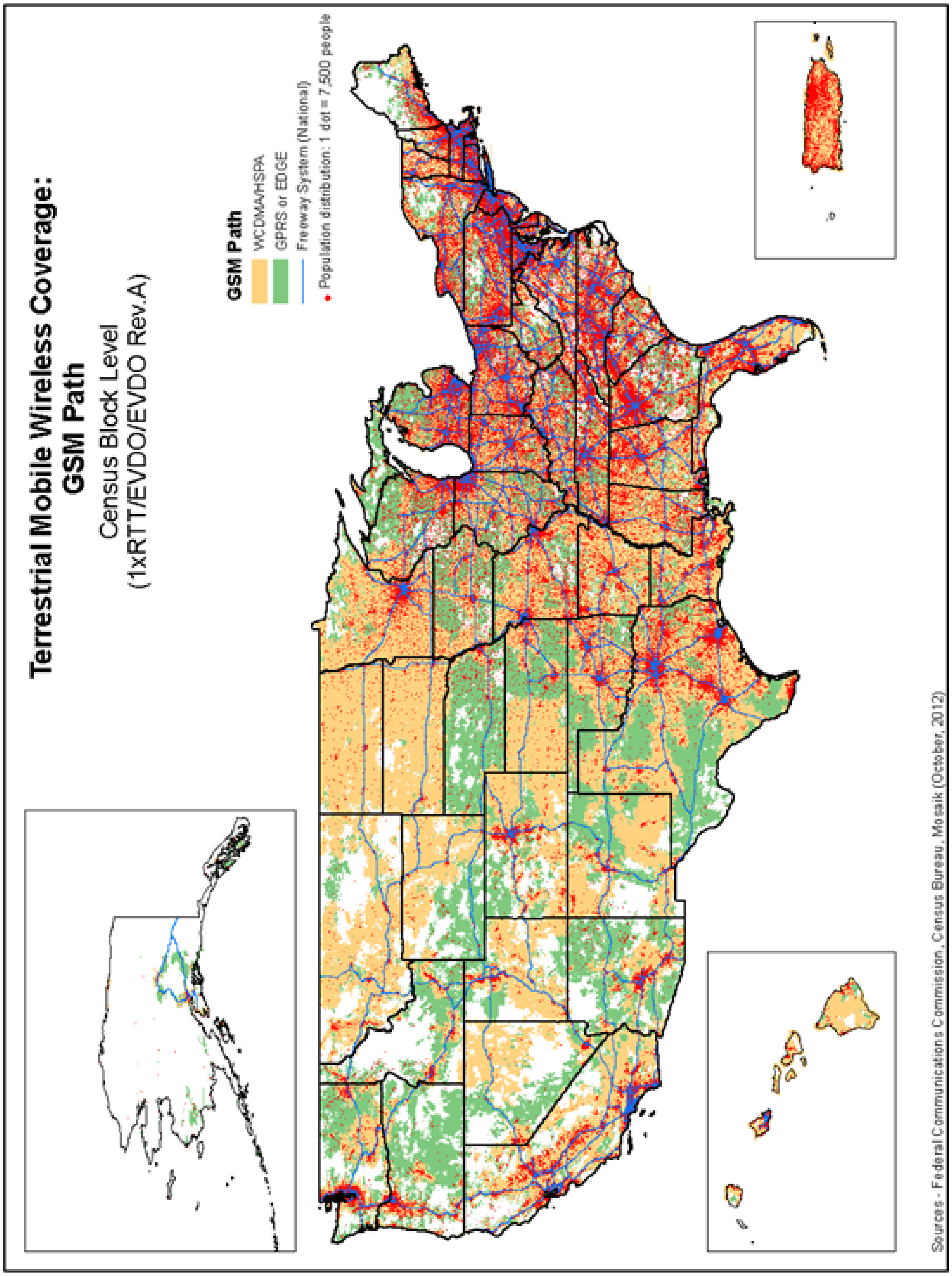
Map C-26
Mobile Wireless Coverage: CDMA Path (2), 2012



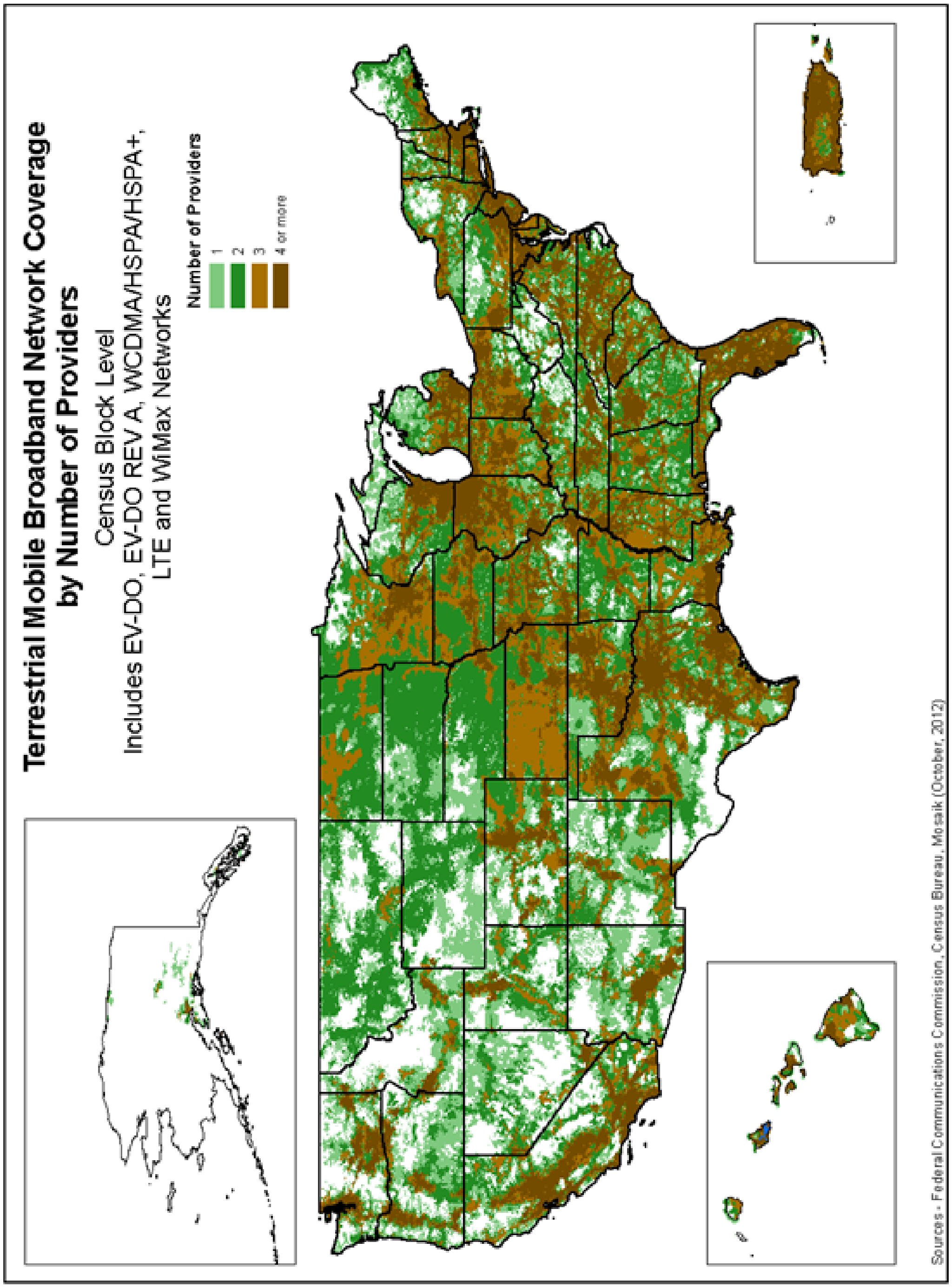
Map C-27
Mobile Wireless Coverage: GSM Path



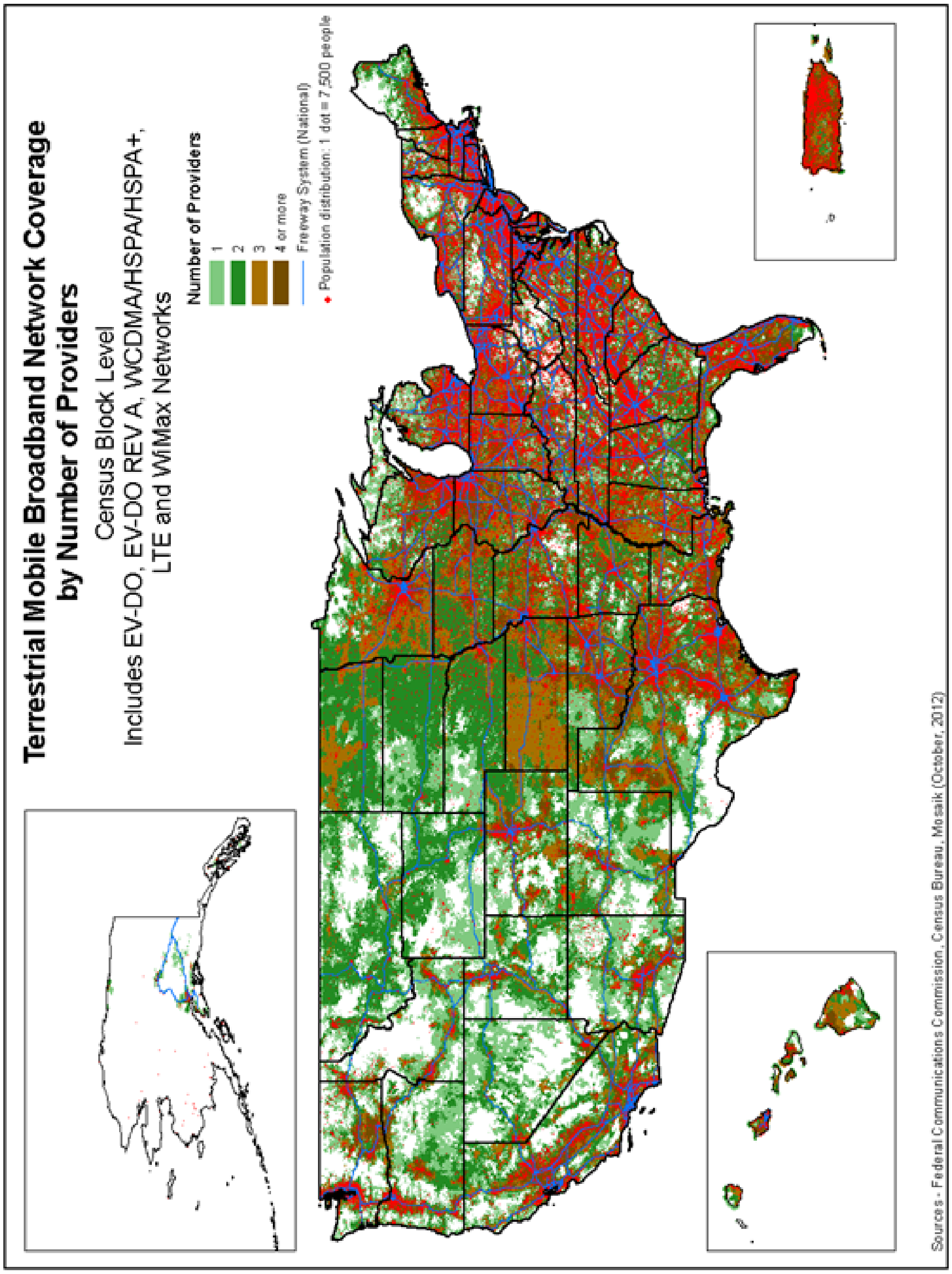
Map C-28
Mobile Wireless Coverage: GSM Path (2), 2012



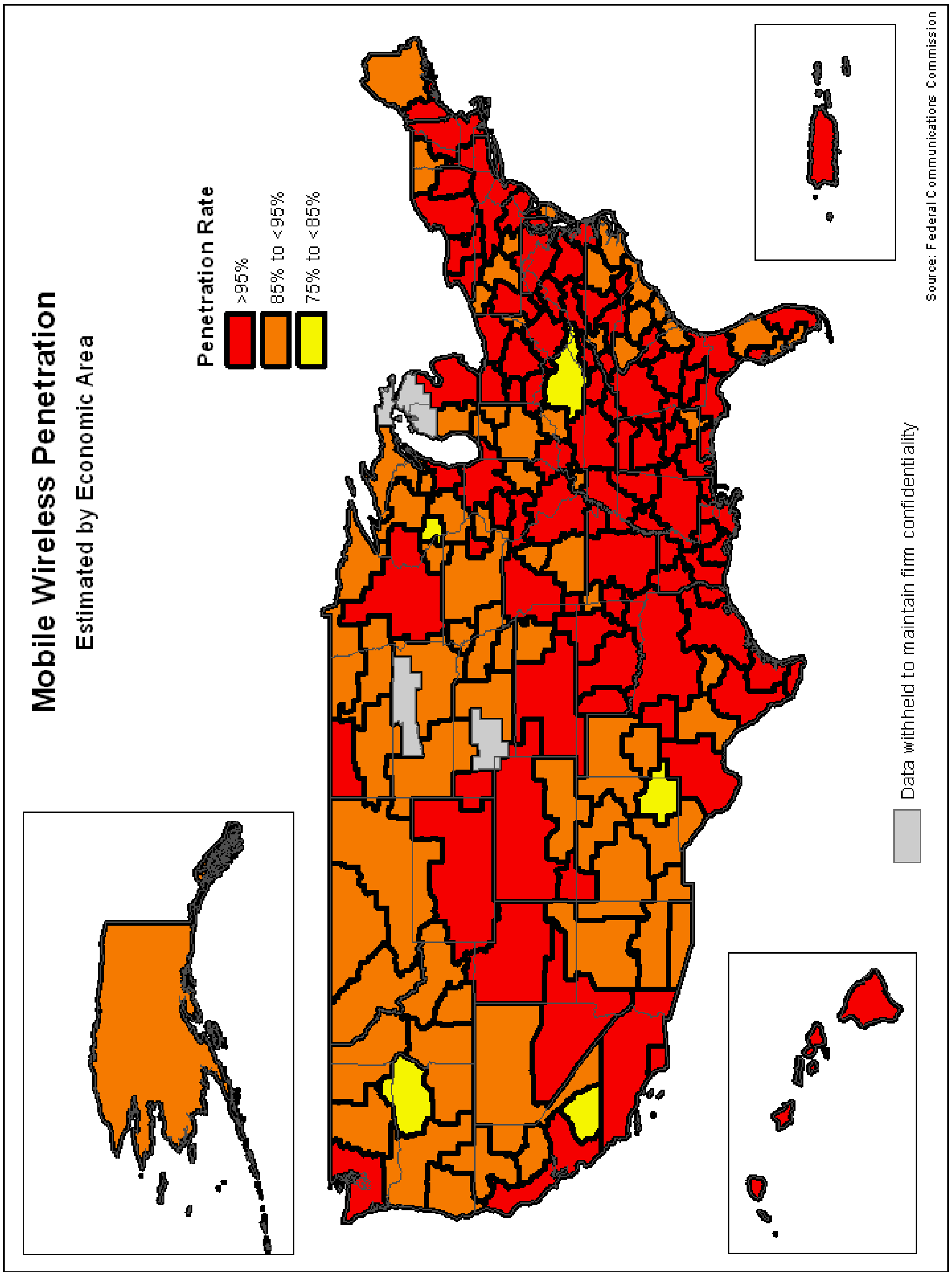
Map C-29
Mobile Broadband Network Coverage, 2012



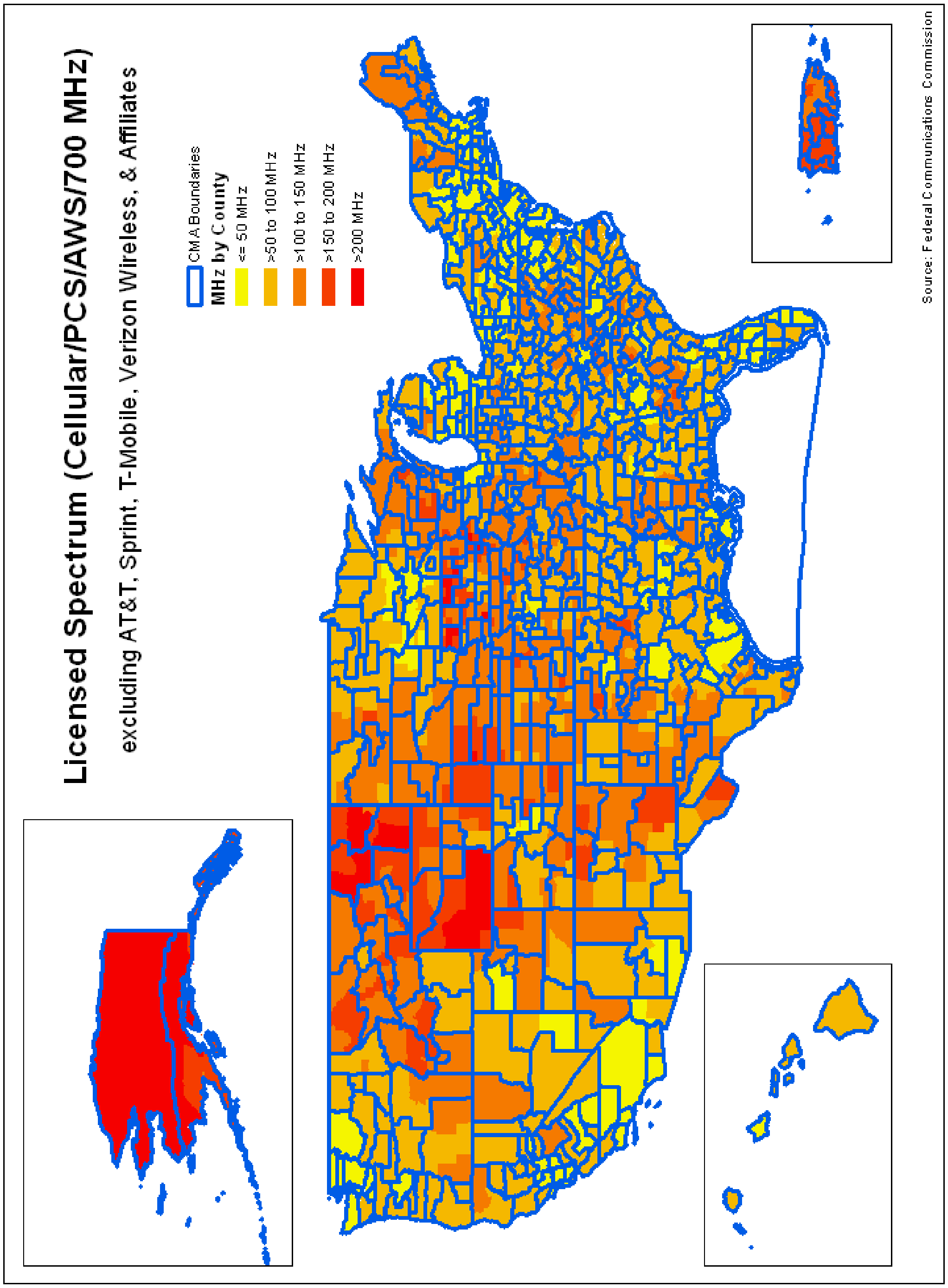
Map C-30
Mobile Broadband Network Coverage (2), 2012



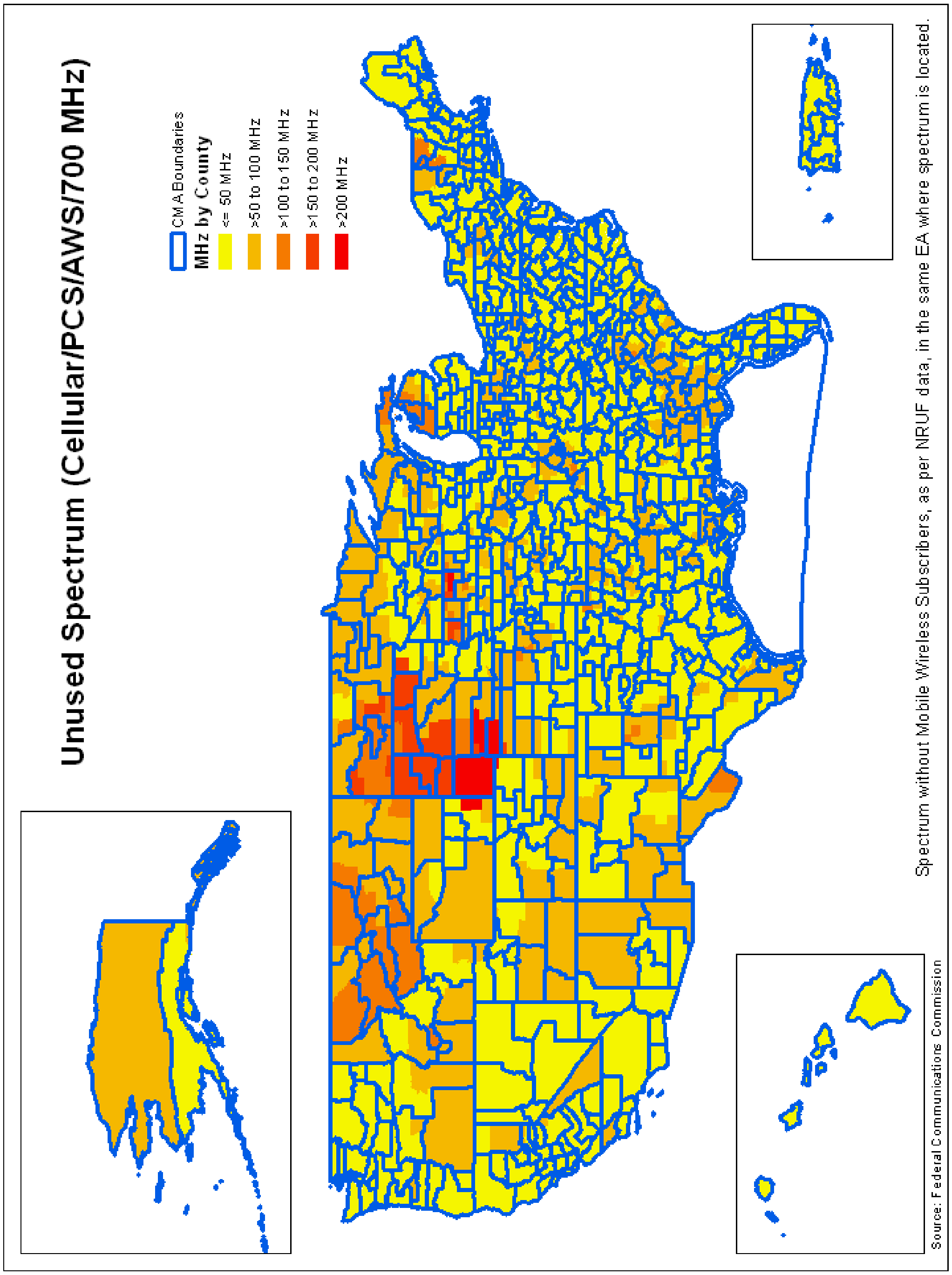
Map C-31
Mobile Wireless Penetration By EAs, 2011



Map C-32
Spectrum Not Licensed to the Nationwide Providers and Their Affiliates



Map C-33
Available Licensed Spectrum



APPENDIX D

Index of Acronyms

2G	Second Generation
3G	Third Generation
4G	Fourth Generation
ALMB	Average Local Monthly Bill
ARPU	Average Revenue Per User
ATC	Ancillary Terrestrial Component
ATN	Atlantic Tele-Network
AWS	Advanced Wireless Service
BEA	Bureau of Economic Analysis
BLS	Bureau of Labor Statistics
BRS	Broadband Radio Service
BTA	Basic Trading Area
CFR	Code of Federal Regulations
CAPEX	Capital Expenditures
CDC	Centers for Disease Control
CDMA	Code Division Multiple Access
CEA	Component Economic Area
CEO	Chief Executive Officer
CMA	Cellular Market Area
CMRS	Commercial Mobile Radio Services
CPI	Consumer Price Index
CPP	Calling Party Pays
DA	Delegated Authority
DAS	Distributed Antenna System
DOJ	Department of Justice
DSL	Digital Subscriber Line
DTV	Digital Television
DTV Act	Digital Television Transition and Public Safety Act of 2005
EA	Economics Area
EBIT	Earnings before Interest and Taxes
EBITDA	Earnings before Interest, Taxes, Debt, and Amortization
EBS	Educational Broadband Service
EDGE	Enhanced Data Rates for Global Evolution
EHA	Exclusive Handset Agreement
EIRP	Equivalent Isotropically Radiated Power
ETF	Early Termination Fee
EV-DO	Evolution Data Optimized
FCC	Federal Communications Commission
FDD	Frequency Division Duplex
FNPRM	Further Notice of Proposed Rulemaking
FSS	Frequency Spread Spectrum
FTC	Federal Trade Commission
GAO	Government Accountability Office
GB	Gigabyte
GHz	Gigahertz
GPRS	General Packet Radio Service

GSM	Global System for Mobile Communication
HDMI	High-Definition Multimedia Interface
HHI	Herfindahl-Hirschman Index
HSDPA	High Speed Downlink Packet Access
HSPA	High Speed Packet Access
HSUPA	High Speed Uplink Packet Access
HTC	HTC Corporation
HTML	HyperText Markup Language
HTTP	Hypertext Transfer Protocol
IB	International Bureau
iDEN	Integrated Digital Enhanced Network
ILEC	Independent Local Exchange Carrier
ISO/IEC	International Organization for Standardization/International Electrotechnical Commission
ITIF	Information Technology & Innovation Foundation
ITU	International Telecommunication Union
kbps	Kilobits per Second
LEC	Local Exchange Carrier
LEO	Low Earth Orbit
LLC	Limited Liability Corporation
LNP	Local Number Portability
LTE	Long Term Evolution
M&O	Management and Operations
M2M	Machine-to-Machine
MB	Megabyte
Mbps	Megabits per Second
MEA	Major Economic Area
MHz	Megahertz
MIMO	Multiple Input Multiple Output
MMS	Multimedia Messaging Service
MOUs	Minutes of use (average minutes of use per subscriber per month)
MSA	Metropolitan Statistical Area
MSS	Mobile Satellite Service
MTA	Major Trading Area
MVNO	Mobile Virtual Network Operator
NCHS	National Center for Health Statistics
NFC	Near-Field Communication
NHIS	National Health Interview Survey
NIST	National Institute of Standards and Technology
NOI	Notice of Inquiry
NPA-NXX	the first six digits of a ten-digit telephone number
NPAC	Number Portability Administration Center
NPRM	Notice of Proposed Rulemaking
NRUF	Numbering Report / Utilization Forecast
NTCA	National Telecommunications Cooperative Association
NTIA	National Telecommunications and Information Administration
OBI	Omnibus Broadband Initiative
OET	Office of Engineering & Technology
OFDMA	Orthogonal Frequency Division Multiple Access
OS	Operating System
PC	Personal Computer
PCS	Personal Communications System
PN	Public Notice

POPs	population (people)
PSTN	Public Switched Telephone Network
PTT	Push-to-Talk
PUC	Public Utility Commission
R&D	Research and Development
R&O	Report and Order
RF	Radio Frequency
RIM	Research in Motion
RPM	Revenue per Minute
RSA	Rural Service Area
SDARS	Satellite Digital Audio Radio Service
SEC	Security and Exchange Commission
SF 1	Summary File 1
SIM	Subscriber Identity Module
SMR	Specialized Mobile Radio
SMS	Short Message Service
TB	Terabyte
TDD	Time Division Duplex
TDM	Time Division Multiplexing
TDMA	Time Division Multiple Access
TNS	A company now known as Kantar Media
TVWS	TV White Spaces
UK	United Kingdom
ULS	Universal Licensing System
UMTS	Universal Mobile Telecommunications System
US	United States
USB	Universal Serial Bus
USC	United States Code
USF	Universal Service Fund
VoIP	Voice over Internet Protocol
VZ	Verizon
WCDMA	Wideband Code Division Multiple Access
WCS	Wireless Communications Service
WiMAX	Worldwide Interoperability for Microwave Access
WLAN	Wireless Local Area Network
WTB	Wireless Telecommunications Bureau
XIT	XIT Communications

APPENDIX E
List of Commenters

Public Notice Comments

AT&T Inc. (AT&T)
Council Tree Investors, Inc.
CTIA - The Wireless Association (CTIA)
Free Press and Media Access
Google Inc.
International Center for Law & Economics
Kevin Michael
LightSquared Subsidiary, LLC
Maneesh Pangasa
Mercatus Center at George Mason University
MetroPCS Communications Cooperative Association (MetroPCS)
Mobile Future
MSS ATC Coalition
National Cable & Telecommunications Association
National Telecommunications Cooperative Association (NTCA)
NextG Networks, Inc.
NTCH, Inc
Open Mobile Video Coalition
Patricia Cooper
PCIA - The Wireless Infrastructure Association (PCIA)
Pong Research Corporation
Progressive Policy Institute
Rural Cellular Association (RCA)
Satellite Industry Association (SIA)
Senza Fili Consulting
Sprint Nextel Corporation (Sprint Nextel)
TechAmerica
Telecommunications Industry Association
Twilio Inc.
Verizon Wireless
Wayne Longman

Public Notice Reply Comments

AT&T Inc. (AT&T)
Clearwire Corporation
Cricket Communications, Inc. (Cricket)
CTIA - The Wireless Association (CTIA)
The Coalition to Save our GPS
T-Mobile USA, Inc. (T-Mobile)
U.S. GPS Industry Council
United States Cellular Corporation (US Cellular)
Verizon Wireless
Wireless Communications Association International, Inc. (WCAI)

STATEMENT OF
CHAIRMAN JULIUS GENACHOWSKI

Re: Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993, Annual Report and Analysis of Competitive Market Conditions with Respect to Mobile Wireless, Including Commercial Mobile Services, WT Docket No. 11-186.

Since the release of the 15th Mobile Wireless Competition Report, America's mobile marketplace has strengthened, with increased private investment and innovation, and revitalized competitors, though competition challenges remain. This 16th Report's analytical framework reflects the Commission's commitment to fact-based, data-driven analyses. We will continue that focus as we tackle the challenges of promoting competition, protecting consumers, and unleashing spectrum, all to drive U.S. leadership in mobile.

CONCURRING STATEMENT OF
COMMISSIONER ROBERT M. McDOWELL

Re: Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993, Annual Report and Analysis of Competitive Market Conditions with Respect to Mobile Wireless, Including Commercial Mobile Services, WT Docket No. 11-186.

This comprehensive report provides data and information about the current state of the wireless industry and demonstrates that the mobile sector continues to thrive in today's challenging economic times. As a result of competition, American consumers are benefitting from the innovative service offerings provided by wireless providers and experience greater choice at lower prices than ever before. America has *always* led the world in the wireless sector and this report illustrates that we still do.

Furthermore, this report shows the continued strides made by wireless providers to build out broadband networks. In fact, capital investment grew from $24.9 billion in 2010 to $25.3 billion in 2011 as wireless providers continue to upgrade and expand networks to meet the needs and demands of Americans. As of October 2012, 82 percent of the U.S. population has a choice of at least four wireless broadband providers and approximately 92 percent of Americans are served by three or more providers. These percentages have increased from 68 percent and 82 percent, respectively, in August 2010. In rural areas, the percentage of the population served by three or more wireless broadband providers has increased from 38 percent in August 2010 to 65.4 percent in October 2012. In short, the raw data throughout this report clearly demonstrates a vibrant and competitive market where consumers enjoy a tremendous array of options.

This report also demonstrates that consumer choice extends beyond the selection of service providers. The industry offers a wide selection of service plans, ranging from high-end and thriftier prepaid options to traditional postpaid plans with various levels of voice minutes, data amounts and financing for the latest innovative devices. In fact, this report details that consumers can choose among more than 20 manufacturers offering more than 250 handsets. Today, approximately 55 percent of American mobile consumers carry smartphones running on different operating systems to download their choice of more than one million available applications.

The Commission's report does not conclude, despite the wealth of evidence before us, "whether or not there is effective competition," as the statute requires.[1] Instead, the report "focuses on presenting the best data available on competition throughout this sector of the economy and highlighting several key trends in the mobile wireless industry." Congress, however, tasked us with making a finding as to whether this sector is *competitive*. Clearly, it is. For this reason, I vote to concur to the *Sixteenth Mobile Wireless Competition Report*, as I have for the last two reports.

Additionally, I continue to be concerned about the Commission's continued determination to differentiate spectrum above and below 1 GHz. Different spectrum bands have distinct propagation characteristics and present contrasting benefits and challenges. Nonetheless, frequencies both above and below 1 GHz are being used to provide the same mobile voice and data services, and LTE is successfully being deployed from 700 MHz to above 2 GHz. The "apples to oranges" distinctions of yore are quickly disappearing thanks to new technologies. Our public policy decisions should reflect these marketplace

[1] 47 U.S.C § 332(c)(1)(C).

realities. The Commission should not continue to gaze at today's dynamic trends through yesterday's lenses.

Moreover, as we go forward, we must ensure that the economic growth displayed in this report continues. Last year, U.S. wireless providers employed 238,071 workers. The wireless sector overall supported 3.8 million jobs, directly and indirectly, and accounted for a $146.2 billion boost to the U.S. gross domestic product.

This shining star of the American economy has succeeded precisely *because* the government has largely kept its hands off of it. Recent overtones emanating from the Commission, however, foreshadow that the days of regulating the wireless sector with a "light touch" may be coming to an end. Increasing government control of this freedom-enhancing economic engine would only slow it down and undermine America's global competiveness. No regulation is cost-free. Adding more rules could put American consumers at a disadvantage compared to their international counterparts. The Commission should not allow this to happen.

I thank the dedicated staff of the Wireless Telecommunications Bureau for all of the hours spent compiling this data. I am grateful for your efforts.

STATEMENT OF
COMMISSIONER MIGNON L. CLYBURN

Re: *Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993, Annual Report and Analysis of Competitive Market Conditions with Respect to Mobile Wireless, including Commercial Mobile Services, WT Docket No. 11-186.*

The percentage of American adults relying solely on mobile for voice service has reached 34 percent, and for those whose incomes are below the poverty line, that figure has risen to 52 percent. Therefore, consistent with the growing importance of cellular services to consumers, I am pleased that we have been improving the amount and quality of the data presented on key factors related to the structure of the wireless industry. Enhanced analysis will improve the Commission's ability to ensure the market structure protects consumer interests.

I continue to pay close attention to the extent in which deployment of mobile services varies depending on certain demographics such as the geographic location and median income. This Report rightly identifies areas with positive gains and highlights where there is need for improvement. I am pleased to see, that according to the data, there has been a substantial increase in mobile broadband services being deployed to rural areas. Most notably, 2.5 million more people in rural areas, who did not have access to any mobile broadband service in August of 2010, now benefit from this service. And the number of people living in rural areas with access to more than two mobile broadband service providers has increased by more than 16 million over the same time frame. I wish to go on record commending service providers and other companies in the industry who facilitated that deployment. Unfortunately, it appears that over the same two-year period, more people living in rural areas have two or fewer options for mobile voice service. Our Fifteenth Report found about 7.1 million people living in rural census blocks with two or fewer mobile voice providers. Now, that figure has increased to approximately 7.7 million. Despite the billions invested on mobile networks each year, I must say that it is disappointing to see 400,000 Americans still lacking access to any mobile service option. We need to continue our focus on policies that can promote more competitive options for mobile voice service.

Nevertheless, I remain encouraged that since the release of the National Broadband Plan, the Commission has adopted rules and taken other steps that promote greater deployment of mobile voice and broadband services. For example, backhaul is a critical input for the deployment of wireless broadband and other wireless services. Since 2011, the Commission has adopted two Orders that can enhance the flexibility and speed with which companies can use microwave spectrum for less expensive backhaul solutions in rural areas. The 2011 Connect America Fund Order approved a Mobility Fund to promote deployment of mobile broadband services in two Phases. In September 2012, the Commission held Phase I of the Mobility Fund to provide one-time support to areas unserved by 3G networks. Through a reverse auction, the Commission assigned $300 million in support to 33 winning bidders to provide voice and mobile broadband services covering up to 83,494.23 road miles in 795 biddable geographic areas located in 31 states and 1 territory. To ensure universal availability of mobile broadband services, Phase II will provide up to $500 million per year in ongoing support to expand and sustain mobile voice and broadband services in communities in which service would be unavailable absent federal support.

The Commission has also taken significant actions to promote the deployment of TV White Spaces. In September 2010, the Commission adopted final rules to allow unused spectrum in the broadcast bands to be used for powerful Internet connections with extended range, fewer dead spots, and improved individual speeds. Many applications are possible in the TV White Spaces, such as broadband access to schools particularly in rural areas. Last summer, New America Foundation, GiG U, the United Negro College Fund, Google, Microsoft, and the other founding members of AIR U, developed a creative partnership to assist rural universities and promote the development of White Space services. In September 2012, the Commission launched its Unlicensed Wireless Microphone Registration System in the U.S. East Coast Region, and on March 1, 2013, the Commission authorized TV White Space data systems to provide service to unlicensed devices located anywhere in the United States and its territories and possessions.

I encourage the industry and consumer advocates to let us know if these policies are sufficient to providing competitive options to mobile consumers and if there are other policy approaches we should consider. And once again, I thank the staff of the Wireless Telecommunications Bureau led by Ruth Milkman, for presenting us with a thorough, expert analysis of the interrelated segments of the mobile wireless service industry.

STATEMENT OF
COMMISSIONER AJIT PAI
APPROVING IN PART, CONCURRING IN PART

Re: Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993, Annual Report and Analysis of Competitive Market Conditions With Respect to Mobile Wireless, including Commercial Mobile Services, WT Docket No. 11-186.

There is a lot of good news in the 16th Wireless Competition Report, which we adopt today. There are now more wireless connections in America than there are people.[2] Practically everyone has access to mobile voice and broadband service (99.9 percent and 99.5 percent, respectively), and a substantial majority of Americans (82 percent) can choose among at least four facilities-based mobile broadband operators.[3] Consumers have an incredible selection of handsets, with 23 manufacturers offering 266 models.[4] And wireless providers are increasingly using the spectrum we auctioned in 2006 and 2008—the AWS-1 and 700 MHz spectrum—to offer 4G LTE services. In fact, annual incremental investment in wireless networks rose to $25.3 billion in 2011, almost 25 percent over what it was two years before.[5]

The result of all this activity? More Americans are choosing smartphones when they purchase a new phone (67 percent in 2012), and more Americans are using them to go online (104 million in 2011).[6] Mobile data traffic more than doubled from 2010 to 2011.[7] And unit prices for mobile services are falling, whether measured on a per-minute basis, on a per-megabyte basis, or by the wireless inflation index.[8] All of this is a testament to the success of the deregulatory approach to wireless taken by both Congress and the Commission over the past two decades.

And yet, I cannot approve today's report in every respect because it does not carry out all the tasks that Congress has assigned us. Specifically, Congress has directed us to include in our annual wireless competition report "an analysis of whether or not there is effective competition."[9] The report simply does not do this. To be sure, some might not like answering this question. But the Communications Act does not give us the discretion to dodge. The binary choice of yes or no doesn't countenance a hedge based on "the complexity of the various inter-related segments and services within the mobile wireless ecosystem."[10]

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[2] *Report* at para. 244.

[3] *Id.* at Tables 5, 9.

[4] *Id.* at Table 44.

[5] *Id.* at Table 33.

[6] *Id.* at paras. 220, 339.

[7] *Id.* at Chart 26.

[8] *Id.* at paras. 264, 268, 263.

[9] 47 U.S.C. § 332(c)(1)(C). Another question unanswered is "[w]hether any of such competitors have a dominant share of the market for [commercial mobile] services." *Id.*

[10] *Report* at 2. I will concede that not everyone in Congress thinks that the Communications Act as it stands directs the FCC to answer the right questions. Last year, the U.S. House of Representatives passed by voice vote the FCC Consolidated Reporting Act of 2012, H.R. 3310, which would have eliminated the Wireless Competition Report as a (continued….)

For what it's worth, the answer is pretty obvious to me: Yes, there is effective competition.[11] That's what our report shows in page after page of analysis. That's what the Wireless Telecommunications Bureau basically found last week when it approved the combination of the fourth and fifth largest wireless providers in America without seeking a vote by the full Commission.[12] And that's what every consumer sees when he or she goes shopping for a new phone—choice and competition are ubiquitous. Because the Report does not acknowledge this conclusion directly, I concur in part.

(Continued from previous page)
stand-alone report and given the Commission considerably more flexibility to report on competition in the communications marketplace. But unless and until Congress amends the Act, it is our statutory responsibility to answer the questions that Congress has asked.

[11] I also believe that no competitor has a dominant share of the market for commercial mobile services. *See supra* note 8.

[12] *Applications of Deutsche Telekom AG, T-Mobile USA, Inc., and MetroPCS Communications, Inc. for Consent to Transfer of Control of Licenses and Authorizations*, WT Docket No. 12-301, Memorandum Opinion and Order and Declaratory Ruling, DA 13-384 (WTB/IB rel. Mar. 12, 2013), *available at* http://go.usa.gov/2EDR.