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. 10-133 (Terminated)

FIFTEENTH REPORT

Adopted: June 24, 2011 **Released: June 27, 2011**

By the Commission: Commissioners Copps and Clyburn issuing separate statements; Commissioner McDowell concurring and issuing a separate statement.

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I. EXECUTIVE SUMMARY

1. Congress requires the Federal Communications Commission (Commission) to produce an annual report on the state of competition in the mobile services marketplace under section 332(c)(1)(C) of the Communications Act. In May 2010, the Commission released the *Fourteenth Report*, which provided an analysis of mobile wireless market conditions during 2008 and 2009.[1] This year's fifteenth Mobile Wireless Competition Report (*Fifteenth Report* or *Report*) updates the data and analysis presented in the *Fourteenth Report*, and analyzes mobile wireless service market conditions during 2009 and 2010,[2] including "competitive market conditions with respect to commercial mobile services" as required by the Act.[3] Like the *Fourteenth Report*, the *Fifteenth Report* presents a multitude of industry data on various aspects of mobile wireless competition.[4]

2. The *Fourteenth Report* examined, for the first time, competition across the entire mobile wireless ecosystem, including an analysis of the "upstream" and "downstream" market segments, such as spectrum, infrastructure, devices, and applications. Consistent with the Commission's first seven Annual Commercial Mobile Radio Service (CMRS) Competition Reports, the *Fourteenth Report* 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 *Fifteenth Report* follows the same analytical framework used in the *Fourteenth Report*, with certain improvements based on responses to that *Report*. Thus, the *Fifteenth Report* 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.

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[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, *Fourteenth Report*, 25 FCC Rcd 11407 (2010) (*Fourteenth Report*).

[2] The *Report* includes network coverage data from American Roamer from the third quarter of 2010. In other instances, particularly where year-end metrics are discussed or annual comparisons are made, the *Report* uses year-end 2009 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.*

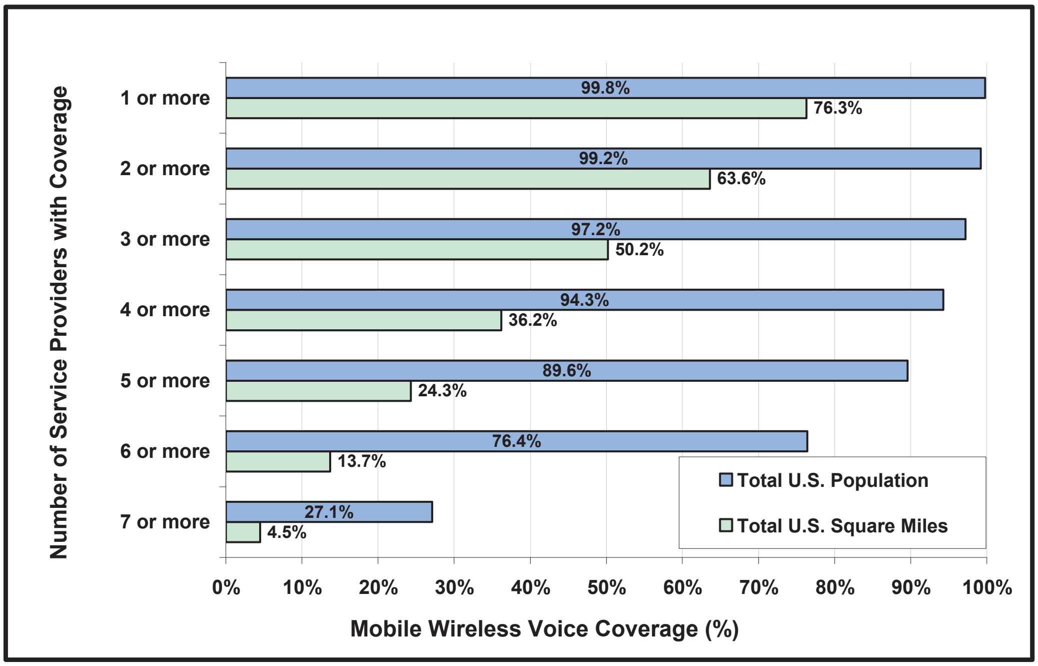
[4] 47 U.S.C. § 332(c)(1)(C). As with previous *Reports,* this *Report* does not address the merits of any license transfer applications that are currently pending before the Commission or that may be filed in the future, which will be decided based on the record collected in each proceeding. *See, e.g., 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*").

Selected developments and key metrics with respect to the current state of mobile wireless competition are highlighted below:

Number of Providers & Network Deployment

For the fourth consecutive *Report*, the Commission has conducted an analysis of service provider coverage by census block, based on data from American Roamer[5] and population data from the 2000 Census.[6] These data present the number of providers with network coverage in these census blocks, which may differ from the number of providers offering service to consumers living in these census blocks.

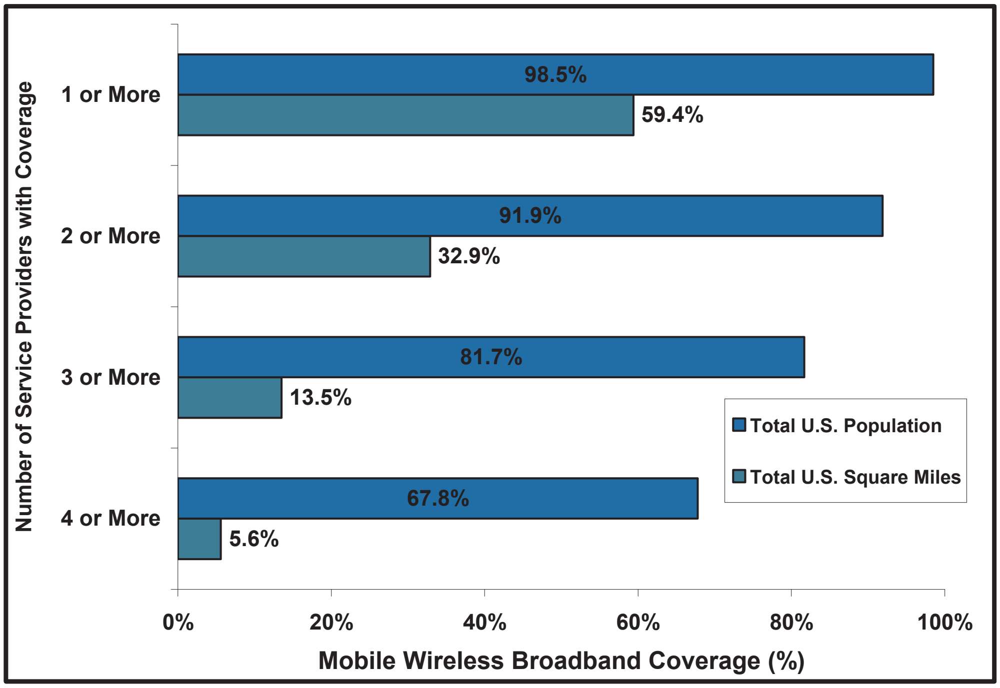
Estimated Mobile Wireless Voice Coverage by Census Block, 2010



[5] Our analysis of mobile wireless network coverage is based on coverage maps provided by American Roamer. We note that this analysis likely overstates the coverage actually experienced by consumers, because American Roamer reports advertised coverage as reported to it by many mobile wireless service providers, each of which uses a different definition or determination of coverage. Although the data are not consistent across geographic areas and service providers, the analysis is useful because it provides a general baseline that can be compared over time across network types, technologies, and providers. *Connecting America: The National Broadband Plan*, FCC, at 39 (Chapter 4) (rel. Mar. 16, 2010), *available at* www.broadband.gov (*National Broadband Plan*). 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. *See* Section III.C.1, Number of Competitors, *infra.*

[6] Unless otherwise noted, population data in the *Report* are taken from U.S. Census Bureau (Census Bureau). For purposes of calculating numbers on broader geographic bases, such as the nationwide penetration rate, we use Census Bureau population estimates as of July 1, 2008. For purposes of calculating the extent of service provision based on census blocks, we use 2000 Census population figures because that is the Census Bureau's most recent data about population at the census block level.

Estimated Mobile Wireless Broadband Coverage by Census Block, 2010[7]



During 2009 and 2010, the four nationwide 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]

[7] Additional information on mobile broadband network availability can be found in the National Broadband Map, released by NTIA on February 17, 2011, *available at* http://www.broadbandmap.gov/.

[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. *See* Section IV.B.1, Network Coverage and Technology Upgrades, *infra,* for a further discussion.

3G/4G Deployment by Selected Mobile Wireless Service Providers

Service Provider	HSPA and EV-DO Deployment	LTE and WiMAX Deployment
Verizon Wireless	As of September 2010, EV-DO Rev. A network covered 289 million POPs.	In December 2010, launched LTE in 38 cities covering 110 million people. Plans to expand LTE to its entire EV-DO footprint (289 million people) by the end of 2013.
AT&T Wireless	As of early 2010, HSPA covered 230 million POPs. As of January 2011, entire HSPA network had been upgraded with HSPA+ (14.4 Mbps).	Plans to launch LTE in areas covering around 75 million people by mid-2011 and to complete its LTE buildout by year-end 2013.
Sprint Nextel	As of August 2010, EV-DO Rev. A network was available in census blocks covering 239 million POPs.	Resells Clearwire's WiMAX service.
Clearwire		As of year-end 2010, WiMAX network covered approximately 120 million people.
T-Mobile	HSPA network covered 212 million POPs as of mid-2010 and HSPA+ (21 Mbps) network covered 200 million POPs in 100 cities as of year-end 2010.	No U.S.-specific plans.
MetroPCS		As of January 2011, launched LTE in 13 cities.

Subscribers, Connections, and Net Adds

The data source that the Commission has used for many years to estimate the number of mobile wireless subscribers, Numbering Report/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. However, consumers are now more likely to use more than one mobile device – 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 – that commonly are assigned telephone numbers. In addition, certain mobile broadband providers do not assign telephone numbers to the devices on their networks. Therefore, NRUF is becoming increasingly less useful in measuring the number of individual subscribers but instead provides an estimate of the number of mobile wireless connections or connected devices.

Based on NRUF data, the number of mobile wireless connections grew four percent from 279.6 million at the end of 2008 to 290.7 million at the end of 2009. CTIA also estimates the total number of mobile subscriber connections based on its industry survey and found that the number of connections grew six percent from 270.3 million at the end of 2008 to 285.6 million at the end of 2009. Industry-wide net new mobile wireless subscriber/connection additions (or "net adds") for 2009 totaled 11.1 million, based on NRUF data, and 15.3 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 2009 there were 274.3 million subscribers to mobile telephone, or voice, service, up nearly five percent from 261.3 million at the end of 2008. At the same time, there were 55.8 million subscribers to mobile Internet access services at speeds exceeding 200 kbps in at least one direction – which is more than double the number at the end of 2008.[9]

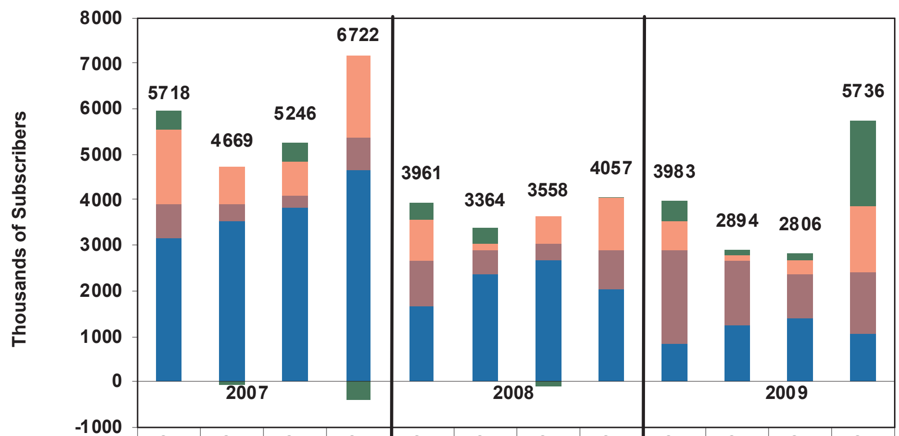
[9] This figure is based on the Commission's Form 477 data, which collects subscribership and other data from providers of Internet access services at speeds exceeding 200 kbps in at least one direction. *See* Section V.A, Subscribership/Connection Levels, *infra*, for a complete discussion. Only services 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.

Mobile Wireless Subscribers and Connections								
Year	Mobile Wireless Connections				Mobile Telephone Subscribers		Mobile Internet Access Subscribers	
	NRUF (millions)		CTIA (millions)		Form 477* (millions)		Form 477 (millions)	
	Total	Net Adds	Total	Net Adds	Total	Net Adds	Total	Net Adds
2001	128.5	n/a	128.4	18.9	124.0	23.0		
2002	141.8	13.3	140.9	12.4	138.9	14.9		
2003	160.6	18.8	158.7	18	157.0	18.1		
2004	184.7	24.1	182.1	23.4	181.1	24.1		
2005	213.0	28.3	207.9	25.8	203.7	22.6		
2006	241.8	28.8	233.0	25.1	229.6	25.9		
2007	263.0	21.2	255.4	22.4	249.3	19.7		
2008	279.6	16.6	270.3	14.9	261.3	12.0	26.5	
2009	290.7	11.1	285.6	15.3	274.3	13.0	55.8	29.3

* Prior to December 2004, only facilities-based wireless carriers with at least 10,000 mobile telephone subscribers per state were required to report data. Starting with the 2005 data, all facilities-based wireless carriers are required to report.

Quarterly net adds during 2009 varied by the type of pricing plan, with wholesale and prepaid subscribers accounting for a larger portion of total net adds than in 2008. In addition, as also shown below, net adds have not been distributed evenly among major mobile wireless service providers.

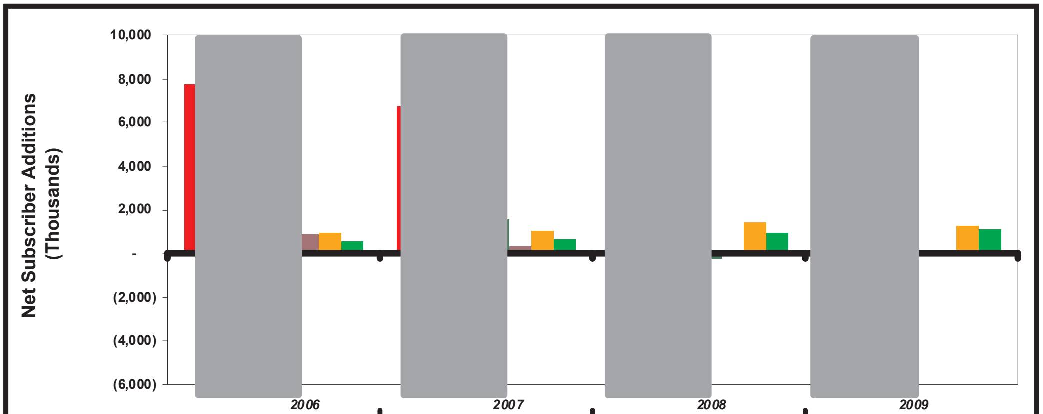
Quarterly Net Adds by Pricing Plan: 2007-2009[10]



	Q1 2007	Q2 2007	Q3 2007	Q4 2007	Q1 2008	Q2 2008	Q3 2008	Q4 2008	Q1 2009	Q2 2009	Q3 2009	Q4 2009
Wholesale	407	-55	395	-418	384	319	-95	7	470	120	139	1872
Traditional Prepaid	1650	815	754	1813	891	166	602	1174	612	87	302	1448
Unlimited Prepaid	776	381	275	708	1025	507	380	854	2086	1449	983	1340
Postpaid	3138	3529	3822	4660	1661	2372	2671	2022	815	1237	1382	1077
Total Net Adds	5718	4669	5246	6722	3961	3364	3558	4057	3983	2894	2806	5736

[10] Wholesale net adds include subscriber connections served by resellers or MVNOs excluding TracFone.

Net Additions by Service Provider[11]



	2006	2007	2008	2009
[redacted]				
Alltel	722	1,576	(181)	
US Cellular	870	307	74	(55)
MetroPCS	941	1,022	1,404	1,273
Leap Wireless	561	635	981	1,109

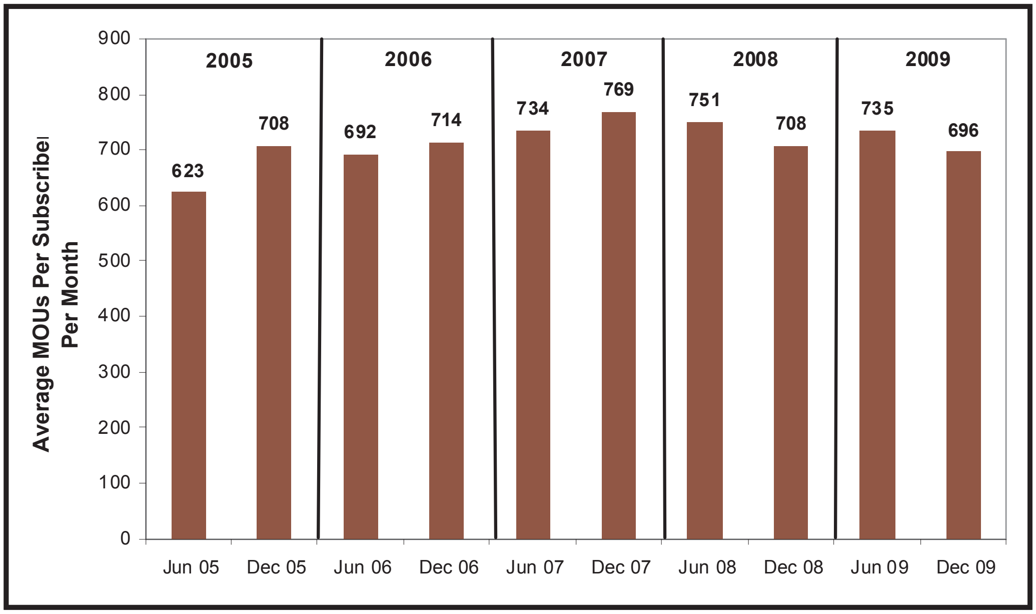
Usage

Average monthly mobile voice usage per subscriber continued to decline in 2009, while text and multimedia messaging usage increased (see charts below). While the data currently available to the Commission on mobile data traffic for the United States are limited, one firm has estimated that mobile data traffic in North America averaged 16,022 terabytes (TB) per month in 2009, two and a half times larger than the 2008 average of 6,282 TB per month.[12] Based on this estimate, one analyst claims that total mobile wireless network traffic was evenly split between voice and data as of June 2010. This analyst also estimates that average monthly data traffic per subscriber grew 78 percent from 138 MB in 2008 to 245 MB in 2009.

[11] Includes 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.

[12] *See* Section V.C, Output and Usage Levels, *infra,* for a complete discussion.

Average Voice MOUs Per Subscriber Per Month



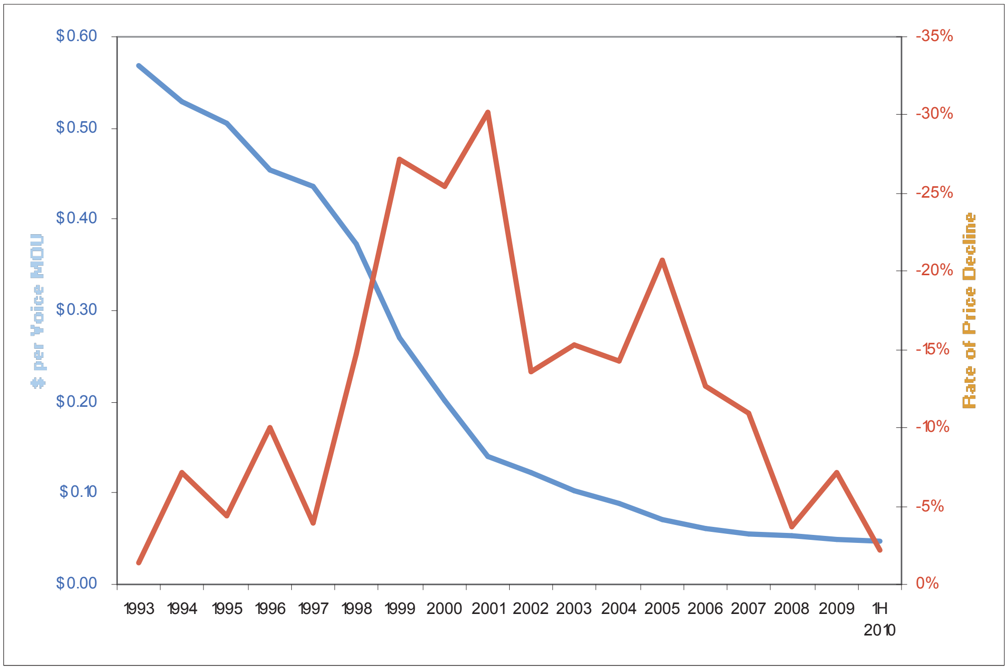
Average Text and MMS Messages Per Subscriber Per Month

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

Price Metrics

Two measures of pricing for wireless services – the Cellular Consumer Price Index (CPI) and unit price (revenue per user per month divided by average unit consumption per month) – show that the price level remained generally flat during 2009. After declining every year since 1997, the annual Cellular CPI was unchanged during 2009, while the overall CPI decreased by 0.4 percent. In addition, average voice revenue per minute (RPM), rounded to the nearest cent, remained at $0.05 for the third straight year. While voice RPM has declined dramatically over the past 17 years, the rate of per-minute price declines has been varied considerably from year to year, and has decreased in recent years, as shown in the chart below.

Mobile Wireless Voice Revenue per Minute: 1993-2010



We are not able to estimate the average price per text message this year because the industry has stopped reporting text messaging revenues separately from overall data service revenues. One analyst, however, has estimated that price per text yields dropped for the fifth consecutive year to $0.009 in 2009, a 25 percent decline from the previous year. Given the limited data available to the Commission on mobile data traffic, we are not able to estimate an industry-wide unit price for non-messaging mobile data services for 2009. However, one analyst has estimated that, as of mid-2010, typical price-per-MB for unlimited data plans on smartphones ranged from $0.02 to $0.15, and the typical price-per-MB for data plans for laptops and wireless data cards ranged from $0.01 to $0.08.[13]

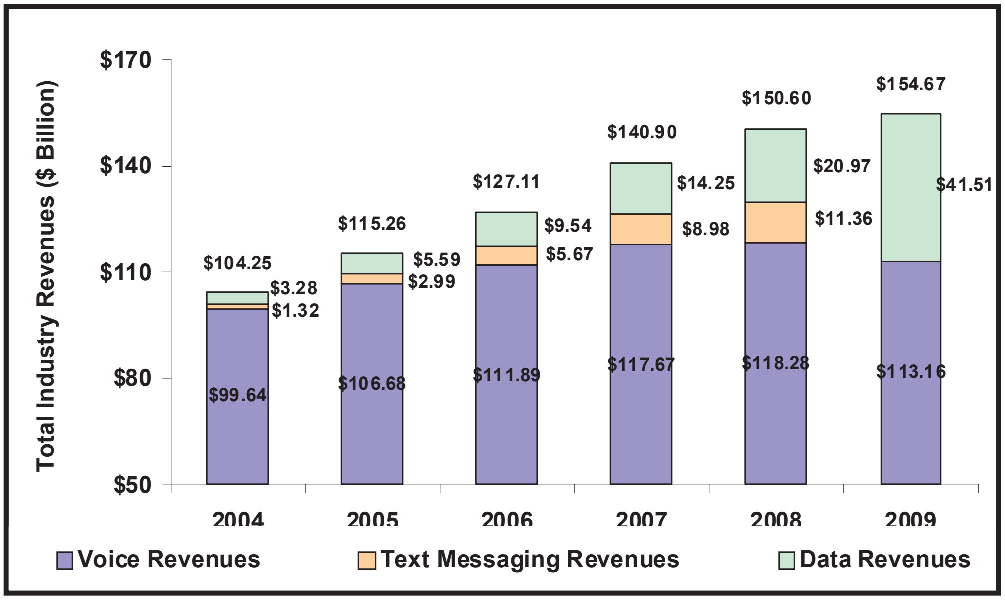
Industry Revenue and Average Revenue Per User (ARPU)

The total revenue generated by the mobile wireless industry is substantial, approximately $154.7 billion in service revenues in 2009, and has been growing consistently.[14] In 2009, the mobile wireless ecosystem comprised 21.8 percent of the total revenues of the U.S. information and communications technology (ICT) industry, up from 19.9 percent in 2008. While the revenues of the ICT industry declined 5.7 percent from 2008 to 2009, the revenues attributable to wireless increased 3.3 percent. The annual revenue growth rates in recent years, however, have been slowing – 2009 revenues were three percent greater than 2008, as contrasted with almost seven percent growth between 2007 and 2008. Annual voice revenues declined for the first time in 2009, by approximately four percent, from $118 billion to $113 billion. At the same time, data revenue increased 28 percent from $32 billion to $42 billion.

[13] *See* Section V.D.1, Price Indicators, *infra,* for a complete discussion.

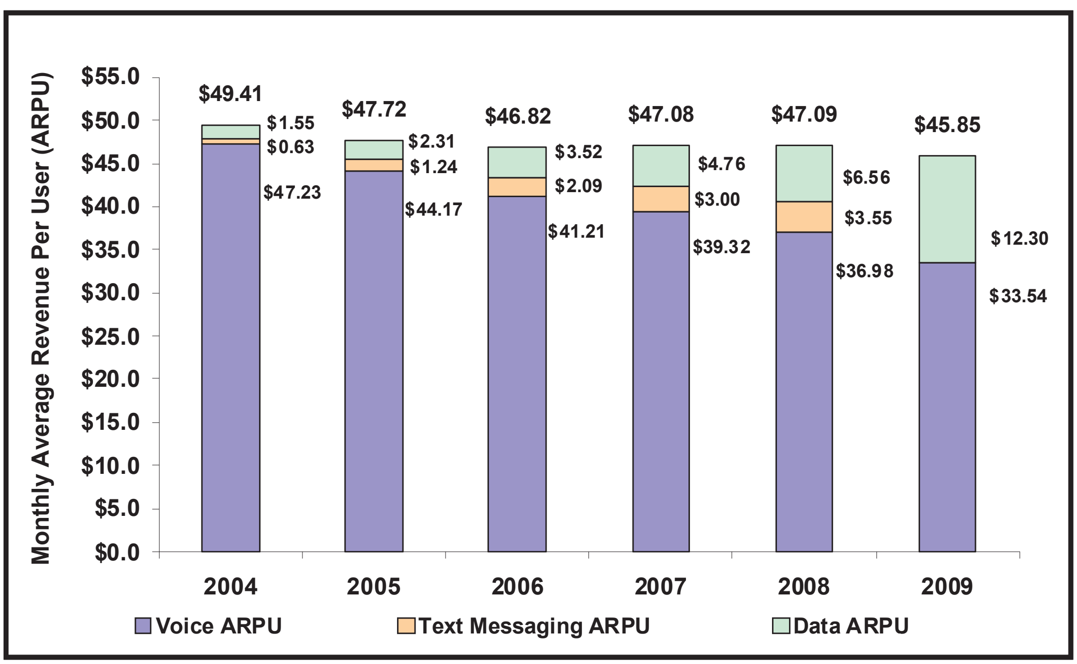
[14] Dollar figures stated in this *Report* have not been adjusted for inflation (*i.e.,* they are nominal dollars) unless stated otherwise.

Total Mobile Wireless Industry Revenues



After remaining unchanged in 2008, total ARPU declined nearly three percent in 2009 from $47.09 to $45.85. In 2009, total revenue was broken into voice service and data service revenue, and voice ARPU declined nine percent from $36.98 to $33.54. Total data service ARPU rose 22 percent from $10.11 in 2008 to $12.30 in 2009, and accounted for 27 percent of ARPU in 2009. In 2008 and prior years, total data revenue collected by industry was broken into messaging revenue and other data service revenue. However, as previously discussed, because this was not done in 2009, we are not able to estimate separate monthly ARPUs for messaging and non-messaging data services.

Monthly ARPU by Type of Service

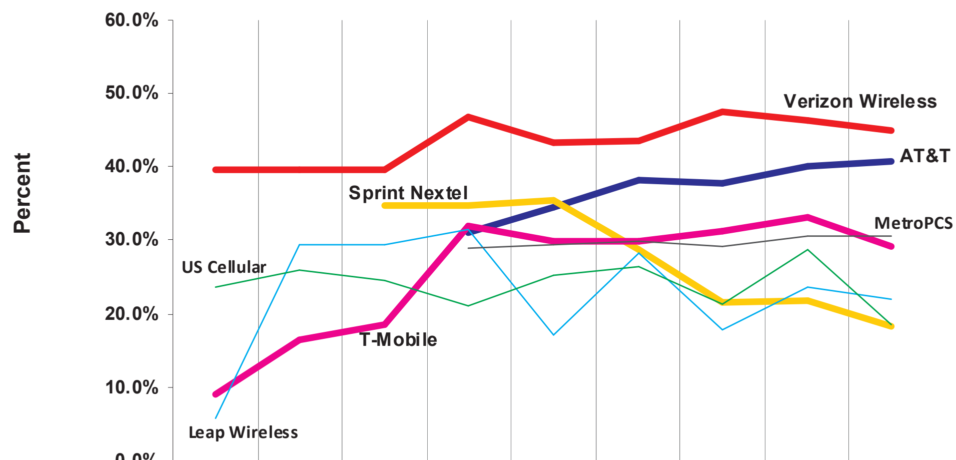


Profitability Metrics

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 November 2010, it was reported that AT&T and Verizon Wireless together accounted for more than 80 percent of wireless industry EBITDA during the third quarter of 2010.[15]

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. In 2009, the difference between the provider with the highest EBITDA margin (Verizon Wireless) and the provider with the lowest (Sprint Nextel) was 26.8 percent. Since 2007, the two largest national providers have been the only providers with EBITDA margins greater than 35 percent.

Reported EBITDA Margins: 2002 – 2009 (Selected Providers)



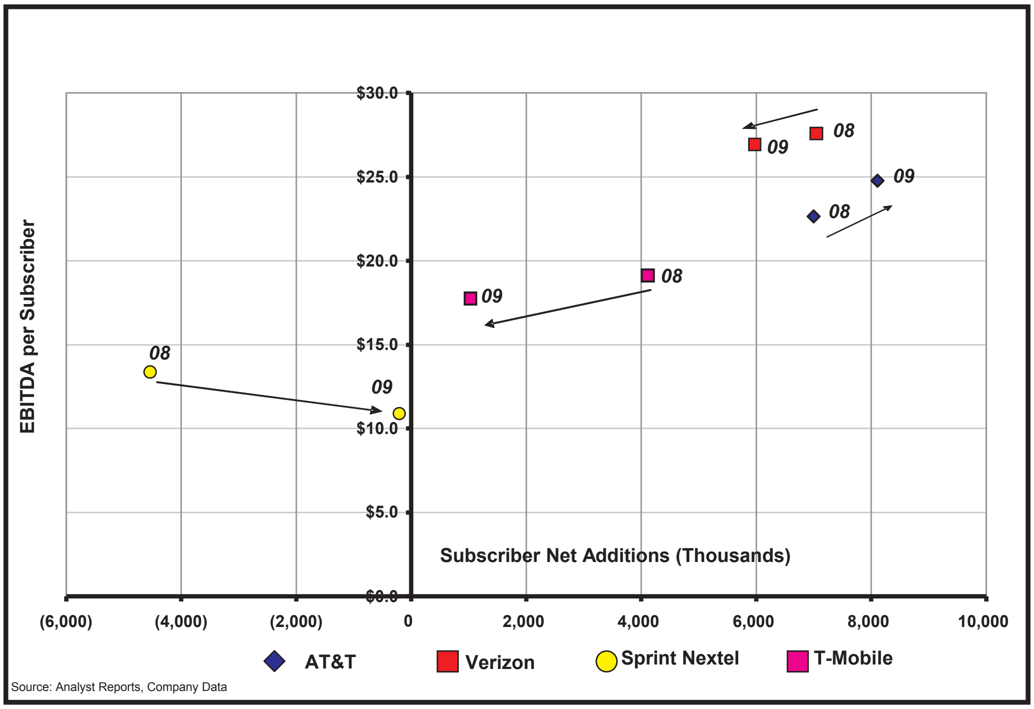
	2002 (Q4)	2003 (Q4)	2004 (Q4)	2005 (Q4)	2006 (Q4)	2007 (Q4)	2008 (Q4)	2009 (Q2)	2009 (Q4)
Verizon Wireless	39.5%	39.7%	39.5%	46.8%	43.2%	43.6%	47.5%	46.3%	45.0%
AT&T				31.1%	34.4%	38.2%	37.7%	40.1%	40.7%
Sprint Nextel			34.8%	34.6%	35.4%	28.7%	21.6%	21.7%	18.2%
T-Mobile	9.1%	16.5%	18.5%	32.0%	29.8%	29.8%	31.1%	33.1%	29.1%
Leap Wireless	5.7%	29.5%	29.4%	31.6%	17.1%	28.2%	17.7%	23.5%	21.9%
US Cellular	23.7%	25.9%	24.6%	21.0%	25.2%	26.4%	21.3%	28.8%	18.4%
MetroPCS				28.9%	29.4%	29.9%	29.2%	30.5%	30.5%

In looking at the annual EBITDA per subscriber versus net adds of the four nationwide service providers, we find that the two largest service providers, AT&T and Verizon Wireless, have both the highest EBITDA per subscriber and the highest net adds. AT&T experienced increases in both net adds and

[15] *See* Section V.G, Profitability, *infra,* for a complete discussion.

EBITDA per subscriber during 2009, while Verizon Wireless's EBITDA per subscriber and net adds declined slightly during 2009. T-Mobile's net adds declined significantly from just over 4 million in 2008 to around 1 million in 2009. At the same time, the company's EBITDA per subscriber also dropped slightly and remained in the $15 to $20 range. Sprint Nextel's net adds improved during 2009, but the company failed to break into positive territory and its EBITDA per subscriber fell to nearly $10.

Subscriber Additions vs. EBITDA Per Subscriber: 2008-2009



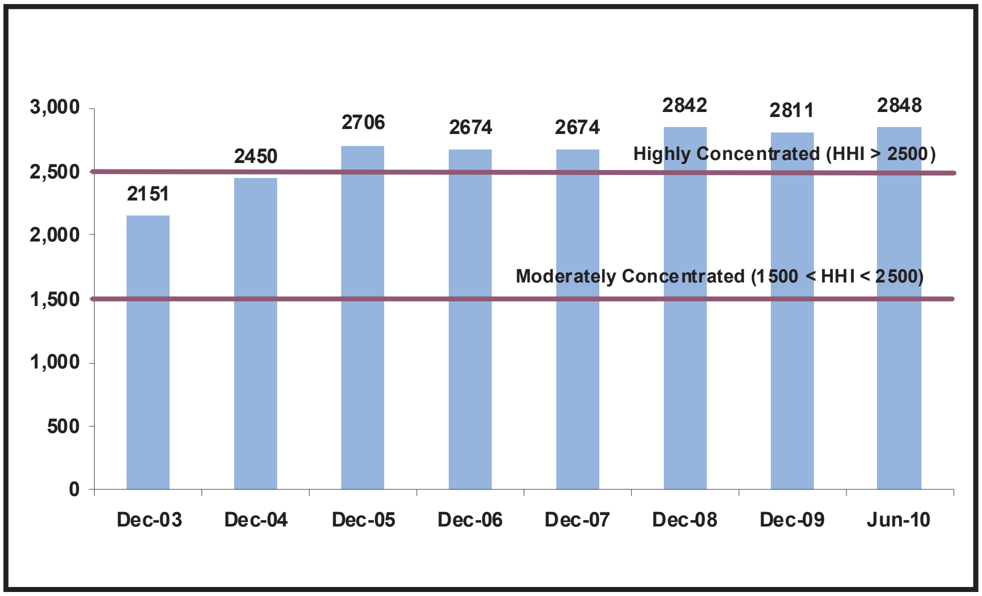
Market Concentration

The Herfindahl-Hirschman Index (HHI), which is calculated by summing the squared market shares of all firms in any given market, is a commonly used measure of industry concentration. 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).[16]

In the mobile wireless services industry, the weighted average of HHIs (weighted by population across the 172 Economic Areas in the United States) was 2811 at the end of 2009, compared to 2842 at the end of 2008. Both the lowest HHI values and the highest HHI values by Economic Area decreased in 2009 relative to 2008. From 2003 (the first year the Commission calculated HHIs) to 2009, the average HHI has increased from 2151 to 2811, an increase of 660 points. As of mid-2010, the weighted average of the HHIs has increased to 2848, slightly higher than the year-end 2008 level.

[16] *See Horizontal Merger Guidelines*, United States Department of Justice and the Federal Trade Commission, http://www.justice.gov/atr/public/guidelines/hmg-2010.pdf. *See* Section III.C.2, Herfindahl-Hirschman Index, *infra*.

Average Herfindahl-Hirschman Index

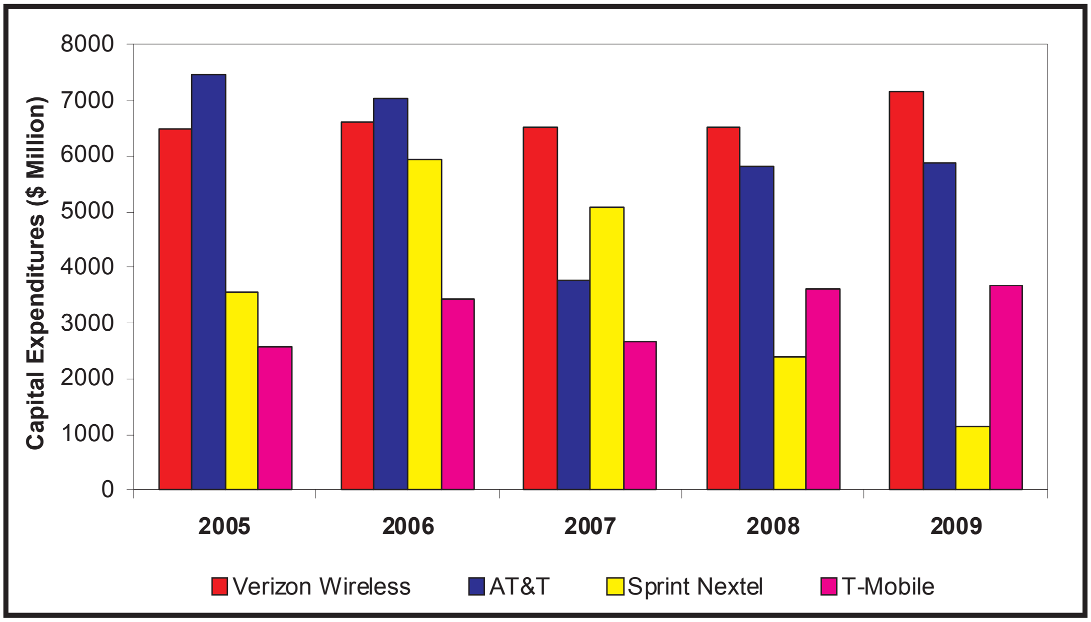


Investment

Annual incremental capital investment by the wireless industry, as reported by CTIA and the U.S. Census Bureau, has varied between $20 billion and $25 billion over the past five years. According to CTIA, capital investment increased slightly from $20.2 billion in 2008 to $20.4 billion in 2009. Census Bureau estimate of wireless industry capital expenditures in 2009 was similar at $20.65 billion. While this represents an 18 percent decrease from $25.6 billion in 2008, in both 2008 and 2009, the wireless sector continued to account for more than 30 percent of all telecom investment, a quarter of all information/communication industry investment, and two percent total investment in the U.S. economy.

Wireless capital investment as a percentage of total wireless industry revenue continued to decline in 2009 from 14 percent to 13 percent. Capital expenditures also have varied significantly from operator to operator, as shown below.

Capital Expenditures by Service Provider



Network Quality

The Commission has recognized the importance of accurate, up-to-date data on mobile network performance – to inform policy, to help consumers make better choices, and to spur competition. The measurement and representation of the overall quality of a provider's network, however, present a number of challenges. For instance, there is neither a single definition of network quality nor a definitive method to measure it. For voice services, aspects of network quality include the strength and coverage of the provider's signal, voice call quality, and the reliability of the network connection, while aspects of network quality for data services also include throughput rates and latency. In addition, the service quality experienced by consumers may vary with time of day, weather, foliage, user location, interference, or network parameters, as well as according to the particular application and/or device being used. The network quality information published by service providers, such as coverage maps and data throughput rates, are most often based on statistical assumptions of network capabilities.

We note that network providers and others gather data on the actual network performance of mobile wireless providers in several ways, including through consumer surveys, network drive tests, fixed probes, internal network level assessments, and the use of crowd-sourcing applications. These methods continue to evolve, and several independent studies have reported network performance measurements for mobile wireless data providers. However, the public data they provide are limited in scope and are not yet robust enough to provide detailed and standardized results.

To help facilitate the availability of better mobile network performance information, during 2010 the Commission released a consumer broadband test for certain smartphone models that collects and reports broadband performance metrics, sought comment on the measurement of mobile broadband network performance and coverage, and solicited 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.

Spectrum

As mobile wireless data usage grows, spectrum becomes an increasingly important input for mobile broadband networks, affecting the ability of service providers to compete in the delivery mobile broadband service. As noted in a recent Commission staff paper, current spectrum forecasts suggest that mobile broadband growth will likely outpace technology and network improvements by an estimated factor of three, leading to a spectrum deficit that is likely to approach 300 megahertz within the next five years.[17] A service provider's particular mix of spectrum holdings affects how it can provide efficient mobile wireless services. For instance, it is well established that lower frequency spectrum may allow for wider coverage with fewer cell sites, which is key in rural areas, and better in-building coverage, which is especially important in urban areas. Furthermore, as some providers have noted, higher-frequency spectrum may be effective for increasing capacity, particularly within smaller, more densely-populated geographic areas.

Most of the spectrum below 1 GHz suitable for the provision of mobile broadband is held by the two largest mobile wireless service providers. Verizon Wireless and AT&T together hold approximately 90 percent of Cellular spectrum based on megahertz-POPs (MHz-POPs),[18] which was the first band to be licensed for commercial mobile services and has the most extensive network buildout. Verizon Wireless holds 45 percent of the MHz-POPs of Cellular and 700 MHz spectrum combined, while AT&T holds approximately 33 percent. In the Broadband PCS (PCS) and Advanced Wireless Services (AWS) spectrum between 1 GHz and 2.5 GHz, no licensee holds more than 23 percent of the MHz-POPs, with T-Mobile holding the most. In the 2.5 GHz band (which include the Broadband Radio Service (BRS) and Educational Broadband Service (EBS)), Clearwire holds the majority of the spectrum.[19]

Backhaul

Several recent trends in the mobile wireless industry have increased the demand for backhaul capacity. First, the increased adoption of smartphones and other Internet-capable mobile devices is leading to the consumption of greater amounts of data. Second, the proliferation of fixed-price mobile Internet access plans enables subscribers to consume more services and greater bandwidth. Third, mobile wireless network data speeds have increased as technology has evolved, with current and future launches of 4G WiMAX and LTE networks supporting even higher data throughput rates and lower latencies. In light of this, identifying solutions to satisfy the growing demand for mobile backhaul is increasingly important.

Handsets and Devices

One way in which mobile wireless service providers and handset manufacturers compete is with their handset and device offerings. Service providers compete in this area by introducing new handsets/devices, distinguishing their handset/device offerings from those of their competitors, responding to competitors' handset/device innovations with rival offerings, offering certain handset/device models on an exclusive basis, and allowing handsets/devices that they do not sell directly to be used on their networks. During 2009 and much of 2010, service providers and device manufacturers launched several new devices – including smartphones, tablets, wireless modem cards, and mobile Wi-Fi

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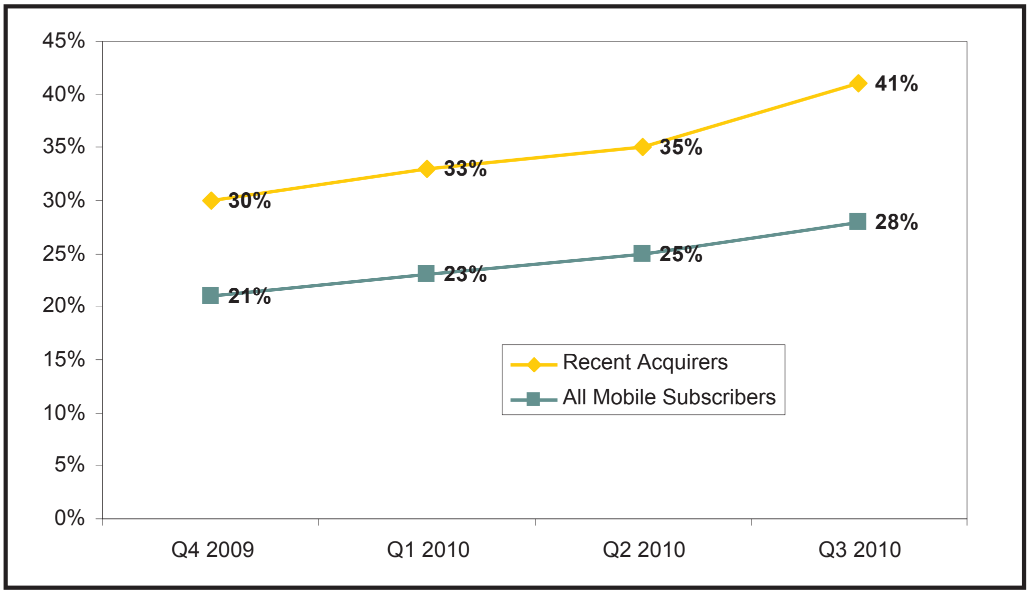
[17] *See* Section VII.A.1, Spectrum, *infra*.

[18] "MHz-POPs" refers to the amount of spectrum in a given license or set of frequencies multiplied by the population covered by the geographic area of the spectrum license. For example, the MHz-POPs of a 20 megahertz license covering a geographic area with a population of 1,000 would be 20,000.

[19] Sprint Nextel and Clearwire combined hold 47 percent of the MHz-POPs of the above-1 GHz spectrum bands (PCS, AWS, BRS, and EBS). Sprint Nextel holds a 54 percent interest in Clearwire and has the ability to nominate seven of Clearwire's thirteen directors. 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.

hotspots – that enable consumers to use data services more quickly and easily while mobile. As shown below, smartphone penetration rates have increased over the past year.

Smartphone Penetration Rates in the United States Q4 2009 – Q3 2010



In addition, smartphone operating system/platform developers compete within the mobile wireless ecosystem. During the first eight months of 2010, Google's share of the smartphone operating system market, with Android, increased from five to nearly 20 percent of smartphones in use. At the same time, the market shares of RIM, Microsoft, and Palm declined while Apple's remained steady.

Share of Smartphones in Use by Operating System (U.S.)

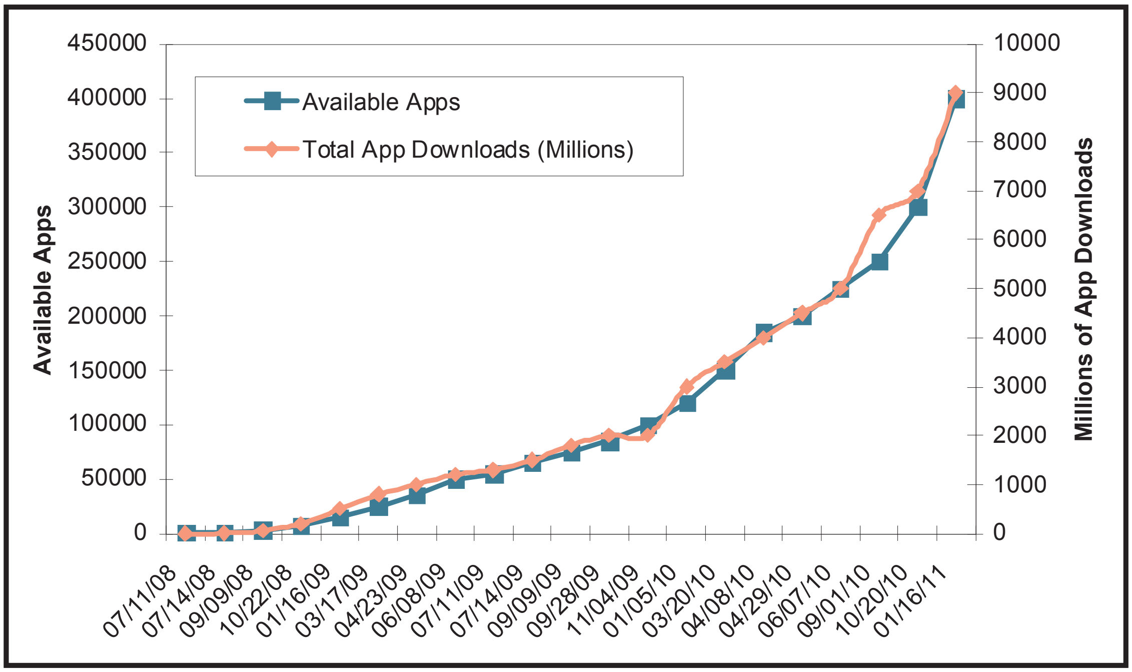
Operating System	Share of Smartphones in Use	
	December 2009	August 2010
RIM	41.6%	37.6%
Apple	25.3%	24.2%
Google	5.2%	19.6%
Microsoft	18.0%	10.8%
Palm	6.1%	4.6%
All Others	3.8%	3.2%

Mobile Applications

Both the number of mobile applications launched and the number of applications downloaded by consumers have grown significantly over the past three years. Several application stores have launched within the last three years, each offering thousands of applications for download. For example, as of September 2010, there were over 250,000 applications available from the Apple App Store, a number that more than doubled in less than a year (see chart below). In addition, the total number of applications downloaded from Apple's App Store grew from 100,000 in 2008 to over 2 billion in 2009, and surpassed 6.5 billion by September 2010, with App Store developers earning over one billion dollars from the sales of their applications in the process. As of September 2010, the more recently created, but rapidly growing Android Market had over 80,000 available applications and had passed one billion total downloads.

Many different types of mobile applications, developed by a range of different third-party developers, are available through mobile application stores and web browsers. 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, hobbies, interests, and industries by various third-party application developers. Analysts believe that one of the major applications driving mobile data usage is social networking. According to comScore, social networking ranked as the fastest-growing mobile content category between April 2009 and April 2010, with the number of mobile consumers using an application to access a social networking website increasing 240 percent to 14.5 million users.

Apple App Store – Available Apps and App Downloads



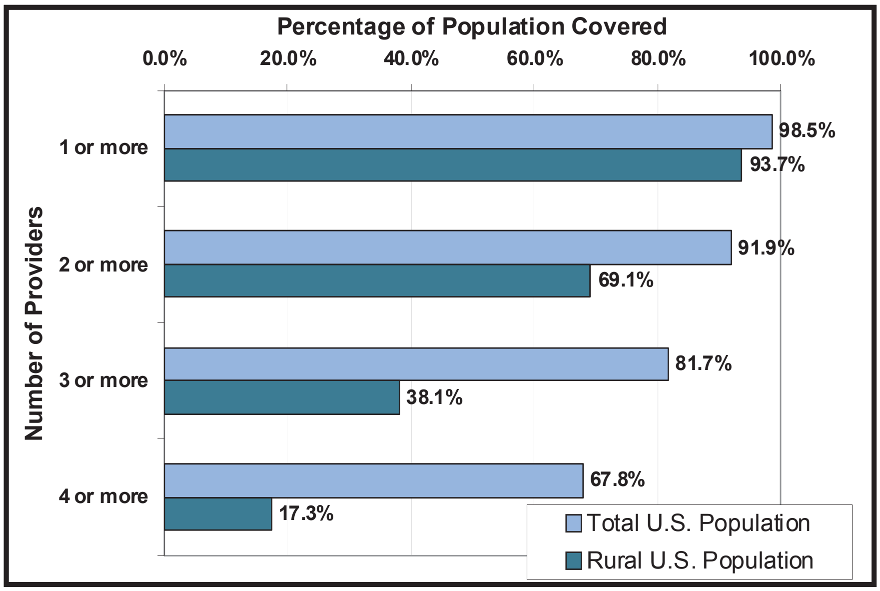
Intermodal Competition

The number of Americans who rely exclusively on mobile wireless for voice service has increased significantly in recent years. According to the January-June 2010 National Health Interview Survey (NHIS), 24.9 percent of all adults lived in households with wireless-only voice connections, up from 21.1 percent in the first half of 2009. When looking at young adults aged 25 to 29, the number is much higher: over 50 percent live in wireless-only households. In addition, the percentage of children living in wireless-only households has increased significantly from 21.3 percent in the first half of 2009 to 29 percent in the first half of 2010.

Urban-Rural Comparisons

Rural counties comprise 86 percent of the geographic area of the United States, and account for approximately 61 million people, or 21 percent of the U.S. population (including Puerto Rico).[20] Although mobile voice and mobile broadband network coverage in rural areas has improved since the *Fourteenth Report*, just over 500,000 people in rural areas had no mobile wireless coverage as of July 2010, and approximately 3.8 million had no mobile broadband coverage as of August 2010. In addition, while 99.2 percent of the rural population is covered by at least one mobile voice provider, and 96.9 percent is covered by at least two providers, there is a disparity in the percentage of rural and total U.S. population covered by more than two mobile voice provider networks. This disparity is even more pronounced when considering mobile broadband service: 82 percent of the total U.S. population is covered by three or more mobile broadband provider networks, compared to just 38 percent of the rural population.

Mobile Broadband Coverage in Rural Areas



International Comparisons

In making cross-country comparisons, several trends can be identified. First, market structure is converging to three or four national competitors per market in many countries. Second, the "calling party pays" system used in most other countries tends to result in lower average voice MOUs and higher revenue per minute of voice service (RPM) than the "receiving party pays" system used in the United States. Average monthly voice usage is significantly higher in the United States than in any other country, as shown in the table below. Third, the average monthly subscriber bill in the United States is considerably higher than the average bill in Western Europe, although Japan has a higher average monthly bill than either the United States or Western Europe. Finally, international differences in regulatory policy and the business environment have produced a wide variety of successful models for the mobile wireless sector, with no one model dominating on all dimensions of market performance.

[20] In this *Report,* rural areas are defined to include counties with a population density of 100 people or fewer per square mile.

2009 Mobile Market Performance in Selected Countries (Merrill Lynch)

Country	*Penetration (% of POPs)*	*Prepaid (% of Subs)*	*Voice MOUs per Month*	*Voice RPM*	*ARPU*	*Data (% of ARPU)*
Receiving Party Pays						
USA	93%	19%	824	$0.04	$49.91	29.3%
Canada	68%	20%	426	$0.09	$55.14	22.1%
Singapore	144%	50%	380	$0.06	$33.01	31.0%
Calling Party Pays						
UK	129%	59%	194	$0.11	$33.52	33.0%
Germany	132%	56%	109	$0.16	$22.08	29.8%
Italy	147%	87%	141	$0.15	$29.12	26.1%
Sweden	131%	35%	211	$0.10	$31.11	25.3%
France	96%	33%	237	$0.15	$48.40	23.7%
Finland	144%	13%	218	$0.13	$33.52	20.5%
Japan	88%	1%	137	$0.25	$58.06	44.5%
South Korea	99%	3%	311	$0.09	$33.63	19.1%
Australia	115%	42%	222	$0.14	$47.27	36.1%

II. INTRODUCTION

3. In 1993, Congress created the statutory classification of Commercial Mobile Radio Services[21] (CMRS) to promote the consistent regulation of mobile radio services that are similar in nature.[22] 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.[23]

4. Congress called on the Commission to report on "competitive market conditions with respect to commercial mobile services."[24] 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.[25]

To comply with Congress's mandate to assess competitive market conditions, this *Report*, like the *Fourteenth Report*, undertakes an expansive and detailed analysis of the entire mobile wireless industry. First, this *Report* integrates an analysis of CMRS into an analysis of all mobile wireless services, including voice, messaging, and broadband. These services often jointly use the same spectrum, network facilities, and customer equipment, and many mobile service providers have integrated the marketing of these services, often offering them in bundles. Many providers of CMRS offer a variety of mobile data services, including mobile broadband Internet access service, which is not classified as "CMRS,"[26] and

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[21] Commercial Mobile Services came to be known as the Commercial Mobile Radio Services, or "CMRS." CMRS includes a large number of terrestrial services and some mobile satellite services. *See* 47 C.F.R. § 20.9(10).

[22] The 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). 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. In some cases, this includes an analysis of offerings outside the umbrella of "services" specifically designated as CMRS. However, because these other services can affect competition in the CMRS market and because providers of these other services can compete with CMRS providers, the Commission has indicated that it is important to consider them in the analysis. As the Commission said, 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).

[23] 47 U.S.C. § 332(c)(1)(C).

[24] 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, 2252, n. 5 (2008) (*Twelfth Report*).

[25] 47 U.S.C. § 332 (c)(1)(C).

[26] In 2007, the Commission classified wireless broadband Internet access service as an information service under the Communications Act and found that wireless broadband Internet access service using mobile technologies was not a (continued….)

other mobile data services whose regulatory status the Commission has not addressed.[27] Also, consumers are increasingly substituting among voice, messaging, and data services, and, in particular, are willing to move from voice to messaging or data services for an increasing portion of their communication needs.

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 broadband 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, 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 competitive and consumer outcomes in the mobile wireless services segment. As the ecosystem has evolved, so have the Commission's *Competition Reports*.[28] 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 the Act is founded upon an expanded view of the mobile wireless services marketplace and an examination of competition across the entire mobile wireless ecosystem.

6. Figure 1 below provides an overview of the mobile wireless ecosystem and the corresponding sections of the *Fifteenth Report* in which each of the ecosystem segments is discussed. The input segments are divided into spectrum, towers, network equipment, and backhaul facilities.[29] 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,[30] and data services (including broadband). The downstream segments include mobile

(Continued from previous page)
"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 5201 (2007).

[27] 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). Aside from broadband Internet access service, the regulatory classification of services and applications that rely on Internet Protocol (IP-enabled services) is pending. *See* IP-Enabled Services, WC Docket No. 04-36, *Notice of Proposed Rulemaking*, 19 FCC Rcd 4863 (2004). In addition, the Wireless Telecommunications Bureau has sought comment on a petition seeking clarification on the regulatory classification of text messaging services. *See* "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).

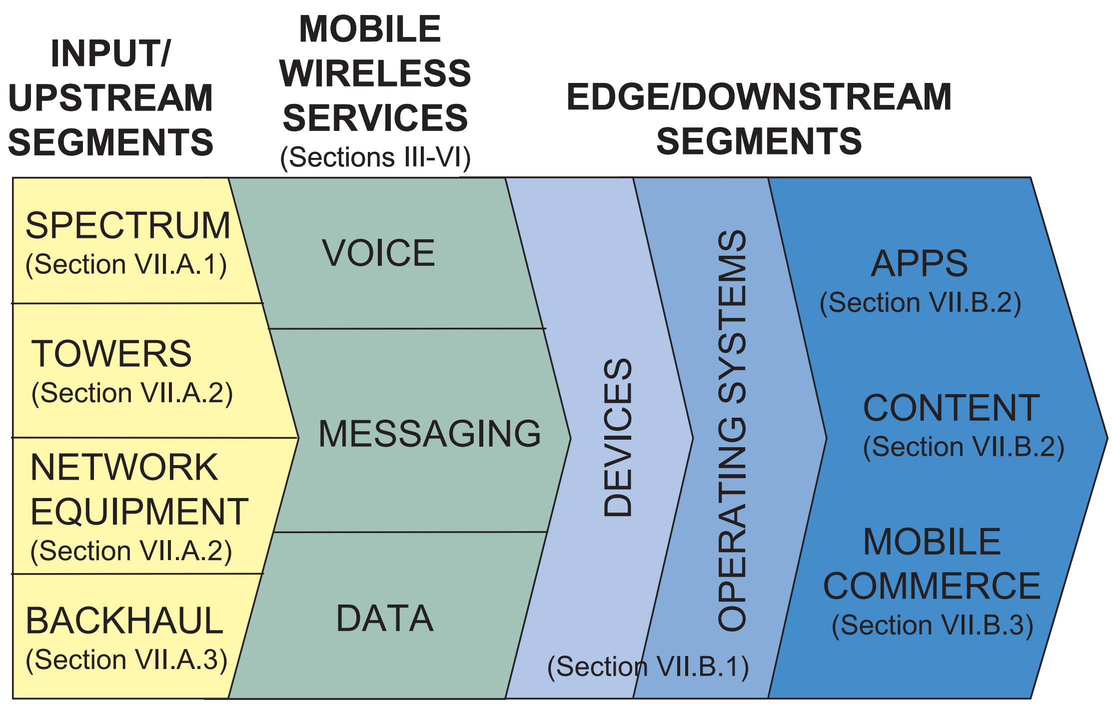
[28] *See* Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993, Annual Report and Analysis of Competitive Market Conditions with Respect to Commercial Mobile Services, *First Report*, 10 FCC Rcd 8844 (1995); *Second Report*, 12 FCC Rcd 11266 (1997); *Third Report*, 13 FCC 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*). The reports can also be found on the Commission's website at http://wireless.fcc.gov/index.htm?job=cmrs_reports.

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

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

devices, device operating systems, and mobile applications, content, and mobile commerce.[31] 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 – 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

[31] 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.

a sustained period of time due to a lack of competitive constraints.[32] This analysis has been organized into four distinct categories: market structure, provider conduct, market performance, and consumer behavior.[33]

8. First, within market structure, the number of competitors is analyzed and measures of concentration are calculated because few providers and 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 2009, the four nationwide service providers accounted for just over 90 percent of the nation's mobile wireless subscribers (including wholesale subscribers), with AT&T and Verizon Wireless together accounting for 62 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. Mergers, a type of exit, are closely reviewed by the Commission. 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, would obtain or maintain market power.[34] Last, although mobile wireless services have some unique characteristics, we regularly assess whether services provided using other technologies, such as wireline, fixed wireless, and satellites, can or will place competitive pressure on mobile wireless service providers.

9. Second, price and non-price rivalry are examined as part of provider conduct. We discuss product differentiation, network investment and technology upgrades, advertising and marketing, and innovation because such non-price modes of competition can impose significant competitive constraints, especially in high technology industries that experience rapid innovation.

10. Third, the section on market performance evaluates evidence of the outcomes of competitive conditions in the mobile wireless industry. This section focuses on the benefits to consumers of competition – such as lower prices, higher consumption, and better quality – while the other sections on market structure, provider conduct, and consumer behavior examine the various structural and behavioral 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 market structure factors, such as concentration measures. The study of prices also provides evidence of any unusual increases or upward trends in prices. In addition, the quantity of services consumed is analyzed in Market Performance because exercises of undue market power may be accompanied by observable restrictions on the quantity of services produced.[35]

11. Fourth, the *Report* examines consumer behavior because the ways in which consumers respond to changes in the price and/or quality of mobile wireless services is one indicator of the level of competition in the industry. The more easily a consumer can switch service providers in response to a

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[32] *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*).

[33] This organization is a variant of the Structure-Conduct-Performance framework in economics. We employ this framework as a taxonomy to organize the data, while recognizing the modern critique of economists that this framework is a descriptive model and some of its assumptions are not found in current economic models. *See, e.g.*, *Modern Industrial Organization* at 2, 268. Numerous commenters supported the use of this framework as a taxonomy. *See also Fourteenth Report*, 25 FCC Rcd at 11434, n. 32.

[34] *See* Section III.E.2, Exit, *infra*, for further discussion of the potential competitive benefits and harms of mergers.

[35] *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 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*).

change in price or non-price factors, the more competitive pressure is put on mobile wireless service providers to improve their service in order to retain their customers. This section analyzes consumer switching costs – including access to information on mobile services, early termination fees (ETFs), and handset issues – as well as churn as a proxy measure of switching costs.

12. In addition to analyzing competition within the mobile wireless services sector, the *Report* analyzes competition in, and the competitive impacts of, the other market segments that constitute the mobile wireless ecosystem. The main input segments of the mobile wireless services market – spectrum, 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 on Downstream Segments. Intermodal Competition is 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), provide an extended discussion on mobile wireless network technologies (Appendix B), and present tables and maps (Appendices C and D).

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 competitive pressure and rivalry present in the mobile wireless industry, the benefits received by consumers, and trends in indicators of firm rivalry and consumer benefits over time. This analysis of competitive conditions 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. It would be overly simplistic to apply a binary conclusion or blanket label to this complex and multi-dimensional 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).[36] Rather, the DOJ's position on competition policy is in agreement with the approach taken in this *Report*.[37] The DOJ 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."[38] 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.[39] This *Report*, like the *Fourteenth Report*, 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

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

[37] *See id*.

[38] *See id*.

[39] 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.

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 June 2010, the Commission's Wireless Telecommunications Bureau sought comment on the data and analytical framework used for its analysis in the *Fourteenth Report*.[40] In response to the feedback received from that *Public Notice*, certain analyses, discussions, and data in this *Report* have been modified or enhanced.

17. *Data Timeframes*. The *Fifteenth Report* focuses on conditions prevailing in the mobile wireless industry during 2009 and much of 2010. 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 2009 data. The *Report's* analysis of network coverage and the number of providers is based on data provided by American Roamer in July 2010 (for voice or overall network coverage) and August 2010 (for mobile broadband and next-generation network coverage). Many sections of the *Report* also discuss major industry developments, where relevant, that occurred during early 2010.

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. MOBILE WIRELESS SERVICES: INDUSTRY STRUCTURE

A. Introduction

19. *Mobile Wireless Services*. The *Fifteenth 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. The *Report* considers information and data on the mobile wireless services industry as a whole as well as on individual services and segments where appropriate. From the standpoint of competitive analysis, the *Report* considers, for the reasons described below, the mobile wireless services industry as a whole.

20. First, a mobile wireless service provider may offer voice and data services using the same spectrum and network infrastructure. Therefore, it is difficult to break down the cost structure of individual services, which would be essential for a detailed competitive analysis.

21. Second, consumers typically receive mobile voice and data services on a single end-user device and purchase these services from a single provider. Although mobile data services are not always offered in conjunction with mobile voice service (*e.g.,* mobile Internet access on a laptop computer or the wireless network connection for an e-reader such as Amazon.com Inc.'s (Amazon) Kindle), mobile wireless subscribers who use their handsets for data services typically purchase these services as either an add-on to voice services or as part of a bundled voice and data plan. In some cases, they may not be able to purchase data services independent of voice services. This bundling of mobile wireless services may shift the focus of competition and consumer choice from individual services to bundles of services.

22. Third, 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.[41] This includes traditional mobile handsets used primarily or exclusively for voice calls, as well as smartphones that are used for both voice and data services, and devices used exclusively for data services, such as

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[40] "Wireless Telecommunications Bureau Seeks Comment on the State of Mobile Wireless Competition," WT Docket No. 10-133, *Public Notice*, 25 FCC Rcd 8416 (WTB 2010).

[41] *See* Section V.A, Subscribership/Connection Levels, *infra*.

wireless modem aircards or e-readers.[42] The NRUF data do not distinguish by the type of device used.

23. Defining the appropriate geographic area for mobile wireless services has a useful role to play in assessing the level of competition.[43] 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.

24. Defining the appropriate geographic area for mobile wireless services is highly 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 relatively large number of licensed service providers; (4) the difficulty of collecting accurate information on the geographic area(s) covered by each mobile operator's network ; (5) a consumer's willingness and ability to purchase services in one or more geographic areas; (6) the extent to which providers offer different terms in different locations.

25. In this *Report*, 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).[44] 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 in the NRUF data.[45] In addition to analyzing the number of competitors within specific geographic areas, we recognize that several providers market and price their services similarly in different areas across the country.

B. Overview of Service Providers

1. Facilities-Based Providers

26. Facilities-based mobile wireless service providers offer mobile voice, messaging, and/or data services using their own network facilities. Most facilities-based providers currently offer circuit-switched mobile voice services that are interconnected with the public switched telephone network (PSTN). Mobile voice service may be offered as a standalone service or in conjunction with messaging or other data services.[46] Mobile wireless voice providers may also 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 portable computers or mobile Wi-Fi hotspot

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

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

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

[45] *See also* Section III.C.2, Herfindahl-Hirschman Index , *infra.*.

[46] Many of the 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.

connections.[47] Certain mobile wireless service providers, such as Clearwire Corporation (Clearwire),[48] offer mobile broadband data services but do not offer circuit-switched mobile voice services.[49] Facilities-based providers compete with each other in offering individual mobile wireless services, as well as bundles of complementary services (*e.g.,* mobile voice, text, and data services) in the same service plan designed to meet the voice and data communication needs of customers.

27. As of year-end 2009, there were four facilities-based mobile wireless service providers in the United States that industry observers typically describe as "nationwide": AT&T, Sprint Nextel,[50] T-Mobile,[51] and Verizon Wireless.[52] 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*.[53] Thus, these four nationwide service providers all have mobile wireless networks that cover in excess of 87.5 percent of the U.S. population in large proportions of the western, mid-western, and eastern United States.[54] A map of the combined coverage areas of these four facilities-based nationwide providers can be found in Appendix D.

28. The next tier of facilities-based providers consists of companies that provide mobile wireless services on a multi-regional, multi-metro, or local basis. Two such providers – Leap Wireless International, Inc. (Leap) and MetroPCS Communications Inc. (MetroPCS) – provide service in multiple large and medium-sized metropolitan areas across the nation.[55] United States Cellular Corporation (US

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[47] Mobile Wi-Fi hotspot devices, such as the Novatel MiFi, can provide mobile broadband Internet access to multiple Wi-Fi-enabled devices, such as netbooks, MP3 players, and smartphones. However, generally, consumers cannot subscribe to a data-only service when using a handset.

[48] *See Clearwire Reports Record Subscriber and Revenue Growth in Third Quarter 2010*, Press Release, Clearwire, Nov. 4, 2010 (In markets where Clearwire has commercially launched, it covers approximately 82 million people). Clearwire offers fixed wireless interconnected VoIP services. *See infra* ¶ 68.

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

[50] Sprint Nextel was created by the merger of Sprint Corp. and Nextel Communications, Inc. *See Tenth Report*, 20 FCC Rcd at 15931, ¶ 60. Note also that Sprint Nextel holds a 54 percent interest in Clearwire, and has the ability to nominate seven of Clearwire's thirteen directors. As of Sept. 30, 2010, three Sprint appointed directors have resigned from Clearwire's Board. Clearwire said the board members resigned to address questions Clearwire raised regarding new antitrust law developments. *3 Sprint Execs Resign from Clearwire Board*, Bloomberg Businessweek, Sept. 30, 2010, at http://www.businessweek.com/ap/financialnews/D9IIAHO80.htm.

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

[52] 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, 2009, at 3. Verizon Wireless is the brand name of Cellco Partnership. *See* Cellco Partnership, SEC Form 10-Q, filed Oct. 29, 2009, at 5.

[53] 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.

[54] 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, 700 MHz, and 2.5 GHz (both BRS licenses and EBS spectrum leases). Their respective holdings are discussed in more detail in Section VII.A.1, Spectrum, and Appendix A, *infra.*

[55] Note that both Leap and MetroPCS provide their subscribers with coverage of the majority of the United States through a combination of home network and roaming arrangements. Leap covers 35 states and the District of Columbia, and MetroPCS splits its operations into 13 geographical regions: Atlanta, Boston, Dallas/Fort Worth, (continued….)

Cellular) is a large regional provider that serves regions in the western, mid-western, and eastern United States.[56] A large, former regional provider, Alltel Corporation (Alltel), was acquired by Verizon Wireless in January 2009.[57]

29. There are over 90 small facilities-based providers throughout the country that typically provide service in a single geographical area, many of them rural areas. For example, Cincinnati Bell Wireless, one of the larger of these providers, provides service in the areas surrounding Cincinnati, Ohio. Cellular South provides service in Mississippi, as well as Memphis and parts of Alabama and Louisiana. Based on American Roamer data, we estimate that there were 93 smaller, facilities-based providers in the United States as of July 2010, down from 98 in October 2009. Non-nationwide service providers may rely on roaming agreements with nationwide facilities-based providers to extend their network coverage.

30. The population covered by the mobile wireless networks of the top facilities-based providers is shown below. Table 1 provides information on mobile wireless voice network coverage, and Table 2 provides information on mobile wireless broadband network coverage for the leading facilities-based providers.

(Continued from previous page)
Detroit, Las Vegas, Los Angeles, Miami, New York, Orlando/Jacksonville, Philadelphia, Sacramento, San Francisco and Tampa/Sarasota. SEC Filings, Form 10-Q. *See* Section III.D, Entry and Exit Conditions, *infra*.

[56] United States Cellular Corp., SEC Form 10-K, filed Feb. 25, 2010, at 1 (states that as of Dec. 2009, US Cellular provided wireless voice and data services to more than 6.1 million customers in 26 states).

[57] *See* Section III.E.2, Exit, *infra*.

Table 1
Mobile Wireless Network Coverage, Selected Facilities-Based Providers: *Voice Networks* [58]

Service Provider	Covered POPs October 2009 (millions)	Covered POPs October 2010 (millions)
Verizon Wireless	270.5	284.9
AT&T	262.8	281.9
Sprint Nextel	258.0	263.2
T-Mobile	246.2	249.5
MetroPCS	84.6	92.1
Leap	80.5	82.7
US Cellular	41.7	41.5

Table 2
Mobile Wireless Network Coverage, Selected Facilities-Based Providers*: Broadband Networks* [59]

Service Provider	Covered POPs November 2009 (millions)	Covered POPs August 2010 (millions)
Verizon Wireless	266.7	270.0
Sprint Nextel[60]	226.9	239.4
AT&T	212.3	228.6
T-Mobile	133.9	183.8
Leap	79.2	81.5
US Cellular	26.6	30.0

31. In addition, subscriber figures for the top service providers are shown in Table 3 and Table 4. Table 3 provides information on the 14 largest facilities-based service providers, and Table 4 shows that the four nationwide service providers accounted for just over 90 percent of the nation's mobile wireless subscribers (including wholesale subscribers) at the end of 2009. At that time, AT&T and Verizon Wireless accounted for 62 percent, up from 60 percent in 2008.[61] The remaining non-nationwide service providers accounted for just under 10 percent of total subscribers. Table 3 shows that, between year-end 2008 and year-end 2009, Verizon Wireless increased its subscriber base by 26.5 percent, primarily through its acquisition of Alltel, and AT&T increased its subscriber base by 10.5 percent. Verizon Wireless's total number of subscribers included 87.5 million retail and 3.7 million wholesale customers, while AT&T's total included 65.1 million postpaid and 20 million prepaid customers.[62] Sprint

[58] American Roamer database, Oct. 2009 and Oct. 2010; population figures based on census blocks using 2000 Census data.

[59] Includes coverage by WCDMA/HSPA and EV-DO networks. American Roamer database, Nov. 2009 and Aug. 2010; population figures based on census blocks using 2000 Census data.

[60] Clearwire covered 82 million POPS as of Nov. 2010. *See* Section IV.B, Non-Price Rivalry, *infra*.

[61] These shares are not necessarily representative of the shares in individual EAs. *See* Section V.A.5, Mobile Wireless Connections by Economic Area (EA), *infra*, for a discussion of EA penetration rates.

[62] Verizon acquired Alltel in Jan. 2009 (the 5th largest firm in 2008, with an estimated 13.2 million subscribers). ATN acquired the divestiture markets of the Verizon-Alltel acquisition as of Apr. 2010, and is providing service under the ALLTEL brand name. Their subscriber base was 827,370 on June 30, 2010, and thus would be one of the ten largest facilities-based providers as of mid-2010. AT&T acquired Centennial in Nov. 2009 (the 9th largest firm in 2008 with an estimated 1.1 million subscribers). Sprint Nextel acquired iPCS (its affiliate, and the 12th largest provider in 2008, with 691 thousand subscribers). SEC Filings, Forms 10-K and 10-Q.

Nextel's total number of subscribers included 34 million postpaid, 10.7 million prepaid customers, and 3.5 million wholesale and affiliate subscribers. T-Mobile's total number of subscribers included 26.8 million postpaid and 7 million prepaid customers.

Table 3
Top 14 Facilities –Based Mobile Wireless Service Providers by Subscribers[63]
(based on publicly-available subscriber counts, in thousands)

	Service Provider	Year-End 2008	Year-End 2009	Year-End 2010
1	AT&T	77,009	85,120	95,536
2	Verizon Wireless	72,056	91,249	94,135
3	Sprint Nextel[64]	48,338	48,133	49,910
4	T-Mobile	32,758	33,790	33,734
5	MetroPCS	5,367	6,640	8,155
6	US Cellular	6,196	6,141	6,072
7	Leap	3,845	4,954	5,518
8	Clearwire[65]	475	688	4,345
9	América Móvil/Claro[66]	686	826	
10	Cellular South[67]	800	≈800	
11	Cincinnati Bell Wireless	551	533	509
12	Ntelos	435	439	438
13	Pocket Comm.[68]	300	320	
14	SouthernLINC[69]	*	≈220	

[63] Customers of facilities-based providers include post-paid, pre-paid, wholesale and affiliates: all customers that use the provider's network. Subscriber counts also include all connected devices, including data-only devices. For 2008 data, *see Fourteenth Report*, 25 FCC Rcd at 11648, Table C-4. For 2009 and 2010 data, sources include publicly-available company documents such as annual reports and SEC filings. Subscriber information for privately held companies is taken from news releases and press reports, such as those at www.fiercewireless.com.

[64] Sprint customers include customers on their iDEN and CDMA networks, but not Clearwire's WiMAX network.

[65] Clearwire customers include a small, unknown number of customers on Clearwire's legacy fixed wireless network.

[66] From 20-F filings, this includes Claro subscribers in Puerto Rico, where the 2008 data have been adjusted to reflect the netting out of the Dominican Republic and Jamaica. TracFone's subscriber counts were not included as TracFone is not a facilities-based provider.

[67] *See* Comments of Cellular South, WT Docket No. 05-265, at 1 (filed June 14, 2010) ("It is a regional carrier serving more than 800,000 customers, primarily in rural areas").

[68] This number includes Pocket Communications subscribers in southeast Texas only. Pocket expanded to New England in 2009, but subscriber numbers were not reported to the best of our knowledge.

[69] *See* Comments of SouthernLINC Wireless, GN Docket No. 08-71, at 1 (filed Dec. 29, 2009)("…it serves nearly 222,000 subscribers over 127,000 square miles").

Table 4
Service Provider Share of Subscribers and Revenues (Year-End 2009)[70]

Year End 2009	Percent of Subscribers (%)	Percent of Revenues (%)
Verizon Wireless	31.94	33.82
AT&T	29.80	30.70
Sprint Nextel	16.85	16.58
T-Mobile	11.83	12.13
Metro PCS	2.32	1.98
US Cellular	2.15	2.48
Leap Wireless	1.73	1.36
Other	3.37	0.95

2. Resale/MVNO Providers

32. A reseller or mobile virtual network operator (MVNO) purchases mobile wireless services wholesale from facilities-based providers and resells the services to consumers.[71] Various types of MVNOs exist. For example, some MVNOs target their service and product offerings at specific demographic, lifestyle, and market niches. Their customers may include a relatively large proportion of 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. Other MVNOs are motivated by the desire of a facilities-based provider 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. For example, Leap (Cricket), a facilities-based provider, employs an MVNO business model that it refers to as a "hybrid wholesale and facilities-based model." As of August 2010, Cricket entered into a wholesale agreement with Sprint Nextel which allows Cricket to offer the products and services of Sprint Nextel's EV-DO network throughout the United States. Cricket states that "this agreement will allow us to significantly strengthen and expand our retail position and distribution relationships."[72] In turn, the hybrid MVNO and facilities-based model employed by Sprint Nextel supplies EV-DO mobile wireless voice and data services using its own networks and supplies WiMAX services purchased wholesale from its business partner Clearwire, which also has wholesale relationships with Bright House, Comcast, and Best Buy among others.[73]

[70] John C. Hodulik, *et al.*, *US Wireless 411, Version 37.0*, UBS, UBS Investment Research, Sept. 7, 2010 (*US Wireless 411 2Q10*); Company SEC 10-K filings. These shares are not necessarily representative of the shares in individual EAs. Based on preliminary year-end 2010 data, the four nationwide providers account for 90 percent of subscribers and 93 percent of revenues. John C. Hodulik, *et al.*, *US Wireless 411, Version 39.0*, UBS, UBS Investment Research, Mar. 30, 2010; Company SEC 10-K filings.

[71] 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 Oct. 18, 2010).

[72] *Cricket Communications Enters into Wholesale Agreement with Sprint*, Press Release, Leap Wireless, Aug. 3, 2010. *Leap Reports Third Quarter Results*, Press Release, Leap Wireless, Nov. 2, 2010.

[73] *See* Clearwire, SEC Form 10-K, filed Feb. 24, 2010, at 11; Best Buy, *Internet on the Go – Best Buy Connect*, http://www.bestbuy.com/site/Computers+Promotions/null/pcmcat214600050004.c?id=pcmcat214600050004 (visited Feb. 16, 2011)

33. 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.[74] 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, or business model.[75]

34. Estimates of the number of MVNOs operating in the United States in the first quarter of 2010 vary from 43 to 61.[76] A large MVNO, Virgin Mobile USA, was acquired by Sprint Nextel in the fourth quarter of 2009.[77] One industry analyst report states that there is a consolidation trend in the MVNO segment that is likely to continue in the near future.[78] The largest MVNO currently is TracFone Wireless (TracFone), which had over 14 million subscribers at the end of 2009, giving it a subscriber base in the United States that is larger than every facilities-based provider other than the four nationwide providers.[79] TracFone is owned by América Móvil[80], S.A.B. de C.V., a telecommunications service provider in Latin America and Puerto Rico, and offers mobile wireless services through agreements with approximately ten wireless service providers in the United States, including AT&T and Verizon Wireless.[81] TracFone had 3.2 million net customer additions in 2009, 1.2 million of which were added in the fourth quarter alone.[82]

35. Comprehensive data on MVNO subscribers are generally not reported by either MVNOs or facilities-based providers that host MVNOs. Many MVNOs are privately-held companies that do not

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[74] *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*).

[75] *See On the Competitive Effects of Mobile Virtual Network Operators*, at 263, 266, 268.

[76] CTIA estimates that there are at least 43 MVNOs. CTIA Comments at 6, 58. Verizon Wireless, citing Wireless Intelligence MVNO Report, estimates that there are 61 MVNOs. Verizon Wireless Comments at 22. *See also* Table C-7, Appendix C.

[77] *Sprint Nextel Completes Acquisition of Virgin Mobile USA*, Press Release, Sprint Nextel, Nov. 24, 2009. Prior to this acquisition, Sprint Nextel held an approximate 13 percent interest in Virgin Mobile USA. *Sprint Nextel to Acquire Virgin Mobile USA*, Press Release, Sprint Nextel, July 28, 2009.

[78] *See* WCIS Insight, http://www.telecomsmarketresearch.com/research/TMAAAQPN-WCIS-Insight--Global-MVNO-Operations---A-study-of-current-business-models-and-emerging-opportunities.shtml (visited Sep. 16, 2010) (stating, "The US market has seen a host of failed MVNOs, whose offerings have been taken on by partner MNOs or whose value propositions failed. There is likely to be continued consolidation in this market with only those MVNOs with a robust business model likely to survive").

[79] 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.

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

[81] *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). One analyst report estimated that 70 percent of TracFone's subscribers in June 2009 were served by AT&T's network facilities. *See Macquarie - Just Who is TracFone Anyway?*, at 2. *See also* América Móvil, S.A.B. De C.V., SEC Form 20-F, filed May 25, 2010, at 57.

[82] América Móvil, S.A.B. De C.V., SEC Form 6-K, filed Feb. 3, 2010, at 16.

publicly report financial or subscriber data.[83] It is a standard practice of many facilities-based providers to include the subscribers of providers reselling their services in their own subscriber counts.[84] Similarly, CTIA and many industry analyst reports include MVNO subscribers with the subscribers of the host facilities-based providers.[85] Some facilities-based providers do not report their wholesale subscribers separately from their retail subscribers, and they do not report the subscribers of each of the MVNOs hosted on their networks. For instance, AT&T's 2009 Annual Report did not report wholesale customers separately from retail customers.[86] By contrast, Verizon Wireless reports MVNO subscribers separately from its own subscribers in its 2009 Annual Report, but does not report the subscribers of individual MVNOs that are hosted on its network.[87] For the above reasons, the reported data on MVNOs are generally inadequate for determining the host facilities-based providers of all the MVNOs and their subscriber figures.

36. Consistent with current industry practices, the Commission attributes the subscribers of MVNOs to their hosting facilities-based providers when it calculates market concentration metrics.[88] The relationship between an MVNO and its hosting facilities-based provider is a mutually beneficial strategic partnership.[89] These strategic partnerships may increase competition and consumer welfare, for example, by providing service to or competition in hitherto underserved or unserved geographic areas or market segments. Industry analyst reports state that wholesale customers are valued customers of the underlying facilities-based carriers, and that Verizon Wireless and AT&T use strategic partnerships with TracFone, for example, to compete with each other for customers.[90] However, these partnerships may also result in

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[83] For a list of MVNOs, *see* Table C-7, Appendix C.

[84] *See* Verizon Communications, Inc., SEC Form 10-K, Portions of Verizon Annual Report to Shareholders, filed Mar. 12, 2010. *See* SEC, *Courtesy Copy of AT&T Inc. 2009 Annual Report,* filed Feb. 25, 2010. *See* Deutsche Telekom AG, SEC Form 20-F, filed Feb. 25, 2010, at 28. *See* Sprint Nextel, SEC Form 10-K, filed Feb. 26, 2010, at 37. 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. 26, 2010, at 3, 37. *See* Clearwire Corp., SEC Form 10-K, filed Feb. 24, 2010, at 2.

[85] Robert F. Roche and Lesley O'Neill, *CTIA's Wireless Industry Indices, Semi-Annual Data Survey Results: A Comprehensive Report from CTIA Analyzing the U.S. Wireless Industry, Mid-Year2009 Results*, Nov. 2008, at 11 (*CTIA Mid-Year 2009 Wireless Indices Report*) ("[s]ubscribers to [MVNOs] are accounted for in the results reported by the facilities-based companies that support the [MVNO] offerings"). *See also* CTIA Comments at 57 (stating "The HHI of France has been adjusted to include the MVNO subscribers with their underlying carriers."). *See* Robert F. Roche and Lesley O'Neill, *CTIA's Wireless Industry Indices, Semi-Annual Data Survey Results: A Comprehensive Report from CTIA Analyzing the U.S. Wireless Industry, Year-End 2009 Results*, May 2010, at 11 (*CTIA Year-End 2009 Wireless Indices Report*); John C. Hodulik, *et al*., *US Wireless 411, Version 36.0*, UBS, UBS Investment Research, June 3, 2010 at 8, 14, 19 (*US Wireless 411 1Q10*).

[86] *See* AT&T Inc. 2009 Annual Report. *See also* SEC, *Courtesy Copy of AT&T Inc. 2009 Annual Report*, filed Feb. 25, 2010.

[87] *See* Verizon Communications, SEC Form 10-K, Portions of Verizon Annual Report to Shareholders, filed Mar. 12, 2010. Two subscriber figures are reported: Total Customers and Retail Customers.

[88] *See* Section III.C, Horizontal Concentration, *infra.*

[89] *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.

[90] *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").

MVNOs not exerting the same degree of competitive pressure as if they were independent facilities-based providers.[91] Further, unlike facilities-based providers, MVNOs do not engage in the full range of non-price rivalry such as network investments, network upgrades, or network coverage.

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 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.[92] 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 decline in the near future.[93] Another narrowband provider, Space Data Corp., provides commercial telemetry services across the south-central United States to energy, utility, and transportation companies.[94] 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.[95]

4. Mobile Satellite Service Providers

38. Mobile Satellite Services (MSS) providers offer mobile wireless services by providing satellite-based communications to mobile devices. Traditionally, MSS has involved voice and narrowband data services, but licensees are increasing the number and variety of broadband services that they offer.[96] 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.[97] Examples of MSS consumers include the oil industry, maritime users, public safety agencies, and other government/military operations.[98]

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[91] *See 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").

[92] See USA Mobility, *Wireless Messaging – Products and Services*, http://www.usamobility.com/products/messaging/ (visited Nov. 4, 2010); *Tenth Report*, 20 FCC Rcd at 15923, ¶ 33.

[93] USA Mobility Inc., SEC Form 10-K, filed Feb. 25, 2010, at 4.

[94] Space Data Corp., *Overview of SkySite Network*, http://www.spacedata.net/technology.htm and http://www.spacedata.net/company.html (visited Oct. 28, 2010); *Tenth Report*, 20 FCC Rcd at 15923, ¶ 34.

[95] *See* SkyTel, *Powering Innovations using SkyTel's Network-on-Demand Communications Platform*, http://www.skytel.com/index.html (visited Apr. 20, 2010).

[96] *See generally Thirteenth Report*, 24 FCC Rcd at 6302-09, ¶¶ 253-73; SkyTerra Communications, Inc., Transferor, And Harbinger Capital Partners Funds, Transferee, Applications for Consent to Transfer of Control of SkyTerra Subsidiary, LLC, IB Docket No. 08-184, *Memorandum Opinion and Order and Declaratory Ruling*, 25 FCC Rcd 3059, 3078-79, ¶¶ 33-36 (International Bureau/Office of Engineering and Technology/WTB rel. 2010) (*SkyTerra/Harbinger*).

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

[98] 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. As of September 2010, the Genus is available for enterprise, government, and small business customers.

39. The mobile satellite service industry is undergoing major technological and structural changes.[99] As with the rest of the telecommunications sector, technological advances in the mobile satellite industry are shifting consumer demand and industry growth to broadband services.[100] Certain MSS providers have stated plans to offer high-speed data services, especially in connection with terrestrial networks using their Ancillary Terrestrial Component (ATC) authority.[101] Such services in the future could potentially enhance competition in the provision of terrestrial mobile wireless services.[102] In July 2010, the Commission commenced a proceeding to make MSS spectrum more available for new investment in mobile broadband networks while also ensuring that the United States maintains robust MSS capabilities.[103] As part of this proceeding, the Commission adopted a Report and Order in April 2011 to apply certain secondary market spectrum leasing policies to MSS/ATC leasing arrangements and to add co-primary mobile and fixed allocations to the MSS allocation.[104] As of the end of 2010, however, no terrestrially-based mobile services have been offered using MSS spectrum.

C. Horizontal Concentration

40. 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 will be higher whenever a small number of competitors each possess a relatively large share of subscribers or sales. High market concentration levels may raise some concern that any given market is not competitive. However, an analysis of other factors, such as entry conditions and the degree of price and non-price rivalry, may nonetheless find that a market with high concentration levels is competitive. As measures of market concentration for the mobile wireless industry, we discuss below the number of competitors and the Herfindahl-Hirschman Index (HHI).

1. Number of Competitors – Coverage and Service Offerings

41. In this section, we estimate the percentage of the population in the United States covered by facilities-based mobile wireless service providers in more than 8 million U.S. census blocks.[105] This

[99] *See generally SkyTerra/Harbinger*, 25 FCC Rcd at 3080-85, ¶¶ 40-54. In July 2010, the venture arising out of this transaction was named LightSquared. *See also infra* Section IV.B.1.a, Service Provider Technology Deployments.

[100] *SkyTerra/Harbinger*, 25 FCC Rcd at 3080, ¶ 40.

[101] *Id.* at 3078-80, ¶¶ 33-36, 40. One MSS provider, LightSquared, plans to construct a 4G mobile broadband network using its ATC authority. *Id.*, 25 FCC Rcd at 3085, ¶¶ 55-56, 3088-89, ¶¶ 68-72. In January 2011, LightSquared was granted a conditional waiver of the ATC "integrated service" rule and modification of its ATC authority. *See* LightSquared Subsidiary LLC Request for Modification of its Authority for an Ancillary Terrestrial Component, SAT-MOD-20101118-00239, Call Sign: S2358, *Order and Authorization*, 26 FCC Rcd 566 (International Bureau rel. 2011).

[102] *SkyTerra/Harbinger*, 25 FCC Rcd at 3087, ¶ 62 (LightSquared's construction of a "satellite/terrestrial 4G mobile broadband network…will help enhance competition among current mobile wireless providers").

[103] *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, *Notice of Proposed Rulemaking and Notice of Inquiry,* 25 FCC Rcd 9481 (2010) (*MSS NPRM* and *MSS NOI*, respectively).

[104] *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*, FCC 11-57 (rel. Apr. 6, 2011).

[105] A census block is the smallest geographic unit for which the Census Bureau tabulates decennial census data. *See* U.S. Census Bureau, *Glossary Of Basic Geographic And Related Terms - Census 2000*, http://www.census.gov/geo/www/tiger/glossary.html#glossary (visited Nov. 1, 2010). Many blocks correspond to individual city blocks bounded by streets, but blocks – especially in rural areas – may include many square miles and may have some boundaries that are not streets. The Census Bureau established blocks covering the entire nation (continued….)

analysis is based on provider coverage maps provided to the Commission through a contract with American Roamer,[106] an independent consulting firm that tracks service provision for mobile voice and mobile data services.[107] Map 3 below depicts the number of facilities-based providers across the United States. More detailed regional maps, as well as an enlarged version of Map 3 below, are available in Appendix D. In addition, using NRUF data, this section also provides an estimate of the percentage of the population covered by facilities-based wireless service providers in all CMAs in the United States, excluding territories.[108]

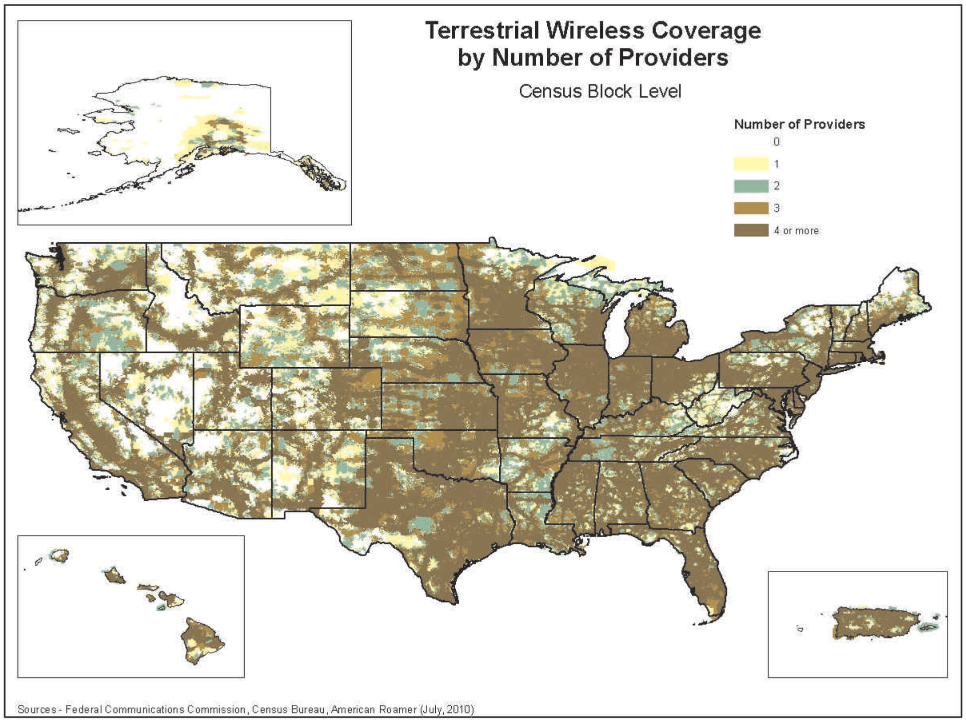
(Continued from previous page)
for the first time in 1990. Previous censuses back to 1940 had blocks established only for part of the nation. Over 8 million blocks are identified for Census 2000. U.S. Census Bureau, *Question & Answer Center*, http://www.census.gov/ (visited Oct. 2, 2010). The mean size 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. Commission analysis is based on Census 2000 "Summary File 1 (SF 1)," U.S. Census Bureau, *United States Census 2000*, http://www.census.gov (visited Oct. 2, 2010).

[106] American Roamer provides data on carriers under contract as coverage boundary maps based on the coverage boundaries provided to them by mobile wireless network operators. American Roamer began 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* American Roamer, http://www.americanroamer.com (visited Nov. 1, 2010).

[107] American Roamer likely overstates the coverage actually experienced by consumers, because it reports advertised coverage as reported to it by many wireless service providers, each of which uses a different definition of 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).

[108] *See also* Section V.A, Subscribership/Connection Levels, *infra*.

Map 3
Coverage by Mobile Wireless Competitors



42. Estimates of the total number of mobile wireless service providers by aggregate census block coverage, by population coverage, and by land area coverage are presented in Tables 5 - 7. Table 5 presents coverage by all mobile wireless service providers including on federally owned or administered land, and Table 6 shows the extent of coverage in areas of the country excluding Federal lands. Table 7 presents coverage by mobile wireless broadband providers.[109]

43. Including or excluding Federal lands results in a similar number of competitors by population coverage. However, due to the large quantity of sparsely-populated Federal lands, the analysis shows significantly greater percentages of land coverage when Federal lands are excluded. For example, Table 5 shows that approximately 50.2 percent of the total U.S. land area is covered by three or more facilities-based providers when Federal lands are included. This compares to approximately 62.6 percent of the land area, as shown in Table 6, when Federal lands are excluded. As 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

[109] Due to confidentiality agreements with American Roamer, we cannot provide details about the census blocks served by individual facilities-based providers. Also, note that the data in Tables 5 - 8 show the number of facilities-based providers with coverage but do not necessarily show the number of choices of service providers that consumers living in those census blocks have. For example, some facilities-based providers may have built coverage to serve their subscribers based elsewhere and do not sign up subscribers who live in those areas.

the population in a license area."[110] Federally-owned lands constitute nearly 30 percent of the approximately 3.6 million square mile land area of the United States.[111] A map showing the extent of Federal lands, with American Indian Reservations and Alaska Native Village Statistical Areas, can be found in Appendix D.

44. Table 5 shows that approximately 285 million people, or 99.8 percent of the total U.S. population, are covered by at least one facilities-based provider, according to our census block level analysis. Equivalently, approximately 568 thousand people, or 0.2 percent of the U.S. population, are not covered at all. Approximately 277 million people, or 97.2 percent of the population, are covered by at least three mobile voice providers. Approximately 269 million people, or 94.3 percent of the population, are covered by at least four mobile voice providers.[112]

45. Table 6 shows that approximately 280 million people, or 99.8 percent of the U.S. population, excluding those on Federal lands, are covered by at least one facilities-based provider. Approximately 273 million people, or 97.4 percent of the total U.S. population, are covered by three or more service providers and approximately 265 million people, or 94.7 percent of the U.S. population, are covered by four or more competitors. Table 6 also shows that approximately 14 percent of the land area of the United States, when Federal lands are excluded, has no mobile wireless network coverage.

Table 5
Estimated Mobile Wireless Coverage by Census Block, 2010, Including Federal Land[113]

Total Number of Providers with Coverage in a Block	Number of Blocks	POPs Contained in Those Blocks	% of Total US POPs	Square Miles Contained in Those Blocks	% of Total US Square Miles
Total for US	***8,262,363***	***285,230,516***	***100.0%***	***3,799,408***	***100.0%***
1 or more	8,077,075	284,662,944	99.8%	2,897,440	76.3%
2 or more	7,783,494	282,848,398	99.2%	2,414,997	63.6%
3 or more	7,205,526	277,207,821	97.2%	1,907,329	50.2%
4 or more	6,474,651	269,054,180	94.3%	1,374,885	36.2%
5 or more	5,609,301	255,554,136	89.6%	923,576	24.3%
6 or more	4,223,558	217,934,994	76.4%	519,963	13.7%

[110] 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) (*700 MHz Second R&O*).

[111] *See* United States Department of the Interior, *Federal Lands and Indian Reservations*, http://www.nationalatlas.gov/printable/fedlands.html (visited Nov. 10, 2010).

[112] Equivalently, approximately 16 million people, or 5.7 percent of the U.S. population, are not covered by four or more mobile service providers.

[113] Commission estimates based on American Roamer database July/Aug. 2010. The estimates include Clearwire's mobile WiMAX network coverage from August 2010 (attributed to Sprint Nextel). Population and land area are based on census blocks. POPs are from the 2000 Census, and square miles include the United States and Puerto Rico.

Table 6
Estimated Mobile Wireless Coverage by Census Block, 2010, Excluding Federal Land[114]

Total Number of Providers with Coverage in a Block	Number of Blocks	POPs Contained in Those Blocks	% of Total US POPs Excluding Those on Federal Land	Square Miles Contained in Those Blocks	% of Total US Square Miles Excluding Federal Land
Total for US	***7,794,199***	***280,371,248***	***100.0%***	***2,652,534***	***100.0%***
1 or more	7,692,053	279,944,922	99.8%	2,292,729	86.4%
2 or more	7,468,944	278,382,726	99.3%	2,018,213	76.1%
3 or more	6,969,448	273,171,048	97.4%	1,659,227	62.6%
4 or more	6,303,755	265,441,967	94.7%	1,232,730	46.5%
5 or more	5,488,234	252,439,053	90.0%	846,916	31.9%
6 or more	4,154,244	215,736,542	76.9%	483,966	18.2%

46. Table 7 shows the extent of mobile broadband coverage, which includes EVDO, WCDMA/HSPA, and mobile WiMAX networks.[115] Approximately 281 million people, or 98.5 percent of the U.S. population, are covered by one or more mobile providers using 3G or 4G network technologies. The percentage of the population covered by at least two mobile providers using 3G or 4G network technologies increased from 73 percent in May 2008 to nearly 92 percent in July 2010. In addition, the percentage of the population covered by three or more providers increased from 51 percent in May 2008 to 82 percent in July 2010. Table 7 also shows that approximately 68 percent of the population is covered by at least four mobile broadband providers.

Table 7
Estimated Mobile Wireless Broadband Coverage by Census Block, 2010[116]

Total Number of Providers with Coverage in a Block	Number of Blocks	POPs Contained in Those Blocks	% of Total US POPs	Square Miles Contained in Those Blocks	% of Total US Square Miles
1 or More	7,592,010	280,968,129	98.5%	2,256,684	59.4%
2 or More	6,080,844	262,143,759	91.9%	1,250,781	32.9%
3 or More	4,404,980	232,955,932	81.7%	511,506	13.5%
4 or More	3,078,722	193,393,372	67.8%	211,900	5.6%

[114] Commission estimates based on American Roamer database, July/Aug. 2010. The estimates include Clearwire's mobile WiMAX network coverage from Aug. 2010 (attributed to Sprint Nextel). Population and land area are based on census blocks. POPs are from the 2000 Census, and square miles include the United States and Puerto Rico. 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 Nov. 1, 2010).

[115] LTE networks are also included in mobile broadband networks. However, there were no commercial LTE launches in the United States as of Aug. 2010.

[116] Commission estimates are based on American Roamer database, July/Aug. 2010. The estimates include coverage by all EVDO, EVDO Rev. A, HSPA/UMTS/WCDMA, and mobile WiMAX networks. Population and land area are based on census blocks. POPs are from the 2000 Census, and square miles include the United States and Puerto Rico.

47. In addition, in Table 8 below, we present an estimate of the total number of providers offering mobile wireless service to any consumer in each CMA for the United States, excluding territories.[117] Specifically, Table 8 includes the number of providers that have a greater than two percent market share of mobile wireless connections based on NRUF data within the CMA.[118] Because a facilities-based service provider may offer service to consumers in only part of any given CMA, which often is made up of several counties, a consumer may have fewer choices of service providers than the total number of providers offering service in his or her CMA.[119] Table 8 shows that in each of the 716 CMAs, there are at least two mobile wireless service providers offering service in at least part of the CMA. Approximately 29 percent of CMAs have three or fewer providers offering service, and 71 percent have four or more providers.

Table 8
Estimated Mobile Wireless Providers Offering Service by CMA, Excluding Territories

Number of Providers Offering Service anywhere in a CMA	Number of CMAs	Total CMAs (Percent)
Total for U.S., excluding territories	*716*	*100*
1 provider	0	0%
2 providers	64	8.9%
3 providers	140	19.6%
4 providers	231	32.3%
5 providers	250	34.9%
6 or more providers	31	4.3%

2. Herfindahl-Hirschman Index

48. The Herfindahl-Hirschman Index (HHI), one measure of market concentration, is employed by the Commission primarily because it is 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'

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[117] The Commission typically evaluates the competitive effects of transactions involving mobile wireless licenses at the CMA level because that is the relevant geographic market for most consumers. Consumers generally search for service providers in the local areas where they live, work, and travel and are unlikely to search for providers that do not serve their local areas. *See, e.g.,* 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*); Applications of Cellco Partnership d/b/a Verizon Wireless and Atlantis Holdings LLC For Consent to Transfer Control of Licenses, Authorizations, and Spectrum Manager and *De Facto* Transfer Leasing Arrangements and Petition for Declaratory Ruling that the Transaction is Consistent with Section 310(b)(4) of the Communications Act, WT Docket No. 08-95, *Memorandum Opinion and Order*, 23 FCC Rcd 17444 (2008) (*Verizon Wireless-Alltel Order*). *See also* Section III.A, Introduction, *supra*.

[118] Because NRUF includes data on the number of telephone numbers that have been assigned to end-user devices, this analysis does not include providers whose data-only devices are not assigned a mobile telephone number. *See also* Section V.A, Subscribership/Connection Levels, *infra*.

[119] Service providers typically screen potential customers by zip code. *See*, *e.g.*, Applications of AT&T Wireless Services, Inc., Transferor, and Cingular Wireless Corp., Transferee, *Memorandum Opinion and Order*, 19 FCC Rcd 21522, ¶ 87-88, ¶ 103 (2004).

shares of subscribers result in higher HHI values.[120] 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.[121]

49. *HHI Methodology*. As in previous *Reports*, we apply the HHI to the shares of mobile wireless connections held by facilities-based mobile wireless providers at the level of EAs, calculating shares of connections from the providers' numbers of connections.[122] 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 subscriber connections of MVNOs are included with the subscriber connections of their hosting facilities-based providers. Therefore, HHIs and other market concentration metrics that use subscriber connections or sales of facilities-based providers only may not fully reflect the effect of MVNOs on competition and consumer welfare (*see* Section B.2 above).[123] Leading industry analyst reports on the mobile wireless industry include wholesale subscribers with retail subscribers when they calculate market concentration metrics.[124] Although MVNOs' subscribers are not included in the HHIs, their competitive effects are evaluated in our discussion of provider conduct and industry performance.

50. The number of mobile wireless connections for each provider is determined based on the Commission's year-end 2009 NRUF data, which track phone number usage information for the United States.[125] A national weighted average HHI by EA is obtained by averaging the HHIs of all 172 EAs, with more (less) importance attached to EAs that have a higher (lower) population. Although we

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[120] 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)].

[121] 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. 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).

[122] *See* Section III.A, Introduction, *supra*. As discussed in Section V.A, Subscribership/Connection Levels, *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.

[123] *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, Verizon Comments at 126.

[124] *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 34.0*, UBS, UBS Investment Research, Nov. 16, 2009 at 19 (*US Wireless 411 3Q09*).

[125] The methodology used to compile NRUF data is described in Section V.A, Subscribership/Connection Levels, *infra*.

calculate the HHI on an EA basis for this *Report*, as shown in Table 9 and Chart 1, we do not conclude that EAs are the appropriate geographic market for other purposes.[126] Moreover, basing the HHI on broader (narrower) geographic regions 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 for one based on EAs. Calculating the HHI based on a single nationwide region would result in a national HHI that is lower than for a national HHI based on population weighted EA HHIs, because the total number of providers in the entire United States far exceeds the number of providers that compete in any single local area. As discussed in Section II.A, the consumer searches for a mobile wireless provider in the local area where he lives, works, and travels.[127] Similarly, applying a single nationwide region would assume that every American is able to choose from more than one hundred facilities-based providers, but 93 percent of the U.S. population has network coverage by less than seven facilities-based providers.

51. *Current HHI Values*. As shown in Table 9 and Chart 1, the weighted average of the HHIs (weighted by EA population) was 2811 at the end of 2009, down from 2842 at the end of 2008, a decrease of approximately 1 per cent.[128] From 2003 (the first year the Commission calculated HHIs using this methodology) to year-end 2009, the average HHI has increased from 2151 to 2811, an increase of 660 points (see Table 9 and Chart 1). The lowest EA HHI values and the highest EA HHI values both decreased in 2009 relative to the 2008 HHI values as shown in Table 9. For 2009, the value of the HHI for individual EAs ranges from a low of 1903 in EA 108 (covering parts of Wisconsin) to a high of 6572 in EA 142 (covering parts of Nebraska and Wyoming).

52. Using the most recent NRUF data possible, we also calculated the weighted average of the HHIs as of June 2010. Since year-end 2009, the weighted average has increased by approximately one percent to 2848. Both the minimum and maximum values remain lower than in 2008.[129] Thus, in June 2010, the value of the HHI for individual EAs ranges from a low of 2077 in EA 64 (covering parts of Illinois, Indiana and Wisconsin) to a high of 6538 in EA 142 (covering parts of Nebraska and Wyoming). The slight increase in the weighted average of the HHIs since year-end 2009 most likely reflects the closing of two transactions: AT&T/Verizon-Alltel and ATN/Verizon-Alltel.[130]

[126] 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.

[127] 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. American Roamer, Oct. 2009. *See* ¶ 69, *infra*.

[128] *See* Appendix C, Table C-3, *infra*, for EA subscribership levels, penetration rates, and population densities. The simple average in 2009 (not weighted by population) is 3359.

[129] Note that we used July 1, 2009 population estimates from the Census Bureau as the weights for calculating the weighted average HHIs for year-end 2009 and June 2010 because, according to the Census Bureau, "The Population Estimates Challenge program will be temporarily suspended beginning on February 3, 2010. The program will be suspended during both the decennial census year and the following year to accommodate the taking of the 2010 Census. During this time, the Census Bureau will not provide the operations necessary to review the July 1, 2009 population estimates. The program will resume in 2012 after the release of the 2011 population estimates." *See* http://www.census.gov/popest/archives/challenges.html (visited Nov. 10, 2010).

[130] *See* Section III.E, Recent Entry and Exit, *infra*.

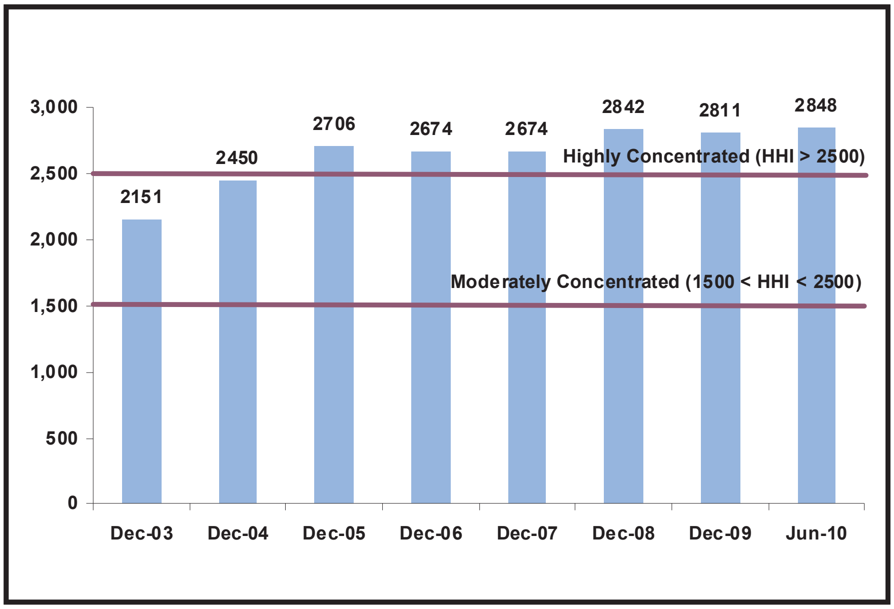
Table 9
Mobile Wireless Market Concentration: Herfindahl-Hirschman Index[131]

	Ninth Report	*Tenth Report*	*Eleventh Report*	*Twelfth Report*	*Thirteenth Report*	*Fourteenth Report*	*Fifteenth Report*
Year	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*[132]	***2009***
Average	2151	2450	2706	2674	2674	2842	**2811**
High	7155	7064	9042	6551	6272	6801	**6572**
Low	1325	1554	1605	1609	1795	2123	**1903**

[131] Population-weighted average of 172 EAs based on Commission estimates using NRUF and Census Bureau population data.

[132] 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 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, the divestiture markets from the Rural Cellular acquisition) to 6801 (EA 142 which covers parts of Nebraska and Wyoming).

Chart 1
Average HHI of EAs[133]



53. 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 calculated as 3068. 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. 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.[134] The economic determinants of industry concentration are discussed further in Section III.D, Entry and Exit Conditions.

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[133] Chart 1 is based on the data shown in Table 9. 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.

[134] 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 EA HHI Values on EA Population Densities[135]

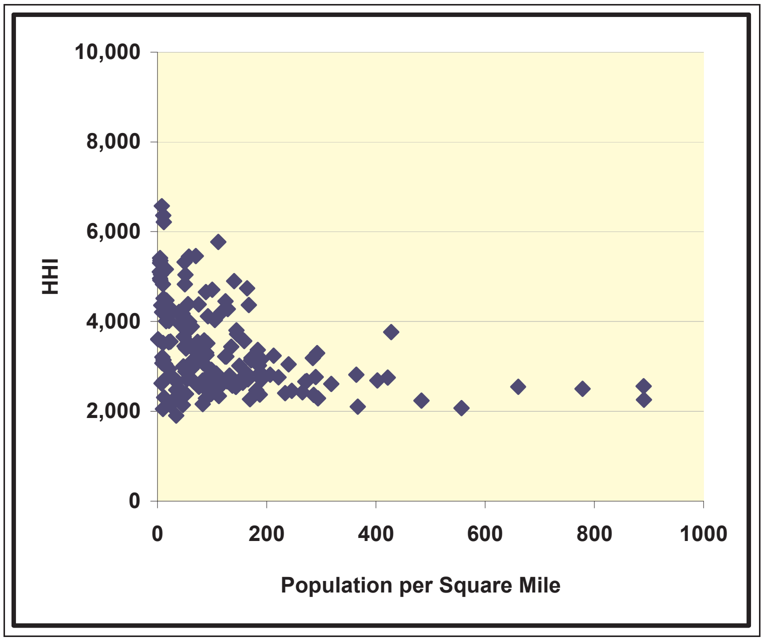
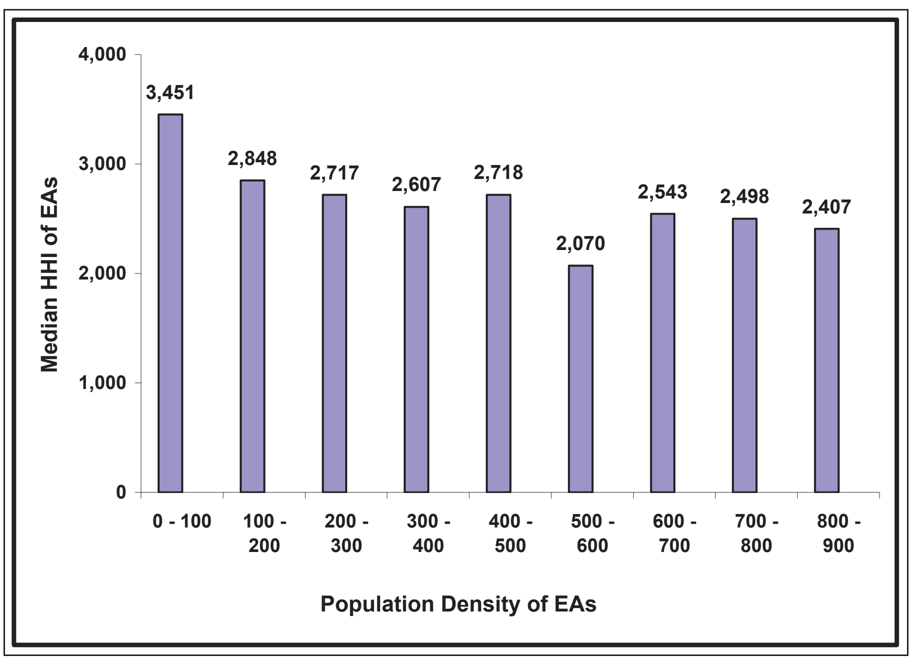


Chart 3
Median HHI of EAs in Population Density Bands



[135] Population density is measured as Population/Square Mile. The highest population density, 891, occurs in EA 34 (Tampa-St. Petersburg-Clearwater, FL), and the lowest population density, 1, occurs in EA 171 (Anchorage, AK).

54. *Relation between HHI and Competition*. Shares of subscribers and measures of concentration are 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.[136] High market concentration may indicate that a firm or firms potentially may be able to exercise market power, but market concentration measures alone are insufficient to draw such a conclusion. Therefore, this *Report* analyzes other factors that may influence the state of competition in the mobile wireless services market. These include entry and exit conditions, the degree of price and non-price rivalry, innovation, and the influence of the upstream and downstream markets.[137]

D. Entry and Exit Conditions

55. 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 ensuring competition in the marketplace.

56. We distinguish regulatory from non-regulatory entry and exit conditions in order to distinguish Commission spectrum and infrastructure policies from basic market conditions. Regulatory entry conditions are related to access to the inputs necessary to offer mobile wireless services. They include spectrum policy, which affects the total 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. Regulatory delay can, in turn, lead to entry delay and therefore is a form of an entry barrier.[138] 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.[139] The major structural features that may act as entry barriers in any given industry include economies of scale, absolute cost advantages (costs which must be borne by the entrant but which are not borne by incumbents), capital cost requirements and product differentiation (which leads to consumer loyalty and higher switching costs). These will be discussed in the context of the mobile wireless industry.

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[136] *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 Antitrust Law and Economics*, at 117.

[137] 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.*

[138] 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*). Legal entry conditions that are not included under regulatory entry conditions could include corporate tax rates, a factor that directly affects profit calculations and hence entry conditions.

[139] *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)*.

1. Regulatory Entry and Exit Conditions

57. *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.[140] Second, interference and technical rules can affect both spectrum access and spectrum efficiency, and, hence, overall network capacity.[141] Therefore, spectrum policies affect the ability of potential entrants to access spectrum and hence the resources required to build out or expand capacity.[142]

58. *Tower Siting.* State and local zoning rules for erecting wireless towers or attaching equipment to pre-existing structures 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.[143] 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.[144] 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.[145] Furthermore, the *Declaratory Ruling* reduced regulatory barriers to entry by finding that it is a violation of the Communications Act for a state or local government to deny a wireless service facility-siting application because service is available from another provider.[146]

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

[141] *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.*

[142] Further discussion and data on the market for spectrum, recent spectrum auctions, upcoming spectrum auctions, and spectrum policy can be found in Section VII.A.1, Spectrum, *infra* and Appendix A, *infra.*

[143] 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).

[144] *Id*. at 13995, ¶ 4.

[145] *Id*. at 13995 ¶ 4, 14013 ¶ 49. Five organizations representing local governments requested that a portion of that ruling relating to the suspension of these time periods when an application is considered incomplete be reconsidered. The Commission released an *Order on Reconsideration* on August 4, 2010, reaffirming the decision that the timeframes as described above are automatically tolled only when the reviewing government notifies the applicant of the incompleteness within the first 30 days after receipt. 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, *Order on Reconsideration*, 25 FCC Rcd 11157 (2010); *petition for review pending,* City of Arlington, Texas v. FCC, No. 10-60039 (5th Cir. filed Jan. 12, 2010). This action was undertaken to help reduce any existing regulatory barriers to entry.

[146] 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, 13995-96, ¶ 5 (2009).

2. Non-Regulatory Entry and Exit Conditions

59. Non-regulatory entry and exit conditions are market conditions that directly affect a firm's ability to enter into or exit from a market. Service provider entry and exit decisions are primarily determined by the height of structural entry barriers and expected post-entry market profitability.[147] Expected post-entry market profitability depends on many factors, including providers' costs, 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.[148] In addition, on the demand side, population, population density, income, other socioeconomic variables, and macroeconomic conditions affect the service revenue projections of potential entrants.

60. In the mobile wireless services industry, the major sources of 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[149] 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.

61. 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 generally lower in the mobile wireless industry than in the wireline industry.[150] However, economics of scale are important in the mobile wireless industry. A high level of network deployment costs (a type of fixed cost [151] 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.[152] For example, areas with a low population density tend to have fewer

[147] High economic profits encourage entry to 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.

[148] *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.

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

[150] *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.

[151] Fixed costs are costs that are associated with fixed factors in production and are generally incurred independently of the quantity of output produced. However, fixed costs can change if maximum production capacity is changed. They can be financed in many ways, including over time. *See Intermediate Microeconomics*, at 353. Economies of scale exist if long run average cost is declining with output (number of subscribers). If economies of scale are large relative to market size, this may limit the number of firms that can profitably survive in the long run.

[152] *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 (arguing that some markets tend to be more concentrated because as market size increases, there is an incentive for (at least one) firms to escalate their expenditure on endogenous sunk costs leaving, somewhat counterintuitively, room for fewer firms in the market, even at very large market sizes). *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 *Barriers to Understanding*, 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, (continued….)

facilities-based competitors (and higher concentration) than areas that have a high population density.[153] For an entrant to survive in the market, the market must be large 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.[154] 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.[155] Below, we briefly discuss the major costs of setting up a network and gaining a customer base.

62. *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. For instance, in the two recent major spectrum auctions, 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.[156] 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. Leasing spectrum in the secondary market can reduce initial spectrum acquisition costs, distributing the costs over time. Some companies, such as Spectrum Bridge, Inc., provide online marketplaces for spectrum exchange.[157] Additional information about spectrum can be found in Section VII.A.1.

63. *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.[158] 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.[159] 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

(Continued from previous page)
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).

[153] *See* Section III.C, Horizontal Concentration, *infra*.

[154] *See* Dennis W. Carlton, *Why Barriers to Entry are Barriers to Understanding*, American Economic Review, 2004, 94: 2, at 468-469 (*Barriers to Understanding*). *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?*).

[155] *See, e.g*., *Barriers to Understanding*, 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).

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

[157] Spectrum Bridge Inc.'s online market exchange, SpecEx, can be accessed at http://www.specex.com/Default.aspx (visited Oct. 18, 2010).

[158] 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).

[159] *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*).

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.[160]

64. 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.[161] 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.[162] 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.

65. *Handsets and Devices.* Mobile handsets and devices are the end points of mobile wireless networks that connect consumers to the networks.[163] They directly affect the quality of a consumer's mobile wireless experience, and, hence, they 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.[164] Although handset manufacturers sell many handsets to any service provider with a compatible network, some handsets are subject to exclusivity arrangements that restrict their distribution to a single service provider in the United States.[165] Exclusive handset arrangements held by existing providers could potentially create an entry barrier if lack of access to the exclusive technology were to delay the entry of potential entrants.[166]

66. *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 promote brand recognition. Marketing expenditures are a significant factor of non-price competition in

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[160] *See* Section IV.B.1.d, Roaming, *infra*, for an additional discussion of roaming.

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

[162] *See* Section VII.A.1, Spectrum, *infra.*

[163] *See* Sections IV.B.3, Differentiation in Mobile Wireless Handsets/Devices and VII.B.1, Mobile Wireless Handsets/Devices and Operating Systems, *infra*, for a more detailed discussion of handsets and devices.

[164] According to the Nielsen Company's Mobile Insights survey, in the first quarter of 2009, the specific handset was the seventh ranking factor in consumers' choice of a provider. Roger Entner, *When Choosing A Carrier Does the iPhone Really Matter?*, Nielsen Wire, Aug. 10, 2009 (citing data from The Nielsen Company's Mobile Insights survey).

[165] *See* Section VII.B.1, Mobile Wireless Handsets/Devices and Operating Systems, *infra*.

[166] Lack of access to a particular good due to a legal restriction may have an effect on potential entrants similar to the good having a high price. However, s*ee Competition Policy*, at 378 (stating that it is well-known that exclusivity agreements can benefit innovation and consumers; the trade-offs must be evaluated in a case-by-case cost-benefit analysis).

the mobile wireless industry.[167] 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 (for example, Cox Communications, discussed below) 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.[168]

E. Recent Entry and Exit

1. Entry

67. 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. Entry normally proceeds through several stages that require a significant period of time to complete, including raising financial capital, acquisition of spectrum rights,[169] deployment of the mobile wireless network, and a product launch stage during which a customer base is gained. In addition, technological advances can impact the degree of entry, not only for potential entrants, but also for incumbent firms. For example, significant capital expenditures are involved with the "switchover" to a new technology, or upgrading of existing network infrastructure.[170] 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.[171] In particular, estimating the date of potential entry is one factor in a more comprehensive entry analysis that predicts how soon there will be new rivals who are in a position to place competitive constraints on the existing competitors.[172] Below we summarize entry commitments that are large enough to be consistent with entry that could introduce new competitive constraints at the regional or national level.

68. *Clearwire Corporation.* In 2009, Clearwire's services consisted primarily of wireless (mobile and fixed) broadband data in the 2.5 GHz band. The company also offered a fixed wireless VoIP service, but not an interconnected mobile voice service.[173] As of October 2010, Clearwire was providing

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[167] *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.

[168] *See* Section IV.B.2IV.B.2, Advertising, Marketing, Sales Expenditures, and Retailing, *infra.*

[169] 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, Spectrum, *infra*.

[170] For example, Sprint Nextel recently announced that it is investing $4 -5 billion to upgrade its infrastructure by "consolidating multiple network technologies into one, seamless network." *Sprint Announces Network Vision – A Cutting-Edge Network Evolution Plan With Partners Alcatel-Lucent, Ericsson and Samsung*, News Release, Sprint Nextel, Dec. 6, 2010, *available at* http://newsroom.sprint.com/news/sprint-announces-network-vision-network-evolution-plan.htm.

[171] *See Theory Meets Practice*, at 206.

[172] *Id.* at 190.

[173] Clearwire Corp., SEC Form 10-K, filed Mar. 26, 2009, at 3, 9 ("Mobile WiMAX technology enables us to offer mobile and fixed communications services over a single wireless network."); Clearwire Corp., SEC Form 10-K, filed Feb. 24, 2010, at 8; Clear, *Mobile Internet*, http://www.clear.com/shop/services/mobile, (visited Apr. 20, 2010); Clear, *Home Internet*, http://www.clear.com/shop/services/home, (visited Apr. 20, 2010). Clear, *Devices*, http://www.clear.com/shop/devices, (visited Sep. 22, 2010).

mobile data services in 74 markets across the United States and deploying its mobile wireless network using the 802.16e mobile WiMAX technology.[174] Clearwire also sells wholesale WiMAX services to Sprint Nextel and other service providers.[175] At year-end 2008, Clearwire had 475,000 retail subscribers. By year-end 2009, Clearwire had 688,000 subscribers, an increase of 45 percent. As of November 1, 2010, Clearwire's WiMAX networks where Clearwire has commercially launched cover an estimated 82 million people, with approximately 1 million retail and 1.8 million wholesale subscribers.[176] Clearwire has wholesale service agreements with its investors under which they can resell wireless broadband services to their respective end user customers. For example, Clearwire has an MVNO agreement with Sprint Nextel under which Sprint Nextel can purchase mobile broadband data services from Clearwire for resale to consumers, and Clearwire can purchase CDMA EV-DO mobile wireless voice and data services from Sprint Nextel for resale to consumers.[177] In recent transactions, the Commission's concentration and spectrum analysis has attributed Clearwire to Sprint Nextel because Sprint Nextel owns more than a 10 percent equity interest in Clearwire.[178] Furthermore, as of the fourth quarter of 2010, one member of the board of directors of Sprint Nextel is also a member of the board of directors of Clearwire.[179]

69. *Leap and MetroPCS.* The entry of current facilities-based providers into new geographic markets is an important form of entry.[180] Leap and MetroPCS are metropolitan area service providers that have recently invested in new markets. Leap states that its business model is to keep "costs low by engineering high-quality, efficient networks covering only the urban and suburban areas where its potential customers live, work and play enabling it to sell its wireless minutes for less than it costs other carriers to produce theirs,"[181] and "provide customers with unlimited wireless services for a flat rate without requiring a fixed-term contract or a credit check."[182] Leap, under the brand name Cricket, holds PCS and AWS licenses covering markets throughout much of the country, and has expanded its coverage from approximately 53.9 million POPs in October 2008 to 80.5 million POPs in October 2009, an

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[174] *See* Clearwire, *Coverage Map*, http://www.clear.com/coverage (visited Oct. 21, 2010).

[175] *See* Section IV.B.1.a, Service Provider Technology Deployments, *infra.*

[176] *See Clearwire Reports Record Subscriber and Revenue Growth in Third Quarter 2010*, Press Release, Clearwire, Nov. 4, 2010. The figure for wholesale subscribers includes users of multi-mode 3G/4G devices in areas where Clearwire has not yet launched 4G service, but from whom it currently expects to receive nominal revenue. As of September 30, 2010, approximately 45 percent of the company's wholesale subscribers resided outside of Clearwire's launched markets. These networks include, among others, Atlanta, Baltimore, Charlotte, Chicago, Dallas, Honolulu, Houston, Kansas City, Las Vegas, Philadelphia, Portland, Oregon, Salt Lake City, San Antonio, Seattle, St. Louis, and Washington D.C.

[177] Clearwire Corp., SEC Form 10-K, filed Mar. 26, 2009, at F-17.

[178] *See* Clearwire Corporation, SEC Form 10-Q, filed Aug. 5, 2010, at 22. As of June 30, 2010, Sprint owned the largest interest in Clearwire with an effective voting and economic interest in Clearwire of approximately 53.9 percent and Intel, Google, Comcast, Time Warner Cable, Bright House Networks and Eagle River collectively owned a 31.8 percent interest in Clearwire. An executive vice president of Intel and the CEO of Eagle River are also on the board of directors for Clearwire.

[179] Frank Ianna. *See* http://investors.clearwire.com/phoenix.zhtml?c=198722&p=irol-govboard and http://www.sprint.com/governance/board/ (visited Oct. 21, 2010).

[180] 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).

[181] Leap, *About Leap*, http://www.leapwireless.com/l1_about_leap.htm (visited Jan. 13, 2010).

[182] Leap Wireless International Inc., SEC Form 10-K, filed Mar. 1, 2010, at 1. Verizon Wireless claims that Leap and MetroPCS have been achieving penetration rates of between eight and 13 percent in markets where they have been active for five or more years. *See Fourteenth Report*, 25 FCC Rcd at 11462, n. 175.

increase of 26.6 million. In 2010, Leap began offering their customers service plans with nationwide voice roaming, including in Alaska, Hawaii and Puerto Rico. As of June 30, 2010, Leap had 5.3 million subscribers, a 16.5 percent increase from June 2009.[183]

70. MetroPCS states that it provides mobile wireless services in "selected major metropolitan areas in the United State[s,]" and it provides "a variety of wireless communications services to our subscribers on a no long-term contract, paid-in-advance, flat-rate, unlimited usage basis."[184] MetroPCS, which holds PCS and AWS spectrum in many markets throughout the United States, has expanded its facilities-based coverage from 56 million POPs in October 2008 to approximately 146 million in October 2010. As of the fourth quarter 2010, MetroPCS became the first U.S. facilities-based provider to launch a network using LTE technology, and has launched its LTE network in nine major metropolitan areas – Las Vegas, Dallas/Fort Worth, Detroit, Los Angeles, Philadelphia, San Francisco, Boston, New York and Sacramento.[185] As of the end of June 2010, MetroPCS had 7.6 million subscribers.[186]

71. *Atlantic Tele-Network (ATN)*. The acquisition of 26 of the divestiture markets from the Verizon-Alltel transaction by ATN, which was consummated in April 2010, led to a new entrant in the U.S. mobile wireless retail services marketplace. Through this acquisition of the Alltel divestiture markets, "ATN offers wireless voice and data services to retail customers under the 'Alltel' name in rural markets located principally in the Southeast and Midwest. Additionally, through another affiliate, Commnet, the Company offers 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 June 30, 2010, ATN had approximately 807,000 subscribers, making them the ninth largest mobile wireless facilities-based provider, with a network footprint covering approximately six million POPs.[187]

72. *Cox Communications.* Cox Communications (Cox) invested more than $500 million in spectrum in the AWS and 700 MHz bands and the development of infrastructure in 2006 and 2008.[188] 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,[189] and Cox began market testing its mobile wireless service.[190] However, in May 2011, Cox announced that it would

[183] As of September 30, 2010, Cricket covered 35 states and the District of Columbia and had approximately 5.1 million customers. In addition, Cricket has various roaming relationships as well as a wholesale agreement with Sprint Nextel to allow them to offer their wireless services outside their current network footprint. *See* Leap Wireless International Inc., SEC Form 10-Q, filed Nov. 3, 2010.

[184] MetroPCS Communications Inc., SEC Form 10-K, filed Mar. 1, 2010, at 5.

[185] *See* Section IV.B.1, Service Provider Technology Deployments, *infra.*

[186] MetroPCS, *SEC Form 10-Q*, http://investor.metropcs.com/phoenix.zhtml?c=177745&p=irol-irhome (visited Oct. 21, 2010).

[187] *See* Atlantic Tele-Network, SEC Form 10-Q, http://ir.atni.com/financials.cfm (visited Oct. 21, 2010), at 7, 21.

[188] *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.

[189] *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.

[190] *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.

abandon its plans to build its own wireless network and would instead resell Sprint Nextel's mobile wireless services.[191] Cox Enterprises, the parent company of Cox Communications, has stated that it plans to bundle mobile wireless services with other Cox products and initially target these services at its existing customer base.[192] Cox currently has about six million customers for its cable and broadband products. As of May 2011, Cox was offering mobile wireless voice and high-speed Internet access services in Hampton Roads, Virginia; Omaha, Nebraska; Orange County, California; Oklahoma City and Tulsa, Oklahoma; Cleveland, Ohio; Rhode Island; and the communities it serves in Connecticut.[193]

2. Exit

73. Exit of service providers – whether through mergers, acquisitions, or discontinuance – affects the structure of 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.[194] 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, reduced quality of services, 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.[195]

74. 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.[196] However, if the consolidation substantially increases the size of the firm, there may be reduced competitive pressure on the firm, potentially leading to higher consumer prices and/or lower incentive to improve its consumer services.[197] Service providers in non-overlapping geographic markets are not considered competitors for present purposes.

75. *Mergers and Acquisitions*. 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.[198] A

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[191] *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.

[192] *See* Cox Enterprises, *2008 Annual Report*, http://www.corporatereport.com/cox2008/index.html (visited Apr. 20, 2010) at 3.

[193] *See Cox Launches Wireless in Rhode Island, Connecticut, Cleveland*, Press Release, Cox, May 17, 2011; *Cox Unveils Unprecedented "Unbelievably Fair (SM) Wireless Plans, Bringing More Value To The Bundle*, Press Release, Cox, Nov. 19, 2010, *available at* http://cox.mediaroom.com/index.php?s=43&item=516; Cox, *Unbelievably Fair Wireless*, http://www.unbelievablyfairwireless.com/ (visited Feb. 23, 2011).

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

[195] *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.

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

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

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

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 10 below.[199] 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.[200] Below we summarize these transactions and report on the status of divestitures that were required in some recent transactions.[201]

Table 10
Selected Mergers and Acquisitions: 2005-2010

Year of Commission Approval	Merger
2005	Sprint/Nextel
2007	AT&T/Dobson
2008	AT&T/Aloha T-Mobile/Suncom Verizon Wireless/Rural Cellular Verizon Wireless/Alltel Sprint Nextel/Clearwire
2009	AT&T/Centennial
2010	AT&T/Verizon-Alltel ATN/Verizon-Alltel Sprint/iPCS

76. *AT&T/Centennial.* On November 5, 2009, the Commission consented with conditions to AT&T's acquisition of Centennial Communications Corp. (Centennial), and on November 6, 2009, AT&T completed its acquisition of Centennial, with Centennial shareholders receiving approximately $945 million in cash in exchange for their shares.[202] Centennial held Cellular, PCS, and AWS spectrum

[199] 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.

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

[201] 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. On March 20, 2011, AT&T announced its intention to acquire T-Mobile, the fourth largest mobile wireless provider, for $39 billion, subject to regulatory approval. Applications for approval of these two transactions are currently pending before the Commission. *See* "AT&T Mobility Spectrum LLC and Qualcomm Incorporated Seek FCC Consent to the Assignment of Lower 700 MHz Band Licenses," WT Docket No. 11-18, *Public Notice*, 26 FCC Rcd 1335 (2011); "Commission Opens Docket for Proposed Transfer of Control of T-Mobile USA, Inc. and Its Subsidiaries from Deutsche Telekom AG to AT&T Inc.," WT Docket No. 11-65, *Public Notice*, DA 11-673 (rel. Apr. 14, 2011).

[202] *AT&T Completes Acquisition of Centennial Communications*, Press Release, AT&T, Nov. 6, 2009. *See also* AT&T Inc., SEC Form 8-K, filed Nov. 6, 2009.

and EBS spectrum leases, and provided voice and data wireless service to approximately 633,100 wireless customers in parts of Indiana, Michigan, Ohio, Louisiana, Mississippi, and Texas using GSM technology.[203] Centennial also provided mobile wireless service to approximately 424,400 subscribers in Puerto Rico and the U.S. Virgin Islands using CDMA-track technology.[204] The Commission determined that competitive harm was unlikely in most mobile wireless markets as a result of the *AT&T/Centennial* transaction, and that the public interest, convenience, and necessity were served by the transaction, subject to certain conditions imposed in the Commission's *Memorandum Opinion and Order*.[205] To remedy likely anti-competitive harms in particular geographic markets, the Commission required AT&T to divest Centennial's mobile wireless assets in seven CMAs, six in Louisiana and one in Mississippi.[206]

77. *Verizon Wireless/Alltel*. The Commission approved the Verizon Wireless/Alltel transaction on November 4, 2008.[207] The Commission conditioned its approval of the transaction on the companies divesting the licenses and related operational and network assets in five markets where the Commission found potential for competitive harm.[208] The Commission also conditioned the transaction on the companies' voluntary commitment to divest the licenses and related operational and network assets in 105 markets and on Verizon Wireless's voluntary commitments with respect to providing roaming services to other providers.[209] The companies closed their transaction on January 9, 2009.[210]

78. *Divestitures*. The divestitures of the mobile wireless assets by Verizon Wireless and AT&T – as conditions of the *Verizon Wireless/Alltel* and *AT&T/Centennial* transactions, respectively – had all received regulatory approval (by the Commission and the DOJ) as of October 2010.[211] Verizon Wireless divested 79 of the 105 CMAs to AT&T and the remaining 26 CMAs to ATN.[212] AT&T divested

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[203] *AT&T-Centennial Order*, 24 FCC Rcd at 13919, ¶ 8.

[204] *Id.* at 13919, ¶ 9.

[205] *Id.* at 13981, ¶ 166.

[206] *Id.* at 13961, ¶ 111. The DOJ required divestiture in an additional market in Mississippi. *Id.* at 13926, ¶ 23.

[207] *Verizon Wireless-Alltel Order*, 23 FCC Rcd at 17546-47 ¶ 233.

[208] *Id.* at 17491-93, ¶¶ 100-106.

[209] *See id.* at 17515-16, 17524-25, 17546-47, ¶¶ 157, 178-181, 233. The Commission conditioned its approval of the transaction on Verizon Wireless's compliance with a voluntary commitment to phase out its requests for federal high-cost universal service support over a five-year transition period and with a voluntary commitment to use counties for measuring compliance with the Commission's wireless E911 location accuracy rules governing handset-based technologies. *Id.* at 17532-33, ¶¶ 197 & 201.

[210] *Verizon Wireless Completes Purchase of Alltel; Creates Nation's Largest Wireless Carrier*, Press Release, Verizon Wireless, Jan. 9, 2009.

[211] For a discussion of the divestiture requirements of these transactions, *see* Applications of Cellco Partnership d/b/a Verizon Wireless and Rural Cellular Corporation for Consent to Transfer Control of Licenses, Authorizations, and Spectrum Manager Leases and Petitions for Declaratory Ruling that the Transaction Is Consistent with Section 310(b)(4) of the Communications Act, WT Docket No. 07-208, *Memorandum Opinion and Order and Declaratory Ruling*, 23 FCC Rcd 12463, 12512-15, ¶¶ 110-122 (2008); *Verizon Wireless-Alltel Order*, 23 FCC Rcd at 17491-93, 17515-18, ¶¶ 99-106, 157-162; *AT&T-Centennial Order*, 24 FCC Rcd at 13960-63, ¶ 109-119.

[212] *See* 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) (*Verizon Wireless – AT&T Order*); Applications of Atlantic Tele-Network, Inc. and Cellco Partnership d/b/a Verizon Wireless for Consent to Assign or Transfer Control of Licenses and Authorizations, WT Docket No. 09-119, *Memorandum Opinion and Order*, 25 FCC Rcd 3763 (2010); "Wireless Telecommunications Bureau and International Bureau Grant Consent for the Transfer of Control and Assignment of Licenses and Authorizations from AT&T Inc. to Texas 10, LLC," WT Docket No. 10-78, *Public Notice*, 25 FCC Rcd 10978 (2010).

five of the eight Centennial CMAs to Verizon Wireless and the remaining three CMAs to Cellular One MTPCS (Texas 10, formerly branded as Chinook).[213] Cellular One MTPCS provides service to customers in Montana, Texas, Oklahoma and Wyoming and is a new entrant into Louisiana through the AT&T/Centennial divestitures.[214]

79. *Exit*. On October 4, 2010, Pocket Communications (Pocket) announced that it would be exiting the market on October 31, 2010. Pocket had operated in south Texas and in parts of the Northeast. In July 2010, Leap and Pocket entered into a joint venture that transferred Pocket's Texas spectrum to the joint venture.[215] MetroPCS has applied to acquire Pocket's licenses in the Northeast.[216] In addition, three other small firms exited the market in 2010: XIT Cellular from two markets in Texas, Caprock Cellular from one market in Texas, and SLO Cellular (Cellular One of San Luis Obispo) from one market in California. AT&T has applied to acquire the respective licenses associated with these exits.[217]

IV. MOBILE WIRELESS SERVICES: PROVIDER CONDUCT

80. In addition to industry structure, a second 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 they engage in price and non-price rivalry. During 2008 and 2009, mobile wireless service providers continued to compete on the basis of price as well as on various non-price factors, which are discussed in detail below. Non-price factors include technology deployment and network upgrades, product information and perception (advertising and marketing strategies), and downstream product differentiation such as handset/device and application offerings.

A. Price Rivalry: Developments in Mobile Service Pricing Plans

81. One way that mobile wireless providers compete is through differentiated pricing plans. In the mobile wireless sector, we observe different pricing levels and structures, for varying service packages, with various handsets and policies on handset pricing. Today, all of the nationwide service providers, and many smaller operators, offer some version of a national flat-rate pricing plan in which customers can purchase a "bucket" of minutes to use on a nationwide or nearly nationwide network without incurring roaming or long-distance charges. All of the nationwide service providers also offer some version of a family plan.[218]

82. Operators have experimented with various types of "unlimited" calling options.[219] For example, some providers offer "calling circle" plans that allow subscribers unlimited free calling to and from a small number of designated numbers, regardless whether they are for wireline or wireless phone,[220] while other providers offer plans that provide for free calls only to customers who use the same

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[213] *See* Applications of Cellco Partnership d/b/a Verizon Wireless and AT&T, Inc. for Consent to Assign or Transfer Control of Licenses and Authorizations and Request for Declaratory Ruling on Foreign Ownership, WT Docket No. 09-121, *Memorandum Opinion and Order*, 25 FCC Rcd 10985 (2010).

[214] *See* Cellular One, http://www.cellonenation.com/companyinfo.php (visited Nov. 1, 2010).

[215] Leap Wireless International Inc., SEC Form 10-Q, filed Mar. 1, 2010.

[216] *See* http://wireless2.fcc.gov/UlsApp/ApplicationSearch/searchAppl.jsp, File Number 0004421015.

[217] *See* http://wireless2.fcc.gov/UlsApp/ApplicationSearch/searchAppl.jsp, File Numbers 0004340296 and 0004340280 (AT&T/XIT application); File Number 0004284198 (AT&T/Caprock Cellular application); File Numbers 0004300558 and 0004300573 (AT&T/SLO Cellular application).

[218] *See Tenth Report*, 20 FCC Rcd at 15946, ¶ 98.

[219] *See Twelfth Report*, 23 FCC Rcd at 2292, ¶ 113.

[220] *Eleventh Report*, 21 FCC Rcd at 10984, ¶ 91. *See also* Allie Winter, *Verizon Wireless Apes Alltel's My Circle With New Small Businesses Calling Plan*, RCR Wireless News, June 11, 2008 (reporting that, in June 2008, Verizon (continued….)

mobile wireless provider ("on-net" mobile-to-mobile options).[221] In 2008, unlimited national flat-rate calling plans were launched by all the nationwide operators,[222] and then spread from postpaid service to the prepaid and reseller segment of the market.[223] Both postpaid and prepaid versions of these unlimited flat-rate plans include bundled options that combine unlimited nationwide calling with either unlimited text messaging or unlimited use of other data services as well as text messaging.[224] In 2009, Sprint Nextel launched its "Any Mobile, Anytime" feature, which allows unlimited mobile-to-mobile calling to any domestic wireless number, rather than a limited selection of designated wireless and wireline numbers.[225] Finally, a number of smaller, regional, and multi-metro providers, like Leap and MetroPCS, have been offering unlimited local calling plans.[226]

83. In addition to unlimited voice plans and bundled voice-and-data offerings, until recently all the nationwide operators also offered unlimited data plans for smartphones, and it was standard industry practice to offer only this unlimited data pricing option to smartphone users. As discussed below, the most significant development in mobile service pricing plans since the release of the *Fourteenth Report* is the introduction by three of the four nationwide service providers of tiered, usage-based data pricing for smartphone users, with AT&T no longer offering unlimited data plans to new smartphone users. Another significant development is AT&T's introduction of higher early termination fees (ETFs) for smartphone wireless service contracts, following a similar move by Verizon Wireless in late 2009. Apart from these developments in the pricing of postpaid service, the ongoing movement by the nationwide operators into the prepaid service segment continues to put pressure on smaller traditional prepaid service providers to revamp their pricing plans and lower the prices of their own unlimited prepaid service offerings.

1. Postpaid Service

84. The focus of this section of the *Report* reflects new developments in the pricing of postpaid service during the period covered by the *Report*, and accordingly varies from period to period depending on how industry pricing practices evolve. Consequently, whereas the *Fourteenth Report* included an extensive discussion of recent pricing changes and new features and options with respect to postpaid voice plans,[227] the present *Report* focuses on the industry's shift from unlimited data pricing to tiered, usage-based data pricing for smartphones.

85. *Data Plan Pricing*. Purchase of a monthly data plan is typically a requirement for smartphones such as the iPhone and its closest competitors. Until recently, the industry norm was one price plan per device, and this was an unlimited data plan.[228] Partly because of the incentives created by

(Continued from previous page)
Wireless also introduced a new plan for businesses, allowing unlimited calling between a Verizon Wireless number and up to five wireline numbers for $5 per line).

[221] *Eleventh Report*, 21 FCC Rcd at 10984, ¶ 91.

[222] *Thirteenth Report*, 24 FCC Rcd at 6244, ¶112.

[223] *Id.* at 6246, ¶118.

[224] *Id.* at 6247, ¶120.

[225] *Fourteenth Report*, 25 FCC Rcd at 11470, ¶ 90.

[226] *Id.* at 6295, ¶231.

[227] *Fourteenth Report*, 25 FCC Rcd at 11470-71, ¶¶ 90-92.

[228] Craig Moffett, *et al*., *Quick Take – U.S. Wireless: At Last… Rationing Arrives*, Bernstein Research, June 2, 2010, at 1 (*Rationing Arrives*); Andrew Dowell, *AT&T Moves Away From Unlimited-Data Pricing*, Wall Street Journal, June 2, 2010. As discussed in the *Fourteenth Report*, beginning in January 2010 Verizon Wireless required the purchase of a 25 MB monthly data plan for its entire line of 3G "multimedia" handsets, or so-called "feature phones," but retained a requirement to purchase a more expensive unlimited monthly data plan for its line of more advanced 3G smartphones. *See Fourteenth Report*, 25 FCC Rcd at 11472, ¶ 95. The advent of tiered data pricing (continued….)

this all-you-can-eat data pricing structure, iPhone and other smartphone users consumed significantly more bandwidth than average mobile wireless subscribers and the heaviest smartphone users accounted for a disproportionate share of data traffic.[229] For example, AT&T estimated that three percent of its smartphone users were generating 40 percent of its wireless data traffic.[230] As discussed in the *Fourteenth Report*, reports suggest that bandwidth consumption by data-intensive iPhone users may have degraded service quality for those users and other mobile wireless subscribers on the network during peak periods in certain cities.[231] One analyst report explained that "… unlimited data smartphone plans have no mechanism to disincentivize heavy data users from clogging the network" because, under this pricing structure, "… no matter how much data a user consumes, they all pay the same price."[232]

86. In response, AT&T devoted a large share of its capital spending to various measures to upgrade and expand the capacity of its HSPA network, but did not change its approach to data pricing.[233] In late 2009, however, the chief executive of AT&T's wireless operations hinted that the company would eventually shift from unlimited data pricing to charging subscribers based on the amount of data used in order to encourage high-usage customers to curb demand for network capacity and improve the operator's ability to manage its network.[234] Analysts have long anticipated the introduction of usage-based wireless data pricing, arguing that a departure from the unlimited data pricing model is only a matter of time.[235]

87. In June 2010, AT&T became the first national operator to move from unlimited data pricing to usage-based tiered data pricing for smartphones.[236] Beginning June 7, 2010, AT&T eliminated its $30 per month unlimited data plan for new smartphone subscribers, and in its place, introduced a two-tiered pricing structure: an entry plan of $15 per month for 200 megabytes of data usage and a more expensive plan of $25 per month for two gigabytes. Each plan has overage charges for users who exceed their monthly data usage allotment. Users will be charged $15 for an additional 200 megabytes of data usage on the entry plan and $10 for each additional gigabyte consumed on the more expensive two-gigabyte plan. To help customers manage their data usage, AT&T alerts customers by sending free text messages when they near their limits, and provides online tools, including a smartphone application that shows monthly usage information. Smartphone customers, including iPhone customers, who choose the more expensive two-gigabyte plan also have the option to add tethering for an additional $20 per month.

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for feature phones is also discussed in Simon Flannery, *et al*., *Wireless Data: The Torch Passes from Voice to Data*, Equity Research, Morgan Stanley, June 1, 2010, at 14 (*Torch Passes from Voice to Data)*.

229 Tom Kaneshige, *AT&T IPhone Users Irate at Idea of Usage-Based Pricing*, PCWORLD, Dec. 14, 2009; Glenn Derene, *In Defense of AT&T's New Utility Pricing System*, Popular Mechanics, June 2010, at http://www.popularmechanics.com/print-this/defending-atts-utility-pricing-system; George Ou, *Tiered Mobile Services Could Mean Half Price for Most Users*, Digital Society, July 7, 2010; *Fourteenth Report*, 25 FCC Rcd at 11527, 11550-51, ¶¶ 182, 224.

230 Andrew Dowell, *AT&T Moves Away From Unlimited-Data Pricing*, Wall Street Journal, June 2, 2010; Martin Peers, *AT&T Weighs the Price on Data*, Wall Street Journal, June 2, 2010; Tom Kaneshige, *AT&T IPhone Users Irate at Idea of Usage-Based Pricing*, PCWorld, Dec. 14, 2009.

231 *Fourteenth Report*, 25 FCC Rcd at 11550-51, ¶ 224.

232 *Torch Passes from Voice to Data*, at 15.

233 *Fourteenth Report*, 25 FCC Rcd at 11550-51, ¶¶ 224.

234 Tom Kaneshige, *AT&T IPhone Users Irate at Idea of Usage-Based Pricing*, PCWorld, Dec. 14, 2009.

235 *Rationing Arrives*, at 1 (stating that "For the better part of two years, the question around usage based pricing (UBP) plans has been when, not if."); *Torch Passes from Voice to Data*, at 15.

236 *AT&T Announces New Lower-Priced Wireless Data Plans to Make Mobile Internet More Affordable to More People*, Press Release, AT&T, June 2, 2010; Andrew Dowell, *AT&T Moves Away From Unlimited-Data Pricing*, Wall Street Journal, June 2, 2010; Martin Peers, *AT&T Weighs the Price on Data*, Wall Street Journal, June 2, 2010; *Rationing Arrives*, at 1-2.

AT&T also eliminated the $30 unlimited data option for new iPad users and replaced it with the $25 per month two-gigabyte plan.[237]

88. Existing smartphone users already on the $30 unlimited data plan could switch to the new cheaper plans, but also had the option to stay on their $30 unlimited data plans after their service contracts expire, even if they switch or upgrade devices and sign a new contract. However, they lose this option if they move to a new plan or opt for tethering.[238] Existing iPad users who already had the unlimited data plan could keep that plan or switch to the new plan with two gigabytes of data.

89. It is not clear what the impact of this new tiered pricing structure will be on data usage, consumers' monthly bills and operator revenues because it depends on the way in which both new and existing customers respond to the new price signals.[239] AT&T estimated that 98 percent of its smartphone customers currently use less than two gigabytes per month while 65 percent use less than 200 megabytes of data per month on average.[240] Accordingly, the company argued that the new tiered pricing structure could lower the cost of using smartphones for most users and encourage them to make wider use of mobile Internet services.[241] However, the company acknowledged that it is uncertain how consumers will respond to the incentives created by usage-based pricing, and views its pricing shift as an experiment in consumer behavior.[242]

90. The Nielsen Company analyzed the effects of AT&T's tiered pricing scheme using its own data on the distribution of smartphone data consumption collected from the monthly phone bills of more than 60,000 mobile customers.[243] According to Nielsen, there is a large disparity of usage among smartphone users, with the heaviest users consuming "staggering amounts of data." Average data consumption increased from about 90 MB per month during the first quarter of 2009 to 298 MB per month during the first quarter of 2010, which represents a year-on-year increase of approximately 230 percent.[244] However, the top six percent of smartphone users are consuming half of all data.[245] A quarter of smartphone users consumed less than 1 MB of data per month in the first quarter of 2010, down from more than a third in the first quarter of 2009.[246] Nielsen concludes from its data that "the vast majority of customers, 99 percent according to the 60,000 phone bills that Nielsen collects and analyzes every month as part of their Customer Value Metrics product, are better off with a pricing scheme like AT&T's new data pricing model than under flat-rate pricing where they are paying for much more than they ever use."[247]

[237] As discussed in Section IV.A.2, Prepaid Service, *infra*, AT&T's data plans for the iPad are prepaid, rather than postpaid.

[238] *Rationing Arrives*, at 2.

[239] Spencer E. Ante, *AT&T's Pricing Shift Will Test Behavior*, Wall Street Journal, June 3, 2010 (*AT&T's Pricing Shift Will Test Behavior*).

[240] *AT&T Announces New Lower-Priced Wireless Data Plans to Make Mobile Internet More Affordable to More People*, Press Release, AT&T, June 2, 2010; *AT&T's Pricing Shift Will Test Behavior*.

[241] *AT&T Announces New Lower-Priced Wireless Data Plans to Make Mobile Internet More Affordable to More People*, Press Release, AT&T, June 2, 2010; *AT&T's Pricing Shift Will Test Behavior*.

[242] *AT&T's Pricing Shift Will Test Behavior*.

[243] Roger Entner, *Quantifying the Mobile Data Tsunami and its Implications*, Nielsenwire, June 30, 2010 (*Quantifying the Mobile Data Tsunami and its Implications*).

[244] *Quantifying the Mobile Data Tsunami and its Implications*.

[245] *Quantifying the Mobile Data Tsunami and its Implications*.

[246] *Quantifying the Mobile Data Tsunami and its Implications*.

[247] *Quantifying the Mobile Data Tsunami and its Implications*.

91. After a lag of several months, first Verizon Wireless and then T-Mobile introduced tiered smartphone data plans on a promotional basis, leaving Sprint as the only remaining nationwide operator to offer only an unlimited data option for smartphones.[248] In October 2010, Verizon Wireless introduced a new limited data plan of $15 per month for 150 MB of data, half the price of its $30 per month unlimited data plan for smartphones.[249] Customers who exceed the monthly limit were charged an extra ten cents per megabyte in overage charges.[250] The new $15 plan was available to new customers with a two-year contract requirement, while existing customers have the option of moving to the less expensive limited plan or keeping their current plan. While Verizon Wireless offered the $15 plan during the holiday season, it was no longer available as of February 201,[251] and the only data plans available for new smartphone customers at that time was the $29.99 per month unlimited plan.[252] However, press reports have claimed that Verizon Wireless may move to tiered data plans in the future.[253]

92. T-Mobile announced the launch of tiered smartphone data plans at the beginning of November 2010.[254] The operator added a new less expensive plan of 200 MB of data use for $10 per month with a new two-year contract, or $15 per month with no contract extension. This is a limited time promotional offer, with the $10 price increasing to $15 after the promotion ends.[255] In addition to this new cheaper data plan, T-Mobile continues to offer an unlimited smartphone data plan for $30 per

[248] Simon Flannery *et al*., *Quick Comment: T-Mobile & Verizon Tiered Data Plans Kick-Start Holiday Promos; Sprint Data Plans Now at a Premium*, Morgan Stanley, Nov. 3, 2010, at 1; Eric Zeman, *Sprint CEO: No Tiered Data Plans from Us*, PhoneScoop, Dec. 7, 2010, at http://www.phonescoop.com/news/item.php?n=7090. As of January 2011, Sprint was offering two tiers of mobile data service for the Samsung Galaxy Tab tablet device: $29.99 per month for 2 GB and $59.99 per month for 5 GB. *See* Sprint, *Mobile Broadband Plans – Tablet 3G Mobile Broadband Connection Plan*, http://shop.sprint.com/NASApp/onlinestore/en/Action/DisplayPlans?INTNAV=LEG:HE:Plans (visited Jan. 7, 2011).

[249] Roger Cheng, *Verizon Wireless to Offer $15 Data Plan*, Wall Street Journal, Oct. 19, 2010 (*Verizon Wireless to Offer $15 Data Plan*); Roger Cheng, *Verizon Wireless to Offer Cheaper Data Plan*, Wall Street Journal, Oct. 20, 2010 (*Verizon Wireless to Offer Cheaper Data Plan*).

[250] *Verizon Wireless to Offer $15 Data Plan*; *Verizon Wireless to Offer Cheaper Data Plan*.

[251] *Verizon Wireless to Offer Cheaper Data Plan*; Verizon, *Individual Plans,* http://www.verizonwireless.com/b2c/store/controller?item=planFirst&action=viewPlanList&sortOption=priceSort&typeId=1&catId=323&sel=ind (visited Feb. 16, 2011).

[252] *Verizon Wireless to Offer $15 Data Plan*; *Verizon Wireless to Offer Cheaper Data Plan*; Verizon, *Individual Plans,* http://www.verizonwireless.com/b2c/store/controller?item=planFirst&action=viewPlanList&sortOption=priceSort&typeId=1&catId=323&sel=ind (visited Feb. 16, 2011). Separate, tiered pricing plans were available at that time for mobile broadband access on tablets, netbooks, notebooks, and mobile hotspots. *See* Verizon, *Mobile Broadband Plans*, http://www.verizonwireless.com/b2c/mobilebroadband/?page=plans&lid=//global//plans//mobile%20broadband//all%20mobile%20broadband%20plans (visited Feb. 16, 2011).

[253] *Verizon Wireless to Offer $15 Data Plan*; Roger Cheng, *Verizon iPhone: $30 Unlimited Data (for Now)*, Wall Street Journal, Jan. 25, 2011, at http://blogs.wsj.com/digits/2011/01/25/verizon-iphone-30-unlimited-data/?mod=e2tw (citing statements by Verizon's Chief Operating Officer, Lowell McAdam).

[254] Associated Press, *T-Mobile USA Adds Cheaper Data Plan*, Wall Street Journal, Nov. 1, 2010; Simon Flannery *et al*., *Quick Comment: T-Mobile & Verizon Tiered Data Plans Kick-Start Holiday Promos; Sprint Data Plans Now at a Premium*, Morgan Stanley, Nov. 3, 2010, at 1 (*Quick Comment: T-Mobile & Verizon Tiered Data Plans Kick-Start Holiday Promos; Sprint Data Plans Now at a Premium)*.

[255] *Quick Comment: T-Mobile & Verizon Tiered Data Plans Kick-Start Holiday Promos; Sprint Data Plans Now at a Premium*, at 1.

month.[256] However, prior to offering its usage-based pricing promotion, T-Mobile introduced changes in its policies for data service that allow the operator to reduce a customer's data speed if his/her monthly data usage exceeds 5 GB.[257] In particular, under a provision T-Mobile added to its terms and conditions, the operator can restrict a customer's monthly data consumption after 5 GB by slowing down their connection or taking other measures to prevent their use of a disproportionate amount of bandwidth from degrading service quality and network performance for other customers.[258]

93. *Terms and Conditions*. Under the predominant postpaid handset subsidy model, customers are required to sign a one- to two-year service contract in exchange for purchasing a handset at a discount, and are subject to paying an ETF if they cancel their wireless service before the term of their service contract expires. As noted in the *Fourteenth Report*, in November 2009, Verizon Wireless differentiated its method of setting ETFs by introducing a new two-tiered structure in which the ETF for designated "advanced devices" ($350) is double the amount of the ETF for regular handsets ($175).[259] In June 2010, AT&T Wireless followed suit with the introduction of a similar, though slightly differentiated, two-tiered structure for ETFs.[260] In particular, AT&T Wireless raised its ETF from $175 to $325 on contracts signed for smartphones and cellular-connected netbook computers, while simultaneously cutting its ETF by $25 to $150 on contracts for regular handsets.[261] Like Verizon Wireless, AT&T Wireless continues to pro-rate ETFs on contracts for both smartphones and regular handsets by reducing the ETF by a fixed amount for each full month of service completed by the customer.[262]

2. Prepaid Service

94. In the United States, most mobile wireless subscribers pay their phone bills after they have incurred charges, which requires service providers to extend credit to their customers. This approach is known as postpaid service.[263] Prepaid service, in contrast, requires customers to pay for service prior to making calls. Prepaid plans typically produce lower ARPUs and higher churn rates for service providers in comparison to postpaid service.[264] For these reasons, the industry generally had not

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[256] *Quick Comment: T-Mobile & Verizon Tiered Data Plans Kick-Start Holiday Promos; Sprint Data Plans Now at a Premium*, at 1.

[257] *Id*.; Roger Cheng, *Sprint May Cap Data Roaming on Laptops*, Wall Street Journal, June 15, 2010; *Verizon Wireless to Offer $15 Data Plan*; T-Mobile, *Additional Terms for Data Plans and Features*, http://www.t-mobile.com/Templates/Popup.aspx?PAsset=Pln_Lst_DataPlan (visited Feb. 26, 2011).

[258] T-Mobile, http://www.t-mobile.com/Templates/Popup.aspx?PAsset=Ftr_Ftr_TermsAndConditions&print=true, *July 2010 Terms and Conditions* (visited Aug. 24, 2010). If the customer's total usage exceeds five GB during a billing cycle, T-Mobile may reduce the customer's data speed for the remainder of that billing cycle. In addition, if the customer uses his or her data plan in a manner that could interfere with other customers' service, affect the operator's ability to allocate network capacity among customers, or degrade service quality for other customers, T-Mobile may suspend, terminate or restrict the customer's data session, or switch the customer to a more appropriate data plan.

[259] *Fourteenth Report*, 25 FCC Rcd at 11472, ¶ 94.

[260] Roger Cheng, *AT&T Raises Smartphone, Netbook Termination Fees*, Wall Street Journal, May 22, 1010.

[261] *Id*.

[262] *Id., Fourteenth Report*, 25 FCC Rcd at 11472, ¶ 94. Verizon Wireless reduces its $175 ETF for regular handsets by $5 per month for each full month the customer retained Verizon Wireless's service, while it reduces its $350 ETF for designated advanced devices by $10 per month for each full month of service completed by the customer.

[263] *See* Section V.A.3, Mobile Wireless Subscribers by Pricing Plan, *infra*, for information on mobile wireless subscribers by pricing plan.

[264] *Twelfth Report*, 23 FCC Rcd at 2293-94, ¶ 116.

heavily promoted prepaid offerings in the past.[265] More recently, however, the pool of unsubscribed customers qualified for postpaid plans declined to the point where prepaid offerings, which do not require credit checks, have become more attractive to more service providers.[266] In response, some service providers have introduced new prepaid plans, or entire "flanker brands," for prepaid service.[267] In some cases, providers have tailored prepaid offerings to suit segments of the market that do not want or cannot get a traditional service plan, particularly the youth market segment. As one 2009 analyst report put it, "As penetration of cellular phones has increased among more attractive demographics, providers have increasingly offered and promoted prepaid plans as they dig deeper and deeper into younger and poorer demographics to sustain growth."[268] In addition to facilities-based providers, many MVNOs offer prepaid plans rather than standard monthly billing.

95. As noted in the *Fourteenth Report*, the prepaid service segment has evolved in recent years due in part to the introduction and growth of unlimited prepaid service offerings.[269] As one analyst explained, "The prepaid market used to be fairly homogenous, with customers buying minutes ahead of time on a card, or 'European Style,' and in general far overpaying for handsets and minutes relative to postpaid customers."[270] This kept prepaid usage and ARPU low. However, with the growth of unlimited prepaid offerings, among other developments, there is a trend to lower per-minute rates and increased usage and ARPU in prepaid services. As a result, analysts stress that the market segment for prepaid service is "bifurcating" into a low-end segment and a high-end segment.[271] The low-end segment comprises traditional pay-as-you-go prepaid service, while the high-end segment encompasses unlimited ("all you can eat") prepaid offerings.

96. TracFone is generally regarded as the leader in the low-end prepaid niche.[272] Although Tracfone's rates are slightly higher on a per minute basis than those of alternative prepaid offerings, the company targets low-usage and safety-oriented customers whom other prepaid service providers are reluctant to go after because the average monthly revenue per user (ARPU) they generate, at around $10-12, is so low.[273] TracFone purchases minutes predominantly from AT&T and resells them through a national distribution network under various brands, including TracFone, Net10, and Safelink.[274] 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.[275] Analysts attribute much of TracFone's recent subscriber growth to its Safelink offer, a program supported by the Universal Service Fund (USF) that

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[265] *Id*.

[266] *Id*.

[267] *Id*.

[268] *Recipe for Disaster*, at 20.

[269] *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*).

[270] *Slumdog Millionaires*, at 3.

[271] 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.

[272] *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 (*TracFone's Prepaid Niche*).

[273] *TracFone's Prepaid Niche*; *Slumdog Millionaires*, at 4, 24.

[274] *Slumdog Millionaires*, at 24.

[275] *TracFone's Prepaid Niche*.

provides a free cell phone and credit for a limited amount of free monthly wireless service to eligible low-income families.[276]

97. Since the release of the *Fourteenth Report*, TracFone is facing a new challenger in the low-end prepaid segment. In May 2010, Sprint announced the introduction of a new low-end prepaid brand that it calls Common Cents Mobile.[277] Sprint's new prepaid option is a pay-by-the-minute wireless plan that the company sells through Wal-Mart. The new service charges seven cents per minute for calls and the same amount per text message – about half as much as TracFone.[278]

98. The unlimited prepaid segment includes the earliest unlimited prepaid providers, Leap and MetroPCS, and more recent unlimited prepaid players such as Sprint Nextel's Virgin Mobile and Boost Mobile prepaid brands. As noted in the *Fourteenth Report*,[279] one of the latest entrants to the unlimited prepaid segment is TracFone's "Straight Talk" service, which became nationally available in October 2009 after a limited trial service that began the previous summer.[280] As with other TracFone prepaid brands, the Wal-Mart store chain distributes Straight Talk handsets and service.[281] Unlike TracFone's other prepaid brands, however, Straight Talk runs on Verizon Wireless's network and was initially marketed with Verizon Wireless's name and logo on the box.[282] In addition, whereas other TracFone brands are targeted at low-usage customers in the traditional pay-as-you-go prepaid segment, Straight Talk's unlimited prepaid offerings are targeted at customers with higher usage and ARPU.

99. As detailed in the *Fourteenth Report*, analysts singled out Sprint Nextel's Boost Mobile prepaid brand and TracFone's Straight Talk prepaid service as being the most aggressive in cutting the price of unlimited nationwide service offerings in 2009.[283] Both Boost Mobile and Straight Talk are part of a broader movement by the nationwide mobile operators into the prepaid segment either through the sale of their own prepaid brands, as in the case of Sprint Nextel, or through resale arrangements, as with Verizon's agreement to sell network services for TracFone's Straight Talk offering.[284] In addition to Boost Mobile's unlimited prepaid offerings, Sprint Nextel's push into the prepaid segment is reflected in other recent developments such as its acquisition of Virgin Mobile USA in the fourth quarter of 2009[285] and its aforementioned introduction of a new low-end prepaid brand, Common Cents Mobile, in May 2010. Similarly, the launch of TracFone's Straight Talk service represented a shift in business strategy for Verizon Wireless, which previously had "largely avoided the prepaid market."[286]

100. The more aggressive push by the nationwide network operators into the prepaid segment continued to pressure traditional regional prepaid providers such as Leap and MetroPCS to lower their

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[276] *The Haves and the Have-Nots Diverge*, at 10; *Slumdog Millionaires*, at 25; *TracFone's Prepaid Niche*.

[277] Niraj Sheth and Roger Cheng, *Phone Rivals Dial Up Prepaid Services*, Wall Street Journal, May 14, 2010 (*Phone Rivals Dial Up Prepaid Services*).

[278] *Phone Rivals Dial Up Prepaid Services*.

[279] *Fourteenth Report*, 25 FCC Rcd at 11475, ¶ 101.

[280] Roger Cheng, *Wal-Mart Wireless Expands*, Wall Street Journal, Oct. 15, 2009 (*Wal-Mart Wireless Expands*).

[281] *Wal-Mart Wireless Expands*.

[282] *Wal-Mart Wireless Expands*; Craig Moffett *et al*., *Weekend Media Blast: Tilt*, Bernstein Research, Jul. 10, 2009, at 1 (*Weekend Media Blast: Tilt*).

[283] *Fourteenth Report*, 25 FCC Rcd at 11475-76, ¶ 102; *Recipe for Disaster*, at 14, 16; *Slumdog Millionaires*, at 5, 16.

[284] *Phone Rivals Dial Up Prepaid Services*.

[285] *Fourteenth Report*, 25 FCC Rcd at 11443, ¶ 34.

[286] *Phone Rivals Dial Up Prepaid Services*.

prices.[287] As detailed in the *Fourteenth Report*,[288] in the second half of 2009 first MetroPCS and then Leap responded to Boost Mobile's and Straight Talk's low-priced unlimited service offerings with two successive rounds of price cuts for certain add-on features of their unlimited local calling plans. Since then, both MetroPCS and Leap have responded yet again, this time not only by reducing their prices, but also by abandoning their original business model – local calling plans coupled with additional per-minute charges for roaming – in favor of the flat-rate nationwide coverage model that dominates the postpaid service segment.

101. In January 2010, MetroPCS unveiled new all-inclusive pricing plans that cover taxes and fees for the customer and undercut similar offerings from Sprint Nextel's Boost Mobile brand by ten dollars.[289] In addition, all the pricing plans now include unlimited nationwide talk, text and Web services, with the more expensive plans offering additional options and features for extra monthly charges.[290] In March 2010, Leap followed suit with the launch of new simplified service plans that all offer unlimited nationwide voice service, with higher monthly recurring charges for additional features such as unlimited nationwide text coverage, unlimited photo and video messaging, mobile Web services and navigation services.[291] In August 2010, Leap went a step further to match MetroPCS's new pricing plans by announcing new all-inclusive pricing plans that fold taxes and fees into the monthly recurring charge and include unlimited nationwide talk and text service.[292]

102. Other developments in the prepaid segment since the release of the *Fourteenth Report* reflect a movement by prepaid service providers to compete more aggressively for mobile service customers who use smartphones, laptops and other advanced data devices. In addition to the aforementioned changes in their pricing plans for regular devices, both MetroPCS and Leap Wireless have recently added new smartphones to their handset line-up and introduced new complementary higher-tier pricing plans for broadband devices.[293] Beginning in August 2010, Sprint Nextel's Virgin Mobile prepaid brand launched a mobile broadband plan for laptop users that offers unlimited data for $40 per month with no contract required.[294] The new all-you-can-eat service offering replaces an earlier tiered

[287] *Phone Rivals Dial Up Prepaid Services*; Anupreeta Das, *Leap-MetroPCS Wireless Talks Stay Stalled*, Wall Street Journal, June 6, 2010; *Fourteenth Report*, 25 FCC Rcd at 11476, ¶ 103.

[288] *Fourteenth Report*, 25 FCC Rcd at 11476, ¶ 103.

[289] *New Service Plans Starting at $40 Give Consumers Unlimited Talk, Text and Web with Local, State Taxes and Regulatory Fees Included*, Press Release, MetroPCS, Jan. 12, 2010; Roger Cheng, *MetroPCS Steps Up Wireless Price War*, Wall Street Journal, Jan. 13, 2010 (*MetroPCS Steps Up Wireless Price War*).

[290] *New Service Plans Starting at $40 Give Consumers Unlimited Talk, Text and Web with Local, State Taxes and Regulatory Fees Included*, Press Release, MetroPCS, Jan. 12, 2010.

[291] *Cricket Launches New Nationwide Coverage in all 50 States as part of Enhanced Value-Driven, Simplified Service Plans*, Press Release, Leap Wireless, Mar. 23, 2010.

[292] *Leap Lays Out Growth Plans for Prepaid Wireless Business*, Press Release, Leap Wireless, Aug. 3, 2010 (*Leap Lays Out Growth Plans for Prepaid Wireless Business*); Roger Cheng, *Leap Wireless Overhauls Plans*, Wall Street Journal, Aug. 4, 2010. (*Leap Wireless Overhauls Plans*)

[293] *Leap Wireless Overhauls Plans*; *Leap Lays Out Growth Plans for Prepaid Wireless Business*; *Leap Adds a Human Touch to the Smartphone Market With Its First Android(R) Phone, the Sanyo ZIO by Kyocera*, Press Release, Leap Wireless, Aug. 26, 2010; *MetroPCS Offers the Blackberry Curve 8530 With $60 Unlimited Talk, Text, Web and Data Service Plan*, Press Release, MetroPCS, July 23, 2010; *MetroPCS Steps Up Wireless Price War*; *New Service Plans Starting at $40 Give Consumers Unlimited Talk, Text and Web with Local, State Taxes and Regulatory Fees Included*, Press Release, MetroPCS, Jan. 12, 2010.

[294] Erika Morphy, *Virgin Mobile Gets Scrappy With Unlimited, Contract-Free Data Plan*, TechNewsWorld, Aug. 25, 2010 (*Virgin Mobile Gets Scrappy With Unlimited, Contract-Free Data Plan*).

pricing structure with data caps.[295] Leap Wireless likewise offers an unlimited prepaid broadband internet service plan for both laptops and home desktop computers at the same price point in direct competition with the Virgin Mobile service.[296] In contrast, comparable postpaid offerings from competitors are typically priced at $60 per month and usually require a two-year contract.[297] Finally, AT&T's data plans for the iPad are prepaid on a monthly basis, and do not require a one- or two-year contract.[298]

B. Non-Price Rivalry

103. In addition to price, mobile wireless service providers compete on many other dimensions. This section identifies three broad categories of non-price rivalry among mobile wireless service providers: 1) network upgrades; 2) product information and perception, which include advertising and marketing; and 3) downstream product differentiation, which includes handset/device and application offerings. Indicators of non-price rivalry, which are discussed in detail below, include technology deployment and upgrades, advertising and marketing expenditures, and handsets/devices and application offerings.

1. Network Coverage and Technology Upgrades

104. Network investment remains a centerpiece of providers' efforts to improve their customers' mobile wireless service experience. During 2009 and 2010, several providers upgraded their networks with technologies that enable faster data transfer speeds for mobile data services, while others announced plans to deploy new mobile broadband network technologies in the coming years.[299] Industry analysts and commenters have highlighted the key role that mobile broadband networks – and the products, services, and applications that rely on them – play in mobile wireless competition. As mobile voice service has become commoditized and mobile voice penetration is reaching saturation, mobile wireless service providers are differentiating themselves with the speeds, reliability, capabilities, and coverage of their mobile broadband networks and with the handsets/devices, applications, and other products and services that run on those networks.[300]

105. As a component of upgrading their networks, service providers can improve capacity, coverage, and service quality through their spectrum positions. As mentioned elsewhere, service providers have added to their spectrum holdings in recent years through the Commission's spectrum auctions, the purchase of licenses in the secondary market, and mergers and acquisitions.[301] These transactions have enabled several operators – including Leap, MetroPCS, AT&T, Verizon Wireless, and T-Mobile – to expand into new geographic areas and allowed others to upgrade networks in existing markets.[302]

106. The Commission has largely adopted flexible licensing policies that do not mandate any

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[295] *Id*.

[296] Leap Wireless, *Cricket 3G Broadband*, http://www.mycricket.com/broadband (visited Oct. 20, 2010).

[297] *Virgin Mobile Gets Scrappy With Unlimited, Contract-Free Data Plan*.

[298] A.M. (Toni) Sacconaghi, Jr., *et al*., *Apple: Alas, The iPad Unveiled - What Does It Mean?*, BernsteinResearch, Jan. 28, 2010, at 2-3.

[299] *See* Section IV.B.1, Service Provider Technology Deployments, *infra*.

[300] *See Fourteenth Report* 25 FCC Rcd at 11477, ¶ 106.

[301] *See* Section III.D, Entry and Exit Conditions, *supra.* Section VII.A.1, Spectrum, *infra*, also highlights the key importance of spectrum holdings in influencing service providers' network deployment costs and network capacity.

[302] *See* Section III.E, Recent Entry and Exit, *supra*, and Section VII.A.1, Spectrum, *infra.* According to T-Mobile, "the launch of the 3G network also enables T-Mobile to accommodate and serve more customers more efficiently through the use of its AWS spectrum, effectively doubling T-Mobile USA's spectrum position." *T-Mobile USA Begins Commercial 3G Network Rollout*, Press Release, T-Mobile, May 5, 2008.

particular technology or network standard for commercial mobile wireless licensees. Mobile wireless service providers have the flexibility to deploy the network technologies and services they choose as long as they abide by certain technical parameters designed to avoid radiofrequency interference with adjacent licensees.[303] As a result of this approach, different U.S. service providers have deployed, over the past 15 years, different digital network technologies with divergent technology migration paths. The two main migration paths for 2G, 2.5G, and 3G technologies have been the CDMA and GSM technology paths, as shown in Figure 2 below.[304] Certain CDMA and GSM service providers are now deploying or planning to deploy LTE technology, and some GSM operators are deploying HSPA+.[305] At least one major service provider is deploying an alternate technology, WiMAX, as discussed below.

107. When competing mobile wireless service providers deploy compatible network technologies, greater economies of scale in the production of both terminals and network infrastructure equipment can result, lowering the unit cost of handsets, chipsets, and other network equipment.[306] This, in turn, may promote more rapid adoption of mobile wireless services, and standardization tends to produce a greater variety of handsets.[307] It has been argued that the Commission's market-based approach to wireless network standards helped to encourage the development of the CDMA wireless network technology.[308] Competition among mobile wireless providers using incompatible wireless network technologies has other advantages that can benefit consumers, including increased product variety and differentiation of services, more technological competition, and tougher price competition.[309]

[303] 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.

[304] Additional information on mobile wireless network technologies, including definitions, background, and average and peak download speeds for the various technologies, can be found in Appendix B, Mobile Wireless Network Technologies, *infra.*

[305] *See* Table 11.

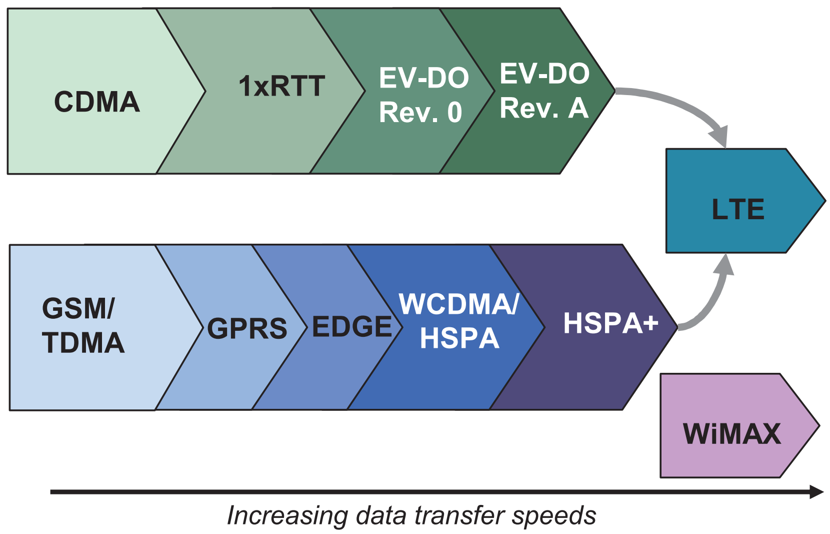
[306] *See Fourteenth Report* 25 FCC Rcd at 11478-79, ¶ 109.

[307] *See Fourteenth Report* 25 FCC Rcd at 11478-79, ¶ 109.

[308] *See Fourteenth Report* 25 FCC Rcd at 11478-79, ¶ 109.

[309] *See Fourteenth Report* 25 FCC Rcd at 11478-79, ¶ 109.

Figure 2
Mobile Wireless Network Technology Evolution



a. Service Provider Technology Deployments

108. During 2009 and early 2010, several mobile wireless service providers upgraded, or announced plans to upgrade, their networks with mobile broadband technologies. While each of the four nationwide providers has announced or begun implementing plans to offer a faster network, each has chosen a different path towards fulfilling such plans. For example, Verizon Wireless launched LTE in December 2010, Sprint Nextel is offering WiMAX through its investment in Clearwire,[310] T-Mobile and AT&T have deployed HSPA+, and AT&T plans to deploy LTE in 2011 (see Table 11).[311] 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.[312]

[310] To date, Sprint's investment in Clearwire's WiMAX technology includes a $1.17 billion cash investment and the provision of spectrum and other assets valued at $7.4 billion at the time they were provided. Sprint Ex Parte Communication, WT Docket No. 05-265, Feb 7. 2011.

[311] Of the top four nationwide mobile wireless providers, AT&T and T-Mobile use GSM as their 2G digital technology and WCDMA as their 3G digital technology, while Verizon Wireless and Sprint Nextel use CDMA as their 2G technology and EV-DO Rev. A as their 3G technology. Sprint Nextel also uses iDEN on the former Nextel network as a 2G technology.

[312] 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; 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; Derek Kerton, *Will the Real 4G Please Stand Up?*, RCR Wireless News, Dec. 22, 2010, at http://www.rcrwireless.com/article/20101222/OPINION/101229976/analyst-angle-will-the-real-4g-please-stand-
(continued….)

Table 11
3G/4G Deployment by Selected Mobile Wireless Service Providers

Service Provider	HSPA and EV-DO Deployment	LTE and WiMAX Deployment
Verizon Wireless	As of September 2010, EV-DO Rev. A network covered 289 million POPs.	In December 2010, launched LTE in 38 cities covering 110 million people. Plans to expand LTE to its entire EV-DO footprint (289 million people) by the end of 2013.
AT&T Wireless	As of early 2010, HSPA covered 230 million POPs. As of January 2011, entire HSPA network had been upgraded with HSPA+ (14.4 Mbps).	Plans to launch LTE in areas covering around 75 million people by mid-2011 and to complete its LTE buildout by year-end 2013.
Sprint Nextel	As of August 2010, EV-DO Rev. A network was available in census blocks covering 239 million POPs.	Resells Clearwire's WiMAX service.
Clearwire		As of year-end 2010, WiMAX network covered approximately 120 million people.
T-Mobile	HSPA network covered 212 million POPs as of mid-2010 and HSPA+ (21 Mbps) network covered 200 million POPs in 100 cities as of year-end 2010.	No U.S.-specific plans.
MetroPCS		As of January 2011, launched LTE in 13 cities.

109. *Verizon Wireless*. As of September 2010, Verizon Wireless had deployed EV-DO Rev. A technology – which provides advertised, typical, average download speeds of 600 kbps-1.4 megabits per second (Mbps) and upload speeds of 500-800 kbps – across portions of its network covering 289 million people.[313] In addition, in December 2010, Verizon Wireless launched its LTE network in 38 major U.S. cities covering approximately 110 million people.[314] The company claims that its LTE network provides average data rates of 5-12 Mbps downstream and 2-5 Mbps upstream.[315] In addition, LTE provides lower latency and will enable global roaming in countries where Vodafone, a major investor in Verizon Wireless, operates.[316] Verizon Wireless plans to expand LTE to its entire EV-DO footprint by the end of 2013.[317] While the company initially offered only two devices, both USB wireless modem cards, that are compatible with its LTE network, it announced in January 2011 that it plans to

(Continued from previous page)
up#. For additional information on mobile wireless network technologies, including the average and peak download speeds of the various technologies, can be found in Appendix B, Mobile Wireless Network Technologies, *infra.*

[313] Verizon Wireless, *Network Facts*, http://aboutus.vzw.com/bestnetwork/network_facts.html (visited Sept. 20, 2010). The company expanded its EV-DO coverage by 5 million POPs from its mid-2009 levels of 284 million POPs. *See Fourteenth Report*, 25 FCC Rcd at 11482, ¶ 112.

[314] *Blazingly Fast: Verizon Wireless Launches the World's Largest 4G LTE Wireless Network on Sunday, Dec. 5*, Press Release, Verizon Wireless, Dec. 4, 2010, *available at* http://news.vzw.com/news/2010/12/pr2010-12-03.html.

[315] *Blazingly Fast: Verizon Wireless Launches the World's Largest 4G LTE Wireless Network on Sunday, Dec. 5*, Press Release, Verizon Wireless, Dec. 4, 2010, *available at* http://news.vzw.com/news/2010/12/pr2010-12-03.html.

[316] *Thirteenth Report*, 24 FCC Rcd at 6254, ¶ 136.

[317] Sascha Segan and Chloe Albanesius, *Verizon Launching LTE in 38 Cities*, PC World, Oct. 6, 2010, at http://www.pcmag.com/article2/0,2817,2370344,00.asp; Verizon Wireless Comments at 12; Rob Pegoraro, *Faster Forward – 4G Forecast: More Details on Verizon's LTE Plans*, The Washington Post, Sept. 21, 2010, at http://voices.washingtonpost.com/fasterforward/2010/09/4g_forecasts_more_details_on_v.html.

begin offering ten new LTE-compatible consumer-oriented devices, including smartphones and tablets, by mid-2011.[318]

110. *AT&T*. As of early 2010, AT&T had deployed its HSPA network to areas of the country covering 230 million POPs.[319] In addition, as of January 2011, AT&T had upgraded virtually all of its existing HSPA network with an HSPA+ (14.4 Mbps) technology, which provides theoretical peak download speeds of 14.4 Mbps and, according to AT&T, can reach actual download speeds up to 6 Mbps in cell sites with enhanced backhaul.[320] AT&T also plans to deploy LTE technology beginning in 2011. The company announced in September 2010 that it had begun conducting LTE trials in Baltimore and Dallas, and that it plans to launch LTE in areas covering around 75 million POPs by mid-2011.[321] In January 2011, AT&T also stated that it expects to complete its LTE deployment by the end of 2013.[322] The company is planning to offer voice and data services on its HSPA and LTE networks simultaneously,[323] and to use both AWS and 700 MHz spectrum for its LTE deployment.[324]

111. As discussed in the *Fourteenth Report*, AT&T is also is in the process of increasing the number of high-speed backhaul connections to its cell sites in conjunction with its wireless network technology upgrades. The company is adding primarily fiber connections to its HSPA-upgraded cell sites to accommodate increased data speeds and traffic.[325] According to analysts and the company, AT&T's

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318 *Verizon Wireless Unveils Suite of 4G LTE Smartphones, Tablets, A MiFi Hotspot and Notebooks*, Press Release, Verizon, Jan. 6, 2011, *available at* http://news.vzw.com/news/2011/01/pr2011-01-06n.html. Sascha Segan and Chloe Albanesius, *Verizon Launching LTE in 38 Cities*, PC World, Oct. 6, 2010, at http://www.pcmag.com/article2/0,2817,2370344,00.asp.

319 *See* AT&T, *The Truth About 3G* (television advertisements), http://www.att.com/truthabout3g/?WT.srch=1 (visited Feb. 1, 2010); *Fourteenth Report*, 25 FCC Rcd at 11484-85, ¶ 115.

320 *AT&T Announces Plans to Deliver Nation's Most Advanced Mobile Broadband Experience*, News Release, AT&T, Jan. 5, 2011, at http://www.att.com/gen/press-room?pid=18885&cdvn=news&newsarticleid=31477&mapcode=consumer|financial. Prior to launching HSPA+ (14.4 Mbps), AT&T had upgraded its network with an HSPA 7.2 software upgrade, which supported theoretical peak download speeds of 7.2 Mbps, with actual speeds being lower and varying due to a number of factors. *AT&T Upgrades 3G Technology at Cell Sites Across Nation*, Press Release, AT&T, Jan. 5, 2010 (*AT&T Upgrades 3G Technology at Cell Sites Across Nation*).

321 Eric Zeman, *AT&T Says LTE Roll-Out Coming Mid-2011*, InformationWeek, Sept. 16, 2010, at http://www.informationweek.com/news/telecom/voice/showArticle.jhtml?articleID=227500076&cid=RSSfeed_IWK_News; Phil Goldstein, *AT&T to Launch LTE by Mid-2011*, FierceWireless, Sept. 16, 2010, at http://www.fiercewireless.com/story/t-launching-lte-mid-2011/2010-09-16 (citing AT&T Operations CEO, John Stankey).

322 *AT&T Announces Plans to Deliver Nation's Most Advanced Mobile Broadband Experience*, News Release, AT&T, Jan. 5, 2011, at http://www.att.com/gen/press-room?pid=18885&cdvn=news&newsarticleid=31477&mapcode=consumer|financial.

323 Phil Goldstein, *AT&T to Launch LTE by Mid-2011*, FierceWireless, Sept. 16, 2010, at http://www.fiercewireless.com/story/t-launching-lte-mid-2011/2010-09-16 (citing AT&T Operations CEO John Stankey).

324 *See Fourteenth Report*, 25 FCC Rcd at 11484-85, ¶ 115; Karl Bode, *AT&T Sheds More Light on LTE Plans*, Broadband DSL Reports, Oct. 21, 2010, at http://www.broadbandreports.com/shownews/ATT-Sheds-More-Light-On-LTE-Plans-111018; Mike Dano, *AT&T's Rinne Details LTE Plans: VoLTE in 2013*, FierceBroadbandWireless, Oct. 20, 2010, at http://www.fiercebroadbandwireless.com/story/ts-rinne-details-lte-plans-volte-2013-will-use-aws-and-700-mhz/2010-10-20 (both articles cite statements by Kris Rinne at 4G World trade show in Chicago).

325 In December 2009, AT&T began the backhaul upgrades at cell sites in six cities – Charlotte, Chicago, Dallas, Houston, Los Angeles, and Miami – and announced plans to continue upgrading cell sites across its network during 2010 and 2011. *AT&T Upgrades 3G Technology at Cell Sites Across Nation*. For additional information on backhaul, see Section VII.A.3, Backhaul Facilities, *infra.*

network upgrades will improve consistency in accessing data sessions, increase efficiency, meet the rising demands on the network from bandwidth-heavy data applications, and address service quality problems – such as dropped calls, delayed text and voice messages, and slow download speeds – which typically occur during periods of peak use in dense urban areas with higher concentrations of iPhone users.[326] AT&T claims that the backhaul upgrades will also be used to support its LTE deployment.[327]

112. *Sprint Nextel/Clearwire*. Sprint Nextel operates an extensive CDMA EV-DO network covering over 239 million POPs.[328] In December 2010, Sprint Nextel announced plans to improve the quality, coverage, and speeds of its existing networks, while lowering operating costs, by consolidating its multiple technologies in multiple spectrum bands into multi-mode base stations.[329] The company plans to begin this Network Vision upgrade in 2011 and estimates that it will take three to five years to complete. In addition, Sprint Nextel is reselling the WiMAX service offered by Clearwire, in which Sprint Nextel has an ownership interest,[330] in areas of the country where Sprint Nextel also offers CDMA-based mobile wireless voice and data services.[331] During 2009 and 2010, Sprint Nextel began offering several dual-mode devices – including smartphones, laptop cards, and mobile Wi-Fi hotspots – that are compatible with both Clearwire's WiMAX and Sprint Nextel's EV-DO network.[332]

113. As of the end of 2010, Clearwire's WiMAX network covered approximately 120 million POPs, up from 10.1 million POPs in September 2009.[333] In addition to being resold by Sprint Nextel, Clearwire's WiMAX high-speed Internet access service is resold by companies such as Comcast and Best Buy, as well as directly under the CLEAR brand.[334] Clearwire has reported that it plans to "aggressively"

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[326] *See Fourteenth Report,* 25 FCC Rcd at 11484-85, ¶ 115; *AT&T Upgrades 3G Technology at Cell Sites Across Nation.*

[327] *AT&T Upgrades 3G Technology at Cell Sites Across Nation*.

[328] According to the August 2010 American Roamer database, Sprint Nextel's EV-DO network has been deployed in census blocks covering 239 million people.

[329] *Sprint Announces Network Vision – A Cutting-Edge Network Evolution Plan with Partners Alcatel-Lucent, Ericsson, and Samsung*, Press Release, Sprint Nextel, Dec. 6, 2010, *available at* http://newsroom.sprint.com/news/sprint-announces-network-vision-network-evolution-plan.htm; Kulbinder Garcha, *et al.*, *Sprint Announces Details of Its Network Vision Project – Implications for Wireless Infrastructure Sector*, CreditSuisse, Equity Research, Dec. 6, 2010.

[330] As discussed above, Sprint Nextel currently holds a majority ownership interest in Clearwire and has the ability to nominate 7 of the 13 board members. *See* Section III.E, Recent Entry and Exit, *supra*.

[331] *See* Sprint Nextel, SEC Form 10-K, filed Feb. 26, 2010, at 1-3.

[332] Sprint Nextel, SEC Form 10-Q, filed Aug. 5, 2010, at 19-20; *Fourteenth Report*, 25 FCC Rcd at 11483, ¶ 113.

[333] Sprint Nextel, SEC Form 10-Q, filed Aug. 5, 2010, at 19; Clearwire, SEC Form 10-Q, filed Aug. 5, 2010, at 23; Clearwire, SEC Form 10-K, filed Feb. 24, 2010, at 6-7; AT&T Comments at 45; *Fourteenth Report*, 25 FCC Rcd at 11485-86, ¶ 117; Eric Zeman, *Top 11 Mobile Predictions for 2011*, InformationWeek, Jan. 20, 2011, at http://www.informationweek.com/news/smb/mobile/showArticle.jhtml?articleID=228900152&cid=RSSfeed_IWK_News.

[334] Clearwire, SEC Form 10-K, filed Feb. 24, 2010, at 6-7; Clearwire, *CLEAR Super Fast Mobile Internet*, http://www.clear.com/ (visited Sept. 23, 2010); Comcast, *Internet 2go Coverage Areas*, http://www.comcast.com/Corporate/Learn/xfinity/4g-3g-wireless-coverage-map.html (visited Sept. 24, 2010); Best Buy, *Internet on the Go – Best Buy Connect*, http://www.bestbuy.com/site/Computers+Promotions/null/pcmcat214600050004.c?id=pcmcat214600050004 (visited Feb. 16, 2011); *Fourteenth Report*, 25 FCC Rcd at 11485-86, ¶ 117. Comcast and Bright House Networks hold an ownership interest in Clearwire. *See* Section III.E.1, Entry, *supra.*

grow its wholesale business during 2011, while continuing its retail distribution model.[335] Clearwire's WiMAX network operates on spectrum in the 2.5 GHz band using its BRS licenses and EBS spectrum leases, and the company claims that its WiMAX network provides average download speeds of 3-6 Mbps with burst rates up to 10 Mbps.[336] While Clearwire's current network employs WiMAX technology, the company announced in August 2010 that it is conducting trials of both TDD and FDD LTE technologies in the 2.5 GHz spectrum band and testing coexistence scenarios of WiMAX and LTE in that band.[337] According to Clearwire, a test in Phoenix yielded download speeds of 20-70 Mbps, substantially higher than the 5-12 Mbps expected download speeds announced by other providers that plan to launch LTE.[338]

114. *T-Mobile*. T-Mobile, like AT&T, is deploying HSPA and HSPA+ technology across its mobile wireless network. At the end of 2009, T-Mobile's HSPA network covered 205 million POPs, nearly the double the number covered at the end of 2008.[339] As of August 2010, T-Mobile's HSPA network coverage had expanded to 212 million POPs.[340] In January 2010, the company announced that its HSPA 7.2 Mbps upgrade had been completed across its entire HSPA network.[341] In the fourth quarter of 2009, T-Mobile also launched HSPA+ (21 Mbps) technology in its Philadelphia network and had expanded its HSPA+ footprint to 200 million POPs in 100 markets as of the end of 2010.[342] The version of HSPA+ that T-Mobile is deploying has theoretical maximum peak speed of 21 Mbps downlink and 5.7 Mbps uplink.[343] The company claims that the actual HSPA+ speeds it offers are comparable to those of currently-deployed WiMAX and LTE networks and is now marketing this technology as "4G."[344]

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[335] *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=.

[336] Clearwire, *What is WiMAX?*, http://www.clear.com/discover?intcmp=index_d_prmnav_dis (visited Sept. 23, 2010); *Fourteenth Report*, 25 FCC Rcd at 11485-86, ¶ 117.

[337] *Clearwire Announces New 4G LTE Technology Trials Expected to Yield Unmatched Wireless Speeds in the U.S.*, Press Release, Clearwire, Aug. 4, 2010. (*Clearwire Announces New 4G LTE Technology Trials Expected to Yield Unmatched Wireless Speeds in the U.S*).

[338] *Clearwire Announces New 4G LTE Technology Trials Expected to Yield Unmatched Wireless Speeds in the U.S.*

[339] *T-Mobile USA Reports Fourth Quarter and Full Year 2009 Results*, Financial Release, T-Mobile, Feb. 26, 2010 (*T-Mobile USA Reports Fourth Quarter and Full Year 2009 Results)*, *available at* http://s.tmocache.com/Cms/Files/Published/0000BDF20016F5DD010312E2BDE4AE9B/5657114502E70FF301270BB668BE399A/file/TMUS%20Q4%20Press%20Release%20FINAL.pdf.

[340] T-Mobile Reply at 1.

[341] Eric Zeman, *T-Mobile Upgrades to HSPA 7.2Mbps, First to Deploy HSPA+*, PhoneScoop, Jan. 5, 2010, at http://www.phonescoop.com/news/item.php?n=5310.

[342] *T-Mobile USA Reports Fourth Quarter and Full Year 2009 Results*; *T-Mobile USA Reports Second Quarter 2010 Results*, Financial Release, T-Mobile, Aug. 5, 2010 (*T-Mobile USA Reports Second Quarter 2010 Results)*, *available at* http://www.t-mobile.com/Cms/Files/Published/0000BDF20016F5DD010312E2BDE4AE9B/5657114502E70FF3012A436A0A85BF12/file/TMUS%20Q2%202010%20Press%20Release%20FINAL.pdf; Eric Zeman, *Top 11 Mobile Predictions for 2011*, InformationWeek, Jan. 20, 2011, at http://www.informationweek.com/news/smb/mobile/showArticle.jhtml?articleID=228900152&cid=RSSfeed_IWK_News.

[343] *Fourteenth Report,* 25 FCC Rcd at 11485, ¶ 116; T-Mobile, *Moments fly by. So should download times,* http://t-mobile-coverage.t-mobile.com/# (visited Sept. 29, 2010); CTIA Comments at 10.

[344] *T-Mobile USA Reports Second Quarter 2010 Results*; T-Mobile Reply at 1; CTIA Comments at 10-11; Verizon Wireless Comments at 12. While T-Mobile had launched its HSPA+ 21 Mbps network at the writing of the *Fourteenth Report*, the company had not yet identified this network as "4G."

115. *Other CDMA Operators*. Apart from Sprint Nextel and Verizon Wireless, 29 other smaller, regional and multi-metro CDMA operators also had deployed EV-DO or LTE technology within their networks as of August 2010.[345] MetroPCS, which never upgraded its CDMA network with EV-DO technology, became the first mobile wireless service provider to launch LTE in the United States in September 2010.[346] As of January 2011, the operator had deployed LTE in 13 cities.[347] In addition, Leap has deployed EV-DO across its entire network footprint, which covered approximately 94.2 million POPs at the end of 2009.[348] Leap's EV-DO covered POPs increased 41 percent during 2009 from 67 million at the end of 2008.[349] In addition, US Cellular's EV-DO network has grown from covering five markets at the end of 2008 to covering 75 percent of its customer base as of December 30, 2009.[350] The company plans to expand EV-DO to 90 percent of its customer base at the end of 2010.[351] The EV-DO networks of the non-nationwide CDMA providers combined had been deployed in census blocks covering 117 million people, or 41 percent of the U.S. population, as of August 2010.[352]

116. *LightSquared*. In July 2010, Harbinger Capital Partners, which acquired MSS licensee SkyTerra in March 2010, announced plans to build an integrated satellite/terrestrial LTE network under the name LightSquared that will provide coverage through its terrestrial network to at least 100 million U.S. POPs by the end of 2012, at least 145 million POPs by the end of 2013, and to at least 260 million POPs by the end of 2015.[353] LightSquared plans to achieve this by ultimately deploying, through a contract with Nokia, approximately 40,000 base stations by the end of 2015.[354] LightSquared plans to use

[345] American Roamer database, Aug. 2010.

[346] *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=; *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=. 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.3, Differentiation in Mobile Wireless Handsets/Devices, *infra*.

[347] The cities, in order of launch, are: Las Vegas, Dallas, Detroit, Los Angeles, Philadelphia, San Francisco, Boston, New York, Sacramento, Atlanta, Jacksonville, Miami, and Orlando. *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; *MetroPCS Launches 4G LTE Service in Atlanta, Jacksonville, Miami and Orlando Metropolitan Areas*, Press Release, MetroPCS, Jan. 25, 2011.

[348] Leap Wireless International, Inc., SEC Form 10-K, filed Mar. 1, 2010, at 2.

[349] *Fourteenth Report*, 25 FCC Rcd at 11483-84, ¶ 114.

[350] United States Cellular Corp., SEC Form 10-K, filed Feb. 25, 2010, at 7; *Fourteenth Report*, 25 FCC Rcd at 11483-84, ¶ 114 (US Cellular initially launched EV-DO in Milwaukee; Chicago; Des Moines; Tulsa, and southern Wisconsin.

[351] United States Cellular Corp., SEC Form 10-K, filed Feb. 25, 2010, at 7.

[352] American Roamer database, Aug. 2010.

[353] *See SkyTerra/Harbinger*, 25 FCC Rcd at 3085, 3088-89, 3098-99, ¶¶ 56, 72, App. B (Attach. 2 at 1-2). LightSquared is the venture arising out of this transaction.

[354] *See* http://www.lightsquared.com/press-room/press-releases/lightsquared-announces-chipset-partnership-and-initial-device-manufacturers/ (last visited Feb. 16, 2011); *see also* Kevin Fitchard, *New LTE Network Embraces the 'Dumb Pipe,'* Connected Planet, July 20, 2010 (*New LTE Network Embraces the 'Dumb Pipe'*); Greg Bensinger, *Falcone's LightSquared to Challenge Clearwire with 4G in Chicago, Dallas*, Bloomberg, Aug. 31, 2010, (*Falcone's LightSquared to Challenge Clearwire with 4G in Chicago, Dallas*) at http://www.bloomberg.com/news/2010-08-31/falcone-s-lightsquared-to-challenge-clearwire-with-4g-in-chicago-dallas.html; Tracy Ford, @ *PCIA: LightSquared Details Device Plans, NSN Network Buildout*, RCR Wireless News, Oct. 7, 2010, at

(continued….)

a wholesale business model in which it will offer LTE and satellite connectivity to other wireless network operators, cable operators, consumer electronics companies, and other technology companies.[355]

117. *Use of Distributed Antenna Systems (DAS) and Femtocells*. In addition to upgrading their networks for mobile broadband systems, mobile wireless operators are also taking steps to improve indoor coverage through the use of new technologies such as distributed antenna systems (DAS) and femtocells.[356] DAS provides enhanced coverage in highly trafficked areas such as shopping malls and office buildings. Femtocells are personal cell sites that can be installed in a consumer's home that receive cell phone signals within the home and nearby area and use an in-home broadband connection for the last-mile transport of calls and data transmissions.[357] Several mobile wireless operators have made femtocells available to their customers to improve coverage in areas that might not otherwise have it.[358]

b. Coverage by Technology Type

118. Using a census block level analysis of American Roamer data,[359] we are able to estimate coverage by air interface type in the approximately 8 million census blocks.[360] As of July 2010, virtually the entire population of the United States lived in census blocks where operators provide digital mobile wireless coverage using CDMA, GSM/TDMA, or iDEN (including their respective next generation technologies), or some combination of the three.[361] As shown in Table 12 below, CDMA and GSM/TDMA have been deployed in census blocks containing 283 million and 282 million people, respectively. iDEN coverage is more limited, available in census blocks covering 259 million people, or 91 percent of the U.S. population. A map showing coverage by mobile wireless digital technologies can be found in Appendix D, Map D-23. Compared with the network technology coverage reported in the *Fourteenth Report*, CDMA coverage remained unchanged while GSM and iDEN coverage increased slightly, from 98 to 99 percent of the U.S. population for GSM, and from 88 to 91 percent of the population for iDEN.[362] In October 2010, Sprint Nextel reported that it would eventually shut down its iDEN network.[363]

(Continued from previous page) http://www.rcrwireless.com/ARTICLE/20101007/CARRIERS/101009964/-pcia-lightsquared-details-device-plans-nsn-network-buildout; *LightSquared Could Cover Nine Metro Areas with LTE During 2011*, Cellular-News, Sept. 1, 2010, at http://www.cellular-news.com/story/45143.php.

[355] *See SkyTerra/Harbinger Order*, 25 FCC Rcd at 3085, ¶ 55; LightSquared Subsidiary LLC Request for Modification of its Authority for an Ancillary Terrestrial Component, SAT-MOD-20101118-00239, Call Sign: S2358, *Order and Authorization*, 26 FCC Rcd 566, at 569, ¶ 6 (International Bureau 2011) (granting conditional waiver of ATC "integrated service" rule and modification of LightSquared's ATC authority). *See also Falcone's LightSquared to Challenge Clearwire with 4G in Chicago, Dallas*; *New LTE Network Embraces the 'Dumb Pipe'*..

[356] *See Fourteenth Report*, 25 FCC Rcd at 11479, ¶ 110.

[357] *Id*.

[358] *Id*.

[359] *See* Section III.C.1, Number of Competitors, *supra*, for a discussion of the limitations of American Roamer data.

[360] By utilizing such a small geographic area to analyze technological availability, we are able to minimize the concerns regarding the over-counting of population and geographic area covered that were inherent in previous reports' county-based analyses (there are approximately 3,200 in the United States). *See* Section III.C.1, Number of Competitors, *supra*.

[361] Because service providers may provide coverage solely to service customers based elsewhere, the existence of coverage in an area does not necessarily mean that consumers living in those areas have the option of subscribing to each of the service providers. *See supra* note 109.

[362] *See Fourteenth Report*, 25 FCC Rcd at 11486-87, ¶ 118, Table 12.

[363] Phil Goldstein, *Hesse: Sprint Eventually Will Shut Down iDEN*, FierceWireless, Oct. 27, 2010, at http://www.fiercewireless.com/story/sprints-hesse-iden-shutdown-coming-eventually/2010-10-
(continued….)

Table 12
Mobile Wireless Coverage by Technology[364]

Technology	*POPs in Covered Blocks*[365]	*% of Total POPs*	*Square Miles Contained in Those Blocks*	*% of Total Square Miles*
CDMA	283,012,304	99.2%	2,656,291	69.9%
GSM/TDMA	282,245,886	99.0%	2,418,867	63.7%
iDEN	258,571,891	90.7%	1,135,311	29.9%
Total Digital	284,658,590	99.8%	2,894,888	76.2%

119. Table 13 below provides estimates, based on American Roamer data, of the extent of mobile data and mobile broadband network coverage in the United States. Table 13 shows the population and land area covered by the 2.5G CDMA and GSM mobile data network technologies, as well as population and land area covered by the mobile broadband network technologies, HSPA, EV-DO, and WiMAX. Table 13 shows that 2.5G mobile data networks, which were widely deployed several years ago, covered 99.8 percent of the total U.S. population as of August 2010. Coverage by the individual CDMA and GSM path technologies, as well as the overall 2.5G coverage figure, each increased a fraction of a percent from November 2009.[366]

120. When looking at mobile broadband coverage, Table 13 shows that 98.5 percent of the U.S. population was covered by at least one mobile provider using a 3G or 4G network technology as of August 2010, up from 98.1 percent in November 2009.[367] EV-DO coverage increased 0.4 percent from 279 million people, or 97.9 percent of the U.S. population, to 280 million people, or 98.3 percent of the U.S. population.[368] Also, HSPA coverage grew five percent from 217 million POPs to 228 million POPs (76 percent to 80 percent of the U.S. population).[369] In addition, mobile WiMAX networks, which covered approximately 28 million people in November 2009, had expanded to census blocks covering over 50 million POPs, or 18 percent of the population, as of August 2010.[370]

(Continued from previous page)
27?utm_medium=nl&utm_source=internal (citing Sprint Nextel CEO Dan Hesse). The company gave no firm date for the shutdown and said it would be a gradual process. *Id.*

[364] Commission estimates based on American Roamer database, July 2010. POPs are from the 2000 Census, and the square miles include the United States and Puerto Rico.

[365] A covered block has at least one provider.

[366] *See Fourteenth Report*, 25 FCC Rcd at 11487-88, ¶ 121, Table 13.

[367] See Fourteenth Report, 25 FCC Rcd at 11487-88, ¶ 122, Table 13.

[368] *See Fourteenth Report*, 25 FCC Rcd at 11487-88, ¶ 122, Table 13.

[369] *See Fourteenth Report*, 25 FCC Rcd at 11487-88, ¶ 122, Table 13.

[370] Mobile broadband coverage across different states and areas of the country is shown in Map D-29 in Appendix D.

Table 13
Mobile Wireless Data/Broadband Network Coverage by Census Block[371]

Technology		*POPs in Covered Blocks*	*% of Total POPs*	*Square Miles Contained in Those Blocks*	*% of Total Square Miles*
2.5G	CDMA 1xRTT	282,944,167	99.2%	2,629,513	69.2%
	GPRS/EDGE	282,137,101	98.9%	2,348,442	61.8%
	Total 2.5G Mobile Data Network Coverage	**284,592,972**	**99.8%**	**2,834,959**	**74.6%**
3G/ 4G	WCDMA/HSPA	227,718,219	79.8%	524,653	13.8%
	EV-DO/EV-DO Rev. A	280,437,386	98.3%	2,234,901	58.8%
	Mobile WiMAX	50,360,040	17.7%	32,189	0.8%
	Total Mobile Broadband Coverage (3G/4G)	**280,965,094**	**98.5%**	**2,256,448**	**59.4%**

121. Additional information on mobile broadband network deployment can be found in the National Broadband Map.[372] 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.[373] The Map is searchable by address and indicates the broadband providers offering service in the corresponding census block or street segment.[374]

122. Chart 4 below depicts the pace of 3G and 4G deployment over the past five years. EV-DO network coverage has grown from 62.6 percent of the U.S. population in 2006 to 98.3 percent in August 2010.[375] This is reflected in the network deployment activities of the two major EV-DO providers, Verizon Wireless and Sprint Nextel, which have begun to focus on 4G rather than EV-DO deployment – Verizon Wireless with LTE and Sprint Nextel with its investment in Clearwire. HSPA network coverage was not nearly as extensive as EV-DO coverage in 2006, covering only 20 percent of the U.S. population.[376] However, HSPA deployment has been increasing in recent years, and HSPA networks covered nearly 80 percent of the population in August 2010. As discussed, the largest HSPA network operators, AT&T and T-Mobile, are in the process of expanding and upgrading their networks.

[371] Commission estimates based on data supplied by American Roamer, Aug. 2010. POPs are from the 2000 Census, and the square miles include the United States and Puerto Rico.

[372] 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/.

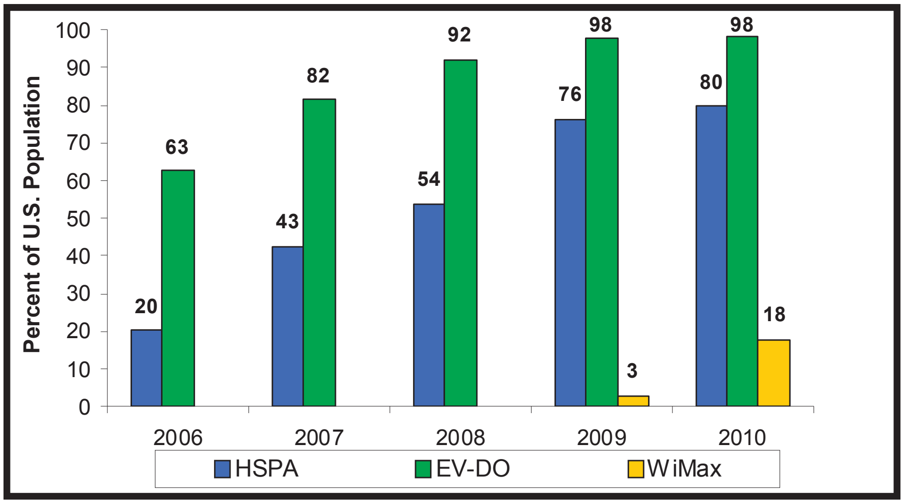
[373] Broadband Technology Opportunities Program (BTOP) Quarterly Program Status Report, Nov. 2010, NTIA, at 8.

[374] Broadband Technology Opportunities Program (BTOP) Quarterly Program Status Report, Nov. 2010, NTIA, at 8. NTIA anticipates offering analytical tools to help consumers, businesses, policymakers, and researchers make further use of this data. *Id.*

[375] *See Eleventh Report*, 21 FCC Rcd at 10985, ¶ 95, Table 8.

[376] *See id*.

Chart 4
The Pace of 3G and 4G Network Deployment[377]



123. While mobile broadband network coverage has grown in recent years, certain geographical areas remain unserved by advanced mobile technologies. In October 2010, the Commission sought comment on the creation of a Mobility Fund that would use Universal Service Fund reserves to significantly improve coverage in these areas for current- or future-generation mobile wireless network technologies that provide mobile voice and Internet services.[378] The Mobility Fund NPRM proposes that market mechanisms – specifically, a reverse auction – be used to make one-time support available to service providers in order to cost-effectively extend mobile coverage in specified unserved areas.[379]

c. Coverage by Income Level

124. For the first time, this *Report* analyzes how the number of facilities-based mobile wireless providers that have coverage in a census tract varies based on median income levels. The analysis is based on mobile wireless and mobile broadband coverage data reported by American Roamer and estimates of median household income levels in each of the country's 65,000 census tracts prepared by Geolytics.[380] According to this analysis, the average number of mobile wireless providers increased from 6.07 in census tracts with median household income less than $25,000 to 6.35 in census tracts with median household income of more than $150,000, an increase of 0.28 service providers. The average number of mobile broadband providers increased from 3.32 in census tracts with median household income less than $25,000 to 3.72 in census tracts with median household income of more than $150,000,

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[377] Commission estimates based on American Roamer database, Aug. 2010 (for 2010 data). *See 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.

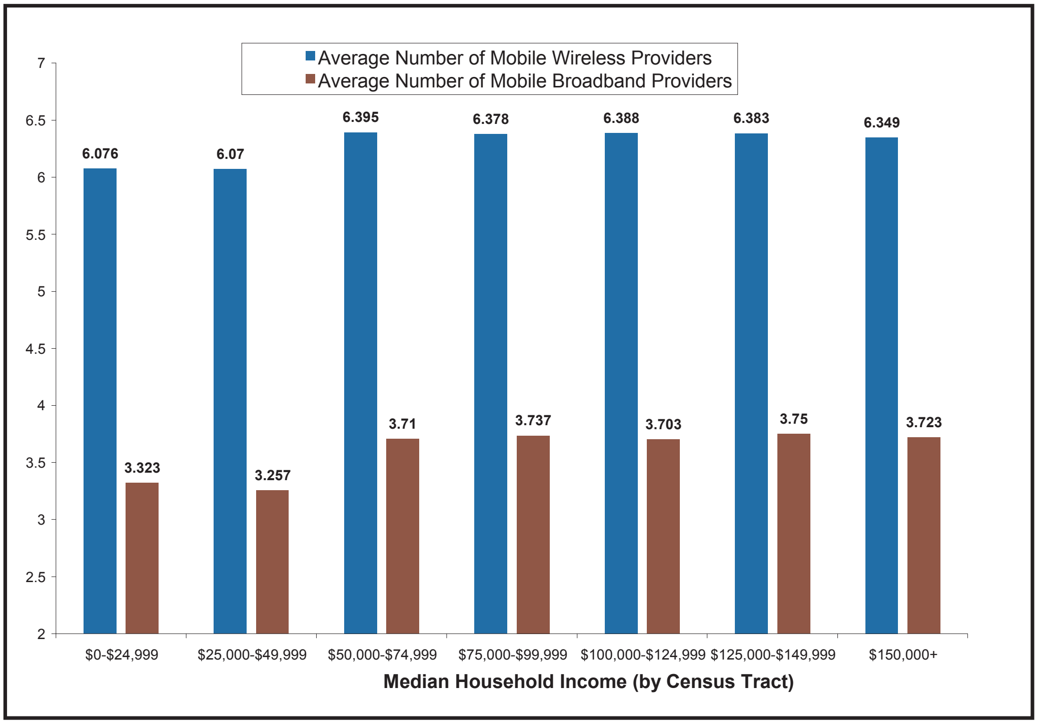
[378] Universal Service Reform, Mobility Fund, WT Docket No. 10-208, *Notice of Proposed Rulemaking*, FCC 10-182, at ¶ 1 (rel. Oct. 14, 2010).

[379] *Id*.

[380] Data on numbers of mobile wireless providers and mobile broadband providers are based on American Roamer database, July/August 2010. Data on median household income are based on Geolytics 2010 estimates. 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.

an increase of 0.40 service providers (see Chart 5). According to these data, the greatest difference in deployment appears to be between census tracts with median household income levels below and those with income levels above $50,000 per year.

Chart 5
Average Numbers of Mobile Wireless Providers and Mobile Broadband Providers in Census Tracts by Median Household Income



d. Roaming

125. Due to the challenges inherent in building out a wireless network, which can include both economic and environmental obstacles, it may be more cost-effective in some areas for a mobile wireless provider to enter into roaming agreements with other providers rather than build out its own facilities.[381] Roaming arrangements between commercial mobile wireless service providers allow customers of one mobile wireless provider to automatically receive service from another provider's network when they are in areas that their provider's network does not cover.[382] As shown in Table 22, total annual intercarrier

[381] *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). Nonetheless, even where roaming services are available, providers deploying next generation networks still have incentives to build out to ensure that their subscribers receive all of the benefits of the providers' own advanced networks. *Id.* at 4197-98 ¶ 32. In particular, the relatively high price of roaming compared to providing facilities-based service is often sufficient to counterbalance the incentive to "piggy back" on another provider's network. *Id.*

[382] 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 (continued….)

roaming revenues and voice minutes have declined as a percentage of total service revenues and total minutes, respectively, over the past ten years.[383] From a customer perspective, many service plans now include nationwide roaming at no additional cost to subscribers. In addition, changes in the mobile wireless industry over the last decade have resulted in service plans with larger geographic calling areas, which may have affected roaming arrangements in some instances.

126. Despite the declining contribution of roaming relative to wireless industry revenues and minutes of use on the whole, roaming remains important for mobile wireless providers in areas where they do not have network coverage. No mobile wireless provider – including none of 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.[384] In addition, as discussed above, there are various non-nationwide providers whose business plans are not focused on building out nationwide networks.[385] Nonetheless, through roaming agreements with other mobile wireless providers, many of the non-nationwide providers are able to offer voice coverage and service plans that are national in scope.[386] Accordingly, roaming can be particularly important for small and regional providers with limited network population coverage to remain competitive by meeting their customers' expectations of nationwide service.[387] Similarly, roaming may be important to new entrants who wish to begin offering service before they have fully built out their networks.[388]

(Continued from previous page)
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.

[383] *See* Section V.D.3, Intercarrier Roaming Rates and Revenue, *infra*.

[384] *Fourteenth Report*, 25 FCC Rcd at 11489-90 ¶ 125; *Roaming Order on Reconsideration,* 25 FCC Rcd at 4192 ¶ 23; *see also* Cricket Reply at 6; Sprint Nextel Comments at 30-31. One potential measure of the significance of roaming in the wireless industry is roaming revenues, which are discussed in detail below. *See* Section V.D.3, Intercarrier Roaming Rates and Revenue, *infra*.

[385] *See* Section III.E.1, Entry, *supra*. For example, Leap and MetroPCS focus mainly on offering service to customers in metropolitan areas, while US Cellular offers regional coverage to more than 6.1 million customers in five geographic market areas across 26 states. *See* United States Cellular Corporation, SEC Form 10-K, filed Feb. 25, 2010, at 1.

[386] *See, e.g.,* Cricket, *Best Cell Phone Coverage Areas, Cellular Maps*, http://www.mycricket.com/coverage/cell-phone-coverage (visited Oct. 14, 2010) (stating that "Cricket Wireless offers nationwide cell phone coverage all over the U.S."); Cricket, *Wireless Coverage Maps*, http://www.mycricket.com/coverage/maps/wireless (visited Oct. 14, 2010) (providing an interactive U.S. map showing Cricket's roaming coverage); MetroPCS, *Unlimited Cell Phone Plans*, http://www.metropcs.com/plans/ (visited Oct. 14, 2010) (showing MetroPCS plans that include nationwide coverage); MetroPCS, *Coverage Map*, http://www.metropcs.com/coverage/ (visited Oct. 14, 2010) (providing an interactive U.S. 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 Oct. 14, 2010) (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 Oct. 14, 2010) (providing interactive U.S. maps depicting US Cellular national voice and data coverage).

[387] *Fourteenth Report*, 25 FCC Rcd at 11489-90 ¶ 125; *see also* Cricket Reply at 6; RTG Comments at 6. Commenters in response to the *Fifteenth Report Public Notice* contend that the same consumer expectations regarding roaming and the nationwide availability of mobile wireless voice services now apply equally to mobile wireless data services. *See* Cricket Reply at 7; RTG Comments at 6.

[388] *Fourteenth Report*, 25 FCC Rcd at 11489-90 ¶ 125; *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").

127. Given the importance of roaming, particularly to small and regional providers, some commenters have identified the inability to negotiate favorable roaming agreements as a potential competitive concern.[389] According to a recent survey by NTCA of its membership, which consists exclusively of small, rural providers, 51 percent of the survey respondents indicated that "negotiating roaming agreements" was an area of concern.[390] In addition, several commenters state that, given the increasing significance of mobile wireless data services, the ability for small providers to negotiate data roaming agreements with large providers for these services on non-discriminatory terms and at reasonable rates is particularly important.[391] In comments filed in this proceeding, AT&T reports that it is negotiating data roaming with several providers but does not provide any more detail.[392] Verizon Wireless states that more than a third of its 60 active roaming partners also have data roaming agreements, about half of which provide for roaming on Verizon Wireless's EV-DO network.[393]

128. In recent years, the Commission has taken actions to underscore the importance of roaming. In 2007, for instance, it clarified that automatic voice roaming is a common carrier obligation for CMRS providers.[394] In the *2007 Roaming Order and FNPRM*, the Commission held that CMRS providers must provide automatic voice roaming services to other technologically compatible providers outside their home areas upon reasonable request and on a just, reasonable, and nondiscriminatory basis pursuant to Sections 201 and 202 of the Communications Act.[395] 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 carrier requesting roaming holds spectrum in an area.[396] In the *Roaming Order on Reconsideration*, the Commission found that making automatic voice roaming arrangements available on just and reasonable terms and conditions will promote competition among multiple mobile wireless service providers, ensure that consumers have access to seamless coverage nationwide, and provide incentives for all providers to invest and innovate by using available spectrum and constructing wireless network facilities on a widespread basis.[397] In April 2011, the Commission, resolving questions raised in the 2007 *Roaming FNPRM* and the 2010 *Roaming*

[389] *See* NTCA Comments at 3-4; RCA Comments at 4-5.

[390] NTCA 2009 Wireless Survey Report, April 2010, at 13.

[391] *See* MetroPCS Comments at 10-11; Sprint Nextel Comments at 30-31; US Cellular Reply at 15; Cricket Reply at 6-9. 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.*

[392] AT&T Reply at 25.

[393] Verizon Wireless Comments at 41.

[394] *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.")

[395] *Id*. at 15818-19 ¶ 2. The common carrier obligation to provide roaming extends to real-time, two-way switched voice or data services that are interconnected with the public switched telephone network and utilize an in-network switching facility that enables the provider to reuse frequencies and accomplish seamless hand-offs of subscriber calls. The Commission also extended the automatic roaming requirement to push-to-talk (PTT) and text messaging services, and in its Further Notice of Proposed Rulemaking sought comment on whether the roaming obligation should be extended to services that are classified as information services and services that are not CMRS.

[396] *Roaming Order on Reconsideration*, 25 FCC Rcd at 4182 ¶ 2.

[397] *Id.*

Second FNPRM, issued the *Data Roaming Order*.[398] 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.[399] The Commission found that its actions to promote commercial data roaming would facilitate investment in and deployment of mobile broadband networks.[400]

2. Advertising, Marketing, Sales Expenditures, and Retailing

129. Product information and perception is a second area of non-price competition among mobile wireless service providers. Firms may engage in advertising and marketing either to inform consumers of available products or services or to increase sales by changing consumer preferences.[401] Mobile wireless service is an "experience good,"[402] and in general, advertising for an experience good tends to be persuasive rather than informational in nature.

a. Advertising Expenditures

130. Advertising spending by wireless service providers, while still significant, continued to decline during 2009. According to Nielsen, advertising expenditures for mobile wireless service dropped eight percent from $3.7 billion in 2008 to $3.4 billion in 2009, albeit not as much as the decline in total U.S. ad spending. And such spending was still quite substantial.[403] At the same time, total U.S. ad spending fell nine percent to $117 billion. Despite the drop in overall advertising spending, wireless service providers continued to spend more on advertising than firms in many other industries. In Nielsen's rankings of advertising spending by product category, "wireless telephone service" rose from 6th place in 2008 to 5th place in 2009.[404]

131. When looking at the advertising expenditures of individual firms, we see that certain wireless service providers are among the largest advertisers in the country, but their ad spending declined in 2009. According to data from Kantar Media (formerly TNS), Verizon Communications (Verizon) and AT&T were the second and fourth largest U.S. advertisers, respectively, during 2009, as they were in 2008.[405] Verizon's advertising expenditures declined 6.9 percent during 2009 from $2.4 billion to $2.2 billion, while AT&T's ad spending dropped 4.1 percent from $1.986 billion to $1.904 billion. On the other hand, ad spending by Sprint Nextel – the 8th largest U.S. advertiser – rose 30 percent during 2009

[398] *Reexamination of Roaming Obligations of Commercial Mobile Radio Service Providers and Other Providers of Mobile Data Services,* Second Report and Order, 26 FCC Rcd 5411 (2011).

[399] *Id.* at 5418-5428 ¶¶ 13-31.

[400] *Id.*

[401] *See* CTIA Comments at 52-55; AT&T Comments at 47; Verizon Wireless Comments at 80-81.

[402] An experience good is a product or service that the customer must consume before determining its quality. *See* Dennis W. Carlton and Jeffrey M. Perloff, Modern Industrial Organization (3rd ed.), Addison, Wellsley, Longman, Inc., 1999, at 484.

[403] *U.S. Ad Spending Down Nine Percent in 2009, Nielsen Says*, News Release, Nielsen, Feb. 24, 2010, *available at* http://en-us.nielsen.com/content/nielsen/en_us/news/news_releases/2010/february/2009_ad_spend_press.html (*U.S. Ad Spending Down Nine Percent in 2009, Nielsen Says*). Nielsen revised its 2008 total wireless telephone service ad spending figure from $3.4 billion to $3.7 billion. *See Fourteenth Report*, 25 FCC Rcd at 11491-92, ¶ 128.

[404] *U.S. Ad Spending Down Nine Percent in 2009, Nielsen Says*; *Nielsen Reports 2008 U.S. Ad Spend Down 2.6%*, Nielsen Wire, Mar. 13, 2009, *available at* http://blog.nielsen.com/nielsenwire/consumer/nielsen-reports-2008-us-ad-spend-down-26/; Verizon Wireless Comments at 80-81.

[405] *Kantar Media Reports U.S. Advertising Expenditures Declined 12.3 Percent in 2009*, News Release, Kantar Media, Mar. 17, 2010, *available at* http://www.kantarmediana.com/intelligence/press/kantar-media-reports-us-advertising-expenditures-declined-123-percent-2009?destination=node%2F24%2Fpress.

from $945 million to $1.23 billion.

132. According to Bernstein, AT&T's share of quarterly wireless ad spending fell to 26.2 percent in the third quarter of 2009, from 31.4 percent in the third quarter of 2008, while Sprint's rose from 15.9 percent to 25.7 percent during the same period.[406] The shares of wireless ad spending for Verizon Wireless and T-Mobile declined slightly during that period. Bernstein claims that Sprint's significant increase in ad spending represents the company's "continuing bid to restore its brand," while "AT&T reduced spending markedly ... as it increasingly struggled with eroding network performance, declining customer satisfaction, and a raft of bad press, all stemming from the heavy data usage of an army of iPhone users."[407]

b. Marketing Campaigns

133. In 2009 and early 2010, mobile wireless service providers' marketing campaigns focused largely on their mobile broadband networks and the data capabilities of the devices available on those networks. Many providers sought to highlight their data network quality, coverage, and/or capabilities, differentiating those from rival offerings. As discussed in the *Fourteenth Report*, in a marketing campaign that began in 2008 and continued throughout 2009, AT&T claimed to have the nation's fastest 3G network.[408] Verizon Wireless countered this campaign by launching a series of advertisements in October 2009 highlighting its mobile broadband network coverage and comparing it to that of AT&T.[409]

134. As service providers have launched new network technologies with faster data speeds during the past year, they have touted the benefits of these network services in their marketing campaigns and many have labeled the services on such networks as "4G." For example, after it began reselling Clearwire's WiMAX service, Sprint Nextel launched a new marketing campaign in which it refers to its network as the Now Network and emphasizes the capabilities and applications of faster mobile Internet services.[410] In addition, when it launched the HTC EVO in June 2010, the company advertised that it was offering the nation's first 4G phone.[411] In November 2010, T-Mobile launched an ad campaign in which it refers to its HSPA+ network as "4G."[412] This campaign includes a television ad that mimics Apple's "I'm a Mac and I'm a PC" ads and highlights the faster speeds and capabilities of T-Mobile's myTouch

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[406] Craig Moffett, *et al.*, *U.S. Wireless: Ad Wars..the Battle for Mind Share*, Bernstein Research, Jan. 22, 2010, at 7.

[407] Craig Moffett, *et al.*, *U.S. Wireless: Ad Wars.. the Battle for Mind Share*, Bernstein Research, Jan. 22, 2010, at 5.

[408] *AT&T Offers Nation's Fastest 3G Network*, Press Release, AT&T, July 10, 2008 (the claims are based on "data compiled by leading independent wireless research firms"). A 12-city test of 3G network speeds conducted by Gizmodo in December 2009 also found that AT&T had the fastest download speeds. See *Our 2009 12-City 3G Data Mega Test: AT&T Won*, Gizmodo, Dec. 22, 2009, *available at* http://gizmodo.com/5428343/our-2009-12+city-3g-data-mega-test-att-won.

[409] *See* Joshua Topolsky, *Verizon Removes Gloves, Begins 'There's a Map for That' Anti-AT&T Ad Campaign*, ENGADGET MOBILE, Oct. 5, 2009, *available at* http://mobile.engadget.com/2009/10/05/verizon-removes-gloves-begins-theres-a-map-for-that-anti-atand/. In the ads, Verizon Wireless claims it has five times the 3G coverage as AT&T.

[410] *Sprint Launches Two New Marketing Campaigns*, Press Release, Sprint Nextel, Apr. 6, 2009; Sprint Nextel, *Welcome to the Now Network*, http://now.sprint.com/nownetwork/?ECID=vanity:nownetwork (visited Dec. 23, 2010); Sprint Commercial – Now Network, YouTube, http://www.youtube.com/watch?v=TwkPPo6-i9M (visited Dec. 23, 2010).

[411] *See New Sprint Campaign Links Iconic "Firsts" with America's First 4G Phone, HTC EVO 4G*, Press Release, Sprint Nextel, June 3, 2010, *available at* http://newsroom.sprint.com/article_display.cfm?article_id=1533; Sprint – HTC EVO 4G Firsts, YouTube, http://www.youtube.com/watch?v=HdLtWVy1DQI (visited Dec. 23, 2010).

[412] *See T-Mobile 4G Service Now Available in More Markets and on More Devices*, Press Release, T-Mobile, Nov. 2, 2010, *available at* http://press.t-mobile.com/articles/americas-largest-4g-network; T-Mobile Launches "Largest and Fastest 4G" Ad Campaign, YouTube, http://www.youtube.com/watch?v=FBYgAulZs6s (visited Dec. 23, 201).

4G device over the iPhone 4.[413] In early 2011, AT&T followed T-Mobile in referring to its HSPA+ network, as well as its future LTE network, as "4G."[414] Verizon Wireless also adopted the 4G marketing label for its LTE network, launched in December 2010, calling it the largest LTE and "most advanced" 4G network in the world."[415]

135. Service providers' advertisements have also focused on the devices available on their networks. For instance, AT&T has highlighted the availability of the iPhone and iPad, Sprint has run ads focused on the capabilities of the EVO device, and many of Verizon Wireless's ads have featured the various DROID devices. As a counterpart to this, some providers have run ads highlighting the weaknesses of the devices available on their competitors' networks. For example, in a 2010 print ad for the DROID X, Verizon Wireless and Motorola publicized the advantages of the DROID over the iPhone 4, stating the DROID's "double antenna design" allowed consumers "to hold the phone any way you like." This was an effort to highlight the antenna problems of the iPhone 4, which caused the device to lose a signal when held a certain way.[416]

136. In mid-2010, both AT&T and Verizon Wireless shifted the tone and focus of their marketing campaigns. The two operators stopped running ads attacking each other's network and shifted to broader, more abstract campaigns that subtly emphasized the benefits of network coverage. AT&T's ads featured the phrase "Rethink Possible," while Verizon Wireless's centered on "Rule the Air." Verizon Wireless ended its "Can You Hear Me Now?" slogan as its Rule the Air ads show objects being transformed into antennas and cell sites. Some of AT&T's ads have featured orange fabric, representing the company's network coverage, being spread across various areas of the country, while another shows a man using a smartphone to quickly change a train ticket in order to board the train and meet his future wife.

c. Retailing

137. Mobile wireless service providers distribute and sell their products and services through a variety of direct and indirect retail channels in order to increase customer growth and reduce customer acquisition costs.[417] The various distribution channels include: 1) direct retail outlets, such as provider-owned stores and kiosks; 2) indirect retail outlets, including mass-market electronics retailers such as Best Buy, Wal-Mart, Target, Costco, Radio Shack, and Amazon; 3) provider websites; and 4) telemarketers.[418] Service providers continued to report in early 2010 that customers obtained through direct channels tend to be more loyal and generate higher revenue that those obtained through indirect channels. For instance, Verizon Wireless had approximately 2,300 company-owned and operated stores and kiosks as of December 31, 2009, and reported that the customers obtained through these channels are less likely to

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413 T-Mobile myTouch 4G "Piggyback," YouTube, http://www.youtube.com/watch?v=3KmfXupi9cg (visited Dec. 23, 2010).

414 *AT&T Announces Plans to Deliver Nation's Most Advanced Mobile Broadband Experience*, Press Release, AT&T, Jan. 5, 2011, *available at* http://www.att.com/gen/press-room?pid=18885&cdvn=news&newsarticleid=31477&mapcode=wireless-networks-general|consumer.

415 4G LTE Technology and Verizon Wireless, YouTube, http://www.youtube.com/watch?v=ED5j7FOXsvU (visited Dec. 23, 2010); *Verizon Wireless Launches the World's Largest 4G LTE Wireless Network on Dec. 5*, Press Release, Verizon Wireless, Dec. 1, 2010, *available at* http://news.vzw.com/news/2010/12/pr2010-11-30a.html.

416 Nilay Patel, *Consumer Reports Confirms iPhone 4 Antenna Problems – And So Do We*, Engadget, July 12, 2010, at http://www.engadget.com/2010/07/12/consumer-reports-confirms-iphone-4-antenna-problems-and-so-do/; Paul Reynolds, *Apple's Bumper Case Alleviates the iPhone 4 Signal Loss Problem*, Consumer Reports, Electronics Blog, July 14, 2010, at http://blogs.consumerreports.org/electronics/2010/07/apple-iphone4-iphone-4-bumper-case-fixes-antenna-issue-problem-signal-loss-tested-verified-consumer-reports-labs-quick-fix.html?loc=interstitialskip.

417 *See Fourteenth Report*, 25 FCC Rcd at 11493, ¶ 132.

418 *Id.*; Verizon Communications, Inc., SEC Form 10-K, filed Feb. 26, 2010, at 4, 9.

cancel their service than those obtained through indirect, mass-market channels.[419] In addition, Leap had 280 direct retail locations, consisting of company-owned stores and kiosks, at year-end 2009, up from 263 at the end of 2008, which generated 23 percent of the company's gross adds in 2009.[420] The company's indirect retail channels consisted of local authorized dealers and "premier" dealers, which are independent dealers that sell Cricket service exclusively in stores that look and function similar to company-owned stores.[421] Leap continued to report that, in 2009, the premier stores generated "significantly more" business than the other indirect dealers. The premier locations made up 46 percent of the company's total indirect retail locations at the end of 2009, up from 37 percent at the end of 2008.[422] In 2009, Leap also began selling its broadband access and daily and monthly pay-as-you-go products at 3,900 national mass-market retail locations.[423]

3. Differentiation in Mobile Wireless Handsets/Devices

138. In addition to network quality and advertising, a third component of non-price rivalry among mobile wireless service providers is the differentiation of the downstream products that they offer or that rely on their networks, including handsets/devices, operating systems, and mobile applications.[424] With respect to handsets and devices, providers compete by introducing new handsets/devices, distinguishing their handset/device offerings from those of their competitors, responding to competitors' handset/device innovations with rival offerings, offering certain handset/device models on an exclusive basis, and allowing handsets/devices that they do not sell directly to be used on their networks.[425] During 2009 and early 2010, data-centric devices – including smartphones,[426] laptop cards, and other data-only devices – continued to drive growth, and service providers launched several new devices in an effort to differentiate themselves from their competitors. In addition, as competition among mobile device operating system/platform developers has intensified, service providers' ability to offer certain device

[419] Verizon Communications, Inc., SEC Form 10-K, filed Feb. 26, 2010, at 9. This represents a decrease of 200 company stores and kiosks from the 2,500 reported as of the end of 2008. *See Fourteenth Report*, 25 FCC Rcd at 11493, ¶ 132

[420] Leap Wireless International, Inc., SEC Form 10-K, filed Feb. 27, 2010, at 5-6.

[421] *Id*.

[422] Leap Wireless International, Inc., SEC Form 10-K, filed Feb. 27, 2010, at 5-6. At the end of 2009, Leap had 3,760 indirect channel locations, including 1,740 premier dealer locations. At the end of 2008, the company had 2,826 indirect channel locations, including 1,036 premier dealer locations. *Id.*; *Fourteenth Report*, 25 FCC Rcd at 11493, ¶ 132.

[423] Leap Wireless International, Inc., SEC Form 10-K, filed Feb. 27, 2010, at 5-6.

[424] *See, e.g., Torch Passes from Voice to Data*, at 24.

[425] *See Fourteenth Report*, 25 FCC Rcd at 11494-95, ¶ 135. *See also* Section VI.A.3, Handsets, Handset Locking, and Handset Applications, *infra.*

[426] 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 The Mobile Internet Report*, Morgan Stanley, Morgan Stanley Research, Dec. 15, 2009, at 110 (*Morgan Stanley Mobile Internet Report*); Verizon Communications, Inc., SEC Form 10-K, filed Feb. 24, 2009, at 6; Wikipedia, *Smartphone*, http://en.wikipedia.org/wiki/Smartphone (visited Mar. 8, 2010). In addition to smartphones and traditional handsets, the third category of devices, for purposes of this *Report*, is data-centric devices, which includes devices with no inherent voice capability, such as USB wireless modem laptop cards, mobile Wi-Fi devices, and laptops and netbooks with embedded mobile wireless modems. The traditional handset category includes voice-centric handsets that do not allow or are not designed for easy web browsing.

platforms, and the applications that run on those platforms, to their customers has influenced their ability to compete.

139. *Smartphones*. As discussed in the *Fourteenth Report*, service providers, handset manufacturers, and platform developers have introduced an array of smartphone devices in recent years to respond to consumer demand for devices with high-speed data capabilities, easy-to-use web browsers, and access to customized mobile applications.[427] These launches have represented both an attempt to prevent customers from switching to a competing provider in order to obtain the device offered by that provider, as well as an effort to migrate traditional, voice-centric handset customers to smartphones. Smartphone users typically generate higher data ARPU and have lower churn rates, which can offset the slowing growth in subscriber penetration and declining voice ARPU.[428] On the other hand, smartphone users also typically have higher bandwidth consumption levels, which can strain wireless network capacity.[429]

140. Service providers launched several new smartphone devices, including many devices running Google's Android operating system, in 2009 and 2010. For example, in 2009, Verizon Wireless began offering the Android-based Motorola and HTC DROID devices, T-Mobile launched the Android-based myTouch 3G, Samsung Behold II, and Motorola CLIQ smartphones, while Sprint Nextel launched the HTC Hero and Samsung Moment.[430] In 2010, Verizon Wireless launched, on an exclusive basis, newer versions of the DROID – the Motorola DROID X and DROID 2, and the HTC DROID Incredible – which included updated features such as faster processing speed, additional memory, Wi-Fi connectivity, higher-megapixel cameras, video cameras, mobile hotspot capabilities, and Adobe Flash player.[431] In June 2010, Sprint introduced the Android-based HTC EVO, the first hybrid EV-DO/WiMAX smartphone.[432] In addition to enabling faster download speeds in areas where the WiMAX network is available, the EVO includes features such as video chat, mobile hotspot capabilities, HDMI cable ports, Adobe Flash, and a kickstand.[433] In September 2010, Sprint launched a second EV-

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[427] *See Fourteenth Report*, 25 FCC Rcd at 11495, ¶ 136.

[428] *See Finding Value in Smartphones*, at 7, 26; *Smartphone Adoption Steadily Rising*, at 1, 2.

[429] *Smartphone Adoption Steadily Rising*, at 1, 2.

[430] *See Fourteenth Report*, 25 FCC Rcd at 11498-99, ¶ 141.

[431] *July 2010: DROID X by Motorola Lands on the Nation's Largest & Most Reliable 3G Network*, Press Release, Verizon Wireless, June 23, 2010, *available at* http://news.vzw.com/news/2010/06/pr2010-06-22.html; *See What DROID Does Next: DROID 2 by Motorola Pre-Sale Starts August 11 at VerizonWireless.com*, Press Release, Verizon Wireless, Aug. 10, 2011, *available at* http://news.vzw.com/news/2010/08/pr2010-08-09c.html; *DROID Incredible by HTC Delivers an Incredible 3G Experience*, News Release, Verizon Wireless, Apr. 29, 2010, *available at* http://news.vzw.com/news/2010/04/pr2010-04-28d.html. Not all features listed are available on all three devices.

[432] The device runs on both Sprint Nextel's EV-DO network and Clearwire's WiMAX network. *The Wait Is Over – America's First 3G/4G Phone, HTC EVO 4G, Available Nationwide Today, Exclusively from Sprint*, News Release, Sprint, June 4, 2010. MetroPCS introduced the first LTE smartphone to be made available in the United States, the Samsung Craft, in September 2010. *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=; *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=.

[433] *The Wait Is Over – America's First 3G/4G Phone, HTC EVO 4G, Available Nationwide Today, Exclusively from Sprint*, News Release, Sprint, June 4, 2010.

DO/WiMAX smartphone, the Samsung Epic 4G.[434] As discussed below, Android's share of the total smartphone operating system market increased significantly during the first eight months of 2010.[435]

141. While other service providers focused on introducing Android-based smartphones in 2009 and 2010, AT&T continued its trend of offering a new version of the Apple iPhone. As mentioned in the *Fourteenth Report*, AT&T began selling the iPhone 3GS in June 2009.[436] In June 2010, Apple released and AT&T began selling, as the exclusive network provider, the iPhone 4.[437] The distinguishing features of the iPhone 4 include a user-facing video camera that enables a two-way video chat application called FaceTime, a high-resolution screen, and a 5-megapixel flash camera.[438] In January 2011, Verizon Wireless announced that it would begin selling the iPhone 4 for use on its EV-DO network in February 2011.[439]

142. A key way in which service providers differentiate themselves from their rivals on the basis of devices is by offering certain smartphone devices on an exclusive basis. The AT&T-iPhone exclusivity arrangement – which ended in February 2011 when Verizon Wireless began offering the iPhone – has been the longest-lived example. However, service providers have offered several other popular smartphones exclusively, such as Verizon Wireless with the DROID device and AT&T with the RIM Blackberry Torch.[440]

143. Related to the efforts by service providers to compete by offering smartphone devices has been the intensifying competition among the smartphone device operating system developers themselves, including Apple, Google, RIM, and Microsoft. And with operating systems come application stores, as each mobile OS developer has created an application store that is bundled with and designed to run on that developer's specific platform. Apple devices provide access to the Apple App Store, Android devices provide access to the Android Market, Blackberry smartphone users can access the Blackberry App World, and so on.[441] As mobile operating systems, and the functionalities and application stores they enable, play a more prominent role in a consumer's mobile wireless experience, consumers are showing an increasing loyalty to particular device platforms. If consumers want to be able to download the applications available from a particular app store, they must use a device that runs the OS that provides access to that app store. Some mobile operating systems are bundled with the devices that are manufactured by the OS developer, such as with Apple and RIM. In such cases, the bundled OS-device

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[434] *Second 3G/4G Phone, Samsung Epic 4G, Launches with One of the Best First-Day Sales for Any Sprint Device*, News Release, Sprint, Sept. 3, 2010, *available at* http://newsroom.sprint.com/article_display.cfm?article_id=1620.

[435] *See* Section VII.B.1, Mobile Wireless Handsets/Devices and Operating Systems, *infra.*

[436] The iPhone 3GS includes a camera, video camera, speaker phone, digital compass, more memory, longer battery life and a new version of the iPhone operating system, OS 3.0. The 3GS is also able to connect to AT&T's HSPA 7.2 Mbps network. *See Fourteenth Report*, 25 FCC Rcd at 11496, ¶ 138.

[437] *AT&T to Offer iPhone 4 on June 24*, News Release, AT&T, June 7, 2010, *available at* http://www.att.com/gen/press-room?pid=18004&cdvn=news&newsarticleid=30863&mapcode=consumer|wireless. *See Fourteenth Report*, 25 FCC Rcd at 11499-500, ¶ 143.

[438] *Apple Presents iPhone 4*, News Release, Apple, June 7, 2010, *available at* http://www.apple.com/pr/library/2010/06/07iphone.html.

[439] *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.

[440] *AT&T and Research in Motion Ignite Customers with the New BlackBerry Torch*, Press Release, AT&T, Aug. 3, 2010, *available at* http://www.att.com/gen/press-room?pid=18197&cdvn=news&newsarticleid=31006&mapcode=wireless;

[441] *See Fourteenth Report*, 25 FCC Rcd at 11499, ¶ 142. The number of applications available on each application store, and the market shares of the various mobile operating systems, are discussed in SectionVII.B.1, Mobile Wireless Handsets/Devices and Operating Systems, *infra*.

manufacturer may choose to sell its devices to multiple service providers or to a single service provider. Other operating systems, such as Android and Microsoft Windows, are available on multiple devices.

144. Service providers, seeking to differentiate their products and services from their rivals, have responded to this developing relationship between operating systems and devices in various ways. First, in cases where the device and OS are bundled, service providers have responded to consumer demand for the applications and features of that OS by offering exclusively, in some cases for a limited period of time, all of the manufacturer's smartphone devices or certain device models. Prior to February 2011, AT&T was the only service provider for all of Apple's iPhone models, while several service providers have sold different RIM Blackberry devices on an exclusive basis. Second, in cases where an OS is available on devices produced by multiple manufacturers, service providers can compete by offering a particular device exclusively and touting the distinguishing features of that device. Examples of this type of conduct by service providers include Verizon Wireless's exclusive offering of the DROID devices and Sprint's launch of the EVO. In cases where a particular smartphone OS is available on other devices offered by competing providers, the service provider has highlighted the attributes of the individual smartphone devices that it sells exclusively, even if for only a limited period of time, as well as the benefits of its network – the speed, coverage, or reliability.[442]

145. *Data-Only Devices*. In addition to launching new smartphone devices in 2009 and 2010, several service providers began offering a range of new data-only devices, including devices to facilitate mobile Internet access on computers – wireless data cards, mobile Wi-Fi hotspots,[443] and netbook computers with embedded modems[444] – as well as tablet devices and e-readers. The first mobile tablet device was the Apple iPad, introduced in January 2010. The iPad has a 10-inch screen, web browsing capabilities, can be used to view photos or watch videos, and has e-reader capabilities and an on-screen touch keyboard. It can be purchased with built-in connectivity to AT&T's HSPA network (or with a Wi-Fi-only connection) but does not allow voice communications.[445] According to one analyst, the iPad is an attractive device for consumers looking at netbooks or e-readers as a second computing device but is too limited to serve as a full replacement for a notebook, laptop, or desktop computer.[446] As a media device, however, the iPad could serve as a more personalized substitute for a television set, according to some industry analysts.[447]

146. In addition, certain mobile wireless networks provide data connections for electronic reading devices, such as the Amazon Kindle or the Barnes & Noble Nook. The data connection, used to download electronic books and other reading materials, is typically provided as resold by third-party retailers, rather than directly by mobile wireless service providers. 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. Estimates of the number of Kindles sold as of January 2010 range from

[442] *See* Section IV.B.1, Network Coverage and Technology Upgrades, *supra.*

[443] 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.

[444] *See* Section V.A, Subscribership/Connection Levels, *infra*, for data on the number of mobile wireless subscribers by device type.

[445] Craig Moffett, *et al*., *Apple: Alas, the iPad Unveiled – What Does It Mean?*, Bernstein Research, Jan. 28, 2010, at 1 (*Apple: Alas, the iPad Unveiled – What Does It Mean*); Craig Moffett, *et al*., *Weekend Media Blast: Maybe We Just Don't Like Each Other*, Bernstein Research, Apr. 23, 2010, at 1-2.

[446] *Apple: Alas, the iPad Unveiled – What Does It Mean?*, at 1.

[447] The 10-inch screen, when held 17 inches away, has approximately the same field of vision ratio as a 50-inch television located eight feet away from a viewer. Craig Moffett, *et al*., *Weekend Media Blast: Maybe We Just Don't Like Each Other*, Bernstein Research, Apr. 23, 2010, at 1-2.

2.5 million to 3 million.[448] In October 2009, Amazon switched from Sprint to AT&T as the data connection provider for the Kindle 2.[449]

147. As discussed in the *Fourteenth Report*, many service providers offer netbook computers, typically selling them at a lower upfront price than when purchased through an electronics retailer, but with the requirement that the customer purchase a monthly mobile broadband access plan with a two-year contract.[450] In October 2010, Sprint introduced the first netbook and notebook computers – the Dell Inspiron Mini 10 and Dell Inspiron 11z – with an embedded dual-mode EV-DO/WiMAX modem.[451]

148. Many service providers also offer mobile Wi-Fi hotspots, and in January 2010, Sprint began offering the first dual mode EV-DO/WiMAX mobile hotspot.[452] In addition, several of the smartphone devices launched by service providers in 2010 included mobile hotspot capabilities, which typically allow around five to eight nearby Wi-Fi-enabled devices to connect to the Internet via the EV-DO or WiMAX connection of the smartphone. Examples of smartphones with built-in mobile hotspot capabilities include the EVO, the DROID X, and DROID 2.

149. While many mobile wireless service providers have been providing EV-DO- and HSPA-enabled wireless modem laptop cards for several years, in 2009 and 2010, a few began offering, or announced plans to offer, WiMAX- and LTE-enabled laptop cards. In 2009 and 2010, Sprint and Clearwire began offering dual-mode laptop cards that can connect to both Sprint's EV-DO network and Clearwire's WiMAX network. As mentioned above, Verizon Wireless began offering two LTE-compatible USB wireless modem cards in December 2010 and unveiled ten additional LTE-compatible consumer-oriented devices, including smartphones and tablets, in January 2011, to be available by mid-2011.[453] In addition, AT&T announced the availability of three LTE/HSPA 7.2-compatible wireless modem cards in October 2010, and plans to begin offering LTE-enabled smartphones, tablets, and mobile

[448] Douglas MacMillan, *Amazon CEO: "Millions" of Kindles Sold*, The Tech Beat, BusinessWeek, Jan. 28, 2010, *available at* http://www.businessweek.com/the_thread/techbeat/archives/2010/01/amazon_ceo_mill.html.

[449] Priya Ganapati, Gadget Lab – *Amazon Dumps Sprint for Kindle 2, Embraces AT&T*, Wired, Oct. 23, 2009, *available at* http://www.wired.com/gadgetlab/2009/10/sprint-kindle-att/. Analysts believe Amazon switched to AT&T because AT&T's network uses the same technology standard (GSM/WCDMA) used in many other countries, and the per-unit equipment costs for Amazon are lower if the company can produce a single Kindle model that can be sold in multiple countries. *Id* (citing Forrester Research analyst, Charles Golvin).

[450] Marguerite Reardon, *Sprint Sells Netbooks for a Buck*, CNET NEWS, July 7, 2009, *available at* http://news.cnet.com/8301-1035_3-10280886-94.html. Sprint Nextel and Best Buy sold the HP Mini for 99 cents as a promotion in July 2009, while the same netbook was offered through Verizon Wireless and AT&T for $199. In all cases, the service providers required the purchase of a two-year service contract. The non-bundled price for the netbook at that time was $389.99 from Best Buy. *Id.*

[451] *Sprint Expands 4G Product Portfolio Again Becoming the First Wireless Carrier in America to Offer 3G/4G-Embedded Netbook and Notebook, Dell Inspiron Mini 10 and Dell Inspiron 11z*, Press Release, Sprint Nextel, Oct. 19, 2010, *available at* http://newsroom.sprint.com/article_display.cfm?article_id=1687.

[452] *Overdrive 3G/4G Mobile Hotspot by Sierra Wireless Can Bring Sprint's 4G Speeds to More Than 400 Million Wi-Fi-Enabled Devices*, Press Release, Sprint Nextel, Jan. 6, 2010, *available at* http://newsroom.sprint.com/article_display.cfm?article_id=1333.

[453] *See* Section IV.B.1.a, Service Provider Technology Deployments, *supra*.

hotspots during the second half of 2011.[454] The devices will reportedly receive a software upgrade in 2011 when AT&T's LTE network is deployed.[455]

150. *Machine-to-Machine (M2M) Devices*. Related to service providers' launch of data-only devices are their efforts to differentiate themselves by permitting devices to operate on their networks that have traditionally not had embedded mobile Internet connectivity and which the service providers do not brand or sell directly. Several mobile wireless service providers have created streamlined process for wholesalers to certify data-only mobile computing and M2M devices for use on service provider's networks.[456] For example, through its Open Development program, Verizon Wireless has certified more than 150 non-traditional mobile devices for use on its network, including utility meters, law enforcement devices, and health care devices.[457] In October 2009, the company opened its LTE Innovation Center lab for the design and testing of M2M products that would rely on the LTE network for data connections.[458] In addition, through its Open Device Initiative/M2M Wholesale Business, Sprint has more than 300 certified, third-party embedded devices operating on its network.[459] M2M devices still account for a relatively small percentage of all mobile wireless devices. At the end of 2009, an estimated 4.3 percent of all mobile network connections in the United States were used for M2M communications.[460] According to Sprint, M2M devices generate lower ARPU than mobile consumer-based devices such as smartphones, but there is a potential for millions of M2M units to be connected to mobile networks.[461]

4. Differentiation in Mobile Applications

151. As mentioned above, one way mobile wireless service providers compete is by differentiating themselves from their rivals through the applications that they provide and allow on their networks.[462] For instance, service providers can have applications pre-loaded on the devices they sell, they can offer applications through provider-branded, "walled garden" mobile platforms, and they can allow applications to be downloaded via web browsers or application stores. In recent years, there has been a shift towards allowing consumers to access and download applications through the web and application stores, rather than limiting them to walled gardens – a trend that was catalyzed by the launch of the iPhone in 2007.[463] The ability to access a wider variety of applications and content and to browse

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[454] Sascha Segan, A*T&T Launches First LTE, HSPA+ Modems*, PC World, Oct. 6, 2010, at http://www.pcmag.com/article2/0,2817,2370331,00.asp (A*T&T Launches First LTE, HSPA+ Modems*); *AT&T Announces Plans to Deliver Nation's Most Advanced Mobile Broadband Experience*, Press Release, AT&T, Jan. 5, 2011, *available at* http://www.att.com/gen/press-room?pid=18885&cdvn=news&newsarticleid=31477&mapcode=wireless-networks-general|consumer.

[455] A*T&T Launches First LTE, HSPA+ Modems*.

[456] *See Fourteenth Report*, 25 FCC Rcd at 11501-02, ¶ 147; Verizon Wireless Comments at 106-107.

[457] Verizon Wireless Comments at 106-107.

[458] *See Fourteenth Report*, 25 FCC Rcd at 11501-02, ¶ 147.

[459] *See Fourteenth Report*, 25 FCC Rcd at 11501-02, ¶ 147; Sprint, *Machine-to-Machine*, http://www.sprint.com/wholesale/m2m.shtml (visited Oct. 21, 2010).

[460] *Berg Insight Says Machines Account for 1.4 Percent of Mobile Network Connections Worldwide*, Press Release, Berg Insight, Dec. 14, 2009.

[461] *Interview: Dan Dooley of Sprint*, Global Telecoms Business, Nov. 9, 2009, at http://www.globaltelecomsbusiness.com/Article/2334673/Sectors/25204/Interview-Dan-Dooley-of-Sprint.html.

[462] Applications can be narrowly defined as a software program that runs on a mobile device, or more broadly defined as any functionality on a mobile device, such as text messaging, voice, etc. *Morgan Stanley Mobile Internet Report*, at 134.

[463] *Morgan Stanley Mobile Internet Report*, at 5, 185, 214-215; *Fourteenth Report*, 25 FCC Rcd at 11502-03, ¶ 148; Katherine Rosman, *Y U Luv Texts, H8 Calls*, The Wall Street Journal, Oct. 14, 2010.

the web more openly has become increasing popular with consumers. Recognizing and capitalizing on this trend, service providers have been selling devices that allow easier web browsing and downloading of applications through web browsers and applications stores.[464] As web-friendly smartphones and application stores have become more popular with consumers, mobile wireless service providers have been competing less on the basis of exclusive content or applications available from a provider-branded platform or walled garden, and to a greater extent on, among other factors, the devices they sell and the types and quantity of applications that can be easily accessed on those devices.[465]

152. While service providers have allowed consumers access to a greater range of applications in recent years, many have maintained certain restrictions on the types of mobile applications that consumers can access on their networks. For example, AT&T prohibits, as part of the terms and conditions of its wireless data service plans, the downloading of movies using peer-to-peer file sharing services because such applications can cause extreme network capacity issues and interference with the network.[466] In addition, Verizon Wireless states that the downloading of applications with its data plans is subject to certain terms related to protecting the network and maintaining the quality of service to all users.[467]

153. Some providers have moved to allow certain high-bandwidth, and in some cases previously-prohibited, applications to be used on their networks. For example, after allowing iPhone customers to make VoIP calls on its HSPA network in October 2009,[468] AT&T announced in February 2010 that it would also allow a video streaming application, SlingPlayer Mobile.[469] In addition, in February 2010, Verizon Wireless announced that all of its smartphone customers with a data plan would be able to use their device for unlimited Skype VoIP calling.[470]

154. The types of mobile applications available to consumers are influenced to a large extent by the mobile operating system used on the device. As mentioned above, each of the major smartphone operating system/platform developers has created an application store in which consumers can download, for free or for a fee, applications that have been designed to work on that specific operating system/platform.[471] The level of control or openness exercised by the operating system developers over the types of applications that are available through their application stores varies. For example, Apple must approve the applications designed by third-party developers before they can be sold through the Apple App Store. On the other hand, the launch of applications and content by third-party developers through the Android Market application store requires no approval by either Google or the wireless

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[464] *See Fourteenth Report*, 25 FCC Rcd at 11502-03, ¶ 148. Mobile wireless service providers often require that customers comply with terms and conditions of service, and may approve or reject certain applications developed by third-party application developers for certain devices or operating systems.

[465] *See Fourteenth Report*, 25 FCC Rcd at 11502-03, ¶ 148.

[466] AT&T, *Wireless Data Service Terms and Conditions*, http://www.wireless.att.com/cell-phone-service/legal/plan-terms.jsp (visited Apr. 9, 2010).

[467] Verizon Wireless, *Mobile Broadband Terms & Condition*s, http://b2b.vzw.com/broadband/bba_terms.html (visited Jan. 20, 2011) ("You may not use our Data Plans ... in a manner ... that interferes with network's ability to fairly allocate capacity among users, or that otherwise degrades service quality for other users").

[468] *AT&T Extends VoIP to 3G Network for iPhone*, Press Release, AT&T, Oct. 6, 2009.

[469] *AT&T and Sling Media Collaborate on SlingPlayer Mobile App for 3G Mobile Broadband Network*, Press Release, AT&T, Feb. 4, 2010.

[470] *Verizon Wireless and Skype Join Forces to Create a Global Mobile Calling Community*, Press Release, Verizon Wireless, Feb. 16, 2010.

[471] *See* Section VII.B.2, Mobile Applications, *infra.*

service provider.[472] Google's Android operating system is made available free of charge to handset manufacturers and wireless service providers, and is available on multiple devices and multiple service providers.[473] As a result, many service providers and device manufacturers have designed customized versions of the Android platform for their products. Some commentators have noted that, because of this, it is difficult for third-party application developers to design and test products for use on a fragmented platform can vary by device and network.[474]

155. 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.[475]

V. MOBILE WIRELESS SERVICES: PERFORMANCE

156. The structural and behavioral characteristics of a competitive market are desirable not as ends in themselves, 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 these kinds of positive outcomes, in this section we analyze various metrics including subscriber growth and penetration, usage, pricing levels and trends, investment, and quality of service.

157. As in previous reports, the market performance section of this *Report* tracks the pricing of mobile wireless services using various pricing measures or proxies, including RPM and average revenue per message. In addition, the market performance section of this *Report* supplements the analysis of pricing trends with an analysis of measures of subscribership, net adds, output/usage, revenue, profitability, and the economic impact of mobile wireless service. The analysis of revenue decomposes total service revenue into three segments: voice, messaging, and other data service revenue. The analysis of profitability uses measures of profitability that account for cost data that are not reflected in pricing and revenue data. This *Report* does not track increasingly important usage trends related to mobile data consumption (e.g., revenue per MB) because most carriers and the industry as a whole do not release these data.

A. Subscribership/Connection Levels

158. Mobile wireless subscribers and connections can be measured in various ways, including by type of service and device, by type of pricing plan, by age, and by geographic area. In looking at the number total number of devices connected to a mobile wireless network, we find that mobile wireless connections increased four percent in 2009 to 290.7 million, which translates into a nationwide penetration rate of 93.5 percent.[476] Prepaid and wholesale subscribers as a percentage of all mobile wireless subscribers continued to increase in 2009 from 19.1 percent to 21.8 percent.[477] In addition, the

[472] *Morgan Stanley Mobile Internet Report*, at 156. Customers are still subject to the terms and conditions of their contracts with wireless service providers.

[473] *See Thirteenth Report*, 24 FCC Rcd at 6269, ¶ 172; *Morgan Stanley Mobile Internet Report*, at 158. Wireless service providers are able to customize elements of the platform to promote their own services and content. *Thirteenth Report*, 24 FCC Rcd at 6269, ¶ 172. While it makes the operating system available for free, Google has focused on bringing in revenue through advertising and monetizing user usage information.

[474] Josh Levy, *Open vs. Closed, Google vs. Apple, iPhone vs. Android*, Open Mobile, Oct. 19, 2010, at http://openmobile.posterous.com/open-vs-closed-google-vs-apple-iphone-vs-andr.

[475] 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*).

[476] *See* Section V.A.1, Total Mobile Wireless Connections, *infra.*

[477] *See* Section V.A.3, Mobile Wireless Subscribers by Pricing Plan, *infra.*

number of mobile wireless Internet access subscribers – those subscribing to mobile Internet access service at speeds over 200 kbps in at least one direction – more than doubled, so that, at the end of 2009, more than 55 million subscribers were using services with 3G or 4G networks technologies. Another source indicates that the adoption of various mobile data services – including text messaging, instant messaging, e-mail, and web access – has grown substantially over the past year, with 38 percent of cell phone subscribers using web access and 72 percent using text messaging as of May 2010.[478] Finally, Commission data on sub-national mobile wireless connections by EAs show that EA penetration rates range from a low of 71 percent in the Sacramento-Yolo, CA EA to a high of over 100 percent in 18 EAs.[479]

1. Total Mobile Wireless Connections

159. The data source that the Commission has used for many years to estimate the number of mobile wireless subscribers, NRUF, tracks the number of phone numbers that have been assigned to mobile wireless devices.[480] As the industry becomes more and more data-centric, the use of NRUF has certain limitations that will become increasingly significant. One important limitation is that NRUF is no longer an accurate reflection of the number of individual subscribers. That is because more consumers are using more than one mobile device – 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 – and many data-only mobile devices have assigned telephone numbers.[481] Thus, NRUF provides an estimate of the number of mobile wireless connections or connected devices. We note that while many mobile wireless devices that are not used for mobile voice services still have a phone number assigned to them, Clearwire's WiMAX mobile and fixed Internet access devices do not have phone numbers assigned to them and are not captured in the NRUF data.[482] We also note that when NRUF is used to calculate a mobile wireless penetration rate, that penetration rate is overstated in terms of the number of individuals that have at least one mobile wireless device. It is possible for the maximum national penetration rate to exceed 100 percent, and, indeed, it does currently exceed 100 percent in certain EAs, as discussed below.[483]

160. Based on NRUF data, we estimate that there were 290.7 million mobile wireless connections at the end of 2009 (see Table 14).[484] This addition of 11.1 million connections from 279.6

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[478] *See* Section V.A.2, Mobile Wireless Subscribers by Type of Service and Device, *infra.*

[479] *See* Section V.A.5, Mobile Wireless Connections by Economic Area (EA), *infra.*

[480] In NRUF, carriers do not report numbers that have been ported to them. Therefore, in order to develop an estimate of mobile wireless subscribership, it is necessary to adjust the raw NRUF data to account for mobile wireless subscribers who have transferred their wireline numbers to wireless accounts. Porting adjustments are developed from the telephone number porting databases managed by Neustar, acting as the administrator of the regional Number Portability Administration Centers (NPACs). The databases contain all ported numbers currently in service. They also contain information about when the number was most recently ported (to a carrier other than the carrier 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.

[481] As discussed above, many mobile wireless devices that are not used for mobile voice services still have a phone number assigned to them and therefore are counted in the NRUF data. We note, however, that Clearwire's 4G mobile and fixed Internet access devices do not have phone numbers assigned to them and are not counted in the NRUF data. *See* Section III.C.2, Herfindahl-Hirschman Index, *supra*.

[482] As of year-end 2010, Clearwire customers amounted to 4.35 millinon.

[483] *See* Section V.A.5, Mobile Wireless Connections by Economic Area (EA), *infra*.

[484] Commission estimate, based on preliminary year-end 2009 NRUF filings, adjusted for porting. Dividing the total number of mobile wireless connections by the total U.S. population would result in a penetration rate of 93.5 percent. According to the Bureau of the Census, the combined population of the 50 states, the District of Columbia, (continued….)

million (restated) at the end of 2008 represents a four percent growth in the number of subscribers during 2009.[485] Between 2005 and 2009, the number of mobile wireless connections has increased over 36 percent. CTIA also estimates the total number of mobile wireless subscriber connections and found that the number of connections grew 5.8 percent from 270.3 million at the end of 2008 to 285.6 million at the end of 2009.[486] According to CTIA, since the end of 2005, mobile wireless connections increased by approximately 37 percent.[487]

Table 14
NRUF and CTIA - Estimated Mobile Wireless Connections[488]

	NRUF			CTIA
	Connected Devices (millions)	*Increase from previous year (millions)*	*Connections Per 100 People*	*Subscriber 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

2. Mobile Wireless Subscribers by Type of Service and Device

161. While the NRUF and CTIA data report the number of mobile wireless connections or connected devices, they do not distinguish among the various types of mobile wireless service. The Commission's Form 477 data, on the other hand, provide data, on both a nationwide and state-by-state basis, on the number of mobile wireless voice subscribers as well as the number of mobile wireless Internet access subscribers. Providers reported on Form 477 that there were 274.3 million mobile telephone subscribers as of December 2009, an increase of 5 percent from 261.3 million at the end of

(Continued from previous page)
and Puerto Rico, as of July 1, 2009, was estimated to be 311 million. *See* U.S. Census Bureau, *Annual Estimates for the Population of the United States, Regions, States, and Puerto Rico: April 1, 2000 to July 1, 2009*, http://www.census.gov/popest/states/tables/NST-EST2009-01.xls (visited Aug. 17, 2010).

485 The number of mobile wireless subscribers at the end of 2008, based on NRUF data, originally reported in the *Fourteenth Report* was 277.6 million. However, this figure had not been adjusted for wireline-to-wireless porting. We have therefore revised the year-end 2008 total to 279.6 million and have adjusted the net addition figures based on this total.

486 *See* Appendix C, Table C-1, *infra*. While the Commission now uses NRUF data as the basis for its estimate of mobile wireless connections for the purposes of this *Report*, we continue to report the CTIA data as a benchmark for comparison because these figures are readily available and are used widely by industry analysts. 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.

487 *Id*.

488 Commission estimates based on NRUF data. *CTIA Year-End 2009 Wireless Indices Report*. In March 2011, CTIA announced there were an estimated 302.9 million mobile wireless subscriber connections as of the end of 2009. CTIA, *Year-End 2010 Top Line Survey Results*, http://files.ctia.org/pdf/CTIA_Survey_Year_End_2010_Graphics.pdf (visited Mar. 31, 2011).

2008.[489] Form 477 also provides data on the number of mobile wireless Internet access subscribers with connections exceeding 200 kbps in various speed tiers, and therefore using 3G or 4G technologies, and on the number of mobile wireless devices in service that are capable of transmitting data at speeds over 200 kbps in at least one direction.[490] 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.[491] 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.[492] As of the end of 2009, approximately 55.8 million mobile wireless Internet access service subscriptions were reported to the Commission on Form 477, more than double the 26.5 million at the end of 2008. In addition, 115.7 million mobile wireless devices in use were reported to be capable of transmitting data at over 200 kbps at the end of 2009, up 35 percent from 86 million at the end of 2008 (see Chart 6). 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.[493]

[489] *See* Appendix C, Table C-2, *infra*. These particular 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.

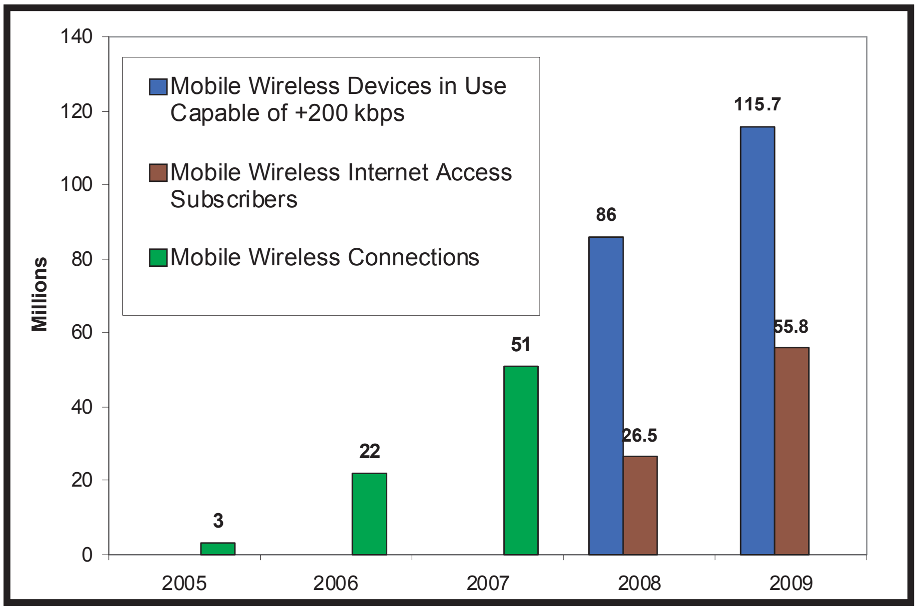
[490] *See* Table C-6, Appendix C, *infra*.

[491] 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*).

[492] *Broadband Data Order*, 23 FCC Rcd at 9703, ¶ 23. In addition, mobile wireless broadband providers are required to report the percentage of the total subscribers in each state that are residential (not billed to a corporate, business, government, or institutional account). *Broadband Data Order*, 23 FCC Rcd at 9703 ¶ 24. 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 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.

[493] For the year-end 2007 and prior reporting periods, Form 477 mobile wireless broadband providers were instructed to report only "the number of subscribers whose mobile device was capable of sending or receiving data at speeds above 200 kbps," and not whether their subscriptions permitted Internet access. Therefore, these numbers are not comparable to the data from year-end 2008 and subsequent periods. *See High-Speed Services for Internet Access: Status as of December 31, 2008*, Industry Analysis and Technology Division, Wireline Competition Bureau, FCC, Feb. 2010, at 3, *available at* http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-296239A1.pdf.

Chart 6
Mobile Wireless Internet Access Subscribers and Devices in Use[494]



162. In addition to the Form 477 data on mobile telephone and Internet access subscribers, CTIA provides various estimates of the number of different types of devices in use (see Chart 7). CTIA reported that there were 257 million data-capable mobile handsets and devices in use at the end of 2009, up 13 percent from 228 million at the end of 2008.[495] The number of SMS-capable handsets in use rose from 227.2 million to 238.4 million during 2009, and the number of web-capable devices increased from 202.7 million to 238.4 million during the same period.[496] CTIA also tracks the number of wireless-enabled laptops and aircards in use and found the number increased 65 percent during 2009 from 7.2 million to 11.9 million.[497] In 2009, CTIA began reporting data on the number of smartphones in use and found that, as of December 30, 2009, there were 49.8 million smartphones in service, up from 40.7 million in mid-2009.[498]

Chart 7
Mobile Wireless Connections by Type of Service and Device

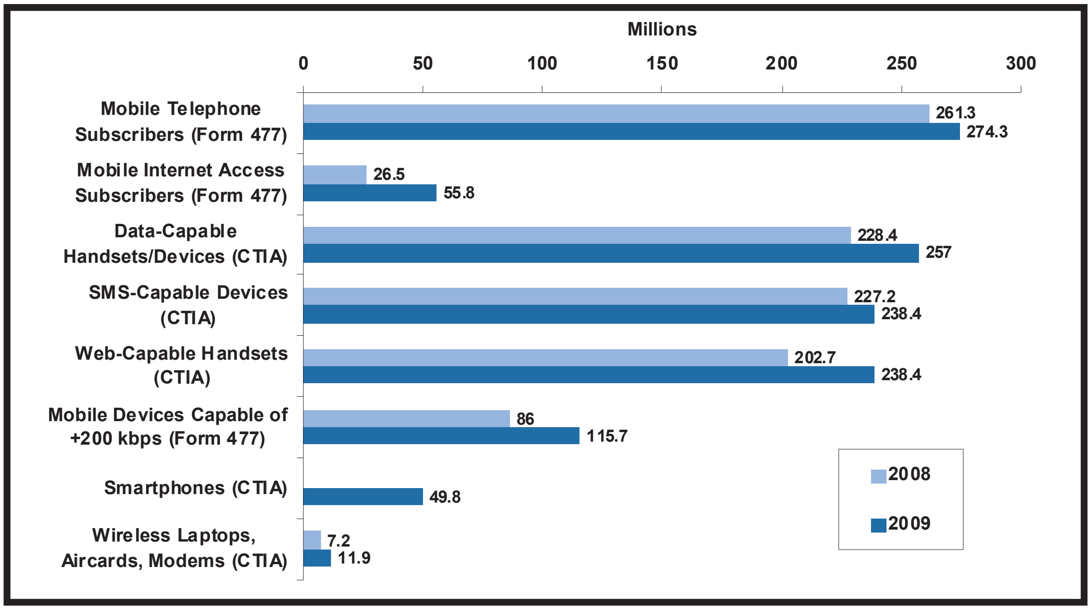
[494] Commission estimates based on Form 477 data. Mobile wireless Internet access subscribers include subscribers whose device and subscription plan allow them to access to the lawful Internet content of their choice at over 200 kbps in at least one direction.

[495] *CTIA Year-End 2009 Wireless Indices Report*, at 10.

[496] *CTIA Year-End 2009 Wireless Indices Report*, at 10.

[497] *CTIA Year-End 2009 Wireless Indices Report*, at 11.

[498] *Id*.



163. In addition, a survey by ChangeWave Research found that 42 percent of its respondents owned a smartphone in December 2009, up from 32 percent in December 2008 and 21 percent in October 2007 (see Chart 8). ChangeWave's results were based on a survey of early adopters and professionals in business, technology, and medicine, rather than a representative sample of the entire population of the United States.[499]

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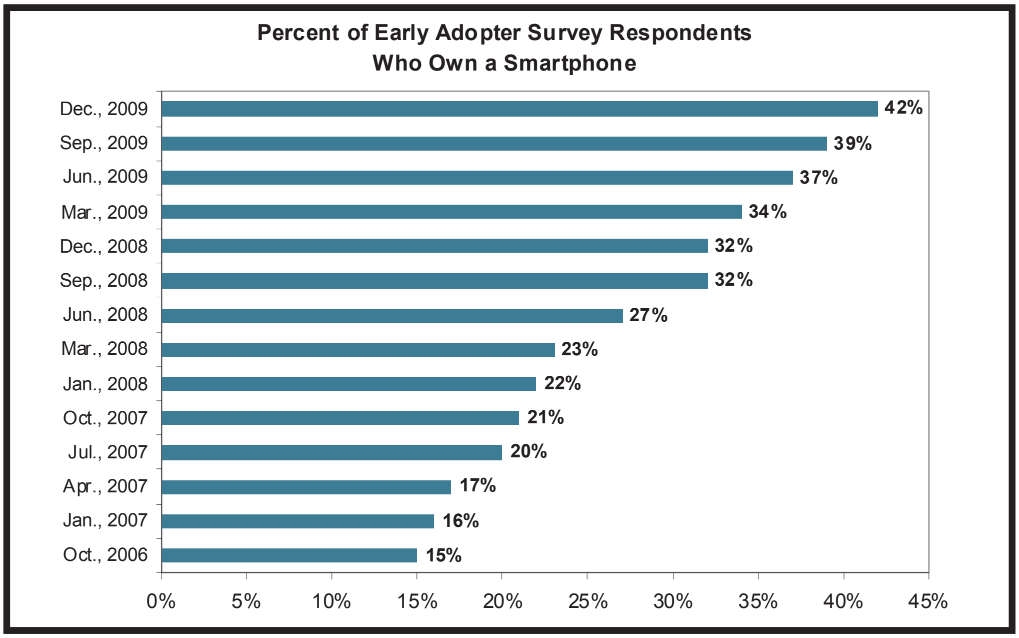
[499] David Lieberman, *FCC Report Inflates Smartphone Usage Estimate, Researcher Says*, USA TODAY, Oct. 25, 2010, at http://content.usatoday.com/communities/technologylive/post/2010/10/fcc-report-inflates-smartphone-usage-estimate-researcher-says/1.

Chart 8
Smartphone Adoption Rates (ChangeWave Survey)[500]



164. In addition to the data on the number of subscribers by type of device, the Pew Internet & American Life Project (Pew) has released data on the percentage of mobile wireless subscribers who use different types of mobile wireless services and applications. As discussed in the *Fourteenth Report*, Pew estimated that 69 percent of American adults used some type of non-voice, mobile data service in April 2009, up from 58 percent in December 2007.[501] In July 2010, Pew released additional data on the number of mobile data users and reported that, as of May 2010, an estimated 40 percent of American adults had used their cell phone to go online (for e-mail, Internet access, or instant messaging), up from 32 percent in April 2009 and 24 percent in December 2007.[502] In addition, Pew estimated that the percentage of cell phone users who used their phones for text messaging, Internet access, or e-mail had increased substantially between December 2007 and May 2010, as shown in Chart 9 below.[503]

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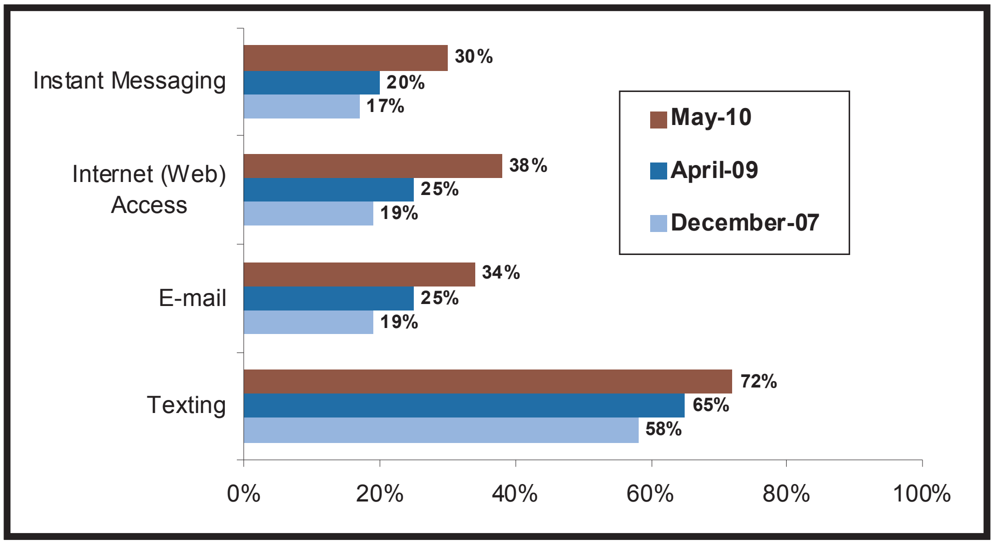
[500] Based on a survey of 4,068 early adopters and professionals in business, technology, and medicine. David Lieberman, *FCC Report Inflates Smartphone Usage Estimate, Researcher Says*, USA Today, Oct. 25, 2010, at http://content.usatoday.com/communities/technologylive/post/2010/10/fcc-report-inflates-smartphone-usage-estimate-researcher-says/1; Paul Carton and Jean Crumrine, *New Survey Shows Android OS Roiling the Smartphone Market*, ChangeWave Research, Jan. 4, 2010, *available at* http://www.changewaveresearch.com/articles/2010/01/smart_phone_20100104.html.

[501] John Horrigan, *Wireless Internet Use, More Than Half of Americans – 56% - Have Accessed the Internet Wirelessly on Some Device, Such as a Laptop, Cell Phone, MP3 Player, or Game Console*, Pew Internet & American Life Project, July 2009 (survey conducted March 26 - April 19, 2009), at 21-22 (*Wireless Internet Use*).

[502] Aaron Smith, *Mobile Access 2010*, Pew Internet & American Life Project, July 7, 2009 (survey conducted April 29 – May 20, 2010), at 7 (*Mobile Access*); *Wireless Internet Use*, at 16.

[503] *Mobile Access 2010*, at 12; *Wireless Internet Use*, at 23.

Chart 9
Mobile Data Service Adoption Rates Among Cell Phone Users[504]



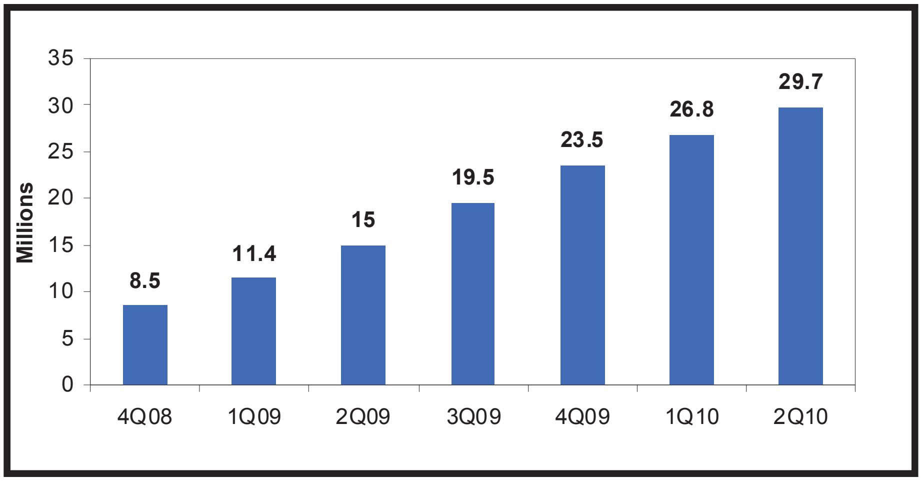
165. Certain individual service providers have reported data on the number of data-capable devices in use by their subscribers. For instance, AT&T reported that, as of the end of 2009, it had 23.5 million postpaid customers using 3G "integrated" devices, those with full Internet access and texting capabilities, up more than 15 million from approximately 8 million at the end of 2008 (see Chart 10). In addition, AT&T had over 1.4 million 3G Laptop Connect Cards in service at the end of 2009, up from 1.2 million at the end of 2008, while the number of Leap mobile broadband laptop cards in service more than tripled during 2009 from approximately 150,000 to nearly 500,000.[505] Verizon Wireless reported that, at the end of 2009, 15 percent of its postpaid subscribers had a smartphone and 11 percent had a multimedia device.[506]

[504] *Mobile Access 2010*, at 7; *Wireless Internet Use*, at 16.

[505] Craig Moffett, *et al.*, *U.S. Telecommunications and Global Telecom Equipment: The Wireless Data Exaflood*, Bernstein Research, June 14, 2010, at 9-10.

[506] Phil Goldstein, *Verizon Benefits from Droid Momentum*, FierceWireless, Jan. 26, 2010, *available at* http://www.fiercewireless.com/story/verizon-notches-2-2m-subs-q4/2010-01-26#ixzz0h2Sz4kWV (citing Verizon CFO Jon Killian). Verizon noted that all of these devices now require a subscription to a data plan. The company expects to continue to see strong growth in wireless data. *Id.*

Chart 10
AT&T 3G Postpaid Integrated Devices[507]



3. Mobile Wireless Subscribers by Pricing Plan

166. While the majority of subscribers in the United States today are postpaid, the prepaid and wholesale segments continued to grow at a faster pace in 2009 than postpaid. According to UBS data, the number of prepaid subscribers grew 17 percent during 2009, with the unlimited prepaid segment growing 58 percent, and the number of wholesale subscribers grew 55 percent (see Chart 11).[508] During the same period, the number of postpaid subscribers grew two percent, and the total number of subscribers grew just under six percent. The increase in unlimited prepaid subscribership levels may reflect the decreasing prices of unlimited prepaid plans, as discussed above, as well as the economic downturn.[509]

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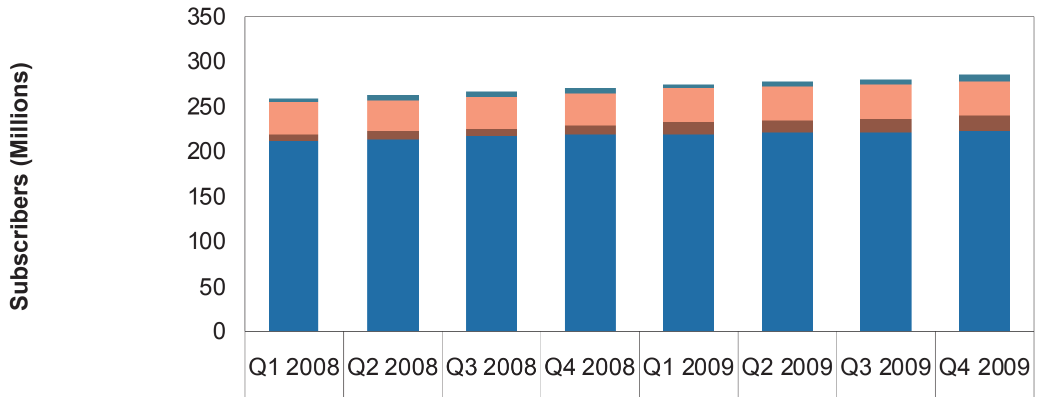
[507] "Integrated" devices as defined by AT&T as devices with full Internet and texting capabilities. AT&T Investor Update, 3Q09 Earnings Conference Call, Oct. 22, 2009, *available at* http://www.att.com/Investor/Financial/Earning_Info/docs/3Q_09_slide_c.pdf ; AT&T Investor Update, 4Q09 Earnings Conference Call, Jan. 28, 2010, *available at* http://www.att.com/Investor/Financial/Earning_Info/docs/4Q_09_slide_c.pdf; AT&T Investor Update, 1Q10 Earnings Conference Call, Apr. 21, 2010, *available at* http://www.att.com/Investor/Financial/Earning_Info/docs/1Q_10_slide_c.pdf; AT&T Investor Update, 2Q10 Earnings Conference Call, July 22, 2010, available at http://www.att.com/Investor/Financial/Earning_Info/docs/2Q_10_slide_c.pdf

[508] *US Wireless 411 2Q10*, at 4.

[509] *See* Section V.A.3, Mobile Wireless Subscribers by Pricing Plan, *supra*; Verizon Wireless Comments at 46-49 (citing IDC, Morningstar, UBS, and Credit Suisse First Boston).

Chart 11
Mobile Wireless Subscribers by Pricing Plan[510]



	Q1 2008	Q2 2008	Q3 2008	Q4 2008	Q1 2009	Q2 2009	Q3 2009	Q4 2009
Wholesale	4.496	4.815	4.72	4.727	5.197	5.317	5.456	7.328
Traditional Prepaid	34.839	35.005	35.606	36.78	37.383	37.474	37.781	38.954
Unlimited Prepaid	8.334	8.841	9.221	10.075	12.162	13.611	14.595	15.935
Postpaid	211.687	214.059	216.73	218.752	219.576	220.809	222.186	223.538

167. Mobile wireless service providers also offer family plans that give discounted rates for households with multiple handsets as a way to increase penetration on a household basis.[511] Most family plans include one line at an average of $45 per month for voice service for the first line and additional lines for approximately $10 per month per line, for up to four more lines.[512] As shown in Chart 12, Credit Suisse estimates that 67 percent of all mobile wireless subscribers were part of a family plan in 2009, up from just 35 percent in 2004.[513] In addition, Nielsen estimates that the 66 percent of all non-corporate wireless subscribers were family plan subscribers in the third quarter of 2009, up from 63 percent in the third quarter of 2008.[514] Family plans allow service providers to increase their subscribership levels to other members of the same household or family, such as children, grandparents, or other relatives.

[510] *US Wireless 4114Q09*, at 4.

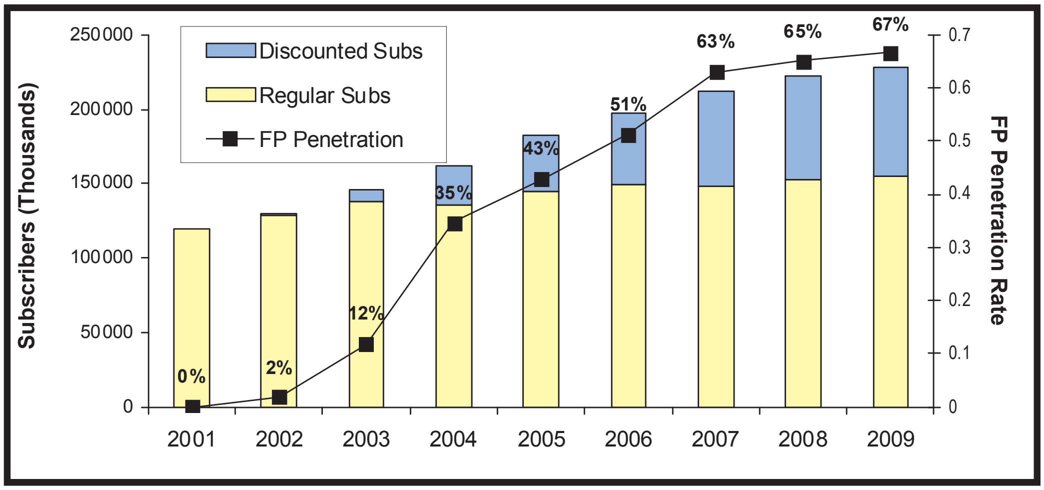
[511] *See* Section IV.A, Price Rivalry: Developments in Mobile Service Pricing Plans, *supra.*

[512] John C. Hodulik, *et al.*, *MetroPCS - Growth Stays Strong, +CF on the Way*, UBS, UBS Investment Research, May 8, 2009, at 2.

[513] In addition, UBS estimates that roughly two-thirds of AT&T's and Verizon Wireless's postpaid customers subscribe to family plans. John C. Hodulik, *et al.*, *Telecommunications - Prepaid Will Set the Pace in Wireless*, UBS, UBS Investment Research, Mar. 23, 2009, at 6.

[514] The Nielsen Company: Mobile Insights 2009.

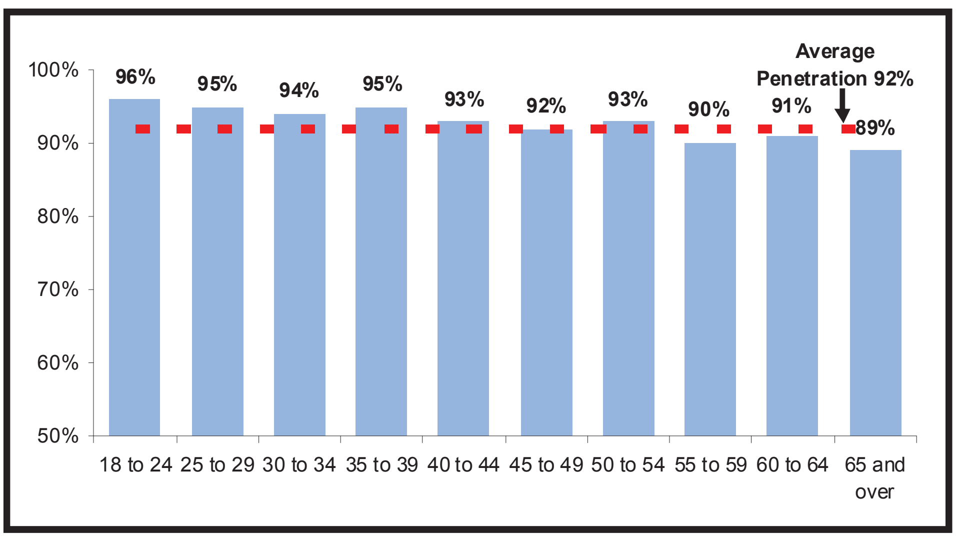
Chart 12
Family Plan Subscribers and Penetration of Postpaid Base[515]



4. Mobile Wireless Subscribers by Age

168. In April 2009, Morgan Stanley estimated mobile wireless subscribership by age group (see Chart 13). While penetration rates are high at nearly every age group, they are highest among 18- to 24-year-olds, where penetration has reached 96 percent. The only age group with a penetration rate less than 90 percent is the 65 and over age range, where penetration is 89 percent.

Chart 13
Mobile Wireless Penetration by Age[516]

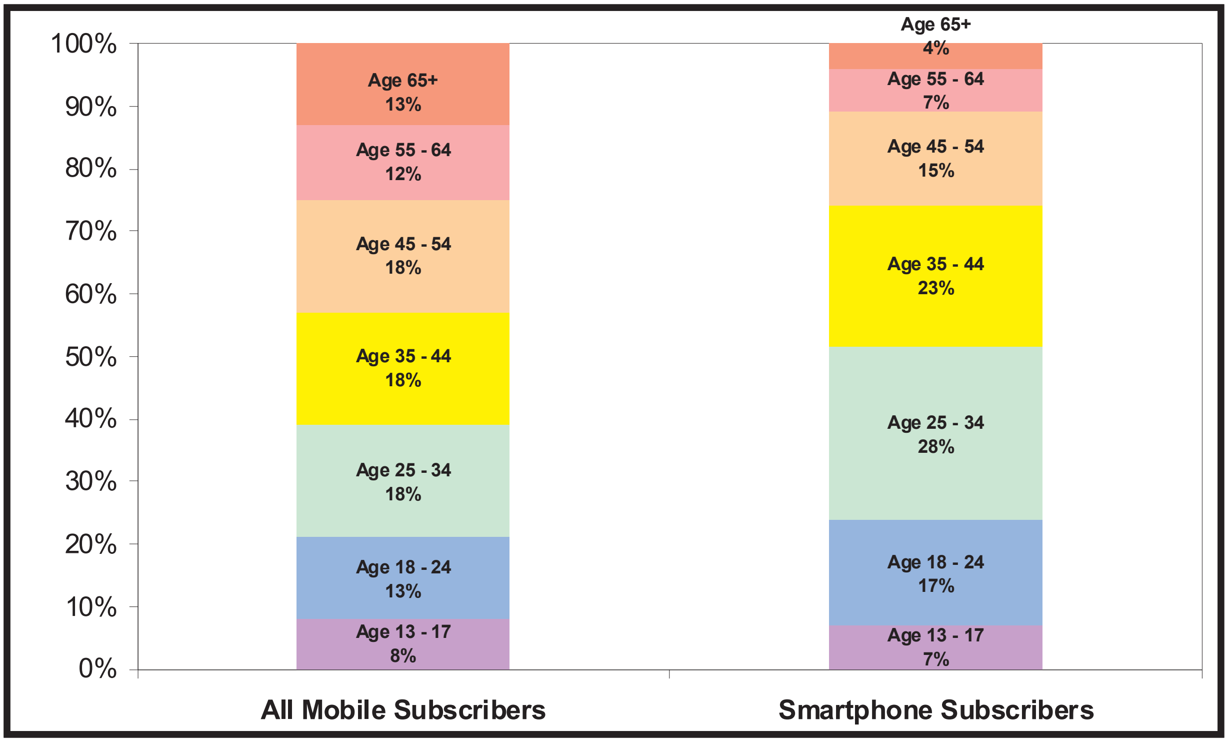


[515] Data provided by Credit Suisse First Boston.

[516] Simon Flannery , et al., *1Q Wireless Survey: Verizon, AT&T & Unlimited Prepaid Carriers Show Strength*, Morgan Stanley, Apr. 12, 2009, at 18 (Exhibit 28).

169. In addition, comScore has estimated the demographic age breakdown of all 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, smartphones are more concentrated in younger age groups. Chart 14 shows that adults age 18-44 comprise 49 percent of all mobile wireless subscribers, but make up 68 percent of smartphone users. On the other hand, adults over age 55 comprise 25 percent of all mobile wireless subscribers but only 11 percent of smartphone subscribers.

Chart 14
Age Breakdown of Mobile Wireless Subscribers[517]



170. Pew also provides data on wireless Internet use among different age groups and found that, as of May 2010, 18-to-29-year-olds had the highest penetration rate of any age group in overall wireless Internet use (Wi-Fi or mobile broadband connection) and in the various device categories – laptop, cell phone, or both, as shown in Table 15.[518] It was most common for adults age 18-49 to access the Internet wirelessly using both a laptop and a cell phone. However, among older adults over age 50, the most common method was with a laptop only. In addition, Pew found that wireless Internet penetration increased across all age groups between April 2009 and May 2010 (see Chart 15).

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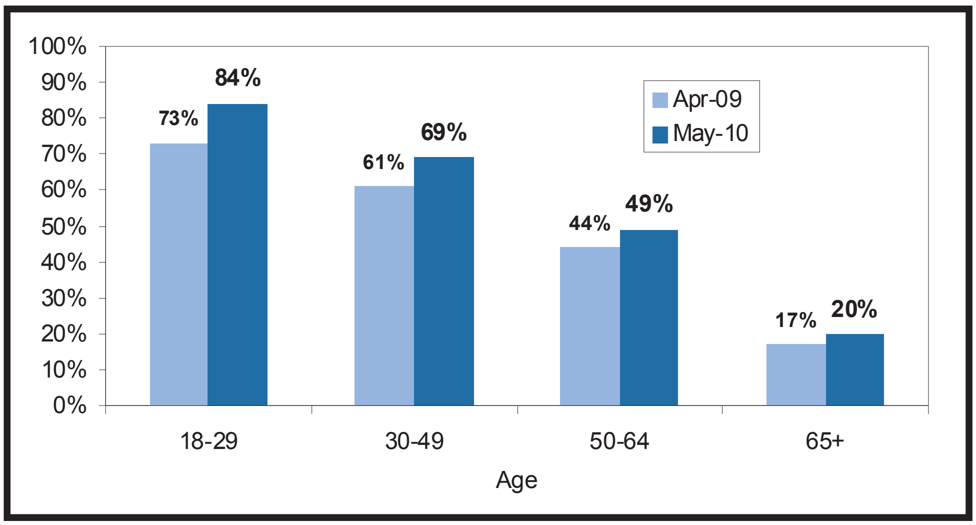
[517] The data are based on a three-month average ending September 2010. *See Age Demographic Breakdown of U.S. Mobile Subscribers vs. Smartphone Subscribers*, comScore, The comScore Data Mine, Nov. 1, 2010.

[518] *Mobile Access 2010*, at 11.

Table 15
Wireless Internet Use by Age and Type of Device[519]

Age	Wireless Internet Penetration Rate	Laptop and Cell Phone	Laptop Only	Cell Phone Only
18-29	84%	45%	19%	19%
30-49	69%	35%	22%	13%
50-64	49%	17%	23%	9%
65+	20%	6%	9%	5%

Chart 15
Percent of Adults Using Wireless Internet Connections (Wi-Fi or Mobile)[520]



171. Pew also provides data on mobile wireless service adoption rates among teenagers. As discussed in the *Fourteenth Report*, Pew found that, as of September 2009, 75 percent of teens age 12 to 17 subscribed to mobile wireless service, and that subscribership levels increased as teens grew older.[521] In a more recent study, Pew provided more in-depth data on mobile wireless usage and adoption rates among teens.[522] Pew reported that a higher percentage of teens use text messaging (54 percent) than use mobile voice calling services (38 percent), and that the adoption rates for both services generally increase with age (see Table 16).[523]

[519] Wireless Internet users include those connecting to the Internet via a Wi-Fi or 3G/4G mobile broadband network. Aaron Smith, *Mobile Access 2010*, Pew Internet & American Life Project, July 7, 2009 (survey conducted April 29 – May 20, 2010), at 11.

[520] *Id*.

[521] *See Fourteenth Report,* 25 FCC Rcd at 11515-16, ¶ 166.

[522] Amanda Lenhart, *et al.*, *Teens and Mobile Phones*, Pew Internet and American Life Project, April 2010, (*Teens and Mobile Phones*), http://www.pewinternet.org/Reports/2010/Teens-and-Mobile-Phones.aspx?r=1 (report based on survey results and focus group feedback from June through October 2009).

[523] *Teens and Mobile Phones*, at 4.

Table 16
Mobile Wireless Voice and Texting Penetration among Teenagers[524]

Age	Text Messaging	Mobile Voice Calling
12	35%	17%
13	41%	29%
14	58%	42%
15	64%	41%
16	57%	51%
17	77%	60%
Teen Average	***54%***	***38%***

172. As discussed in the *Fourteenth Report*, one marketing analyst reported in December 2009 that the adoption rates of mobile data services, such as web browsing, e-mail, and applications, are higher in the 18-to-24 and 25-to-44 age groups than among older users.[525] In addition, as shown in Table 17 below, the smartphone ownership and text messaging adoption rates are higher among younger age groups.[526]

Table 17
Smartphone and SMS Adoption by Age Group[527]

Age Range	Smartphone Ownership Rate	SMS Adoption Rate
18 to 24 year-olds	29%	83%
25 to 44 year-olds	29%	65%
45 to 54 year-olds	24%	52%
55 to 64 year-olds	13%	33%

5. Mobile Wireless Connections by Economic Area (EA)

173. 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 on mobile devices with phone numbers assigned to them.[528] As discussed above, we use EAs as the geographic unit for measuring the level of concentration in the mobile wireless services industry in

[524] *Teens and Mobile Phones*, at 4.

[525] Marketing Sherpa, *Consumer Behavior in the Mobile Channel: 4 Trends Marketers Should Note,* Dec. 22, 2009, *available at* https://www.marketingsherpa.com/sample.cfm?ident=31481.

[526] *Id*.

[527] *Id*.

[528] 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.

order to maintain continuity with past *Reports*[529] and ensure that we do not compromise the confidential information found in the NRUF data.[530]

174. Regional penetration rates for the 172 EAs covering all 50 states, as of December 2009, can be seen in Appendix C, Table C-3. In addition, a map showing regional penetration rates by EAs can be found in Appendix D.[531] Eighteen EAs had penetration rates exceeding 100 percent, up from eight at the end of 2008, which could be the result of subscribers having more than one device, as well as traditional prepaid customers switching to a new device without terminating service on the old one and therefore maintaining two phone numbers.[532] In 83 EAs, the penetration rates exceeded 90 percent, up from 53 EAs at the end of 2008. The EA with the lowest reported penetration rate was Sacramento-Yolo, CA (EA 164), with a penetration rate of 71 percent.[533] The EA with the lowest population density, Anchorage, AK (EA 171), had a penetration rate of 90 percent, while the EA with the highest density, Tampa-St. Petersburg-Clearwater, FL (EA 34), had a penetration rate of 95 percent. As previously stated, based on an analysis of NRUF data, the national penetration rate at the end of 2009 was 94 percent.

B. Net Adds

1. Industry-Wide Net Adds

175. As discussed in the *Fourteenth Report*, as the wireless industry has reached penetration levels exceeding 90 percent of the U.S. population, the growth of net new mobile wireless connections

[529] 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, for analyzing 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.

[530] 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").

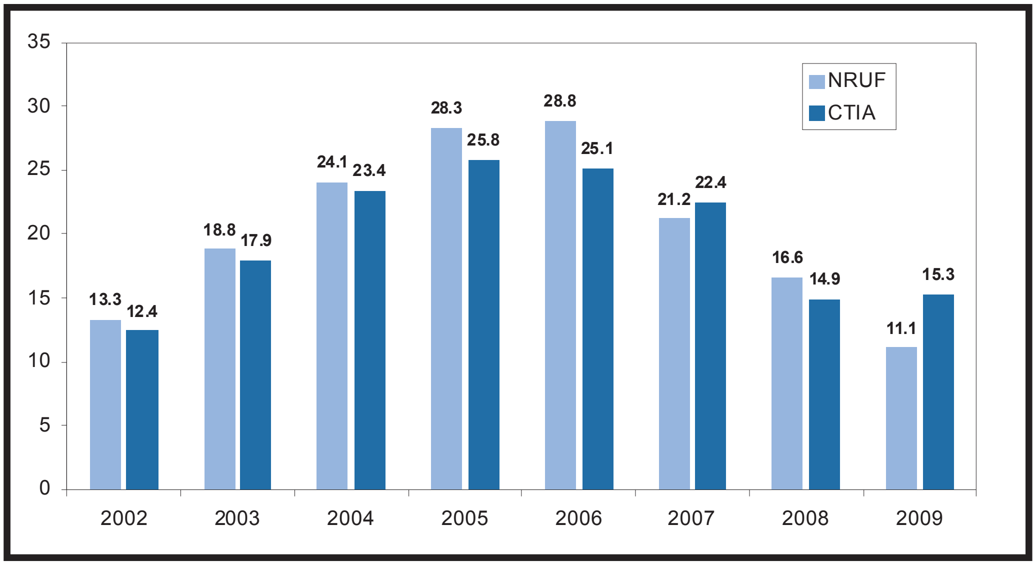
[531] *See* Map D-30, Appendix D, *infra*.

[532] We excluded New Orleans, LA-MS (EA 83) from this analysis due to what we believe to be an aberration with the statistics. See Appendix C, Table C-3: Economic Area Penetration Rates, note 1 infra.

[533] 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.

has decelerated in recent years. During 2009, the number of new connections, based on NRUF data, grew four percent, down from the 6.3 percent growth rate in 2008. The total number of net adds in 2009 was 11.1 million according to NRUF data and 15.3 million according to CTIA data (see Chart 16).

Chart 16
Total Mobile Wireless Connection Annual Net Adds[534]



176. Net adds in 2009 were largely the result of subscribers purchasing a second or third mobile wireless device, such as a laptop card or e-reader, as well as new subscribers, particularly those in younger age groups, purchasing mobile wireless service for the first time.[535] As discussed above, penetration rates among teens and young adults are significantly higher than among adults over age 65.[536] In addition, the number of mobile broadband-enabled laptops and laptop cards increased by 4.7 million during 2009. As shown in Chart 17, a large portion of the net adds in 2009 occurred during the fourth quarter, when net adds totaled 5.7 million, an amount significantly higher than the 2008-2009 quarterly average of 3.8 million. During that quarter, e-readers such as the Amazon.com Kindle and Barnes & Noble Nook were popular holiday gifts. Leap launched mobile broadband service in several new markets and at a lower price than many of its rivals, and introduced several new smartphones.[537]

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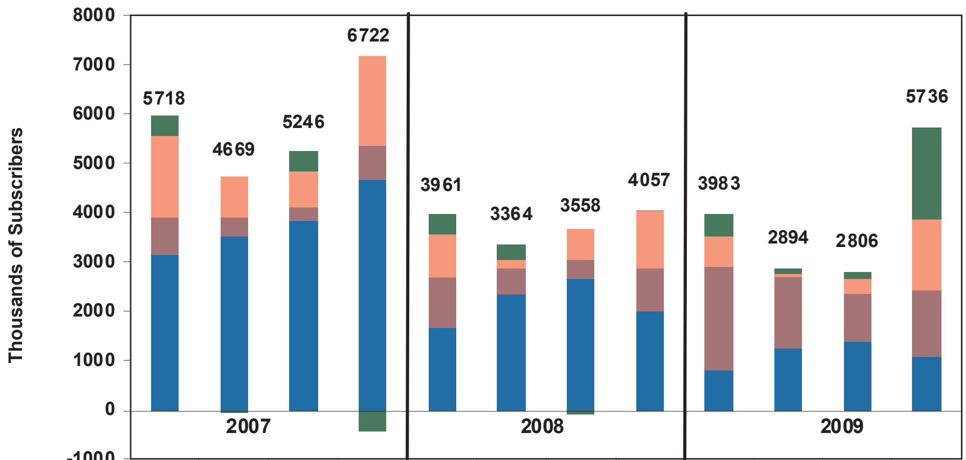
[534] *See* Table 14, *supra*.

[535] As discussed above, the NRUF data used to generate an estimate of mobile wireless subscribers 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 subscriber, and many data-only devices with mobile wireless network connections, such as laptop cards and e-readers, have phone numbers assigned to them. *See* Section V.A.1, Total Mobile Wireless Connections, *supra.*

[536] *See* Section V.A.4, Mobile Wireless Subscribers by Age, *supra*.

[537] *See* Sections IV.A, Price Rivalry: Developments in Mobile Service Pricing Plans, IV.B.1.a, Service Provider Technology Deployments, and, IV.B.3, Differentiation in Mobile Wireless Handsets/Devices, *supra*. According to Bernstein, "[l]aptop cards ... have proliferated, with low cost plans from both Leap Wireless and Clearwire that have begun to take 3G laptop connectivity into the mainstream consumer market for the first time." *See* Craig Moffett, *et al*., *U.S. Telecommunications and Global Telecom Equipment: The Wireless Data Exaflood*, Bernstein Research, June 14, 2010, at 7.

Chart 17
Quarterly Net Adds by Pricing Plan: 2007-2009[538]



	Q1 2007	Q2 2007	Q3 2007	Q4 2007	Q1 2008	Q2 2008	Q3 2008	Q4 2008	Q1 2009	Q2 2009	Q3 2009	Q4 2009
Wholesale	407	-55	395	-418	384	319	-95	7	470	120	139	1872
Traditional Prepaid	1650	815	754	1813	891	166	602	1174	612	87	302	1448
Unlimited Prepaid	776	381	275	708	1025	507	380	854	2086	1449	983	1340
Postpaid	3138	3529	3822	4660	1661	2372	2671	2022	815	1237	1382	1077
Total Net Adds	5718	4669	5246	6722	3961	3364	3558	4057	3983	2894	2806	5736

2. Mobile Wireless Net Adds by Pricing Plan

177. Examining net adds by pricing plan also provides insight into the type of subscriptions that contributed to the growth in mobile wireless connections in 2009. As shown in Chart 17 above, net adds have varied by type of pricing plan over the past two years.[539] The number of postpaid subscribers continued to grow during 2009, but at a slower rate than in 2008. According to UBS, there were 4.5 million postpaid net adds (29 percent of total net adds) in 2009, down from 8.7 million (58 percent of total net adds) in 2008. The number of unlimited prepaid net adds, on the other hand, grew significantly during 2009, from 2.8 million (19 percent of total net adds) in 2008 to 5.9 million (38 percent of total net adds) in 2009. This trend may continue to be a reflection of the lower prices and increased number of offerings for prepaid plans, as discussed above, and of the economic recession, which may have led consumers to seek lower-priced, higher-value mobile wireless service with no long-term contracts.[540]

178. The number of wholesale net adds (excluding TracFone) also grew during 2009, increasing from 615,000 in 2008 to 2.6 million in 2009.[541] Wholesale subscribers accounted for 17 percent of total net adds in 2009, up from four percent in 2008. The increase in the number of wholesale subscribers may reflect the growing number of subscribers who purchased Clearwire's WiMAX service

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[538] *US Wireless 411 2Q10*, at 4. Wholesale excludes TracFone.

[539] Note that the postpaid, unlimited prepaid, and wholesale categories can include subscriptions to voice-only, data-only, and voice-data services.

[540] *See* Section IV.A, Price Rivalry: Developments in Mobile Service Pricing Plans, *supra*.

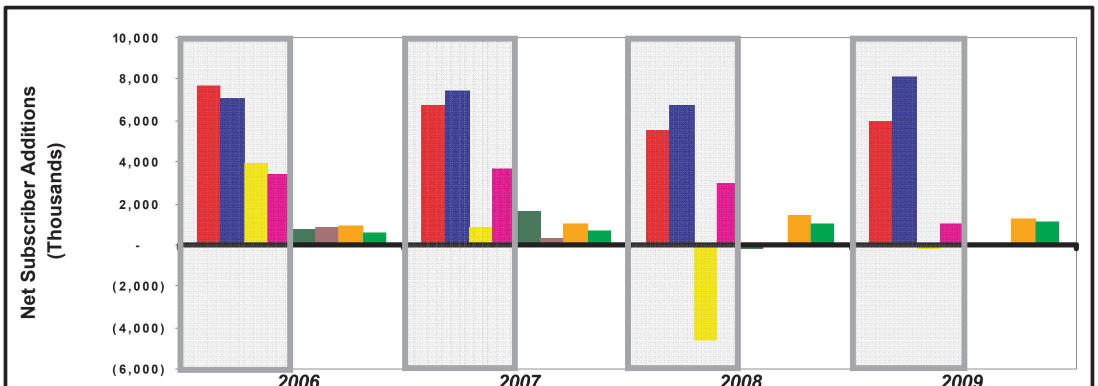
[541] *See* Section V.A.3, Mobile Wireless Subscribers by Pricing Plan, *supra*, for a discussion of the reasons for the increasing number of wholesale subscribers.

on a wholesale basis from another provider,[542] as well as the growing use of data-only devices, such as e-readers, that use mobile data service on a wholesale basis. For instance, UBS estimates that the number of wholesale subscribers grew more than 34 percent during the fourth quarter of 2009 alone, the same period during which Amazon.com and Barnes & Noble were heavily promoting their respective Kindle and Nook e-reader devices for the holiday season.[543]

3. Mobile Wireless Net Adds by Service Provider

179. As discussed in the *Fourteenth Report* and shown in Chart 18 below, net subscriber additions were not been evenly distributed across all service providers. During 2009, AT&T and Verizon Wireless gained 8.1 million and 6 million net adds, respectively, while T-Mobile had just over 1 million net adds and Sprint Nextel had a 205,000 net subscriber loss. MetroPCS and Leap, while smaller than the top four providers, increased their subscriber bases by about 24 and 29 percent, respectively during 2009.

Chart 18
Net Additions by Service Provider[544]



	2006	2007	2008	2009
Verizon Wireless	7,715	6,740	5,558	5,974
AT&T	7,114	7,423	6,785	8,111
Sprint Nextel	3,894	830	(4,667)	(205)
T-Mobile	3,442	3,657	2,973	1,032
Alltel	722	1,576	(181)	
US Cellular	870	307	74	(55)
MetroPCS	941	1,022	1,404	1,273
Leap Wireless	561	635	981	1,109

* Includes 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.

[542] Companies reselling Clearwire's WiMAX service include Comcast, Bright House Networks, and Best Buy. *See* Sections III.E.1, Entry and IV.B.1.a, Service Provider Technology Deployments, *supra.*

[543] *US Wireless 411 2Q10*, at 4. Wholesale subscribers exclude TracFone.

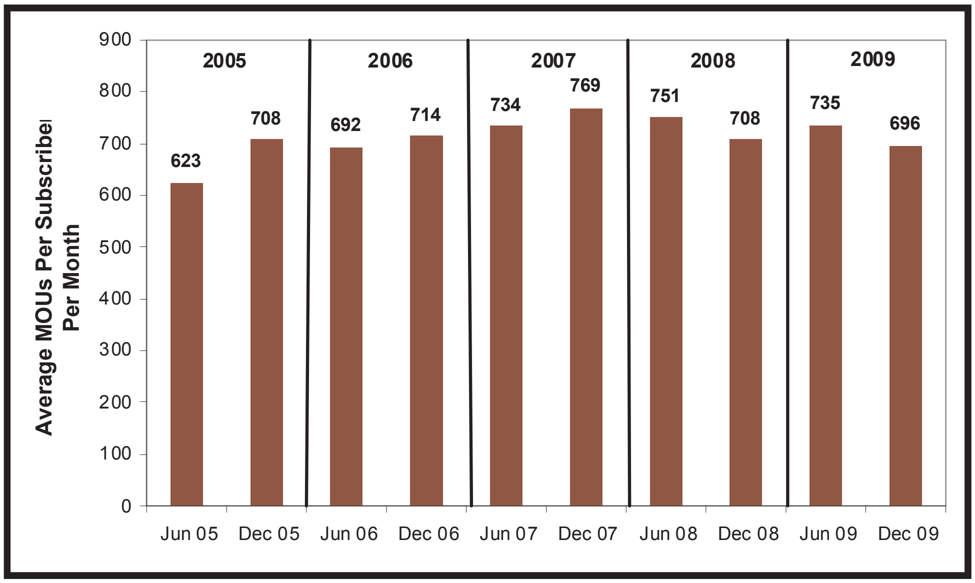
[544] *See Fourteenth Report*, 25 FCC Rcd at 11521, Chart 20, 11648, Table C-4; *Thirteenth Report*, 24 FCC Rcd at 6320-21, Table A-4 (2006 subscriber data); *Twelfth Report*, 23 FCC Rcd at 2361-62, Table A-4 (2005 subscriber data). This research includes wholesale subscribers. *Pro-forma* calculations were made to account for mergers and show only "organic" net adds generated independent of mergers. Verizon Wireless's reported net additions for 2009, including the subscribers acquired from Alltel, totaled 19,193,000. Verizon Communications, Inc., SEC Form 10-K (Portions of Verizon Annual Report to Shareholders), filed Feb. 26, 2010, *available at* http://www.sec.gov/Archives/edgar/data/732712/000119312510041685/dex13.htm.

C. Output and Usage Levels

1. Mobile Voice

180. As a measure of mobile voice usage, CTIA reports the average MOUs for six-month periods.[545] As shown in Chart 19 below, MOUs continued to decline in 2009, from 708 for the second half of 2008 to 696 during the second half of 2009. When comparing the first half of 2008 with the first half of 2009, MOUs declined two percent from 751 to 735. The trend of declining voice minutes may be due to substitution by mobile messaging and other mobile data services, particularly among younger users.[546] A study by Nielsen found that average MOUs fell five percent between 2009 and 2010, and that the decline was 17 percent among 18- to 24-year-olds.[547]

Chart 19
Average MOUs Per Subscriber Per Month[548]



181. Chart 20 below shows that, while T-Mobile's MOU levels have been consistently higher than those of the other three nationwide providers over the past several quarters, the average MOUs of all four nationwide service providers declined during 2009.

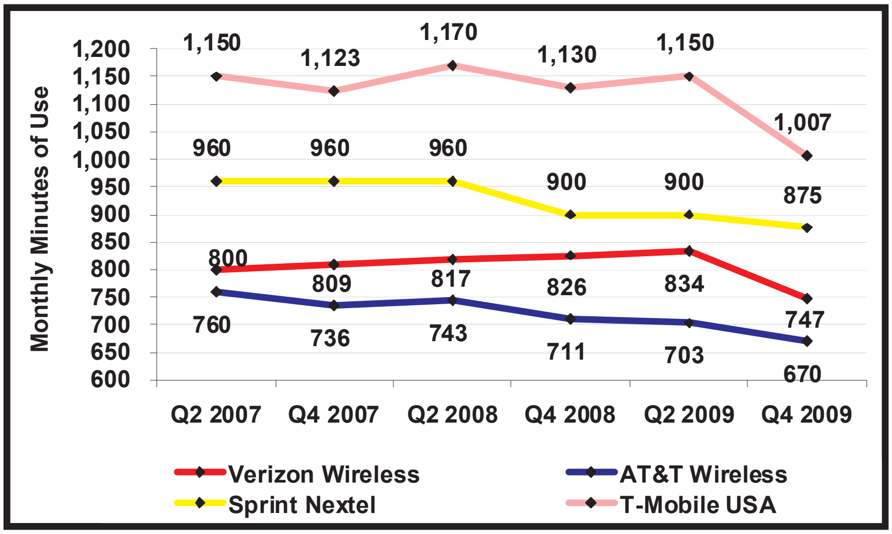
[545] CTIA aggregates all of the service providers' MOUs from January 1 through June 30, or from July 1 through December 31, then divides by the average number of subscribers for the period, and then divides by six. *See Thirteenth Report*, 24 FCC Rcd at 6284, note 582.

[546] *See* Katherine Rosman, *Y U Luv Texts, H8 Calls*, The Wall Street Journal, Oct. 14, 2010; *Fourteenth Report*, 25 FCC Rcd at 11521, ¶ 176. Mobile messaging traffic is discussed in Section V.C.2, Mobile Messaging, *infra.*

[547] *See* Katherine Rosman, *Y U Luv Texts, H8 Calls*, The Wall Street Journal, Oct. 14, 2010.

[548] *CTIA Year-End 2009 Wireless Indices Report*, at 200-201.

Chart 20
MOUs Per Subscriber: Four Nationwide Service Providers[549]



2. Mobile Messaging

182. Mobile text messaging traffic continued to grow in 2009, though at a slower rate than in 2008. According to data reported by CTIA, text messaging volumes grew from a total of 1 trillion in 2008 to 1.6 trillion in 2009 (see in Chart 21).[550] This represents a growth rate of 56 percent, which is lower than the 177 percent growth rate seen in 2008. Mobile wireless subscribers sent significantly more photo, video, and other multimedia messages (MMS) with their devices during 2009. As shown in Chart 22 below, CTIA reports that a total of 34.5 billion MMS messages were sent during 2009, a 131 percent increase from the 14.9 billion sent during 2008.[551] Over 70 percent of the total MMS messages sent during 2009 were sent during the second half of the year.

[549] *US Wireless 411 2Q09.*

[550] *CTIA Year-End 2009 Wireless Indices Report*, at 209-210.

[551] *CTIA Year-End 2009 Wireless Indices Report*, at 211-212.

Chart 21
Six-Month Text Messaging Traffic Volumes[552]

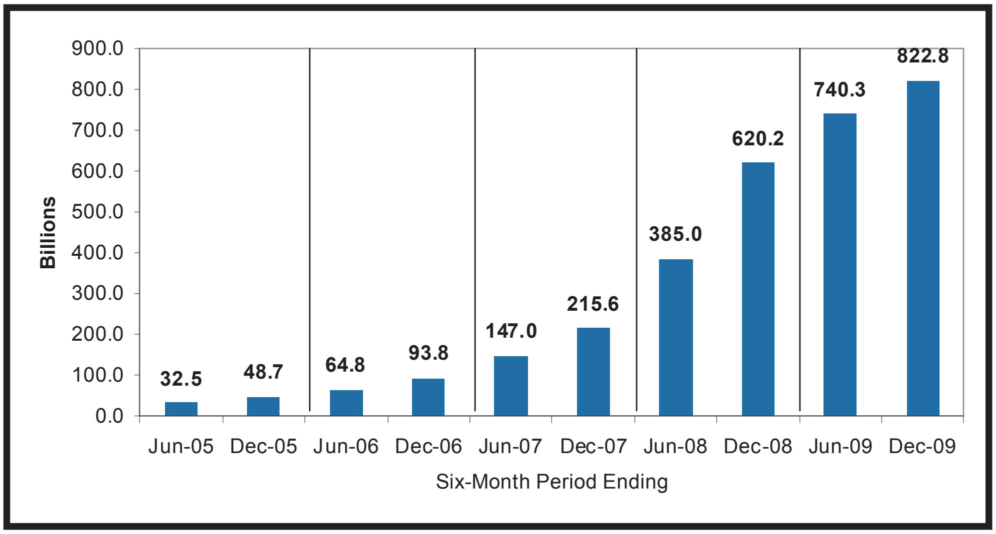
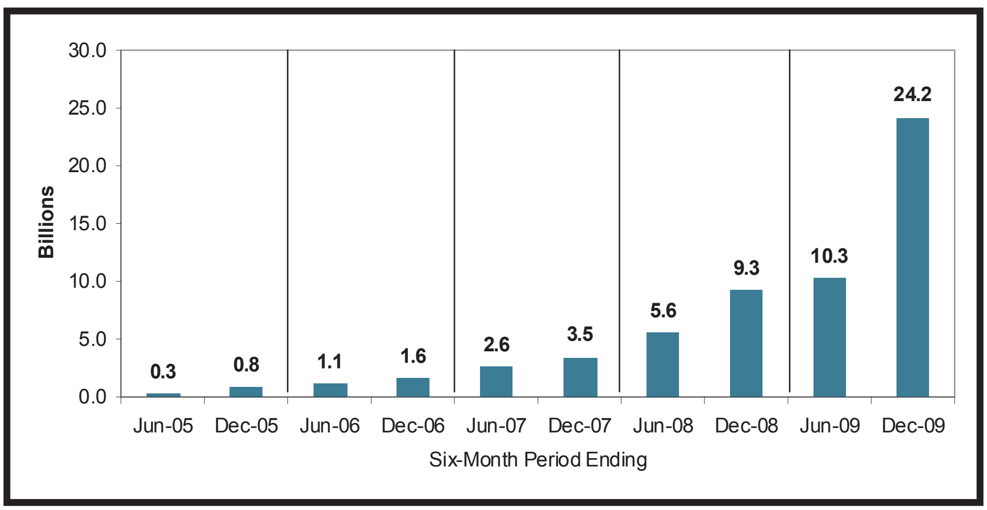


Chart 22
Six-Month MMS Traffic Volumes[553]



183. We can estimate the number of text and MMS messages per subscriber per month by dividing the total number of messages by the average number of mobile wireless subscriber connections, while recognizing that not all mobile wireless subscribers use messaging services. As shown in Table 18, the average mobile wireless subscriber sent 488 text messages and 14.4 MMS messages per month during the second half of 2009. This represents a 26 percent increase in the average number of text messages per subscriber per month from the second half of 2008, and a 148 percent increase in the average number of

[552] *CTIA Year-End 2009 Wireless Indices Report*, at 209-210.

[553] *CTIA Year-End 2009 Wireless Indices Report*, at 211-212.

MMS messages per subscriber per month during the same period. While the growth rate in MMS usage per subscriber remained similar to its 2008 level of 152 percent, the growth rate in text messaging usage slowed significantly from its 2008 level of 169 percent.

Table 18
Average Text and MMS Messages Per Subscriber Per Month[554]

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

184. As discussed in the *Fourteenth Report*, a major driver of growth in mobile messaging has been intensive use among the teen segment. According to a January 2010 study by Nielsen Media, teenagers send an average of 3,146 messages per month, which is the equivalent of more than ten messages every hour that they are not sleeping or in school. In the under-12 age group, Nielsen estimates that children are sending an average of 1,146 messages per month.[555] Users of social media and networking sites such as Twitter and Facebook are also creating text messaging traffic, as such users can be alerted via text message every time a tweet, message, or update earmarked for them is posted.[556] According to AT&T, 400 million texts generated by social networking sites were sent over its network in October 2009, and by September 2010, the number had more than doubled to one billion.[557]

3. Mobile Data Traffic (Non-Messaging)

185. As the mobile wireless industry migrates from a voice-centric to a data-centric service, data on data traffic are becoming increasingly important. Unlike voice and text messaging services, CTIA did not provide 2009 data on non-messaging mobile data traffic, though it did begin reporting data on mobile data traffic in 2010.[558] In October 2010, CTIA reported that mobile wireless service providers handled 161.5 billion MB of data during the first half of 2010, up 49.8 percent from the second half of

[554] *CTIA Year-End 2009 Wireless Indices Report*; Commission estimates.

[555] Roger Entner, *Under-aged Texting: Usage and Actual Cost*, Nielsen Wire, Jan. 27, 2010, *available at* http://blog.nielsen.com/nielsenwire/online_mobile/under-aged-texting-usage-and-actual-cost/.

[556] *See* Katherine Rosman, *Y U Luv Texts, H8 Calls*, The Wall Street Journal, Oct. 14, 2010.

[557] *Id*.

[558] *CTIA Year-End 2009 Wireless Indices Report*; Craig Moffett, *et al*., *U.S. Telecommunications and Global Telecom Equipment: The Wireless Data Exaflood*, Bernstein Research, June 14, 2010, at 12. In addition, U.S. mobile wireless service providers typically do not release precise statistics on the data traffic on their networks.

2009.[559]

186. Other sources also indicate that mobile data traffic is growing significantly.[560] For instance, Cisco estimates that total mobile data traffic in North America grew by two and a half times from 6,282 terabytes (TB) per month in 2008 to 16,022 TB per month in 2009.[561] Based on the Cisco estimates, one analyst claimed that total mobile wireless traffic was evenly split between voice and data as of June 2010.[562] This analyst also estimated that average monthly data traffic per subscriber grew 78 percent from 138 MB in 2008 to 245.4 MB in 2009.[563] According to a report by Allot Communications, global mobile data bandwidth usage increased 72 percent during the second half of 2009.[564] Data traffic is increasing with: (1) the growth in smartphone subscribers; (2) the growing use of data-only mobile devices, such as laptop cards, e-readers, and tablets; and (3) the increased popularity of higher-bandwidth mobile applications.[565] Allot Communications reported that web browsing continued to generate the largest amount of mobile data traffic (33 percent) during the second half of 2009, followed by HTTP streaming video (27 percent), web downloads (21 percent), peer-to-peer messaging (12 percent), and other applications (7 percent).[566] HTTP streaming video was the fastest growing application during the second half of 2009, with the use of that application nearly doubling and YouTube consuming 10 percent of global mobile data bandwidth during that period.[567]

187. Several sources provide estimates of mobile data usage by type of device. One analyst has estimated that iPhone users consume 250-350 MB per month, five to seven times the monthly bandwidth of an average mobile voice subscriber and twice the amount of an average 3G smartphone user.[568] In addition, 59 percent of laptop/aircard users transferred over 500 MB of data traffic per month.[569] As a point of comparison, Bank of America/Merrill Lynch estimated that, in leading mobile broadband markets around the world, per-capita mobile data usage was around 100 MB per month as of

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[559] *CTIA-The Wireless Association Releases Semi-Annual Survey on Wireless Trends*, Press Release, CTIA, Oct. 6, 2010, *available at* http://www.ctia.org/media/press/body.cfm/prid/2021.

[560] *See Fourteenth Report*, 25 FCC Rcd at 11526-27, ¶ 181; *Torch Passes from Voice to Data*.

[561] Craig Moffett, *et al*., *U.S. Telecommunications and Global Telecom Equipment: The Wireless Data Exaflood*, Bernstein Research, June 14, 2010, at 12 (*U.S. Telecommunications and Global Telecom Equipment: The Wireless Data Exaflood)*.

[562] *U.S. Telecommunications and Global Telecom Equipment: The Wireless Data Exaflood*, at 12.

[563] *U.S. Telecommunications and Global Telecom Equipment: The Wireless Data Exaflood*, at 13.

[564] Allot Communications, *Allot MobileTrends - Global Mobile Broadband Traffic Report*, H2/2009, at 3, *available at* http://www.allot.com/mobiletrends.html. (*Allot MobileTrends - Global Mobile Broadband Traffic Report)*.

[565] 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*.

[566] *Allot MobileTrends - Global Mobile Broadband Traffic Report*, H2/2009, at 9.

[567] *Allot MobileTrends - Global Mobile Broadband Traffic Report*, H2/2009, at 4, 7.

[568] *U.S. Telecommunications and Global Telecom Equipment: The Wireless Data Exaflood*, at 6, 17. *See also Fourteenth Report*, 25 FCC Rcd at 11527, ¶ 182, for estimates of mobile data usage by device from Validas.

[569] *U.S. Telecommunications and Global Telecom Equipment: The Wireless Data Exaflood*, at 6, 17. *See also Fourteenth Report*, 25 FCC Rcd at 11527, ¶ 182, for estimates of mobile data usage by device from Validas.

December 2009.[570] In addition, according to Informa, 86 percent of mobile data traffic in North America is generated by smartphone users, notably those using an iPhone or "high-end" Android devices.[571]

188. Estimates of mobile traffic on the networks of individual mobile wireless service providers also indicate consumers are generating increasing amounts of mobile data traffic. In its 2010 Annual Report, AT&T reported that the annual data traffic on its network increased from 8.7 million MB in 2008 to 40.5 million MB in 2009 to 110.3 million MB in 2010.[572] In addition, the average mobile data user on Clearwire's network consumes an estimated 7 GB per month.[573]

D. Pricing Levels, Changes, and Trends

1. Price Indicators

189. Wide variations in the non-price terms and features of mobile wireless service plans make it difficult to characterize the price of mobile wireless service. Consequently, it is difficult to identify sources of information that track mobile wireless service prices in a comprehensive manner.[574] As documented in previous reports, mobile wireless prices have declined significantly since the launch of PCS service in the mid-1990s. Two indicators of mobile wireless service pricing – the Cellular CPI and per-unit price of voice service – show that price levels remained generally flat between 2008 and 2009.[575] As mentioned above, it is no longer possible to calculate unit prices for text messaging because CTIA discontinued reporting a breakout of text messaging revenue from overall mobile wireless data revenue. In addition, it is not possible to calculate unit prices for non-messaging mobile data services because the industry did not report 2009 mobile data traffic and non-messaging data revenue figures.[576]

190. *Cellular CPI*. One source of price information is the cellular telephone services' component of the CPI (Cellular CPI) produced by the U.S. Department of Labor's Bureau of Labor Statistics (BLS).[577] Cellular CPI data are published on a national basis only.[578] As shown in Table 19

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[570] *See Finding Value in Smartphones*, at 28.

[571] *See Smartphones Account for Almost 65% of Mobile Traffic Worldwide*, Press Release, Informa Telecoms & Media, Nov. 2, 2010 (quoting principal analyst, Malik Kamal-Saadi).

[572] AT&T, 2010 Annual Report, at 28, *available at* http://www.att.com/Common/about_us/annual_report/pdfs/ATT2010_Full.pdf. AT&T also reported that its mobile data traffic increased 50-fold between October 2006 and October 2009. *See Fourteenth Report*, 25 FCC Rcd at 11528, ¶ 183. Other sources report that the total traffic on its mobile wireless network doubled during the second half of 2009. *U.S. Telecommunications and Global Telecom Equipment: The Wireless Data Exaflood*, at 6

[573] *U.S. Telecommunications and Global Telecom Equipment: The Wireless Data Exaflood*, at 7.

[574] *See Fourth Report*, 14 FCC Rcd at 10164-10165.

[575] 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.

[576] *See Fourteenth Report*, 25 FCC Rcd at 11529, 11533, ¶¶ 185, 193.

[577] *See* Table 19, *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). 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*.

below, from 2008 to 2009, the annual Cellular CPI remained unchanged while the overall CPI decreased by 0.4 percent. From December 1997, the Cellular CPI has declined 35.8 percent compared to the annual index.

Table 19
Change in CPI[579]

	CPI		Cellular CPI		All Telephone CPI		Local Telephone CPI		Long Distance Telephone CPI	
		Annual Change	Index Value	Annual Change	Index Value	Annual Change	Index Value	Annual Change	Index Value	Annual Change
Dec 1997	100		100		100		100		100	
1998	101.6		95.1		100.7		101.6		100.5	
1999	103.8	2.2%	84.9	-10.7%	100.1	-0.6%	103.4	1.8%	98.2	-2.3%
2000	107.3	3.4%	76.0	-10.5%	98.5	-1.6%	107.7	4.1%	91.8	-6.5%
2001	110.3	2.8%	68.1	-10.4%	99.3	0.8%	113.3	5.2%	88.8	-3.3%
2002	112.1	1.6%	67.4	-1.0%	99.7	0.4%	118.5	4.5%	84.9	-4.4%
2003	114.6	2.3%	66.8	-0.9%	98.3	-1.4%	123.3	4.1%	77.8	-8.4%
2004	117.7	2.7%	66.2	-0.9%	95.8	-2.5%	125.1	1.5%	70.9	-8.9%
2005	121.7	3.4%	65.0	-1.8%	94.9	-0.9%	128.5	2.7%	67.5	-4.8%
2006	125.6	3.2%	64.6	-0.6%	95.8	0.9%	131.1	2.1%	68.3	1.2%
2007	129.2	2.8%	64.4	-0.3%	98.247	2.6%	136.2	3.8%	71.453	4.6%
2008	134.1	3.8%	64.2	-0.2%	100.451	2.2%	141.0	3.6%	74.846	4.7%
2009	133.7	-0.4%	64.2	0.0%	102.39	1.9%	145.0	2.8%	78.099	4.3%
Dec 1997 to 2009		33.7%		-35.8%		2.4%		45.0%		-21.9%

191. *Revenue per Voice Minute*. In addition to the Cellular CPI, some analysts believe Voice RPM is a good proxy for mobile voice pricing.[580] This metric 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 for the equivalent period.[581] Using estimates of industry-wide voice ARPU[582] and MOUs from CTIA, as shown in Table 20, we estimate that Voice RPM in December of 2009, rounded to the nearest cent, remained at $0.05 for the third straight year. The

(Continued from previous page)
[578] *Id*. 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, and pagers. *Id*.

[579] 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 will be discontinued, and a new CPI for land-line telephone services will be published.

[580] *See US Wireless Matrix 1Q07*, at 52.

[581] 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.

[582] 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. *See infra* note 605.

absolute, unrounded estimate of Voice RPM in December of 2009 decreased nine percent from its absolute value in December of 2008.[583] While voice RPM has declined dramatically over the past 17 years, the rate of per-minute price declines has been varied considerably from year to year, and has decreased in recent years, as shown in Chart 23.

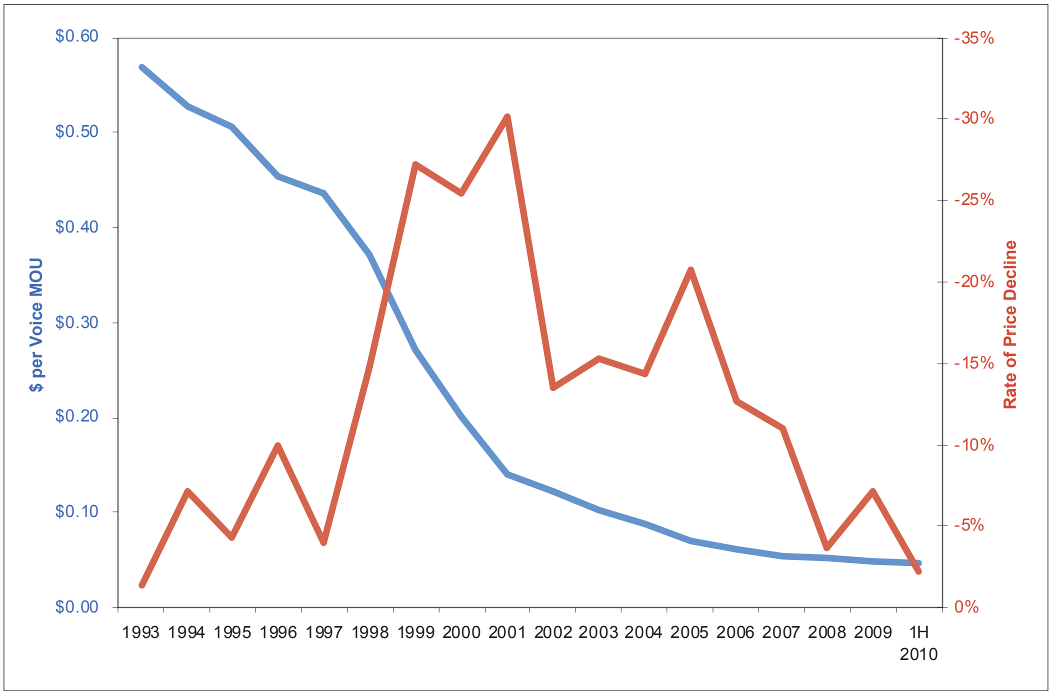
Table 20
Average Revenue Per Minute[584]

	Average Local Monthly Bill	Minutes of Use Per Month	Average Revenue Per Minute (Blended)	Annual Change in Blended RPM	Wireless Data Revenue as Percent of Total Service Revenues	Average Local Monthly Bill (excl. Data Revenues)	Average Revenue Per Voice Minute	Annual Change in Absolute 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%

[583] *See* Table 20, *infra*. Previous reports also included an estimate of Total or Blended RPM, which is calculated by dividing total ARPU by MOUs. However, as the contribution of data services to total revenues has increased, Blended RPM has become an increasingly inaccurate measure of the pricing of mobile voice service. Previously, revenues from mobile data services were a relatively insignificant portion of the average wireless subscriber's bill, and Blended RPM and Voice RPM were mostly identical. However, as data has become an ever increasing portion of subscriber bills, the two metrics have diverged, with the decline in Voice RPM becoming steeper, and its absolute value becoming lower, than Blended RPM. *See Fourteenth Report*, 25 FCC Rcd at 11531, ¶ 189; AT&T Comments at 30-31. Therefore, we are no longer including a discussion of Blended RPM in this *Report*.

[584] *CTIA Year-End 2009 Wireless Indices Report*, at 121, 200. *See* Appendix C, Table C-1 (ARPU). Data covers the last six months of each year. For purposes of this presentation in this table, RPM is rounded to two decimal places, but RPM change is based on absolute RPM.

Chart 23
Mobile Wireless Voice Revenue per Minute: 1993-2010



192. *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.[585] 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*.

193. Although we are no longer able to derive an estimate of average revenue per text message based on CTIA data, an alternative estimate from Morgan Stanley suggests that the unit price for text messages continued to fall in 2009. Morgan Stanley estimated that price per text yields dropped for the fifth consecutive year in 2009 to $0.009, a 25 percent decline from the previous year.[586] Morgan Stanley attributes this continued decline to increased adoption of texting bundle plans.[587]

[585] *See Fourteenth Report*, 25 FCC Rcd at 11532, ¶¶ 191-192.

[586] *Torch Passes from Voice to Data*, at 5, 21.

[587] *Id.* (stating that "the carriers have been slowly pushing subscribers towards bundle plans by raising à la carte texting in stages from $0.10 to now $0.20").

Table 21
Average Revenue Per Text Message[588]

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
2009	1,563,090,908,850	5,634	NA	NA

194. *Broadband Price Unit Metrics*. As noted above, it is not possible to calculate unit prices for non-messaging mobile data services (price per MB) because CTIA's industry data for 2009 did not include mobile data traffic and non-messaging data revenue figures.[589] However, Bernstein estimates that the typical price-per-MB for unlimited data plans on smartphones ranges from $0.02 to $0.15, and the typical price-per-MB for data plans for laptops and wireless data cards ranges from $0.01 to $0.08.[590] In addition, AT&T's estimated price per MB for data traffic – calculated by dividing AT&T's reported annual wireless data revenue by its reported mobile broadband traffic – has declined from $1.21 in 2008 to $0.35 in 2009 to $0.17 in 2010.[591]

2. Wholesale Pricing

195. Resellers and MVNOs purchase minutes at wholesale prices from facilities-based mobile service providers. Contractual agreements between mobile network operators and resellers or MVNOs for wholesale prices differ among MVNOs because they depend upon the rates that each MVNO negotiates with facilities-based providers. These negotiated rates are generally not publicly available, so it is difficult to track wholesale pricing in the mobile wireless sector in a comprehensive manner.

196. As noted in the *Fourteenth Report*, one analyst has estimated the pricing for Sprint Nextel's wholesale deal with Virgin Mobile USA prior to Sprint Nextel's acquisition of Virgin Mobile.[592] According to this analyst, Virgin Mobile paid Sprint Nextel approximately $0.02 per minute on average.[593] The analyst stated that the pricing was almost all variable, and Sprint Nextel's price structure was based on a tiered system in which Virgin Mobile paid a certain per-minute rate for the first level of MOUs and then a lower per-minute rate for the next tiered level of usage, with the rate dropping for only the incremental minutes at the next tier level rather than for all the minutes used. Based on Virgin Mobile's retail pricing structure, the analyst estimated that Sprint Nextel received about 25 percent of the revenues generated by an average Virgin Mobile customer.[594]

3. Intercarrier Roaming Rates and Revenue

197. Intercarrier roaming rates are set by contractual agreements that are confidential, and

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[588] *CTIA Year-End 2009 Wireless Indices Report*, at 115, 198-200; Commission estimates.

[589] *See* Section V.C, Output and Usage Levels, *supra*. *See also Fourteenth Report*, 25 FCC Rcd at 11529, 11533, ¶¶ 185, 193.

[590] *U.S. Telecommunications and Global Telecom Equipment: The Wireless Data Exaflood*, at 17.

[591] AT&T, 2010 Annual Report, at 28, *available at* http://www.att.com/Common/about_us/annual_report/pdfs/ATT2010_Full.pdf. *See* Section V.C.3, Mobile Data Traffic (Non-Messaging), *supra.*

[592] *See Fourteenth Report*, 25 FCC Rcd at 11533, ¶ 195.

[593] *Slumdog Millionaires*, at 22.

[594] *Id.* at 24.

particular rates vary across agreements depending on the terms negotiated by service providers. However, as discussed below, CTIA data on roaming revenues and roaming minutes of use (MOUs) can be used to derive a metric for average roaming revenue per minute. CTIA reports "outcollect" roaming revenues, which are the revenues generated by roamers inside the providers' home coverage areas.[595] Outcollect roaming revenues for the entire mobile wireless industry decreased to $3.061 billion in 2009 from $3.739 billion in 2008.[596] We note that CTIA's roaming revenue data do not distinguish between voice and data revenues. Since total service revenues have continued to grow each year, the contribution of roaming revenues to total service revenues has continued to decline steadily: from 3.3 percent in 2005 to 2.8 percent in 2006, 2.7 percent in 2007, 2.5 percent in 2008, and 2.3 percent in 2009, which is down from over ten percent in 1999.[597]

198. In addition, reported annual roaming voice MOU traffic declined slightly to 121.1 billion MOUs in 2009 from 121.4 billion MOUs in 2008. Over a ten-year period, voice roaming traffic has grown significantly, from 13 billion in 1999 to 121.1 billion in 2009. However, this growth was much slower than overall voice traffic growth, which increased from 147.7 billion minutes to 2.3 trillion minutes during the same period. Therefore, roaming voice traffic as a percentage of overall voice traffic has decreased from 8.8 percent in 1999 to 5.5 percent in 2008 and to 5.3 percent in 2009, a nearly 40 percent relative decline.[598]

199. As we have in past *Reports*, 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 be somewhat overstated because the roaming revenue figure includes revenue from both voice and data services, while the roaming MOU figure includes only voice roaming services.[599] Without separate data for voice and data roaming revenue and traffic, we do not know the degree to which this estimate of average roaming RPM is overstated. As reported in Table 22 below, average roaming RPM has declined from just over 30 cents per minute in 1999 to less than three cents per minute in 2009, and has been generally flat for the past five years.

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[595] Robert F. Roche and Lesley O'Neill, *CTIA's Wireless Industry Indices, Semi-Annual Data Survey Results: A Comprehensive Report from CTIA Analyzing the U.S. Wireless Industry*, *Year-End 2008 Results*, May 2009, at 92-99 (*CTIA Year-End 2008 Wireless Indices Report*).

[596] *See* Table C-1, Appendix C, *infra*.

[597] *Id*. This is for the entire 12-month period.

[598] *CTIA Year-End 2009 Wireless Indices Report*, at 197-198.

[599] As noted above, actual intercarrier roaming rates are set by contractual agreements among providers and are confidential.

Table 22
Roaming Revenues and Rates[600]

	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

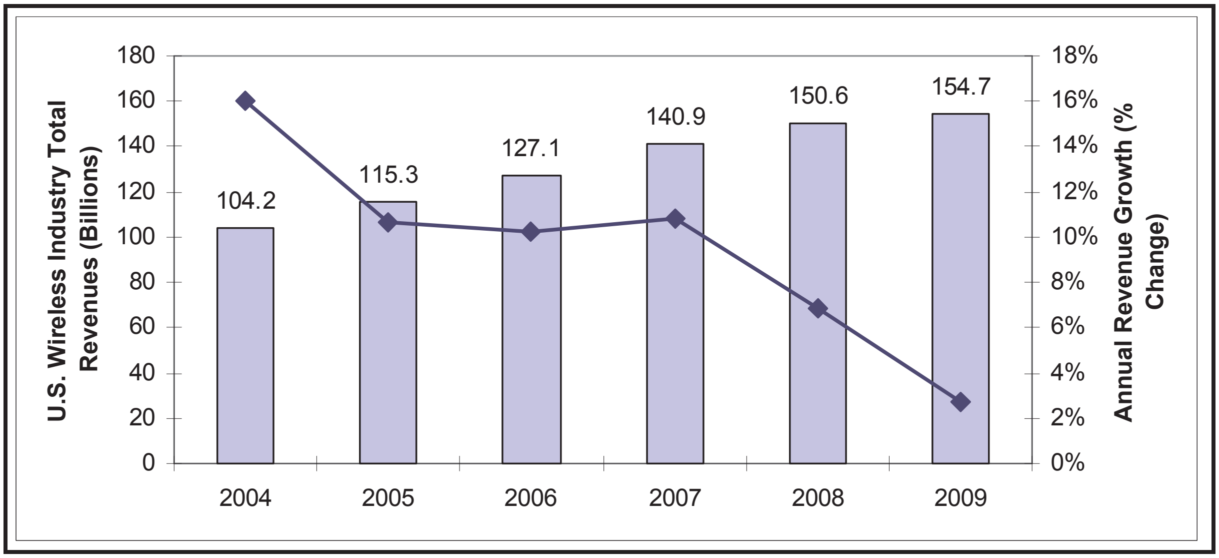
E. Revenue and ARPU

200. Service revenues for the U.S. mobile wireless industry have increased each year between 2004 and 2009, although the annual growth rate for revenues has been in decline since 2007 (see Chart 24). According to CTIA estimates, mobile wireless service providers generated approximately $154.7 billion in service revenues in 2009, up three percent from $150.6 billion in 2008. In March 2011, CTIA announced that service revenues for 2010 totaled $159.9 billion.[601]

[600] *CTIA Year-End 2009 Wireless Indices Report*.

[601] CTIA, *Year-End 2010 Top Line Survey Results*, http://files.ctia.org/pdf/CTIA_Survey_Year_End_2010_Graphics.pdf (visited Mar. 31, 2011).

Chart 24
Wireless Industry Service Revenues[602]

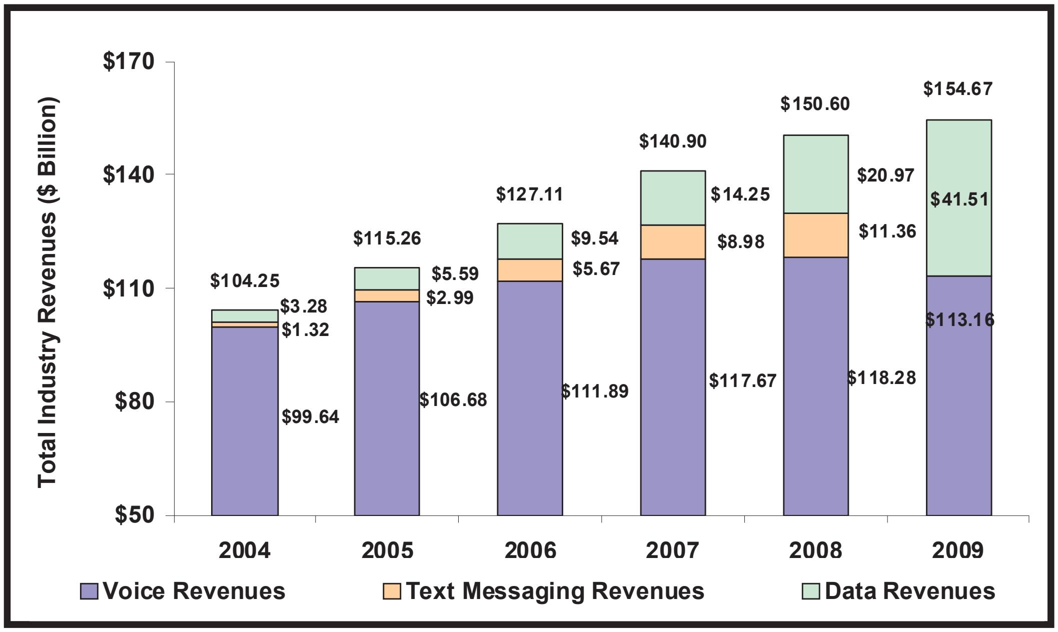


201. CTIA divides mobile wireless service revenues into two categories: voice and data. As shown in Chart 25, annual voice revenues declined for the first time in 2009, by approximately four percent, from $118 billion to $113 billion. At the same time, data revenue increased 28 percent from $32 billion to $42 billion. In 2009, CTIA discontinued the practice of reporting a breakout data series for text messaging and other mobile data service revenues.[603]

[602] *CTIA Year-End 2009 Wireless Indices Report.*

[603] In previous years, CTIA broke service revenues into three categories: voice, messaging, and data. In 2009, CTIA eliminated the messaging category, and messaging and other data services are now combined in the data services category.

Chart 25
Total Mobile Wireless Industry Revenues[604]



202. ARPU is a financial metric widely used in analyzing the mobile wireless industry, and is calculated by dividing CTIA's revenue estimate by its estimate of total subscriber connections. One estimate of ARPU reported by CTIA, average local monthly bill (ALMB),[605] has fluctuated around the $50 level since 2003, and closed 2009 at $48.16, down four percent from the end of 2008. As seen in Table 20, declining industry-wide voice ARPU (as measured by ALMB excluding data revenues) continued to be offset by growth in data ARPU. According to CTIA's ALMB estimates, data revenues accounted for 28.7 percent of total service revenues in the second half of 2009, compared to 23.2 percent a year earlier.

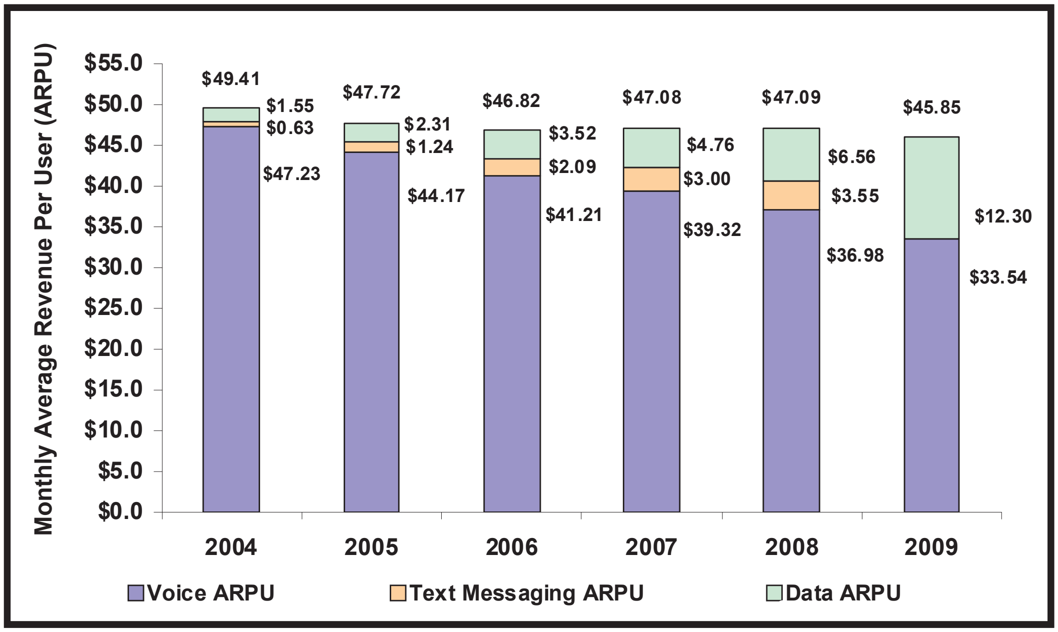
203. An alternate measure of ARPU, which is based on CTIA's total service revenues figure (including roaming and toll revenues), shows that data ARPU has risen steadily since 2004, while voice ARPU has steadily declined (see Chart 26). After remaining unchanged in 2008, total service ARPU declined nearly three percent in 2009 from $47.09 to $45.85. In 2009, total service revenue was broken into voice service and data service revenue, and voice ARPU declined nine percent from $36.98 to $33.54. Wireless data service ARPU rose 22 percent from $10.11 in 2008 to $12.30 in 2009, and accounted for 27 percent of ARPU in 2009.[606]

[604] *CTIA Year-End 2009 Wireless Indices Report.*

[605] There are different ways of calculating ARPU. The measure used here and shown in Table 20 is CTIA's "average local monthly bill," which does not include toll or roaming revenues and "reflects strictly service-related revenues associated with services provided to customers in their home markets." *CTIA Year-End 2009 Wireless Indices Report*, at 183. CTIA provides alternative measures of ARPU, one of which includes roaming but excludes toll revenues, and another of which includes both roaming and toll revenues. These ARPU measures are derived by dividing total service revenue (either including or excluding toll) by the average number of subscribers for the period. For a comparison of the different ARPU measures, see *Id.*

[606] In 2008 and prior years, CTIA reported a breakout of data revenue into text messaging revenue and other data service revenue. Because CTIA discontinued this practice in 2009, it is no longer possible to derive an estimate of ARPU for text messaging services and non-messaging data services.

Chart 26
Monthly ARPU by Type of Service[607]



204. We believe the trends of declining voice ARPU and rising data ARPU are the result of several factors, including increases in mobile data usage and subscribership,[608] further declines in the absolute per-minute price of mobile voice calls, and an increase in the share of subscribers who typically spend less each month on mobile calls (*e.g.*, prepaid customers).[609]

205. The growth in data revenue as a percentage of total revenue for the individual four nationwide service providers is shown in Chart 27. While data revenues have been growing at all four providers, data accounts for a larger percentage of total revenue at Verizon Wireless and AT&T. In the fourth quarter of 2009, data revenue accounted for around 31 percent of Verizon Wireless's and AT&T's total revenue, as compared to 27 percent at Sprint Nextel and 22 percent at T-Mobile. According to one analyst, this difference reflects the increasing smartphone penetration at AT&T and Verizon Wireless.[610] In particular, AT&T claims that it has twice as many smartphones operating on its network than any of its competitors.[611]

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[607] *CTIA Year-End 2009 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. *See CTIA Year-End 2009 Wireless Indices Report*

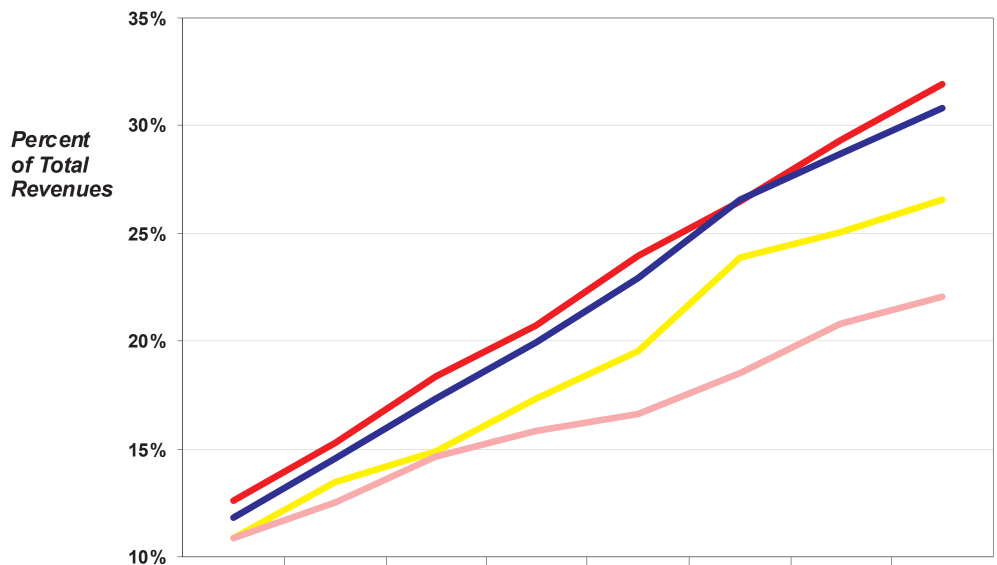
[608] *See* Sections V.A, Subscribership/Connection Levels and V.C, Output and Usage Levels, *supra.*

[609] *See*, *e.g.*, Simon Flannery *et al.*, *Deteriorating Wireless Trends, Revisited*, Morgan Stanley, Equity Research, Jan. 18, 2007, at 3 ("[a] growing portion of these net adds are coming from lower-ARPU family plans, prepaid customers, and others receiving larger buckets of minutes at lower per-minute prices").

[610] *Torch Passes from Voice to Data*, at 24.

[611] *Torch Passes from Voice to Data*, at 24.

Chart 27
Wireless Data Revenue as a Percentage of Total Revenue[612]



	Q2 06	Q4 06	Q2 07	Q4 07	Q2 08	Q4 08	Q2 09	Q4 09
Verizon Wireless	12.6%	15.3%	18.4%	20.7%	24.0%	26.5%	29.3%	31.9%
AT&T	11.8%	14.6%	17.3%	19.9%	22.9%	26.6%	28.7%	30.8%
Sprint Nextel	10.9%	13.5%	14.9%	17.4%	19.5%	23.9%	25.0%	26.6%
T-Mobile	10.9%	12.5%	14.7%	15.8%	16.6%	18.5%	20.8%	22.1%

F. Investment

206. Investment, as measured by capital expenditure, and also referred to as "capital spending" or "CAPEX," is funds spent during a particular period to acquire or improve long-term assets, such as property, plant, or equipment.[613] In the mobile wireless industry, CAPEX primarily consists of spending to upgrade and expand networks to increase data connection speeds, enable more reliable service, and improve coverage.[614]

207. Over the past decade, mobile wireless service providers have invested significantly in wireless network structures and equipment.[615] Between 1999 and 2009, industry-wide capital investment by wireless providers exceeded $213 billion.[616] We note that CAPEX by mobile service providers can be

[612] Data provided by Sanford Bernstein Research.

[613] *A Dictionary of Finance and Banking* (2nd ed.), Oxford University Press, 1997, at 50-51. There are differing opinions on what constitutes capital spending versus non-capital spending.

[614] AT&T, SEC Form 10-K, filed Feb. 25, 2009, at 8, 24; Sprint Nextel, SEC Form 10-K, filed Feb. 27, 2009, at 17.

[615] *See* Section IV.B.1, Network Coverage and Technology Upgrades, *supra.*

[616] *See CTIA Year-End 2009 Wireless Indices Report*, at 137, based on cumulative capital investment figures. CTIA derived the cumulative capital investment figures for 2005-2009 by summing the final 2004 cumulative capital investment figure with subsequently reported incremental capital investment. The industry-wide capital expenditures figure reported in the *Fourteenth Report* of $240 billion for 1998-2008 was based on data from the Census Bureau.

"lumpy," meaning that it can vary significantly from one year to the next for a specific provider.[617] According to AT&T, providers may spend significant amounts to upgrade their networks in one year and then may focus on integrating their upgrades into their offerings and signing up new customers the following year.[618]

208. According to the U.S. Census Bureau, total wireless industry capital expenditures declined from $25.3 billion in 2008 (revised Census data) to $20.7 billion in 2009, a decline of approximately 18 percent. This amount accounted for 31 percent of overall capital expenditures in the telecommunications industry, 24 percent of information/communication sector capital expenditures, and two percent of total capital expenditures in the U.S. economy.[619] Data from CTIA, on the other hand, suggest that capital investment by mobile wireless service providers increased slightly in 2009, reversing the trend of declining investment in 2006 through 2008. CTIA reports that incremental capital investment by wireless operators totaled $20.4 billion in 2009,[620] a one percent increase from the $20.2 spent in 2008.[621]

Table 23
Annual Capital Expenditures by Wireless Service Providers[622]

	2004	2005	2006	2007	2008	2009
Census Bureau: Total Annual Capital Expenditures (in billions)	$24.0	$27.3	$27.9	$22.2	$25.3	$20.7
Census Bureau: Percent Change in Capital Expenditures from Previous Year	14.3%	13.8%	2.2%	(20.4%)	14.0%	(18.2%)
CTIA: Total Annual Incremental Capital Investment (in billions)	$14.1	$25.2	$24.4	$21.1	$20.2	$20.4
CTIA: Percent Change in Incremental Capital Investment from Previous Year	(12.0%)	78.8%	(3.2%)	(13.5%)	(4.3%)	1.0%

209. According to CTIA, while total incremental capital investment increased slightly in 2009, incremental investment per subscriber continued to decline in 2009, as shown in Chart 28. During 2009, capital investment per subscriber fell 4.5 percent to $73.24 from its 2008 level of $76.73. From 2005 to 2009, annual capital investment per subscriber fell 43 percent.

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617 AT&T Comments at 34.

618 AT&T Comments at 34.

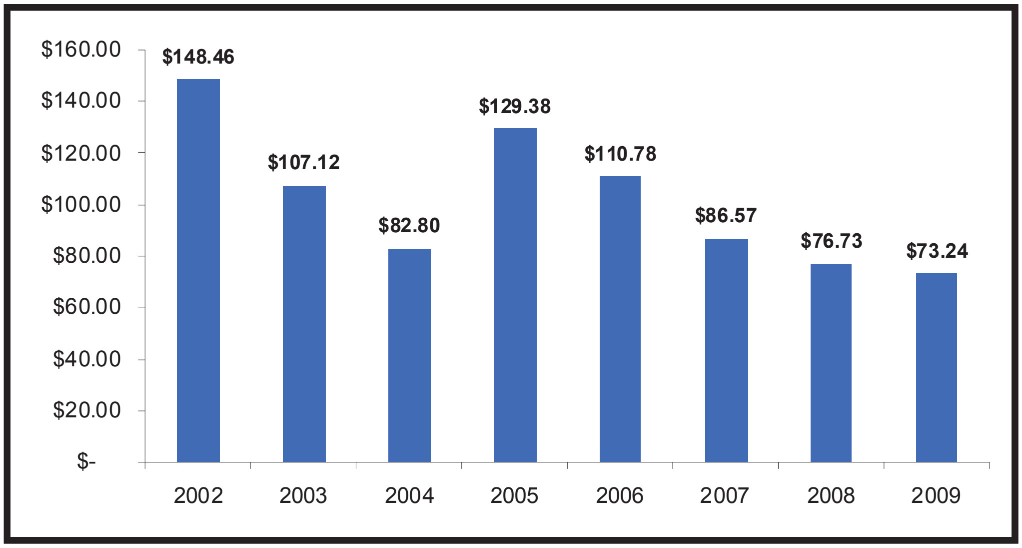
619 *See* U.S. Census Bureau, Annual Capital Expenditures Survey, http://www.census.gov/econ/aces/index.html, visited Feb. 9, 2011.

620 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 2009 Wireless Indices Report*, at 131; CTIA Comments at 66.

621 *CTIA Year-End 2009 Wireless Indices Report*, at 133.

622 U.S. Census Bureau, Service Annual Survey Data, 2007-2008; U.S. Census Bureau, Annual Capital Expenditures Surveys, 2004-2008; *CTIA Year-End 2009 Wireless Indices Report*.

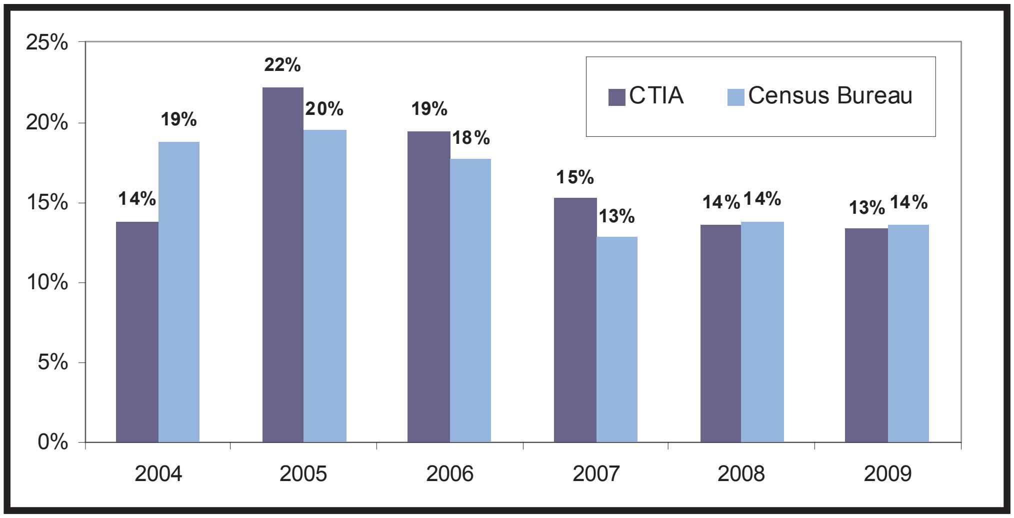
Chart 28
Annual Incremental Capital Investment per Subscriber[623]



210. Based on data from both the Census Bureau and CTIA, we found that capital investment as a percentage of total industry revenue declined between 2005 and 2009 (see Chart 29). Data from CTIA show that investment as a percentage of revenue declined from 14 percent to 13 percent between 2008 and 2009, while Census Bureau data show that this metric remained flat at 14 percent over the same period.

623 *CTIA Year-End 2009 Wireless Indices Report*.

Chart 29
Annual Capital Investment as a Percentage of Industry Revenue[624]



211. As shown in Chart 30, capital expenditures have varied significantly from operator to operator. CAPEX by AT&T and T-Mobile increased slightly during 2009, around 1.5 percent for AT&T and 2 percent for T-Mobile. Capital expenditures by Verizon Wireless increased nearly 10 percent during 2009, which can be attributed, in part, to the addition of the former Alltel network. When Alltel's 2008 CAPEX is added to Verizon's Wireless's 2008 CAPEX for a total of $7.4 billion, the CAPEX of the combined company dropped about 3.6 percent during 2009. Sprint Nextel's CAPEX continued to decline in 2009, dropping 35 percent from its 2008 levels to $1.2 billion, and 80 percent from its 2006 levels of $5.9 billion. According to Sprint Nextel, the decrease in CAPEX in 2009 was the result of fewer cell sites built, and fewer IT and network deployment projects.[625] Sprint Nextel contributed $1.176 billion to Clearwire in 2009 in exchange for an increased ownership interest in the company.[626] As discussed above, Sprint Nextel is currently reselling Clearwire's WiMAX service.[627]

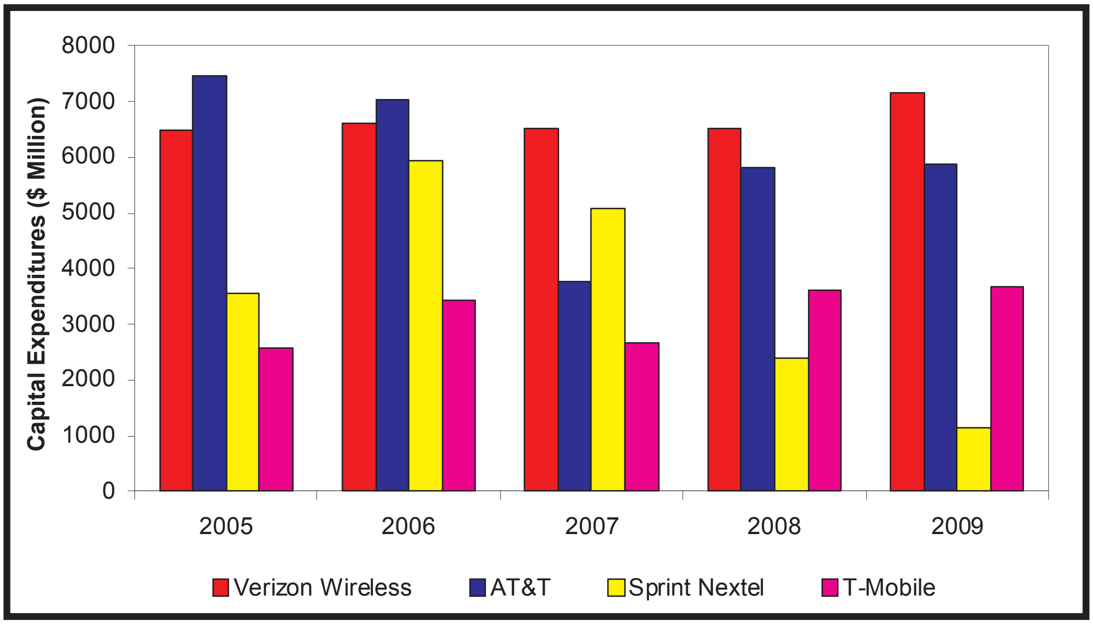
[624] U.S. Census Bureau, Annual Capital Expenditures Surveys, 2004-2008; *CTIA Year-End 2009 Wireless Indices Report*.

[625] Sprint Nextel, SEC Form 10-K, filed Feb. 26, 2010, at 43.

[626] Sprint Nextel, SEC Form 10-K, filed Feb. 26, 2010, at 1.

[627] *See* Section IV.B.1.a, Service Provider Technology Deployments, *infra*.

Chart 30
Capital Expenditures by Service Provider[628]



G. Profitability

212. The *Fourteenth Report* presented for the first time a number of widely used accounting-based indicators of profitability, including EBITDA, EBITDA minus CAPEX, EBITDA per subscriber and EBITDA margin.[629] Accounting profitability measures are useful for comparing profitability across companies and in analyzing the overall industry profitability. 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,[630] nor are they necessarily indicators of competition or market power. The profitability indicators discussed here, however, are widely used by Wall Street financial analysts because limitations on data availability make it difficult to measure true economic profit.

1. Accounting-Based Measures of Profitability

213. *Earning Before Interest and Taxes (EBIT)*. EBIT is the accounting profit of a company before interest expenses and corporate taxes are deducted.[631] EBIT deducts from revenue the cost of

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[628] *US Wireless 411 3Q09*, at 47; John C. Hodulik, *et al.*, *US Wireless 411, Version 25.0*, UBS, Sept. 18, 2009, at 67; Verizon Communications, Inc., SEC Form 10-K, filed Feb. 24, 2009.

[629] *Fourteenth Report*, 25 FCC Rcd at 11543-48, ¶¶ 214-221.

[630] Economic profit is defined as revenue minus opportunity costs. The main distinction between economic and accounting profits is capital costs which reflect a firm's opportunity cost. *See Modern Industrial Organization*, at 247.

[631] *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").

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 performance 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.[632] Federal and State corporate income taxes can be over one-third of pre-tax income and they are deducted in most profit formulas.[633] Further, EBIT data are sensitive to accounting practices for depreciation and mergers. We do not discuss EBIT data in this *Report*.

214. *Earnings Before Interest, Taxes, Depreciation, and Amortization (EBITDA)*. EBITDA equals accounting profits before deducting interest expenses, corporate income taxes, depreciation, and amortization.[634] EBITDA differs from EBIT in that EBIT deducts depreciation and amortization. An advantage of EBITDA is that it is widely used by industry observers, such as equity analysts, as an indicator of profitability in the telecommunications sector.[635] In November 2010, one analyst reported that AT&T and Verizon Wireless together accounted for more than 80 percent of wireless industry EBITDA during the third quarter of 2010.[636] However, EBITDA does not account for capital expenditures or cash flow expenses such as interest and taxes. To the extent that capital expenditures are proportionately similar across firms and over time, EBITDA can be a useful measure of relative performance. We discuss additional EBITDA data below.

215. *EBITDA minus Capital Expenditures (EBITDA minus CAPEX)*. EBITDA minus CAPEX equals EBITDA, discussed above, less the capital investment incurred in the same time period. EBITDA minus CAPEX incorporates capital spending into the profitability measure, and as such provides a rough approximation of free cash flow.[637] Although it is a better approximation of cash flow than EBITDA because it deducts capital expenditures, we note that capital expenditures may differ from estimates of

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[632] *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, 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).

[633] 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.

[634] 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.

[635] *See, e.g., US Wireless 411 2Q09*, at 2 (EBITDA is the accounting definition used for operating cash flow).

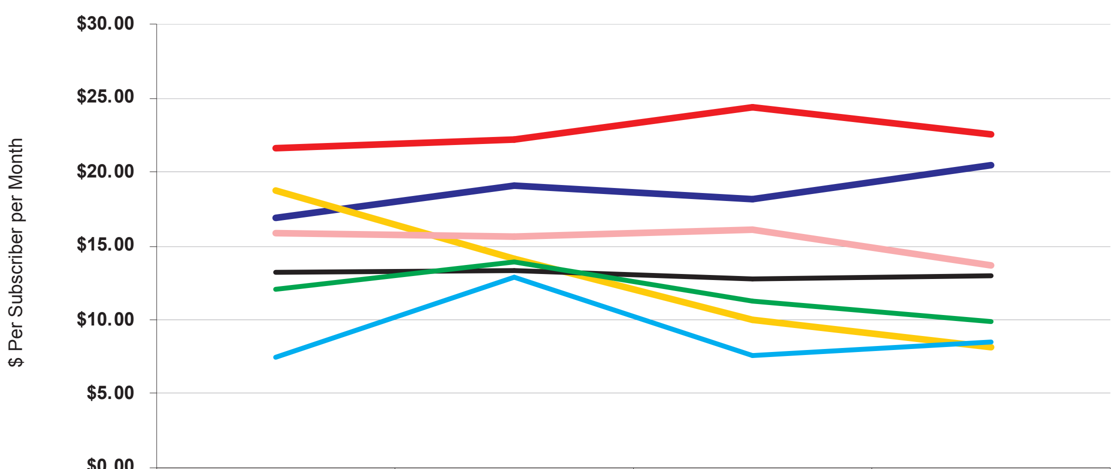
[636] Craig Moffett, *et al.*, *U.S. Wireless: The Calm Before the Storm; Industry Growth Steady at 4.6%, and the Rich Get Richer (...Again)*, Bernstein Research, Nov. 12, 2010, at 1.

[637] *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).

annual capital costs that are used in estimates of economic profits.[638] Also, EBITDA minus CAPEX does not account for purchases of spectrum licenses, a significant expense of mobile wireless providers.

216. *Earnings per Subscriber.* EBITDA per subscriber data for selected service providers are presented in Chart 31. Standardizing EBITDA by subscribers facilitates cross-provider comparisons and makes EBITDA directly comparable to ARPU, another measure of provider performance discussed in this *Report*. As shown in Chart 31, in 2009, the difference between the provider with the highest EBITDA per subscriber (Verizon Wireless) and the provider with the lowest (Sprint) was $14.39. Among the four national providers, AT&T and Verizon Wireless had the highest EBITDA per subscriber since 2007. Sprint Nextel has seen its EBITDA per subscriber decline significantly over the past several years. The differences in EBITDA per subscriber across providers may reflect many underlying factors including different characteristics of service and product offerings, different customer preferences, different network designs and capabilities, different cost structures, scale economies, and the degree of competitive rivalry. The changes in EBITDA per subscriber for individual providers can also reflect changes particular to the provider. For example, acquisitions of networks in mergers or changes in service and product offerings over time. It is possible that some of the correlated changes across providers reflect macroeconomic effects on demand.

Chart 31
EBITDA per Subscriber (Selected Providers)[639]



	2006	2007	2008	2009
AT&T	$16.90	$19.11	$18.12	$20.46
Sprint Nextel	$18.78	$14.10	$9.94	$8.16
T-Mobile	$15.89	$15.68	$16.11	$13.64
Verizon Wireless	$21.61	$22.20	$24.39	$22.55
Leap Wireless	$7.48	$12.84	$7.52	$8.47
Metro PCS	$13.24	$13.35	$12.68	$12.92
US Cellular	$12.09	$13.84	$11.20	$9.85

217. EBITDA minus CAPEX per subscriber data for selected service providers, presented in

[638] *See also Modern Industrial Organization*, at 247.

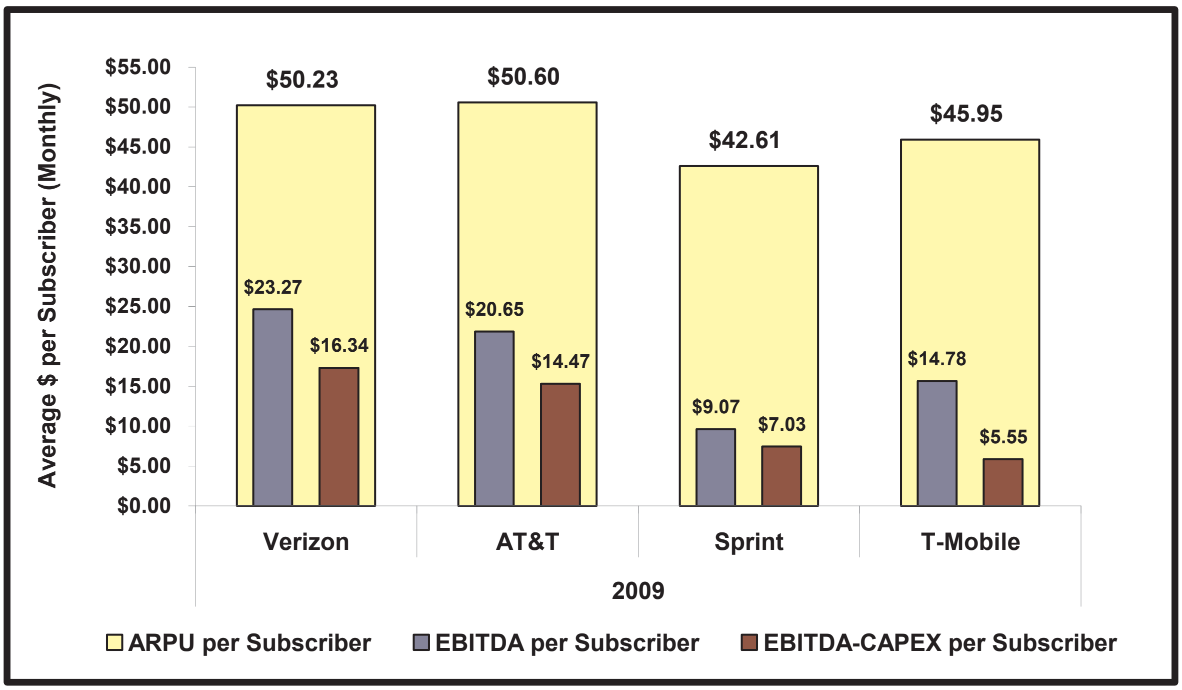
[639] UBS, *US Wireless 411 Reports*, 2006 – 2009.

Table 24, may provide a sense of the relative profitability of the providers on a per subscriber basis. As with EBITDA per subscriber data, EBITDA minus CAPEX per subscriber data are directly comparable to ARPU data. Between 2006 and 2009, the EBITDA minus CAPEX per subscriber for Sprint Nextel and T-Mobile was in a range between $5.55 and $9.67, and declined for both providers. At the same time, Verizon Wireless's EBITDA minus CAPEX per subscriber increased from $11.77 in 2006 to $16.52 in 2008, then declined slightly in 2009. AT&T's EBITDA minus CAPEX per subscriber ranged from a low of $5.91 in 2006, a year when AT&T's CAPEX was unusually high due to the integration and expansion of the Cingular and AT&T Wireless networks and the networks acquired in a transaction with Triton PCS Holdings, Inc., to a high of $14.47 in 2009. ARPU, EBITDA, and EBITDA minus CAPEX are presented together in Chart 32 and Chart 33 to facilitate comparison within this family of measures.

Table 24
EBITDA minus CAPEX per Subscriber per Month (Selected Providers)[640]

	2006	2007	2008	2009
Verizon Wireless	$11.77	$13.83	$16.52	$$16.34
AT&T	$5.91	$14.00	$12.38	$14.47
Sprint Nextel	$9.67	$7.84	$8.52	$7.03
T-Mobile	$7.37	$8.15	$6.61	$5.55

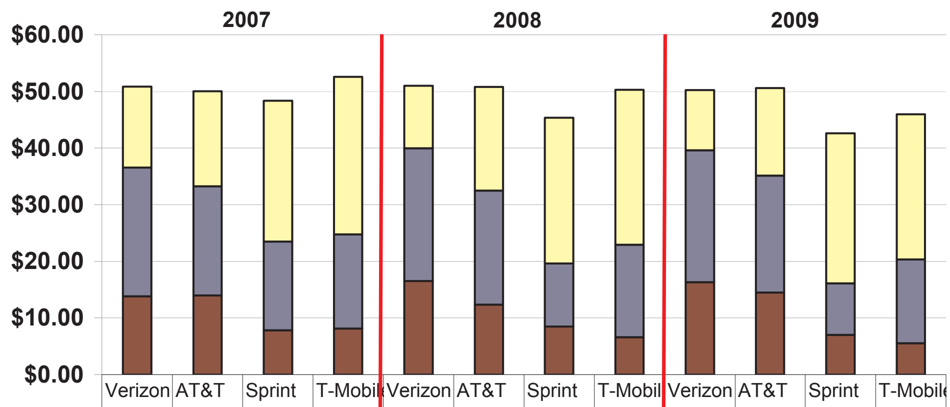
Chart 32
Comparison of ARPU, EBITDA, and EBITDA minus CAPEX Among Nationwide Providers[641]



[640] UBS, *US Wireless 411 Reports*, 2006 – 2009.

[641] *Id*.

Chart 33
Comparison of ARPU, EBITDA, and EBITDA minus CAPEX: 2007-2009[642]



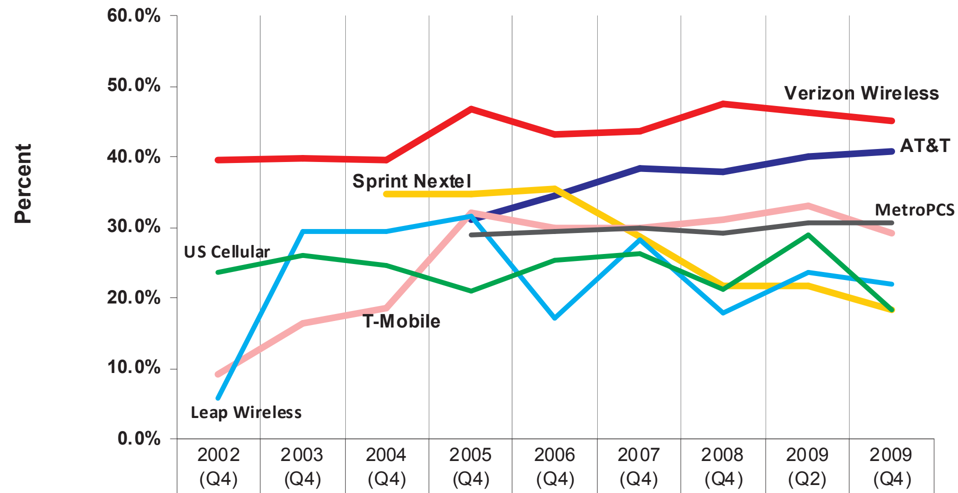
	Verizon 2007	AT&T 2007	Sprint 2007	T-Mobile 2007	Verizon 2008	AT&T 2008	Sprint 2008	T-Mobile 2008	Verizon 2009	AT&T 2009	Sprint 2009	T-Mobile 2009
*ARPU per Sub - ▪ - ▪	$14.33	$16.77	$24.90	$27.81	$11.01	$18.33	$25.74	$27.35	$10.61	$15.49	$26.52	$25.62
EBITDA per Sub	$22.70	$19.26	$15.63	$16.59	$23.46	$20.12	$11.10	$16.31	$23.27	$20.65	$9.07	$14.78
EBITDA-CAPEX per Sub	$13.83	$14.00	$7.84	$8.15	$16.52	$12.38	$8.52	$6.61	$16.34	$14.47	$7.03	$5.55
Total	$50.87	$50.04	$48.37	$52.56	$50.98	$50.82	$45.35	$50.27	$50.23	$50.60	$42.61	$45.95

*The above ARPU per Sub subtracts the components of EBITDA per sub and EBITDA-CAPEX per Sub

218. *EBITDA Margin.* EBITDA as a percentage of service revenue, also called EBITDA margin, appears in Chart 34 and provides another indicator of mobile wireless segment profitability. Standardizing EBITDA by service revenues facilitates cross-provider comparisons. In 2009, the difference between the provider with the highest EBITDA margin (Verizon Wireless) and the provider with the lowest (Sprint Nextel) was 26.8 percent. Since 2007, the two largest national providers were the only providers with EBITDA margins greater than 35 percent. Verizon Wireless has remained in a band between 43 percent and 48 percent since 2005, increasing in 2008 relative to 2007 and declining slightly in 2009. AT&T has remained between 31 percent and 41 percent, decreasing in 2008 relative to 2007 and increased in 2009. Between 2004 and 2009, Sprint Nextel declined from nearly 35 percent to approximately 19 percent. Since 2005, T-Mobile and MetroPCS remained between 28 percent and 33 percent.

[642] UBS, *US Wireless 411 Reports*, 2006 – 2009.

Chart 34
Reported EBITDA Margins: 2002 – 2009 (Selected Providers)[643]

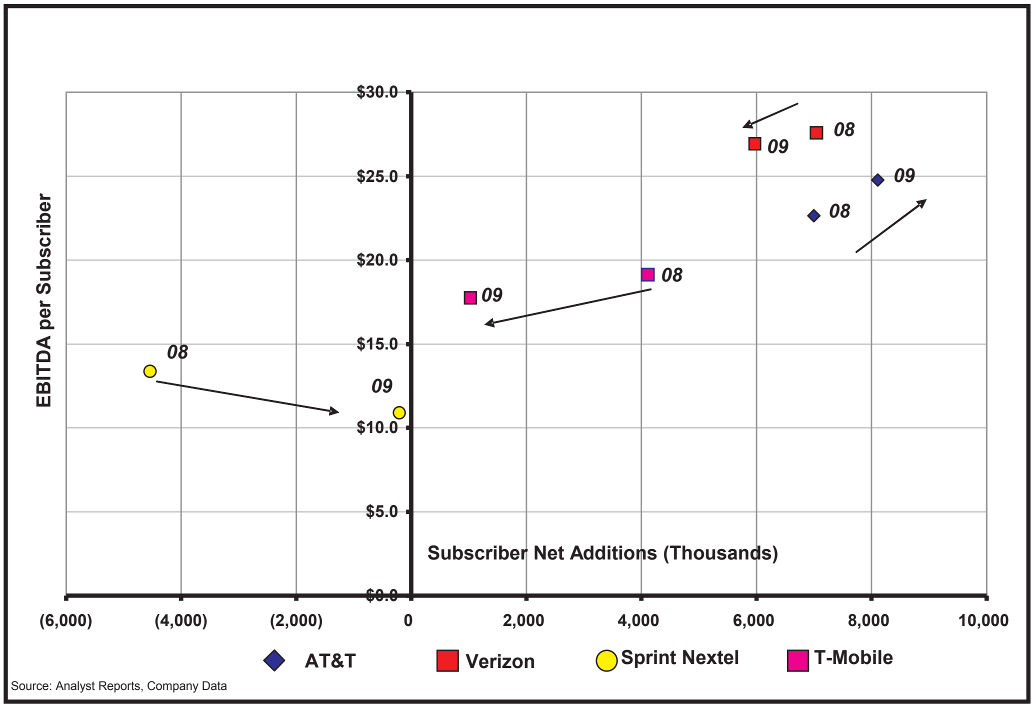


	2002 (Q4)	2003 (Q4)	2004 (Q4)	2005 (Q4)	2006 (Q4)	2007 (Q4)	2008 (Q4)	2009 (Q2)	2009 (Q4)
Verizon Wireless	39.5%	39.7%	39.5%	46.8%	43.2%	43.6%	47.5%	46.3%	45.0%
AT&T				31.1%	34.4%	38.2%	37.7%	40.1%	40.7%
Sprint Nextel			34.8%	34.6%	35.4%	28.7%	21.6%	21.7%	18.2%
T-Mobile	9.1%	16.5%	18.5%	32.0%	29.8%	29.8%	31.1%	33.1%	29.1%
Leap Wireless	5.7%	29.5%	29.4%	31.6%	17.1%	28.2%	17.7%	23.5%	21.9%
US Cellular	23.7%	25.9%	24.6%	21.0%	25.2%	26.4%	21.3%	28.8%	18.4%
MetroPCS				28.9%	29.4%	29.9%	29.2%	30.5%	30.5%

219. In looking at the EBITDA per subscriber versus net adds of the four nationwide service providers (Chart 35), we see that both T-Mobile and Verizon Wireless showed declines in both their net adds and EBITDA per subscriber from 2008 to 2009. Sprint Nextel's net adds improved, but the company failed to break into positive territory. AT&T experienced increases in both net adds and EBITDA per subscriber during 2009.

[643] UBS, *US Wireless 411 Reports*, 2006 – 2009. Data are for the fourth quarter, except for 2009, which is second quarter data.

Chart 35
Subscriber Additions vs. EBITDA Per Subscriber: 2008-2009



H. Network Quality

220. The Commission has recognized the importance of accurate, up-to-date data on mobile network performance – to inform policy, to help consumers make better choices, and to spur competition. The National Broadband Plan, released last March, recommends that the Commission develop broadband performance standards for mobile services.[644] Furthermore, in December 2010, as part of its rules on Internet openness, the Commission adopted a transparency rule for mobile broadband Internet providers that requires public disclosure of information regarding the performance of their broadband Internet access services.[645] Accurate and up-to-date data on mobile broadband performance is also important to network providers who spend significant time and resources measuring network quality for purposes of improving and upgrading network performance.

221. Notwithstanding the importance of information on mobile broadband performance to policymakers, consumers, and providers, the measurement and representation of the overall quality of a provider's network present a number of challenges. For instance, there is neither a single definition of network quality nor a definitive method to measure it. For voice services, aspects of network quality include the strength and coverage of the provider's signal, voice call quality,[646] and the reliability of the

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[644] *See Connecting America: The National Broadband Plan*, at 47.

[645] *See Open Internet Order* at ¶¶ 97-98.

[646] 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, (continued….)

network connection. For data services, network quality also importantly includes throughput rates and latency. Furthermore, certain consumers may place more weight on one particular aspect of network quality than another when making decisions regarding their mobile wireless service. In addition, the service quality experienced by consumers may vary with the time of day, weather, foliage, user location, interference, and the parameters set by network operators. For data services, network quality as perceived by the consumer 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). In addition, from the customer's perspective, overall performance is the product of more than network quality alone and often reflects differences in device quality as well.

222. Despite these challenges, network providers spend significant time and resources measuring network quality for purposes of improving and upgrading network performance, and network quality is a critical factor for many mobile consumers. Service providers often publish network quality information, such as coverage maps and data throughput rates, which are based on statistical assumptions of network capabilities. These assumptions are based upon data gathered on actual network performance of mobile wireless providers, 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 applications. These methods continue to evolve, and several independent studies have reported network performance measurements for mobile wireless data providers. As discussed below, the Commission has recognized the importance of access to accurate, up-to-date data on mobile broadband performance to inform policy, help consumers make better choices, and spur competition.[647]

223. Survey results have been a longstanding source of information regarding consumer satisfaction with their mobile wireless network performance. For example, one source of information about mobile voice service has been J.D. Power, which 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.[648] Prior to 2009, the number of reported wireless call quality problems for the industry overall declined for three consecutive reporting periods and then remained relatively stable from 2007 to 2008 at 15 problems per 100 calls, the lowest level in the history of the study.[649] According to the *2009 Wireless Call Quality Study – Volume 2*, conducted during the first half of 2009, wireless providers reduced the number of connectivity issues, such as dropped calls, to four PP100 from five PP100 six months earlier.[650] In addition, during the same period, the study found declines in both failed initial connections, from four PP100 to three PP100, and audio problems such as calls with static, from three PP100 to two PP100.[651] In

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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.

[647] *See* Section VI.A.1, Access to Information on Mobile Wireless Services, *infra*, for a discussion of the importance of access for consumers to accurate and meaningful information in a format they can understand.

[648] *See J.D. Power and Associates Reports: Overall, Wireless Carriers Reduce Dropped Calls, Failed Connections and Static, Driving an Improvement in Call Quality Performance*, Press Release, J.D. Power, Aug. 27, 2009 (*2009 Wireless Call Quality Study – Volume 2*); *J.D. Power and Associates Reports: Overall Call Quality Performance Declines as Frequency of Dropped Calls Increases, Particularly with Smartphones*, Press Release, J.D. Power, Feb. 18, 2010 (*2010 Wireless Call Quality Study – Volume 1*). 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. The *2009 Wireless Call Quality Study – Volume 2* is based on responses from 25,512 wireless customers. The study was fielded between January and June 2009. The *2010 Wireless Call Quality Study – Volume 1* is based on responses from 24,345 wireless customers. The study was fielded between July and December 2009.

[649] *Fourteenth Report*, 25 FCC Rcd at 11549-50, ¶ 222.

[650] *2009 Wireless Call Quality Study – Volume 2*, at 1.

[651] *Id*.

comparison, the *2010 Wireless Call Quality Study – Volume 1*, conducted during the second half of 2009, concludes that after several consecutive six-month reporting periods of steadily decreasing numbers of connectivity and audio problems due to network upgrades, reported call quality problems increased considerably to 13 PP100 from 11 PP100 six months earlier.[652] In particular, the study found that the number of dropped calls increased to six PP100 from four PP100 six months earlier, and that smartphone customers are nearly three times more likely to experience dropped calls than are traditional mobile phone customers.[653] Overall, the *2010 Wireless Call Quality Study – Volume 1* found that Verizon Wireless ranked highest in call quality in five of six regions, while U.S. Cellular ranked highest in the North Central region.[654]

224. In May 2010, the Commission released the findings of its own survey on the consumer mobile experience.[655] The survey, in part, explored consumers' level of satisfaction with their service provider's network coverage.[656] When asked how satisfied they are with how many places they can get a good signal, 58 percent of personal mobile phone users said they were *very satisfied* and another 29 percent said they were *somewhat* satisfied.[657] Overall, 87 percent of users are at least somewhat satisfied with the coverage of their signal.[658] In addition, the survey results suggest that suburban residents are more likely to say they are very satisfied with their mobile phone signal – 61 percent are very satisfied, compared with 56 percent of urban mobile phone users and 52 percent of rural users.[659] The survey results also reveal that older mobile phone users report higher levels of satisfaction with the quality of their signal. Some 61 percent of mobile phone users over the age of 50 said they are very satisfied with their signal, compared to 52 percent of those between the ages of 18 and 29, which may reflect that younger people, who are more reliant on their mobile phone than older users, are more discriminating about assessing the quality of their signal.[660]

225. In January 2011, *Consumer Reports* published the results of a consumer survey on service quality for mobile wireless providers in 23 metropolitan areas.[661] For each city, providers received a numerical "reader score" based on overall customer satisfaction.[662] In addition to providing

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[652] *2010 Wireless Call Quality Study – Volume 1*, at 1.

[653] *Id*.

[654] *2010 Wireless Call Quality Study – Volume 1*, at 1-2.

[655] *See* John Horrigan and Ellen Satterwhite, "Americans' Perspectives on Early Termination Fees and Bill Shock," FCC (rel. May 26, 2010) (*Americans' Perspectives on Early Termination Fees and Bill Shock*). The Commission's survey of consumers, conducted by Abt/SRBI and Princeton Survey Research Associates, International from April 19 to May 2, 2010, interviewed 3,005 American adults. The national, random, digit-dial survey was conducted in English and Spanish and the sample included both landline and cell phones. For responses based on those with personal cell phones (2,463 respondents) the margin of error is plus or minus two percentage points.

[656] *See Americans' Perspectives on Early Termination Fees and Bill Shock*, at 7.

[657] *Id*.

[658] *Id*.

[659] *Id*.

[660] *Id*.

[661] *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.

[662] *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 (continued….)

city-specific ratings, *Consumer Reports* also provided summary ratings, for both "conventional (contract)" and "no-contract" service providers, which reflect all cities surveyed.[663] In the summary ratings for 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.[664] In addition, the highest rated conventional (contract) provider – U.S. Cellular – received a score of 82.[665] 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.[666]

226. Relatively new sources of information on network quality are network performance studies published by independent third parties that focus on mobile broadband services. By running tests of broadband network performance using a consistent methodology across service providers, these studies offer some provider-to-provider comparisons that may assist consumers in making decisions regarding their mobile wireless service. The currently available studies, however, are not intended to provide a measure of competition or industry-wide performance. The public data they provide are limited in scope and are not yet robust enough to provide detailed and standardized results. For example, many of these studies provide data only for select providers, in select urban areas, during a limited period of time, and therefore present only a snapshot measurement of network performance. In addition, third-party studies often utilize different parameters and methodologies, making it difficult to draw conclusions related to network performance across these studies. Furthermore, methodologies for network performance measurement are evolving and should benefit from improved precision and standardization through further refinement. All of these factors make it difficult to accurately gauge from these studies the level of network performance consumers can expect to experience industry-wide and throughout the nation.

227. As examples of such studies, we are aware that within the past year, *PCWorld* magazine, PCMag.com, and performance testing firm Root Metrics have each published provider-to-provider comparisons of throughput rates and other network quality factors in different cities.[667] While the results of these tests are informative, as discussed above, these results are limited in their scope, particularly in terms of geography and time, and there are significant differences between the studies that make it

(Continued from previous page)
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.

[663] *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.

[664] *Best Phones and Plans,* Consumer Reports, Jan. 2011, at 37. See table entitled, "Ratings: Cell-Phone Service with a Contract."

[665] *Id.*

[666] *Id.*

[667] *See* RootMetrics, *Wireless Data Network Performance,* Nov. 5, 2010, filed in WT Docket No. 10-133 (*RootMetrics Data Network Performance Study*); Sascha Segan, *The Fastest Mobile Networks 2010*, PCMag.com, June 3, 2010, *available at* http://www.pcmag.com/article2/0,2817,2364263,00.asp (*PCMag Mobile Network Performance Study*); Mark Sullivan, *AT&T Roars Back in Round 2 of Our 3G Wireless Network Speed Tests*, *PCWorld*, April 2010, 12-16 (conducted by *PCWorld* magazine and its testing partner, Novarum) (*PCWorld/Novarum 3G Network Performance Study*); Kevin Fitchard, *3G vs.3G: Whose Mobile Data Network Is Best?*, Connected Planet, Dec. 7, 2009, *available at* http://blog.connectedplanetonline.com/unfiltered/2009/12/07/3G-vs-3G-whose-mobile-data-network-is-best/ (presenting results from tests conducted by Root Wireless (also known as RootMetrics)).

difficult to draw conclusions related to network performance across the studies.[668] As a result, while these and similar studies represent a nascent and encouraging effort to measure mobile wireless data network performance and provide consumers with data that could be useful in making informed decisions regarding their mobile wireless data service, the limitations of the data currently available, along with the need to continue to refine data collection methodologies, underscores the need for additional, up-to-date data on network performance that can be collected for a defined set of metrics, over a sufficiently large geographic area, and in a precise and consistent manner over time.

228. As noted above, the Commission has recognized the importance of access to accurate, up-to-date data on mobile network performance and has taken steps to help facilitate the availability of better mobile network performance information. The National Broadband Plan, released last March, recommends that the Commission develop broadband performance standards for mobile services, maintain and expand on current initiatives to capture 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 help consumers make better choices for mobile broadband.[669] To this end, in March 2010, the Commission released an iPhone and Android consumer broadband test that collects and reports data rates, latency, and user location when initiated on the handset.[670] 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 measure the performance of mobile broadband network performance and coverage.[671] 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.[672]

229. Furthermore, 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

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[668] *See RootMetrics Data Network Performance Study*; *PCMag Mobile Network Performance Study*; *PCWorld/Novarum 3G 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 Network Performance Study*, conducted laptop and smartphone tests during December 2009 and January 2010 at 20 locations in each of 13 U.S. cities. In comparison, the *PCMag Mobile Network Performance Study*, published in June 2010, performed laptop-based tests in eight to ten locations in each of 20 cities (with two cities later removed from the study due to technical problems). Finally, the *RootMetrics Data Network Performance Study*, which is filed in the record for this Report, was conducted during August and September 2010 throughout six metro areas with off-the-shelf smartphones. Whereas all of the studies tested the HSPA/EV-DO networks of the four nationwide providers, the *PCMag Mobile Network Performance Study* also tested Cricket's network and "Sprint 4G" service where available. 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.

[669] *Connecting America: The National Broadband Plan*, at 47.

[670] 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 which collects street address and broadband performance data. The fixed application is accessible at www.broadband.gov/qualitytest.

[671] *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).

[672] *See* "Request for Information: Measurement and Reporting of Mobile Broadband Performance and Coverage," RFI 10082010BROADBAND, *Request for Information* (rel. Oct. 8, 2010).

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."[673] 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.[674] Included in this list is "[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."[675]

I. The Impact of Mobile Wireless Services on the U.S. Economy

230. Investment in telecommunications infrastructure contributes positively to economic growth and labor productivity in the United States. One study, which analyzes 21 OECD countries over the period 1970-1990, finds a positive causal relationship between telecommunications infrastructure and aggregate output. The authors find 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.[676] As the digital infrastructure is better developed, transaction costs for businesses fall, increasing efficiency in the overall economy. This reduction in transaction costs including, for example, the costs of ordering, gathering information and searching for services, improves the ability of firms to inter-communicate. Moreover, such investment not only leads to growth in the demand for telecommunications services itself, but also has significant direct effects on complementary industries such as input suppliers, handset manufacturers, operating system providers, and application developers.[677]

231. In addition, there are expected to be significant positive externalities associated with a strong telecommunications sector, whereby "society as a whole benefits from a nationwide wireless network."[678] These additional indirect benefits include enhancing health care and public safety services, increased online opportunities for entrepreneurial activity, as well as helping U.S. consumers more efficiently gather information on goods, services, jobs, and educational opportunities.[679] Below, we further discuss mobile health care, mobile energy and environmental applications, and mobile learning.

232. *Mobile health care.* Mobile health allows clinicians and patients to give and receive care anywhere at any time. Thus, patients can use health applications, monitoring devices and sensors that accompany them everywhere – diabetics, for example, can receive continuous, flexible insulin delivery through real-time glucose monitoring sensors that transmit data to wearable insulin pumps. Physicians can download diagnostic data, lab results, images and drug information to handheld devices like PDAs and smartphones; today's mobile cardiovascular solutions allow a patient's heart rhythm to be monitored continuously regardless of the patient's whereabouts. Through innovations such as these, mobile health results in improved health outcomes, benefitting society as a whole.

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[673] *Open Internet Order* at ¶ 54.

[674] *See Open Internet Order* at ¶ 56.

[675] *Id.*

[676] Roeller, L.H. and Waverman, L., "Telecommunications Infrastructure and Economic Development: A Simultaneous Approach," American Economic Review, 2001, 909-923.

[677] U.S. Department of Commerce, Economic Development Association, "Measuring Broadband's Economic Impact," 2006. The results show more rapid growth in employment and businesses in communities where broadband was widely available.

[678] Pearce, A. and Pagano, M, "Accelerated Wireless Broadband Infrastructure Deployment: The Impact on GDP and Employment," 2009, Media Law and Policy, 11-34.

[679] *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.

233. *Mobile energy and environmental applications.* Wireless broadband plays an increasingly important role in enabling energy efficiency, promoting energy independence, and improving the environment. Advanced electrical meters typically use cellular networks or private wireless broadband networks to backhaul traffic. Wireless broadband connectivity is also fundamental to a smarter transmission grid; synchrophasors (advanced sensors that help grid operators prevent system-wide blackouts) require high-speed connectivity. With the capabilities provided by mobile broadband, utility work crews will be better able to prevent and respond to service interruptions. Wireless broadband can also improve environmental protection. In Wilmington, NC, for example, a wireless broadband solution is being tested to conduct remote monitoring of wetlands, which the city estimates could reduce its costs by $100,000 per year.[680]

234. *Mobile learning.* Wireless technologies and mobile applications enable learning and teaching – both inside and outside the formal classroom. Existing and emerging retail technologies allow innovative approaches to teaching and learning, integrating text, moving and still images and audio, to transform a rigid information-transfer model (from book to teacher to students).[681] Many students have mobile devices for personal use—feature phones, smartphones and non-phone devices like Apple's iPod Touch—and these devices can run applications and functions that support teaching and learning. Purpose-built student machines like the Intel Classmate, the One Laptop per Child project's XO and the InkMedia LC, as well as relatively inexpensive netbooks with WiFi capability, are in growing use in classrooms.[682] New e-reading devices and tablets, from the Kindle DX, nook, Sony Reader, Apple iPad, HP Slate and Skiff, among many others, deliver to students a range of learning opportunities including e-textbooks, e-content and digital learning spaces.[683] States and school districts are blending wireless infrastructure, capable devices and innovative content to enhance educational outcomes.[684]

235. The U.S. wireless industry employed 249,247 workers at the end of 2009, up from 184,449 in 2000, yielding an average job creation rate of 4 percent per year.[685] According to the CTIA, approximately 2.4 million workers overall were directly and indirectly dependent on the industry at the end of 2009. In addition, wireless industry revenues were $152.6 billion in 2009 (in nominal dollars), up

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680 *See* Nate Anderson, *Wilmington, NC Takes White Spaces to Swamp, Ballparks*, Ars Technica, Feb. 24, 2010, http://arstechnica.com/tech-policy/news/2010/02/wilmington-nc-takes-white-spaces-to-swamp-ballparks.ars.

681 Transforming American Education: Learning Powered by Technology, National Education Technology Plan 2010, U.S. Department of Education Office of Educational Technology, at 154.

682 *See* Thomas W. Greaves and Jeanne Hayes, *America's Digital Schools 2008: The Six Trends to Watch*, http://www.fetc.org/FETC2009/Documents/Hayes.pdf, at 121.

683 *See generally* Victor Rivero, *E is for Explosion: E-Readers, Etextbooks, Econtent, Elearning, E-Everything*, http://www.mmischools.com/Articles/Editorial/Features/E-Is-for-Explosion-E-Readers2c-Etextbooks2c-Econtent2c-Elearning2c-E-Everything-5bAvailable-Full-Text2c-Free5d-68088.aspx

684 For example, Maine's Learning Technology Initiative equipped each of the state's 243 middle schools with wireless and provided each school with enough laptops for every seventh- and eighth-grade student and educator. The state's eighth-grade writing proficiency jumped 12 percent after implementation and mathematics and science material retention increased as well as a result of the program. *See* David L. Silvernail and Aaron K. Gritter, *Maine's middle school laptop program: Creating Better Writers*, Maine's Education Policy Research Institute, 2007, http://usm.maine.edu/cepare//Impact_on_Student_Writing_Brief.pdf; David L. Silvernail and Pamela J. Buffington, *Improving Mathematics Performance Using Laptop Technology: The Importance of Professional Development for Success*, Maine's Education Policy Research Institute in collaboration with the Maine International Center for Digital Learning, 2009, http://usm.maine.edu/cepare/pdf/Mathematics_Final_cover.pdf; Alexis M. Berry and Sarah E. Wintle, *Using Laptops to Facilitate Middle School Science Learning: The Results of Hard Fun*, Maine's Education Policy Research Institute in collaboration with the Maine International Center for Digital Learning, 2009, http://usm.maine.edu/cepare/pdf/Bristol_Final_Copy_cover.pdf.

685 CTIA, "The Semi-Annual Wireless Industry Survey", 2010. http://files.ctia.org/pdf/CTIA_Survey_Year_End_2009_Graphics.pdf

from $52.5 billion in 2000, yielding an average annual growth rate of 21.2 percent.[686] Wireless services comprised just 18 percent of the total telecommunications industry in 2000, as compared to 29 percent by the end of 2008.[687]

236. In addition, the wireless telecommunications industry provided $100 billion in "value-added" contributions to U.S.GDP in 2007, and going forward, productivity gains from wireless broadband services could generate as much as $860 billion over the period 2005-2016.[688] These gains would come from sources such as reduced travelling time, improved inventory management, improved automation processes and cost savings resulting from moving from wired to wireless communication, which are particularly significant for small businesses.[689]

237. U.S. telecommunications providers have invested significantly in network deployment and equipment, including mobile broadband networks. In 2009, according to CTIA, total annual incremental capital investment was $20.4 billion (13 percent of total industry revenue), and totaled $217 billion from 1998-2008. The U.S. Census Bureau estimated total annual capital expenditures at $20.65 billion for 2009 (31 percent of all such capital expenditure in the telecommunications industry).[690] Firms have also invested significantly in Research and Development (R&D), spending $7.3 billion in 2008 in the overall telecommunications industry (approximately 2 percent of sales). Overall, mobile wireless broadband is fast becoming a key platform for innovation, especially innovations in areas key to the vitality of the United States.

VI. MOBILE WIRELESS SERVICES: CONSUMER BEHAVIOR

238. Consumer behavior in response to price increases and adverse changes in service is an important indicator of the level of competition in the mobile wireless services industry. If consumers are sufficiently well-informed to take prices and other non-price factors into account, they are in a better position to choose the provider that offers the best terms. If enough consumers have the ability and propensity to switch service providers in response to a change in price or non-price factors, then mobile wireless service providers will have an incentive to compete vigorously to gain customers and retain their current customers. Consumers will be more effective in constraining wireless service provider behavior when the transaction costs they incur in choosing and switching providers are low. Transaction costs depend on, among other factors, subscribers' access to and ability to use information, and economic and non-economic barriers to switching providers. Further, switching costs may not only impact the demand-side of the market but may also increase supply side barriers if potential entrants are deterred from entering the market because they believe it would be difficult to attract consumers away from their existing service provider.

A. Consumer Switching Costs

239. In the context of mobile wireless services, switching costs are costs that a consumer incurs when past investment specific to her current service provider must be duplicated for a new service

[686] *Id*.

[687] *See* U.S. Census Bureau, http://www.census.gov/manufacturing/asm/index.html (visited Nov. 18, 2010).

[688] CTIA, "*The Wireless Industry Overview*", May 12 2010. http://files.ctia.org/pdf/051210_-_Wireless_Overview_FINAL.pdf

[689] Entner, R., "The Increasingly Important Impact of Wireless Broadband Technology and Services on the U.S. Economy," A Study for CTIA, 2008.

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

provider.[691] One recent study that looks explicitly at the effects of switching costs in the mobile wireless industry estimated switching costs (including non-observed "hassle" costs) to be $230.[692]

240. There are five potential sources of switching costs in the mobile wireless industry that can readily be identified: First, there is the cost associated with acquiring the necessary information about the offerings of other service providers in the marketplace. If informational costs are high, consumers may be discouraged from switching. Also, the consumer may only learn about the quality and other aspects of the network after having switched to a new provider. Second, wireless service consumers that have entered into multi-month service subscriptions with their service providers may be liable for early termination fees (ETF) if they choose to prematurely terminate their contracts. Third, there are the costs associated with obtaining a new wireless handset or unlocking the old handset when changing service providers. A potentially related handset change cost is the cost of reacquiring applications purchased for their current handset that may not be transferrable to a new handset (*i.e.* loss of exclusive content such as games, ringtones, etc.).[693] Fourth, there are costs associated with wireless local number portability (LNP). If a consumer cannot take their telephone number with them, the costs of informing their contacts may be high. Historically, the costs associated with wireless number portability were an important source of switching costs in the U.S. wireless telecommunications industry, but are insignificant as of October 2010.[694] Finally, non-economic (psychological) switching costs, *i.e.* customer inertia and/or brand

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[691] 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.

[692] This study modeled behavior of 32,000 customers from 2005 - 2009. *See* Cullen, J. and Shcherbakov, O., 2010, "Measuring Consumer Switching Costs in the Wireless Industry," Working Paper, Apr. 5, 2010. Their estimate is a composite of explicit costs such as early termination fees, and also implicit costs such as time spent setting up new service and canceling existing service, setting up billing, or the loss of service during the switch, *at 4*.

[693] For example, average application prices were estimated at $3.60 per paid application in the first half of 2010, http://www.research2guidance.com/the-smartphone-application-market-has-reached-more-than-2.2-billion-dollars-in-the-first-half-of-2010/, visited November 8, 2010. The average price of iPhone apps was estimated at $4.03 http://www.technewsdaily.com/apple-app-store-booming-1572/, visited November 8, 2010.

[694] 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 (continued….)

loyalty, although extremely difficult to quantify, are also important.

1. Access to Information on Mobile Wireless Services

241. In order to make informed decisions, consumers need detailed information about the price, availability, quality, and features of mobile wireless services. Mobile wireless service providers offer resources on their websites that can assist customers in making informed decisions regarding their wireless services. For example, Sprint Nextel offers an online "Plan Optimizer" so a customer can assess easily, based on past usage, what plan(s) may best fit that usage.[695] 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 area.[696] In addition, J.D. Power's website posts the results of its annual wireless user surveys, which rate handset manufacturers and wireless service providers based on customer satisfaction.[697]

242. Most service provider websites also include online street-level coverage maps so consumers can assess the level of service they can expect to receive in a given area.[698] 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. Even so, the coverage data released by providers is typically based upon statistical assumptions, and may not provide information on the impact of factors such as weather or user location on actual service quality experienced by consumers. Instead, the data may provide only a binary 'yes' or 'no' coverage reading without accounting for signal strength at particular locations. Other coverage maps provide more nuanced readings (*e.g.*, indoor/outdoor or good/better/best), but still are likely to be prepared using methodologies that vary significantly across service providers, limiting their utility for cross-provider comparison.[699]

243. 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

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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.

695 Sprint Nextel Comments at 20.

696 *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.

697 J.D. Power, *Telecom*, www.jdpower.com/telecom (visited Aug. 30, 2010). For example, according to J.D. Power, Apple ranks highest among smartphone manufacturers in customer satisfaction, while LG ranks highest in overall wireless customer satisfaction with traditional handsets. *See J.D. Power and Associates Reports: As Customer Satisfaction with Feature-Rich Smartphones Continues to Increase, Satisfaction with Traditional Mobile Phones Declines*, Press Release, J.D. Power, Oct. 8, 2009.

698 *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; Sprint – Nationwide Coverage, http://coverage.sprintpcs.com/IMPACT.jsp?PCode=vanity:coverage; T-Mobile, Personal Coverage Check, http://www.t-mobile.com/coverage/pcc.aspx; Verizon Wireless, Coverage Locator, http://www.verizonwireless.com/b2c/CoverageLocatorController?requesttype=NEWREQUEST&market=All.

699 In addition, to our knowledge, no reliable coverage dataset currently exists besides American Roamer'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.

throughput rates.[700] 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 data collection methods to use.[701] Information on mobile broadband availability can also be found in the National Broadband Map.[702]

244. Through the *Consumer Code for Wireless Service*, CTIA and the providers that are signatories to the Code, voluntarily commit to providing consumers with tools to assist them in the selection of wireless service.[703] 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.[704] 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.[705] 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.[706] The Code also states that prepaid service providers must disclose the period of time during which any prepaid balance is available for use.[707]

245. 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. For example, some providers allow consumers to set usage limits on their plans so they do not exceed their allowances for voice minutes or messages, which could incur unexpected overage charges. In addition, some providers also allow consumers to elect to receive alerts when they near or exceed their usage limits, although consumers typically pay a monthly fee of around $5 for these services.[708]

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[700] *See* Section V.HV.H, Network Quality, *supra.*

[701] *Id*.

[702] *See* Section IV.B.1.b, Coverage by Technology Type, *infra.*

[703] *See* CTIA, *Consumer Code for Wireless Service*, *available at* http://files.ctia.org/pdf/ConsumerCode.pdf. (*Consumer Code for Wireless Service*).

[704] *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.

[705] *See* CTIA Comments at 46; *See* also *Consumer Code for Wireless Service*.

[706] *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.

[707] *Id.*

[708] *See* CTIA Comments at 44-45. *See, e.g.,* Sprint Nextel, Learn About the Account Spending Limit Program, visited Nov. 8, 2010 http://support.sprint.com/support/article/Learn_about_the_Account_Spending_Limit_program/case-wh164052-20100120-111115. Verizon Wireless charges $4.99 per month to receive alerts, *see* https://wbillpay.verizonwireless.com/vzw/nos/uc/uc_home.jsp. AT&T offers a set of free tools and alerts for certain packages (http://www.networkworld.com/news/2010/060210-att-ends-unlimited-wireless-offering.html?hpg1=bn) and also offers "Smart Limits" for $4.99 a month (http://www.att.net/smartcontrols-SmartLimitsForWireless). U.S. (continued….)

246. Despite the tools available to assist consumers in making informed decisions regarding wireless services, survey data reveals that consumer confusion persists. For example, survey results released by the Commission in May 2010 indicate that 30 million Americans – or one in six mobile users – have experienced bill shock.[709] The results also show that nearly half of mobile phone users who have plans with early termination fees (ETFs) do not know the amount of the fees they are accountable for.[710] 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.[711]

247. The Commission has been proactively working to clear up consumer confusion surrounding bill shock, ETFs, and other issues. In August 2009, the Commission launched a proceeding to examine ways to empower consumers to make smart, informed decisions when it comes to communications services.[712] In January 2010, the Chiefs of the Consumer and Governmental Affairs and Wireless Telecommunications Bureaus sent letters to the major wireless carriers to learn more about their early termination fees.[713] And as one of the first initiatives undertaken by the Commission's Consumer Task Force, in May 2010, the Consumer and Governmental Affairs Bureau released a Public Notice asking about possible ways to prevent bill shock.[714] On October 13, 2010, the Consumer and Governmental Affairs Bureau released a White Paper that analyzed bill shock complaints for the first six months of 2010.[715] On October 14, 2010, the Commission proposed new rules that would require mobile service providers to provide usage alerts and related information to assist consumers in avoiding unexpected charges on their bills.[716] In addition, as discussed in Section V.H, above, 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."[717] 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.[718]

2. Early Termination Fees (ETFs)

248. The practice of assessing ETFs against postpaid subscribers when they cancel their

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Cellular also offers overage protection, http://www.uscellular.com/uscellular/common/common.jsp?path=/overage-protection/index.html.

[709] Federal Communications Commission, "FCC Survey Confirms Consumers Experience Mobile Bill Shock and Confusion About Early Termination Fees," rel. May 26, 2010.

[710] *Id*.

[711] *Best Phones & Plans,* Consumer Reports, Jan. 2011, at 29.

[712] *See* Consumer Information and Disclosure, CG Docket No. 09-158; Truth-in-Billing and Billing Format, CC Docket No. 98-170; IP-Enabled Services, WC Docket No. 04-36, *Notice of Inquiry*, 24 FCC Rcd 11380 (2009).

[713] *See* FCC, Early Termination Fees (ETFs), http://www.fcc.gov/cgb/etf/. Links to copies of the letters sent by the Commission to AT&T, Google, Sprint Nextel, T-Mobile, and Verizon Wireless are provided on the website.

[714] "Comment Sought on Measures Designed to Assist U.S. Wireless Consumers to Avoid 'Bill Shock,'" CG Docket No. 09-158, *Public Notice*, 25 FCC Rcd 4838 (2010).

[715] FCC, "Consumer and Governmental Affairs Bureau White Paper on Bill Shock," rel. Oct. 13, 2010.

[716] *See* Empowering Consumers to Avoid Bill Shock, CG Docket No. 10-207; Consumer Information and Disclosure, CG Docket No. 09-158, *Notice of Proposed Rulemaking*, FCC 10-180 (rel. Oct. 14, 2010).

[717] *Open Internet Order* at ¶ 54.

[718] *Open Internet Order* at ¶ 56.

wireless service agreement or plan before the expiration of its term represents probably the largest quantifiable cost to consumers who wish to switch service providers. These charges are the same across the country, and range from $150 to $350 among the four nationwide mobile wireless service providers.[719] More advanced handsets typically have higher ETFs. For example, AT&T and Verizon Wireless charge $325 or $350 respectively for advanced devices such as the Apple iPhone 4, the Blackberry®Curve™ or the Droid X and $150 or $175 otherwise. However, there is some variation among service providers – for example, T-Mobile's ETF for the new Google Nexus S smartphone is substantially lower, at $200.[720] Additional ETFs may be imposed by certain authorized agents or third-party vendors.[721]

249. As discussed in previous *Reports*, all four nationwide providers have implemented policies to pro-rate ETFs over the course of the contract term, and pro-rated ETFs lower the costs to consumers who switch service providers by progressively reducing the fee they pay to cancel their service early.[722] For example, T-Mobile reduces its early termination fee to $100 if termination occurs with 91 to 180 days remaining on the contract, and then to $50 if there are less than 91 days remaining,[723] and Verizon Wireless reduces its ETF of $350 (for advanced devices) by $10 for each full month of the contract term that is completed.

250. As detailed in the *Fourteenth Report*, the Consumer and Governmental Affairs Bureau (CGB) and the Wireless Telecommunications Bureau (WTB) sought information from Verizon Wireless, Sprint Nextel, AT&T, T-Mobile as well as Google regarding their assessment of ETFs, especially in connection with advanced devices and smartphones, and the impact such ETFs have on consumers' ability to switch providers.[724] All five companies responded by February 23, 2010 describing their practices regarding the disclosure of ETFs to consumers and stating 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

[719] *See Fourteenth Report*, 25 FCC Rcd at 11555, ¶ 234.

[720] *See e.g.* T-Mobile's Terms and Conditions, (visited Dec 28, 2010), available at http://www.t-mobile.com/Templates/Popup.aspx?WT.z_unav=ftr__TC&PAsset=Ftr_Ftr_TermsAndConditions&print=true.

[721] *See, e.g.,* Verizon Wireless, *Service Agreement*, http://www.verizonwireless.com/b2c/globalText?textName=CUSTOMER_AGREEMENT&jspName=footer/customerAgreement.jsp (visited Oct. 21, 2010)

[722] *See Fourteenth Report*, 25 FCC Rcd at 11555, ¶ 235.

[723] *See e.g.* T-Mobile's Terms and Conditions, (visited Dec 28, 2010), available at http://www.t-mobile.com/Templates/Popup.aspx?WT.z_unav=ftr__TC&PAsset=Ftr_Ftr_TermsAndConditions&print=true. Note that if termination occurs during the last 30 days of the contract, T-Mobile charges the lesser of $50 or the monthly recurring charges.

[724] *See Fourteenth Report*, 25 FCC Rcd at 11555-56, ¶¶ 235-236. *See e.g*., *WTB ETF Letter to Verizon Wireless;* Letter from Joel Gurin, Chief, Consumer and Government Affairs Bureau, and Ruth Milkman, Chief, Wireless Telecommunications Bureau, FCC, to Kathleen Grillo, Senior Vice President, Federal Regulatory Affairs, Verizon, DA 10-136 (Jan. 26, 2010); Letter from Joel Gurin, Chief, Consumer and Government Affairs Bureau, and Ruth Milkman, Chief, Wireless Telecommunications Bureau, FCC, to Robert W. Quinn, Jr., Esq., Senior Vice President-Federal Regulatory, AT&T Services, Inc., DA 10-132 (Jan. 26, 2010); Letter from Joel Gurin, Chief, Consumer and Government Affairs Bureau, and Ruth Milkman, Chief, Wireless Telecommunications Bureau, FCC, to Thomas J. Sugrue, Vice President, Government Affairs, T-Mobile, DA 10-135 (Jan. 26, 2010); Letter from Joel Gurin, Chief, Consumer and Government Affairs Bureau, and Ruth Milkman, Chief, Wireless Telecommunications Bureau, FCC, to Vonya B. McCann, Esq., Senior Vice President, Government Affairs, Sprint Nextel Corporation, DA 10-137 (Jan. 26, 2010); and Letter from Joel Gurin, Chief, Consumer and Government Affairs Bureau, and Ruth Milkman, Chief, Wireless Telecommunications Bureau, FCC, to Richard S. Whitt, Esq., Washington Telecom and Media Counsel, Google, Inc., DA 10-133 (Jan. 26, 2010).

recover those subsidies over the life of a contract, but cannot do so when a customer ends a contract early.[725]

251. However, a recent survey that was published by the Commission on May 26, 2010, reveals that of those surveyed, although 54 percent knew that an ETF would be assessed, of that 54 percent, approximately half said that they did not know what the fee would be.[726] Further, 28 percent of respondents said that a fee would not be assessed, and 18 percent did not know whether they would have to pay a fee or not.[727] From those surveyed, only 36 percent replied that the information on their bill in terms of ETFs was very clear. Respondents were also asked whether they had switched service providers in the last three years. Of the 20 percent of respondents who had switched, 75 percent said they did not pay an ETF. When asked whether paying an ETF significantly affected their decision to switch, 43 percent replied that ETFs were "a major reason". According to the survey, other important factors included the need to get a new handset (see Section V1.A.3 below); activation fees for a new service; and the hassle of ending one contract and starting another one, as well as the time involved.

252. There are some alternatives that are available to customers, whereby some providers offer service plans that do not have ETFs. For example, in addition to its multi-month plans with ETFs, Verizon Wireless also offers a month-to-month agreement with all of its nationwide pricing plans that allows customers to terminate their plans at the end of any month without paying an ETF.[728] Customers who choose Verizon Wireless's new month-to-month option either purchase new devices from Verizon Wireless at the full retail price, or procure their own CDMA devices.[729] Another way that consumers can avoid ETFs entirely is to purchase mobile wireless service on a prepaid basis, instead of agreeing to enter into a long-term service contract, which is becoming more popular than in the past as effective prices for these plans have decreased.[730] In addition, the five largest mobile wireless service providers have all implemented various policies that allow subscribers to change elements of their service contracts without triggering the start of a new contract term, thus reducing the likelihood these subscribers will be affected

[725] 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.

[726] Horrigan, J. and Satterwhite, E., "Americans' Perspectives on Early Termination Fees and Bill Shock," FCC, May 26, 2010). This survey was conducted by Abt/SRBI and Princeton Survey Research Associates, International. 3005 U.S. adults were interviewed over the period April 19 to May 2, 2010. The national random digit dial survey was conducted in English and Spanish and the sample included both landline and cell phones. In addition, the Commission has webpage where the initial letters to the service providers, the responses, the summary of the survey and further information on ETFs can be found. *See* www.fcc.gov/cgb/etf/.

[727] Moreover, according to a recent GAO report, "many consumers are unaware when their contracts are renewed or whether they are even under a contract," United State Government Accountability Office, July 2010, Report to Congressional Requesters, "Telecommunications," GAO-10-779.

[728] *No Contract Required – New Month-to-Month Agreement Gives Verizon Wireless Customers Even More Freedom,* Press Release, Verizon Wireless, Sept. 22, 2008.

[729] *Id*.

[730] *See* Section IV.A.2, Prepaid Service, *supra*.

by an ETF.[731]

253. The emergence of a secondary market segment for mobile wireless service contracts may also help promote competition by facilitating consumers' ability to switch service providers. In most cases, wireless service providers allow consumers to get out of their contracts without paying an ETF by transferring the remaining contract term to someone else who meets the provider's credit requirements.[732] A number of websites exist to facilitate transfers of mobile wireless contracts from one consumer to another under these provisions.[733] 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. [734] 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. Finally, at least one wireless service provider, Cellular South, offers to pay the ETF to entice a consumer to move to its network, thus eliminating the ETF as a cost of switching.[735]

3. Handsets, Handset Locking, and Handset Applications

254. Another potential cost of switching to a new service provider is the cost of replacing the handset when a consumer wishes to change from one wireless service provider to another that employs a different air interface. 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.

255. In addition, most handsets sold in the United States are "locked," meaning that they normally will operate only on a single wireless network. Locking can prevent a consumer from taking a handset from one service provider to another, unless the handset is reprogrammed.[736] The ability of a consumer to unlock a handset depends on the service provider. For example, GSM operators have different policies regarding handset unlocking. T-Mobile will provide an "unlock code" after the subscriber account has been active at least 40 days so that the same handset can be used on another operator's GSM network.[737] AT&T releases unlock codes to subscribers after their service has been active for 90 days and is in good standing, and the phone is not sold exclusively by AT&T (*i.e.*, AT&T would not unlock iPhones).[738] CDMA handsets are more difficult to unlock because they do not use a removable Subscriber Identification Module (SIM) card and must be reprogrammed by a CDMA

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[731] *See* Section IV.A, Price Rivalry: Developments in Mobile Service Pricing Plans, *supra.*

[732] Lacapra, L. T., *Breaking Free of a Cellular Contract*, Wall Street Journal, Nov. 30, 2006,.

[733] Examples include www.trademycellular.com and www.celltradeusa.com, visited Sept. 23, 2010.

[734] *See Breaking Free of a Cellular Contract.*

[735] *See* Cellular South, *Three Reasons to Switch to Cellular South*, https://www.cellularsouth.com/switchnow/index.html (visited June 7, 2011).

[736] Some handset manufacturers directly sell unlocked handsets in their Internet shops and through non-provider retailers. *See*, *e.g*., the manufacturer Internet shops selling unlocked handsets at: http://www.nokiausa.com/, http://www.motorola.com/Consumers/US-EN/Home. *See also* Section VII.B.1.a, Handsets/Devices, *infra*.

[737] *See* T-Mobile, *SIM Cards and Unlocking Your Phone*, http://search.t-mobile.com/inquiraapp/ui.jsp?ui_mode=question&question_box=unlock (visited Apr. 28, 2010).

[738] *See* AT&T, *Answer Center – What is the Unlock Code for My Phone?*, http://www.wireless.att.com/answer-center/main.jsp?solutionId=55002&t=solutionTab (visited Apr. 28, 2010).

provider.[739] CDMA providers, however, may be able to "flash" handsets that consumers bring from other providers,[740] which allows subscribers to keep their existing handsets when switching carriers.[741]

256. Even if the air interface is compatible in that service providers use the same underlying technology, devices, however, may not be able to be switched to another provider's network if that network operates on different spectrum bands. For example, T-Mobile's WCDMA handsets operate in the AWS 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. In addition, although the introduction of LTE technology will improve compatibility between providers, we note that LTE is being deployed by different providers on different spectrum bands. For example, AT&T has announced plans to launch LTE using AWS and Lower 700 MHz B and C block spectrum while Verizon has launched LTE using the Upper 700 MHz C block spectrum.[742] 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.[743] The licensees assert that the absence of such a requirement raises various competitive issues.[744] 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.[745] The Commission invited the panelists at the workshop to discuss the following topics: the technical issues associated with interoperability and development of standards, the commercial availability of interoperable chipsets and devices, the ability of small and regional providers to obtain interoperable equipment at a competitive cost, and the effect of interoperability on promoting competition, access to broadband, public safety, and the widespread availability of service in rural areas.[746]

257. Another increasingly important switching cost associated with smartphones is the stranding of mobile applications purchased for a particular handset that cannot be transferred to, or used on, a new handset. Mobile applications are typically tied to a single mobile wireless operating system.

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[739] *See* Cell Phone Forums, *Unlocking a CDMA Phone*, http://cellphoneforums.net/general-cell-phone-forum/t206579-unlocking-cdma-phone.html (visited Mar. 8, 2010).

[740] For example, MetroPCS will "flash" phones for a fee of $10, http://www.metropcs.com/metroflash/ (visited Dec. 28, 2010).

[741] In July 2010, the Librarian of Congress reaffirmed that a consumer's "unlocking" of a handset by modifying its software does not violate the Digital Millennium Copyright Act. http://www.copyright.gov/1201/2010/Librarian-of-Congress-1201-Statement.html (visited Dec. 28, 2010). In addition, and although we cannot vouch for them, websites exist that sell unlock codes: www.unlocking.com; www.cellunlocker.net/; www.theunlockshack.com.

[742] *See supra* Section IV.B.1.a, Service Provider Technology Deployments and note 425. In addition, at the December 3GPP Plenary TSG-RAN Meeting, both Verizon Wireless and AT&T contributed initial technical specifications for IMT-Advanced inter-band carrier aggregation. Verizon proposed carrier aggregation using Band 4 (1.7/2.1 GHz band) and Band 13 (the C Block in the upper 700 MHz band), for approval on downlink carrier aggregation by September 2011 and downlink/uplink carrier aggregation by December 2011. AT&T proposed carrier aggregation using Band 4 and Band 17 (the B and C Blocks in the lower 700 MHz band) within the same timeframe.

[743] *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.

[744] *700 MHz Equipment Petition* at 2, 4.

[745] "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).

[746] *Id.* at 1-2; *see* FCC, 700 MHz Interoperability Workshop (video), Apr. 26, 2011, http://www.fcc.gov/events/700-mhz-interoperability-workshop.

As a result, if a consumer with a smartphone were to contemplate switching either to a new service provider or to new handset using a different operating system with the same service provider, she would likely consider the cost associated with reacquiring applications purchased for use on the current handset that could not be used on the new handset.

4. Non-Economic Switching Costs

258. Social psychologists have shown that consumers will attempt to reduce "cognitive dissonance" by choosing products that they have previously bought or been given when making a repeat purchase.[747] This means that after purchasing mobile wireless services, a consumer will prefer this service provider, even if she did not have strong preferences for this provider prior to signing up for service. This makes customers more likely to stick with the initial service provider chosen.

259. 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.[748] The more a firm can differentiate itself, the more loyal a consumer is likely to become. The degree of customer loyalty will tend to increase in importance as the industry matures (*i.e.*, the rate of new subscriber growth is slowing down). Securing new customers is more costly because there are fewer first-time buyers so firms increasingly focus on capturing existing customers from their competitors.[749]

B. Churn as a Measure of Consumer Switching Costs

260. A reasonable proxy to determine whether switching costs are high enough to prevent consumers from making changes is churn. Churn refers to the percentage of current customers an operator loses over a given period of time, *i.e.*, a company's gross loss of customers during that time period.[750] By examining the magnitude and trend over time of service provider churn, we can quantify the degree to which consumers have both the desire and the ability to change service providers to better meet their mobile wireless service needs.[751]

261. Mobile wireless service providers usually express churn in terms of a percent of their subscribers per month. For example, an operator might report an average monthly churn of two percent, which is equivalent to the loss of about 24 percent of its current customers per year. Most providers report churn rates for postpaid subscribers of between 1.5 percent and 3.3 percent per month (see Chart 36).[752] Churn rates had been decreasing for a number of years. However, the trend has shown a slight increase over the last few quarters, with the nationwide providers averaging a monthly churn rate of just over 2 per cent percent in the fourth quarter of 2009.[753] Prepaid subscriber churn is typically significantly

[747] 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.

[748] 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.

[749] *Id*.

[750] CTIA defines it as "a measure of the number of subscribers disconnecting from service during the period." *CTIA Mid-Year 2009 Wireless Indices Report*, at 70.

[751] Churn only measures consumers that have left a particular service provider; it does not measure consumers that wanted to switch, but were unable to do so. Churn also does not measure the extent to which consumers have switched or would switch in response to relative price changes, so provides no information as to whether firms exercise market power or not.

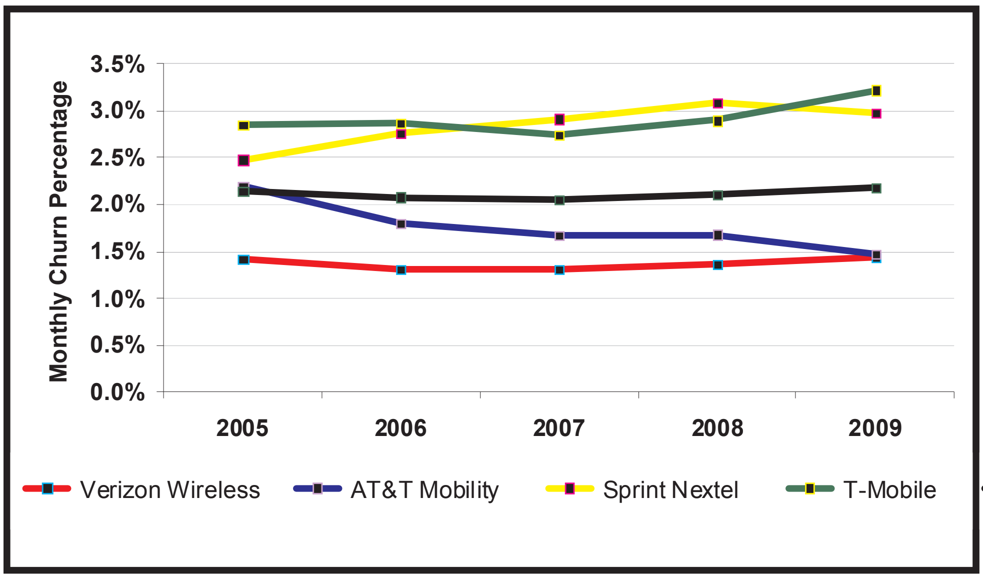
[752] *US Wireless 411 3Q09*, at 20 (Table 16: Monthly Churn).

[753] *US Wireless 411 3Q09*, at 6. *See also Eleventh Report*, 21 FCC Rcd 10947 at 11005, ¶ 145 for reasons for the earlier decline. To give some cross-industry perspective, retail banks have an average churn rate of 7 percent per annum (0.6 percent per month), for example, compared with 18 percent (1.5 percent per month) for automotive insurers. https://www.mckinseyquarterly.com/Financial_Services/Insurance/Limiting_churn_in_insurance_1546.

higher, over four percent per month, as seen in the graph of "comparative churn" below. Churn is a significant expense for the mobile wireless industry. The magnitude of this expense can be estimated by multiplying the number of subscribers lost by the average cost to acquire a new subscriber. For example, using data for the end of 2009 for Leap Wireless, Leap lost an estimated 199,222 thousand subscribers per month, which multiplied by its estimated average cost to acquire a new subscriber (cost per gross addition) of $196, yields an estimated monthly cost to replace those lost subscribers of just over $39 million.[754]

262. *Comparative Churn*. In addition, many service providers report churn for postpaid subscribers separately from prepaid subscribers. As can be seen in the following graph of comparative churn rates, prepaid subscribers are more likely than a post paid subscriber to terminate a relationship with a wireless service provider because they are not constrained by a contract.[755] Chart 37 helps to illustrate the trends in churn for different subscriber types.

Chart 36
Blended Churn Reported by Four Nationwide Service Providers[756]

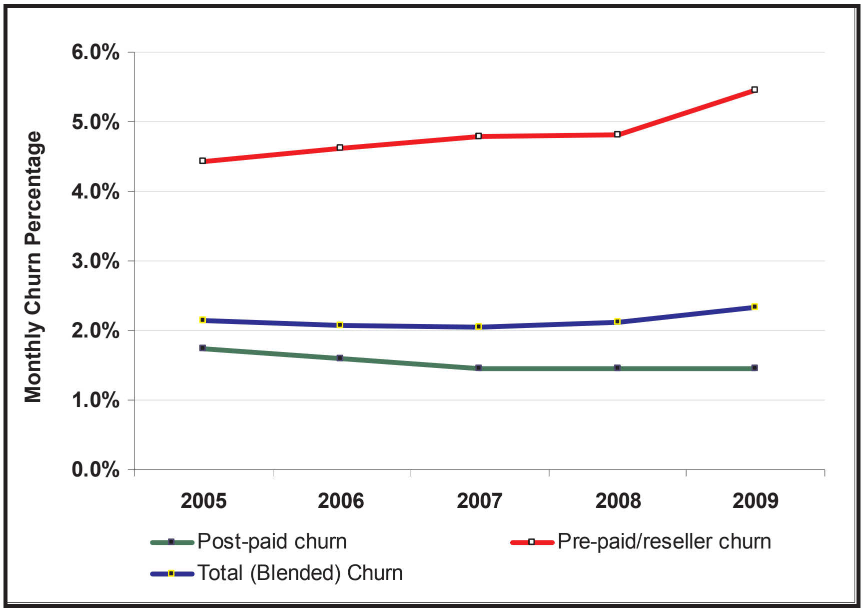


[754] *See Leap Wireless*, SEC Filings, Form 10-K at 60, 71. Note the most recent data we have for AT&T, for example, is for 2008, where the estimated monthly replacement cost is almost $635 million (*see Fourteenth Report*, 25 FCC Rcd at 11559, ¶ 245).

[755] *Leap Wireless & Metro PCS: Low Cost Prepaid Wireless…A Survival Story; Initiating Coverage at Outperform*, Bernstein Research, Dec 14, 2009.

[756] Data provided by Bernstein Research. Annual churn is an average for each of the four quarters. Verizon Wireless is combined with Alltel.

Chart 37
Comparative Churn[757]



263. *Subscriber Lifetime.* Based on industry and reported service provider churn, one can also calculate the number of months an average subscriber is expected to remain a customer of a particular wireless service provider. This measure is referred to as the subscriber lifetime, and is calculated by dividing one by the monthly churn rate.[758] As indicated by Table 25, the weighted average lifetime of a subscriber to Verizon Wireless and/or AT&T ranged between 63 and 71 months over 2009.[759] This compares to a significantly lower subscriber lifetime for prepaid service providers, such as Leap and MetroPCS, of 17 to 30 months, reflecting their comparatively higher churn rates. The industry weighted average was 50 months at year-end 2009.

[757] Data provided by Bernstein Research. Annual churn is an average for each of the four quarters. Verizon Wireless is combined with Alltel.

[758] Subscriber lifetime can also be used to derive ancillary subscriber metrics (such as Total Lifetime Revenue per user, and Lifetime revenues for voice and data revenues).

[759] Calculation of Monthly Lifetime is based on Blended Churn, thus postpaid and prepaid churn calculations would provide different measures.

Table 25
Lifetime of Subscribers (Months)[760]

	1Q07	2Q07	3Q07	4Q07	1Q08	2Q08	3Q08	4Q08	1Q09	2Q09	3Q09	4Q09
National Operators												
AT&T	59	63	59	59	59	63	59	63	63	67	71	71
Verizon Wireless	91	77	77	83	77	83	71	67	67	71	67	71
Sprint Nextel	43	48	43	42	37	48	45	45	45	48	40	42
T-Mobile	38	37	34	36	38	37	33	30	32	32	29	30
Regional & Other Operators												
US Cellular	59	48	45	48	56	53	48	50	53	45	45	48
Alltel	56	59	53	56	56	53	50	NAV	NAV	NAV	NAV	NAV
Centennial Cellular	45	56	43	42	43	50	37	40	45	45	36	NAV
Centennial PCS	37	42	42	38	42	40	38	36	34	34	30	NAV
Cincinnati Bell	29	28	28	29	30	27	25	23	29	31	29	29
Leap Wireless (Cricket)	29	23	19	24	28	26	23	26	30	23	19	21
MetroPCS	25	21	19	21	25	22	21	20	20	17	17	19
Industry Wtd. Average	53	53	50	53	48	53	48	48	50	53	48	50

VII. INPUT AND DOWNSTREAM SEGMENTS OF THE MOBILE WIRELESS ECOSYSTEM

A. Input Segments

264. 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. Spectrum

265. In this section, we briefly describe the Commission's allocation and licensing of commercial wireless spectrum that is used for the provision of mobile voice, mobile broadband and other 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.

a. Availability of Mobile Wireless Services Spectrum

266. Access to spectrum is a precondition to the provision of mobile wireless services. Ensuring that sufficient spectrum is available for incumbent licensees, as well as for entities that need spectrum to enter the market, is critical for promoting competition, investment, and innovation. Incumbent licensees may need additional spectrum to increase their coverage or capacity as they grow

[760] *US Wireless 411 2Q09*; Commission estimates.

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 in this proceeding note the importance of promoting access to spectrum among providers to ensure that all mobile wireless consumers reap the benefits of competition.[761] 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.

267. 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.[762] In the absence of sufficient spectrum, network providers must turn to costly alternatives, such as cell splitting, often with diminishing returns.[763] Accordingly, the *National Broadband Plan* recommends that the Commission make 500 megahertz of spectrum newly available for broadband use within the next ten years, of which 300 megahertz between 225 MHz and 3.7 GHz should be made newly available for mobile use within five years.[764] 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,[765] which was further expanded on in the recent State of the Union address.[766] The need for new spectrum was also underscored by an October 2010 Commission staff technical paper.[767] According to the paper, the current spectrum forecast demonstrates that the amount of mobile data demanded by American consumers is likely to exceed the capacity of wireless networks in the near-term, and that meeting this demand by making additional spectrum available is likely to create significant value for the mobile economy. Specifically, the paper finds that mobile broadband growth is likely to outpace the ability of technology and network improvements to keep up by an estimated factor of three, leading to a spectrum deficit that is likely to approach 300 megahertz within the next five years.[768] The paper also finds that "releasing an additional 275 megahertz of spectrum saves approximately $120

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[761] *See* Cricket Reply at 9-12; Free Press and Media Access Project Comments at 15-17; MetroPCS Comments at 16-24; NTCA Comments at 4-6; RCA Comments at 7; RTG Comments at 8-9; Sprint Nextel Comments at 35 Letter from Russell H. Fox, Mintz Levin, to Marlene H. Dortch, Secretary, FCC, WT Docket No. 10-133 (filed Dec. 2, 2010) (*T-Mobile Dec. 2, 2010 Ex Parte Letter*) at 2-3; USCC Reply at 4-10.

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

[763] *Id*.

[764] *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.

[765] 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.

[766] *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 Feb. 10, 2011.

[767] *See* Federal Communications Commission Staff Technical Paper, *Mobile Broadband: The Benefits of Additional Spectrum*, Oct. 2010 (*FCC Mobile Broadband Paper*). In addition, on October 21, 2010, the Commission hosted a spectrum summit highlighting the need to make additional spectrum available for mobile broadband use and addressing potential ways to ensure America has the spectrum resources necessary to realize the full benefits of mobile broadband services. A video recording of the summit is available at http://reboot.fcc.gov/workshops/spectrum-summit.

[768] *FCC Mobile Broadband Paper,* at 17-19.

billion in capital expenses to accommodate mobile data demand."[769]

268. In October 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,[770] as well as a Fast Track Evaluation report identifying 115 megahertz of spectrum to be made available within five years.[771] 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.[772] It also describes the process for evaluating these candidate bands and the steps necessary to make the selected spectrum available for wireless broadband services.[773] 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.[774] NTIA has recently selected the 1755 – 1850 MHz spectrum band for a detailed evaluation of whether it can be repurposed for commercial mobile broadband use based on a variety of factors, including industry interest and its potential for commercial use within ten years.[775] In addition, a recent Presidential Memorandum directed NTIA, and encouraged the FCC, to collaborate to make available a total of 500 megahertz of federal and non-federal spectrum over the next ten years, suitable for both mobile and fixed wireless broadband use.[776]

269. Currently, mobile wireless operators primarily use licenses associated with three different frequency bands to provide mobile voice and, in most cases, mobile data services: Cellular (in the 850 MHz band), SMR (in the 800/900 MHz band), and broadband PCS (in the 1.9 GHz band). Over the past several years, additional spectrum bands have become available – BRS and EBS in the 2.5 GHz band,

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[769] *FCC Mobile Broadband Paper*, at 20. The paper notes that this value "is likely to be offset somewhat by the costs of acquiring and making use of new spectrum." *Id.* at 21.

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

[771] *See* 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.

[772] *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.

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

[774] *See* 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.

[775] *See NTIA Takes Next Step in 500 MHz Wireless Broadband Initiative*, Press Release, NTIA Jan 31. 2011, *available at* http://www.ntia.doc.gov/press/2011/500mhzstatement_02012011.html.

[776] The spectrum must be available to be licensed by the FCC for exclusive use or made available for shared access by commercial and Government users in order to enable licensed or unlicensed wireless broadband technologies to be deployed. "Presidential Memorandum: Unleashing the Wireless Broadband Revolution," June 28, 2010, *available at* http://www.whitehouse.gov/the-press-office/presidential-memorandum-unleashing-wireless-broadband-revolution.

AWS in the 1.7/2.1 GHz band, the 700 MHz band, and WCS in the 2.3 GHz band – which are beginning to enable the provision of additional competitive mobile voice and data services. 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.[777]

(i) Frequency Bands

270. *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. The Commission completed licensing the majority of Cellular operators in 1991. Cellular licensees provided the first widely-used mobile services.[778] Historically, they have held much of the share of mobile services provided in most markets across the country.

271. *SMR*. By the early 1990s, mobile voice services were also provided using approximately 20 megahertz of SMR spectrum in the 800 and 900 MHz bands. The Commission had established SMR in 1974 to provide for land mobile communications on a commercial basis. The Commission initially licensed SMR spectrum in non-contiguous bands, on a site-by-site basis.[779] The Commission has since licensed additional SMR spectrum on an EA basis, through the auction process. Although the primary use for SMR traditionally was dispatch services,[780] providers such as Nextel acquired significant amounts of SMR spectrum and were successful in launching mobile telephony services in the 1990s, competing with licensees using Cellular spectrum in the provision of mobile telephony services.[781]

272. *Broadband PCS*. Between 1995 and 1999, the Commission auctioned 120 megahertz of broadband PCS, in different bandwidths and licensing areas, in the 1850-1910 MHz and 1930-1990 MHz bands. More efficient digital wireless technologies had been developed, an advance over existing analog cellular networks. This newly available spectrum 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 providers, and 54 percent by five or more providers;[782] by 2009, 96 percent of the U.S. population (by census block) was covered by three or more providers, and 74 percent by five or more.[783] Between 1995 and 2008, the price per minute of mobile wireless service dropped 84 percent,[784] while the number of subscribers increased over 700 percent.[785] With increased competition

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[777] A more detailed description of spectrum available for mobile wireless service is provided in Appendix A. There are other bands – including 1670-1675 MHz and 901-902 MHz (Narrowband PCS) – that are licensed under the Commission's flexible Part 27 or Part 24 rules and can be used to provide CMRS. Appendix A also includes a discussion of the 3650-3700 MHz band, which can be used to provide wireless broadband service.

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

[779] 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").

[780] 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.

[781] 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).

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

[783] *See Fourteenth Report*, 25 FCC Rcd at 11448, Table 4.

[784] *See Id.* at 11532, Table 19.

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,[786] and the number of cell sites more than quadrupled, from 18,000 to over 80,000.[787]

273. *BRS and EBS.* In 2004, the Commission adopted revisions to the rules and band plan governing BRS and EBS 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.[788] 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.[789]

274. *AWS.* In 2006, the Commission auctioned a total of 90 megahertz of AWS spectrum. Since 2008, several licensees, including T-Mobile and Leap, have deployed mobile wireless services using AWS spectrum across the country.[790] In the fourth quarter of 2010, MetroPCS and Cox Communications launched LTE and CDMA EV-DO networks, respectively, using their AWS licenses.[791] In addition, AT&T has announced that it plans to use both the AWS and 700 MHz spectrum bands for its LTE deployment.[792] Other major holders from the 2006 auction (*e.g.* Verizon Wireless and SpectrumCo) have not yet announced deployment plans for this spectrum.

275. *700 MHz.* The auctions of 700 MHz spectrum between 2002 and 2008, combined with the completion of the Digital Television transition in June 2009, have made an additional 74 megahertz of spectrum available for mobile and fixed commercial services.[793] Of this total, 58 megahertz is paired spectrum with sufficient channel widths to support mobile broadband. Beginning in December 2010, Verizon Wireless launched LTE services in this band.[794] In addition, AT&T has announced that it plans to deploy LTE in 2011-2013 using its 700 MHz and AWS spectrum, with its LTE network initially covering 75 million POPs by mid-2011.[795] In addition, AT&T announced in December 2010 that it has agreed to purchase licenses in the Lower 700 MHz D and E blocks from Qualcomm to deploy as a

(Continued from previous page)
[785] *See id.* at 11642, Table C-1.

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

[787] *Id.* at 150.

[788] 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).

[789] *See* Section IV.B.1, Service Provider Technology Deployments, *supra.*

[790] As of mid-2010, T-Mobile's HSPA network covered 212 million people, and its HSPA+ (21 Mbps) network covered 85 million people. *See* Section IV.B.1.a, Service Provider Technology Deployments, *supra*.

[791] *See* Sections IV.B.1, Service Provider Technology Deployments and III.E.1, Entry, *supra.*

[792] *See* Section IV.B.1.a, Service Provider Technology Deployments, *supra.*

[793] The 74 megahertz includes 4 megahertz of spectrum in the 700 MHz Guard Bands, which are not included in Table 26. Portions of the lower 700 MHz band were auctioned previously in Auctions 44, 49, and 60. *See Tenth Report*, 20 FCC Rcd at 15940, ¶ 80. 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.

[794] *See* Section IV.B.1.a, Service Provider Technology Deployments, *supra*, for a discussion of technological deployments in recently-licensed mobile wireless frequency bands.

[795] *Id*. AT&T expects to complete its LTE network deployment by 2013.

supplemental downlink for mobile broadband services.[796]

276. *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.[797] The revised rules will 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.[798]

Table 26
Spectrum Potentially Usable for Mobile Wireless Services[799]

Spectrum Band	Megahertz (Rounded)
Cellular	50
SMR*	26.5
Broadband PCS	120
AWS-1	90
700 MHz	70
2.5 GHz (includes BRS and EBS**)	74 (BRS) and 113 (EBS)
WCS	25
1.4 and 1.6 GHz	13
1910-15/1990-95 MHz***	10

* Including 19 megahertz of SMR spectrum and 7.5 megahertz of spectrum that is available for SMR as well as other services, *see* Appendix A, para. 4 on SMR spectrum
** BRS and EBS spectrum is calculated based on the post-transition band plan described in 47 C.F.R. §27.5(i)(2). EBS licenses must be held by educational institutions; however, EBS licensees can lease a significant portion of their spectrum to commercial operators.
*** Held by Sprint Nextel as a result of the 800 MHz Band Reconfiguration.

277. *Other Spectrum Bands.* Other spectrum bands that may later be used for the provision of mobile voice and broadband services include spectrum in the MSS spectrum bands, which are discussed above in Section III.B.4 of the *Report*.[800] The *National Broadband Plan* recommended that the Commission take steps to accelerate terrestrial broadband deployment in 90 megahertz of spectrum in the three MSS bands (the 2 GHz, the L-band, and the Big LEO band),[801] and the Commission has

[796] AT&T, *AT&T Agrees to Acquire Wireless Spectrum from Qualcomm,* Press Release, Dec. 20, 2010.

[797] *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*, released May 20, 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.*

[798] *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*, released May 20, 2010.

[799] This table only includes the terrestrial, flexible use frequency bands discussed in this section of the *Report.* As discussed above and below, the Commission is taking steps to make additional MSS spectrum available for new investment in mobile broadband networks while also ensuring that the United States maintains robust MSS capabilities. *See* Section III.B.4, Mobile Satellite Service Providers, *supra.*

[800] *See* Section III.B.4, Mobile Satellite Service Providers, *supra*, for a discussion of MSS. Some of the service rules governing MSS bands are currently the subject of a rulemaking and notice of inquiry proceeding before the Commission. *See MSS NPRM* and *MSS NOI*.

[801] *See National Broadband Plan*, at 87.

commenced a proceeding and adopted a Report and Order.[802] LightSquared, for example, plans to offer LTE and satellite connectivity, on a wholesale basis, to other wireless network operators, cable operators, consumer electronics companies, and other technology companies, with coverage through its terrestrial network extending to at least 100 million U.S. POPs by the end of 2012.[803] Also potentially available for mobile wireless services are the 1.4 GHz band and the 1670-1675 MHz band.[804] These bands are not discussed further here because, as yet, services offered in these bands do not impact competition in mobile wireless services.

(ii) Facilitating Access to Spectrum Among Multiple Providers

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

279. *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.[805]

280. *Spectrum Aggregation.* The Commission has adopted different policies through the years with regard to aggregation of commercial mobile spectrum. 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 as a means to preserve competitive opportunities in the mobile communications marketplace, retain incentives for innovation, and promote the efficient use of spectrum.[806] Under these CMRS spectrum aggregation limits, which were modified in 1999, no entity could control more than 45 megahertz out of 180 megahertz of Cellular, SMR, and broadband PCS spectrum in any given cellular market.[807] The Commission eliminated the spectrum cap beginning in

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[802] *See* Section III.B.4, Mobile Satellite Service Providers, *supra.*

[803] *See* Section IV.B.1.a, Service Provider Technology Deployments, *supra*.

[804] *See* Appendix A for additional discussion of the 1.4 GHz band and the 1670-1675 MHz band.

[805] 47 C.F.R § 24.3.

[806] 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).

[807] *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* (continued….)

2003, moving instead to a case-by-case market analysis of proposed merger transactions to address potential competitive concerns if providers sought to aggregate their spectrum holdings in particular markets.[808]

281. *Spectrum Screen.* In 2004, the Commission adopted a "spectrum screen" to assist in its analysis of potential competitive concerns raised by transactions in which providers were aggregating spectrum. This screen identified particular markets in which the spectrum aggregation exceeded a pre-determined amount of spectrum, set at approximately one-third of the critical spectrum input.[809] In those markets, the Commission conducted further analysis to determine whether sufficient spectrum capacity would be available to other providers to compete effectively. In markets where this would not be the case, the Commission required divestiture of spectrum.[810] For purposes of its competitive analysis, the Commission evaluated whether particular spectrum bands were available and "suitable" for mobile wireless services by determining whether the spectrum was capable of supporting mobile services given its physical properties and the state of the equipment technology, whether the spectrum was licensed with a mobile allocation and corresponding service rules, and whether the spectrum was committed to another use that effectively precluded its use for "mobile telephony" service.[811] At that time, the Commission included only Cellular, SMR,[812] and PCS spectrum in its "spectrum screen" analysis. Since then, however, that Commission periodically has modified its spectrum screen as additional spectrum – including 700 MHz,[813] AWS-1,[814] and BRS spectrum[815] – has become available.[816] The Commission also

(Continued from previous page)
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).

808 *See* 2000 Biennial Regulatory Review – Spectrum Aggregation Limits for Commercial Mobile Radio Services, WT Docket No. 01-14, *Report and Order*, 16 FCC Rcd 22668, 22669-71 ¶¶ 2-6 (2001) (*Second Biennial Review Order*). The Commission also raised the spectrum cap to 55 megahertz in all markets during the sunset period. *Id*. at 22671 ¶ 6.

809 Applications of AT&T Wireless Services, Inc. and Cingular Wireless Corporation For Consent to Transfer Control of Licenses and Authorizations, *Memorandum Opinion and Order*, 19 FCC Rcd 21522, 21568-69 ¶ 109 (2004).

810 *Id.* at 21620-21 ¶ 255.

811 *Id*. at 21534-35 ¶ 26.

812 *See Ninth Report,* 19 FCC Rcd at 20633-34 ¶ 89 & n.197; *see also* Applications of Nextel Communications, Inc. and Sprint Corporation, WT Docket No. 05-63, *Memorandum Opinion and Order*, 20 FCC Rcd 13967, 13992 n.155; Applications of AT&T Wireless Services, Inc., Transferor, and Cingular Wireless, Corp., Transferee, *Memorandum Opinion and Order*, 19 FCC Rcd 21522, 21561 ¶ 81 (2004).

813 *Id.* at ¶ 31.

814 *Sprint Nextel-Clearwire Order*, 23 FCC Rcd at 17596-17600, ¶¶ 61-73. For purposes of this spectrum screen, AWS-1 is considered available in those markets where it has been cleared of governmental and non-governmental incumbent users such that it is available for the deployment of mobile wireless services. *See Sprint/Clearwire Order*, 23 FCC Rcd at 17599 ¶ 72.

815 Most BRS spectrum is considered available in those markets where the transition of BRS spectrum to the new band plan has been completed. *Sprint/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. The Commission has not to date included EBS spectrum in (continued….)

has recognized that the mobile services marketplace – including the product market – has evolved, and in 2008 revised its spectrum screen analysis by examining a combined product market for both mobile telephony services and mobile broadband services.[817]

282. *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. In 2003, as part of its secondary market policies, the Commission adopted rules to permit 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.[818] Further, the Commission's secondary markets policies allow licensees to enter into "dynamic" leasing arrangements, where the licensee and spectrum lessee can share use of the same spectrum through the use of cognitive radio technologies.[819] 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 to 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.[820] 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 that these technological innovations have for enabling more effective management of spectrum through use of secondary market arrangements.[821]

(Continued from previous page)
its spectrum screen. As noted in recent orders, the primary purpose of EBS is to further the educational mission of accredited public and private schools, colleges, and universities. Moreover, while EBS licensees are allowed to lease excess capacity to commercial operators, leased spectrum is subject to various special requirements designed to maintain the primary educational character of services provided. In addition, other elements of the EBS licensing regime, such as its solely site-specific character, with the absence of any licensee in various unassigned EBS "white spaces," complicate the use of this spectrum for commercial purposes. *See id.* at 17599-600 ¶ 71; *Verizon Wireless-Alltel Order*, 23 FCC Rcd at 17479 ¶ 67.

816 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.

817 *See Verizon Wireless-Alltel Order*, 23 FCC Rcd at 17469-470, ¶¶ 45-47.

818 *Ninth Report*, 19 FCC Rcd at 20631, ¶ 84.

819 Promoting Efficient Use of Spectrum Through Elimination of Barriers to the Development of Secondary Markets, WT Docket No. 00-230, *Second Report and Order, Order on Reconsideration, and Second Further Notice of proposed Rulemaking*, 19 FCC Rcd 17503, 17547-49 ¶¶ 87-90 (2004) (*Secondary Markets Second R&O*); *700 MHz Second R&O*, 22 FCC Rcd at 15374-80, ¶¶ 231-248.

820 *National Broadband Plan,* at 95-96.

821 *See* Promoting More Efficient Use of Spectrum Through Dynamic Spectrum Use Technologies, ET Docket No. 10-237, *Notice of Inquiry*, FCC 10-198 (rel. Nov. 30, 2010), ¶ 2. The NOI first inquires into the current state of development of dynamic spectrum access technologies, including spectrum sensing and other dynamic spectrum sharing capabilities and techniques. The NOI also requests information on how the Commission can promote the development of these technologies, such as the establishment of dynamic access radio test-beds, and how these radios and spectrum management techniques may be deployed in the future for use on both a licensed and an unlicensed basis. In addition, the NOI seeks comment on whether there are additional steps the Commission should take to improve its "Spectrum Dashboard," how spectrum used through secondary market arrangements could employ dynamic spectrum access radios and techniques, and whether the database access model applicable to unlicensed Television Band Devices might be deployed in other spectrum bands. *Id.*

b. Current Spectrum Transactions

283. Aside from the larger, high profile transactions, there has been a recent increasing trend of smaller transactions involving applications to transfer or assign spectrum licenses involving national or regional service providers.[822] While some of these transactions include minimal network and customer assets as small providers exit, many transactions involve spectrum licenses only.[823] Some licensees transferring their spectrum licenses in these routine transactions are completely exiting while others are selling their licenses in certain geographic areas and retaining their remaining licenses in other geographic areas. For example, in 2010, AT&T filed an application to acquire PCS licenses from Von Donop Inlet PCS, LLC (Von Donop). This application included an assignment of spectrum in nine BTAs and encompassed 37 counties in eight states, and the sale left Von Donop with no wireless assets.[824] Other transactions involved the swap of spectrum licenses among service providers that retained some wireless assets post-transaction.

284. In 2009, all such transactions were spectrum licenses only. AT&T filed applications associated with 12 separate transactions through which it acquired PCS, AWS, and 700 MHz licenses in various geographical areas throughout the United States from licensees who had not yet built out these licenses.[825] Verizon Wireless also filed applications for eight transactions to acquire Cellular and PCS spectrum rights from licensees who had not yet built out these licenses.[826] Among the nationwide service providers, there were swap agreements involving PCS spectrum between T-Mobile and Sprint Nextel and between T-Mobile and Verizon Wireless.[827]

285. In the first ten months of 2010, these trends continued. AT&T filed applications for ten transactions to acquire Cellular, PCS, AWS-1, and 700 MHz licenses from small licensees, while Verizon Wireless filed applications for four transactions to acquire PCS and 700 MHz licenses from small licensees.[828] Also, in the first ten months of 2010, Sprint-Nextel filed to acquire PCS spectrum from Wirefree.[829] Additionally, three sets of swap applications were filed in the first ten months of 2010: AT&T and MetroPCS filed two sets of swap applications for AWS-1 licenses[830] and T-Mobile and Sprint

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[822] Transfer and assignment applications for CMRS spectrum are also regularly filed by smaller licensees, including licensees acquiring spectrum from one of the four nationwide service providers. Applications discussed herein reflect applications that the Commission has found acceptable for filing during 2009 and the first ten months of 2010.

[823] *See* Section III.E.2, Exit, *supra*.

[824] *See* ULS File No. 0004212012, consummated Oct. 29, 2010. *See also* Union Telephone Company which assigned 5 of its 18 lower 700 MHz licenses to AT&T in 2009. *See* ULS File No. 0003682956, consummated Apr. 15, 2009.

[825] *See* Public Notice, 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, 2009 ("*2009 Accepted for Filing PNs*").

[826] *2009 Accepted for Filing PNs*.

[827] Sprint/T-Mobile Swap Applications - *see* Public Notice, 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, ("WTB Accepted for Filing PN") rel. Aug. 19, 2009; Verizon Wireless/T-Mobile Swap Applications - *see* WTB Accepted for Filing PN, rel. Oct 21, 2009.

[828] *See* Public Notice, 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, 2010 ("2010 Accepted for Filing PNs").

[829] *See* WTB Accepted for Filing PN, rel. July 21, 2010.

[830] *See* WTB Accepted for Filing PN, rel. Mar. 3, 2010.

filed swap applications for PCS licenses.[831] During the first ten months of 2010, 13 out of the 16 transactions discussed above were spectrum-only.[832] The analyses of spectrum holdings below do not reflect the recent spectrum-only transactions described in this section.

c. Analysis of Spectrum Holdings Overall

286. Because access to spectrum is necessary for the provision of mobile wireless service, the different spectrum holdings of major 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. As the tables and charts below illustrate,[833] several wireless providers hold significant amounts of spectrum that is usually considered viable for mobile service, although SMR spectrum is not currently suitable for the provision of mobile broadband data services.[834]

287. Verizon Wireless and AT&T each hold significant amounts of 700 MHz, Cellular, broadband PCS, and AWS spectrum. Sprint Nextel 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.[835] Uniquely, the spectrum holdings of Clearwire, which is affiliated with Sprint Nextel,[836] fall in the 2.5 GHz band – where it holds the predominant amount of BRS spectrum, and has access to much of the EBS spectrum through spectrum leasing arrangements.[837] Regional provider US Cellular holds Cellular, 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, PCS, and AWS licenses, primarily in the less populated parts of the United States.

288. Five providers together – Verizon Wireless, AT&T, T-Mobile, as well as Sprint Nextel and Clearwire – hold more than 80 percent of all spectrum, measured on a MHz-POPs basis, that is potentially usable for the provision of mobile wireless services (see Table 27). Table 28 shows megahertz holdings for each provider, weighted by population. Finally, Chart 38 is a graph of providers' spectrum holdings by frequency band, measured on a MHz-POPs basis.

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[831] *See* WTB Accepted for Filing PN, rel. Mar. 3, 2010.

[832] *See* Section III.E.2, Exit, *supra* for an analysis of the transactions that also involved customer transition issues and the exit of the associated firms.

[833] *See infra* Tables 27-28 and Charts 37-39. The data in these tables and charts generally reflect transactions consummated through September 30, 2010. The data reflect the sale of divestiture assets required as part of the Verizon Wireless-Alltel and AT&T-Centennial transactions. The data in these tables do not include MSS spectrum holdings. Nor do they include WCS spectrum holdings. WCS spectrum is currently licensed to several providers, including AT&T, Horizon Wi-Com, NextWave, NTELOS, Sprint Nextel, and Windstream. Additional information on WCS licensees can be accessed using the Spectrum Dashboard located on the Commission's website, *available at* www.fcc.gov/spectrumdashboard.

[834] *See* Para 290, *infra* (discussing limitations on the use of SMR spectrum for broadband service).

[835] 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).

[836] *See* Section III.E.1, Entry, *supra.* Sprint Nextel holds a 54 percent interest in Clearwire, and has the ability to nominate seven of Clearwire's thirteen directors.

[837] 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 supra* note 815.

Table 27
Percentage Spectrum Holdings, Measured on a MHz-POPs Basis
by Provider, by Frequency Band*

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	42.8%	47.7%	0.0%	15.1%	14.9%	0.0%	0.0%
AT&T	24.4%	43.6%	0.0%	26.1%	7.9%	0.0%	0.0%
Sprint Nextel	0.0%	0.0%	93.0%	26.8%	0.0%	0.0%	0.0%
Clearwire	0.0%	0.0%	0.0%	0.0%	0.0%	86.3%	62.0%**
T-Mobile	0.0%	0.0%***	0.0%	19.5%	27.4%	0.0%	0.0%
MetroPCS	0.5%	0.0%	0.0%	2.6%	9.2%	0.0%	0.0%
US Cellular	2.8%	4.4%	0.0%	1.8%	2.1%	0.0%	0.0%
Leap	0.0%	0.0%	0.0%	2.2%	8.7%	0.0%	0.0%
Other	29.5%	4.3%	7.0%	5.8%	29.8%	13.7%	38.0%
Grand Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

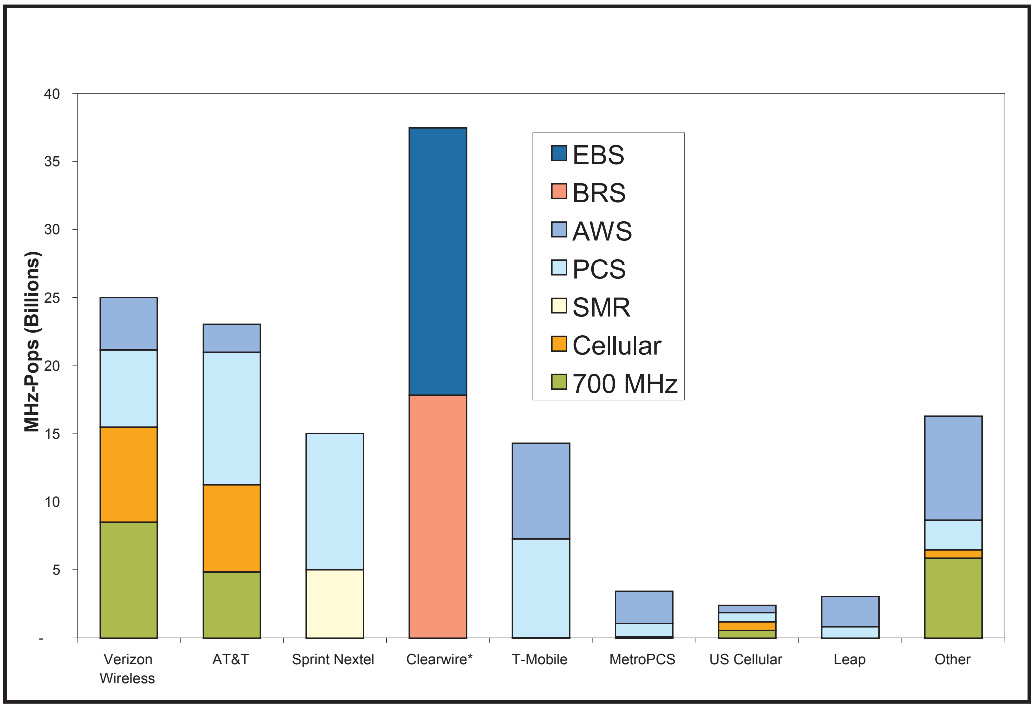
* These are estimates based on the available data.
** As noted above, while EBS licensees may lease excess capacity to commercial operators, various elements of the EBS licensing regime complicate the use of EBS spectrum for commercial purposes (*see* note 815).
*** SunCom Wireless License Company, LLC, a wholly owned subsidiary of T-Mobile, holds one Cellular license.

Table 28
Population-Weighted Average Megahertz Holdings*
by Provider, by Frequency Band

Licensee	700 MHz	Cellular	SMR	PCS	AWS	BRS	EBS
Verizon Wireless	28.4	23.3	0.0	18.9	12.8	0.0	0.0
AT&T	16.2	21.3	0.0	32.5	6.8	0.0	0.0
Sprint Nextel	0.0	0.0	17.7	33.5	0.0	0.0	0.0
Clearwire	0.0	0.0	0.0	0.0	0.0	63.4	69.8
T-Mobile	0.0	0.0**	0.0	24.3	23.4	0.0	0.0
MetroPCS	0.3	0.0	0.0	3.2	7.9	0.0	0.0
US Cellular	1.8	2.1	0.0	2.3	1.8	0.0	0.0
Leap	0.0	0.0	0.0	2.8	7.4	0.0	0.0
Other	19.5	2.1	1.3	7.2	25.5	10.1	42.8

* Weighted average megahertz is the sum of the provider's MHz-POPs, divided by the U.S. population.
** SunCom Wireless License Company, LLC, a wholly owned subsidiary of T-Mobile, holds one Cellular license.

Chart 38
Mobile Wireless Provider Spectrum Holdings by Band, Weighted by Population



d. Analysis of Spectrum Holdings by Spectrum Characteristics

289. 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, it has long been recognized throughout the mobile wireless industry that spectrum resources in different frequency bands can have widely disparate technical characteristics. Not only has the Commission recognized these differences in past proceedings, as discussed below, but regulators in other countries have also put forth policies taking these differences into account as additional spectrum becomes available.[838] As industry analysts, wireless providers, and others have noted, these different technical characteristics provide relative advantages for the deployment of spectrum in different frequency bands under certain circumstances. For instance, there is general consensus that the more favorable propagation characteristics of lower frequency spectrum allow for better coverage across larger geographic areas and inside buildings, while higher frequency spectrum may be well suited for adding capacity. Furthermore, some observers have noted important complementarities associated with a provider having access to spectrum in both the lower and higher frequency bands. 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.

290. Two licensees may hold equal quantities of bandwidth but nevertheless hold very different spectrum assets. For example, as noted in the *National Broadband Plan*, broadband operations using SMR spectrum have not been shown to be viable pending completion of 800 MHz rebanding, given the interference protection provided to neighboring public safety operations.[839] In addition, the

[838] *See* footnote 336, *infra*.

[839] *See* National Broadband Plan, Chapter 5 n. 63; 47 CFR § 90.672.

commercial SMR spectrum in the 900 MHz band currently is interleaved with Business/Industrial/Land Transportation services, and thus is better suited for narrowband deployments.

291. In the United States, there are frequency bands suitable for mobile broadband services at very different frequencies: the 700 MHz and Cellular (850 MHz) bands fall below 1 GHz,[840] and the AWS, PCS, BRS, and EBS bands – at around 2 and 2.5 GHz – are well above 1 GHz. The different characteristics of these respective bands affect how they can be used to deliver mobile services to consumers. As discussed above, a number of commenters in this proceeding generally discuss the importance of access to spectrum to spur competition. In addition, several commenters note the particular importance of access to spectrum below 1 GHz.[841]

292. It is well established that lower frequency bands – such as the 700 MHz and Cellular bands – possess more favorable intrinsic spectrum propagation characteristics than spectrum in higher bands.[842] As a result, "low-band" spectrum can provide superior coverage over larger geographic areas, through adverse climates and terrain, and inside buildings and vehicles. Several commenters in this and related proceedings have noted the advantages of lower frequency spectrum for coverage in rural areas.[843] The Commission has also 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."[844] In its consideration of mobile wireless competition issues, the DOJ has noted the differences

[840] 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*, FCC 10-174 (rel. Sept. 23, 2010) (*TVWS Second MO&O*).

[841] *See, e.g., T-Mobile Dec. 2, 2010 Ex Parte Letter* at 1-3, Attachment at 10-11. T-Mobile requests that the Commission "recognize the high value of spectrum below 1 GHz and the currently concentrated nature of the holdings in that band." *T-Mobile Dec. 2, 2010 Ex Parte Letter* at 1. T-Mobile also states that a mixture of low (below 1 GHz) and upper band spectrum is "important to building competitive high speed mobile broadband networks." *T-Mobile Dec. 2, 2010 Ex Parte Letter,* Attachment at 10-11. *See also* RCA Comments at 7 (asserting that "regional and rural carriers need near-term access to more ready to use, spectrum, particularly under 1 GHz"); Free Press and Media Access Project Comments at 16 (discussing the importance of greater access to spectrum, particularly below 1 GHz). Other commenters note that although spectrum below 1 GHz has superior propagation characteristics, providers with all types of spectrum continue to successfully deploy and upgrade their networks. *See* AT&T Comments at 25-26; Verizon Wireless Comments at 142-144.

[842] *See, e.g.*, *700 MHz Band Second R&O*, 22 FCC Rcd at 15349 ¶ 158, 15354-55 ¶ 176, 15400-401 ¶ 304 (recognizing the excellent propagation characteristics of 700 MHz band spectrum); *White Spaces Report and Order*, 23 FCC Rcd at 16807, 16820-21 ¶ 32 (propagation characteristics of the TV bands enable service at greater ranges than in the 2.4GHz band).

[843] *See, e.g., T-Mobile Dec. 2, 2010 Ex Parte Letter*, at 2, Attachment at 10-11 (lower frequency spectrum is advantageous in rural areas where topography and utility services can limit a provider's ability to "fill in" sites); Verizon Wireless Comments at 137 (stating that "[t]here is no dispute that lower band spectrum possesses propagation characteristics favorable for expanding coverage"); Letter from Joseph P. Marx, AT&T, to Marlene H. Dortch, Secretary, FCC, WT Docket No. 06-150 (filed Oct. 25, 2010), Attachment at 24; Letter from Kathleen O'Brien Ham, T-Mobile, to Marlene H. Dortch, Secretary, FCC, WT Docket No. 09-66 (filed Nov. 25, 2009) (*T-Mobile Nov. 25, 2009 Ex Parte Letter*), Attachment at 8-9; Letter from Kathleen O'Brien Ham, T-Mobile, to Marlene H. Dortch, Secretary, FCC, WT Docket No. 09-66 (filed Apr. 26, 2010) (*T-Mobile Apr. 26, 2010 Ex Parte Letter*); Letter from Tamara Preiss, Verizon Wireless, to Marlene H. Dortch, Secretary, FCC, WT Docket No. 09-66 (filed May 12, 2010) (*Verizon Wireless May 12, 2010 Ex Parte Letter*), at 2; Comcast Comments, GN Docket No. 09-157 (filed Sept. 30, 2009), at 9-12.

[844] *700 MHz Second R&O*, 22 FCC Rcd at 15349, ¶ 158. In the *TVWS Second MO&O*, the Commission noted that this particular spectrum has excellent propagation characteristics that allow signals to reach farther and penetrate walls and other structures. *Id.* at ¶ 1.

between the use of lower and higher frequency bands.[845] Furthermore, regulators in other countries have recognized the distinctive characteristics between lower and higher frequency bands. As lower frequency spectrum is becoming available for mobile services in other countries, some regulators have adopted or are considering policies intended to help facilitate the wider distribution of this newly available spectrum.[846]

293. More specifically, 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.[847] A licensee that exclusively or primarily holds spectrum in a higher frequency range

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[845] *See* United States of America *et al*. v. Verizon Communications Inc. and ALLTEL Corporation, Competitive Impact Statement, Case No. 08-cv-1878, at 5-6 (filed Oct. 30, 2008), *available at* http://www.justice.gov/atr/cases/f238900/238947.pdf (". . . because of the characteristics of PCS spectrum, providers holding this type of spectrum generally have found it less attractive to build out in rural areas."); United States of America v. AT&T Inc. and Dobson Communications Corporation, Competitive Impact Statement, Case No. 1:07-cv-01952, at 5, 11, 13 (filed Oct. 30, 2007), *available at* http://www.justice.gov/atr/cases/f227300/227309.pdf (" . . . the propagation characteristics of [1900 MHz PCS] spectrum are such that signals extend to a significantly smaller area than do 800 MHz cellular signals. The relatively higher cost of building out 1900 MHz spectrum, combined with the relatively low population density of the areas in question, make it unlikely that competitors with 1900 MHz spectrum will build out their networks to reach the entire area served by" the two 800 MHz Cellular providers).

[846] For instance, in its auction of mobile spectrum conducted in April and May of 2010, Germany placed restrictions on the amount of sub-1GHz spectrum (in the 800 MHz band) that any mobile service provider could obtain, depending on how much sub-1 GHz spectrum a particular mobile provider already holds. *See Decision of the President's Chamber of the Federal Network Agency for Electricity, Gas, Telecommunications, Post, and Railway*, Oct. 16, 2009, at 6, 9 *available at* http://www.bundesnetzagentur.de/cae/servlet/contentblob/138364/publicationFile/3682/DecisionPresidentChamberTenor_ID17495pdf.pdf. The only participants in the auction were the four incumbent providers, with three of them – Deutsche Telekom, Vodafone, and O2 (Telefonica) – each acquiring 2 x 10 megahertz of 800 MHz band spectrum, while the fourth – E-Plus (KPN) – did not obtain any 800 MHz licenses. Michael Newlands, *Big Three Operators Happy with Low-Cost German Auction*, Policy Tracker, May 26, 2010. In March 2011, Ofcom in the United Kingdom (UK) proposed setting limits on the amounts of spectrum that bidders can win in its upcoming auction of spectrum in the 800 MHz and 2.6 GHz bands, and proposed establishing caps on total sub-1 GHz and overall mobile spectrum holdings of individual licensees. Under the proposal, Ofcom seeks to ensure that there are at least four companies that each have the minimum amount of spectrum "necessary to provide higher quality data services" as determined by five different spectrum holding combinations. In addition, Ofcom proposed to cap both total sub-1 GHz holdings and overall mobile spectrum holdings. *See Ofcom Prepares for 4G Mobile Auction*, Press Release, Ofcom, Mar. 22, 2011, *available at* http://media.ofcom.org.uk/2011/03/22/ofcom-prepares-for-4g-mobile-auction/; Ofcom, "Assessment of Future Mobile Competition and Proposals for the Award of 800 MHz and 2.6 GHz Spectrum and Related Issues," Mar. 22, 2011, *available at* http://stakeholders.ofcom.org.uk/consultations/combined-award/. The proposal was issued following a decision by the new coalition government of the UK in July 2010 to drop the previous government's spectrum cap requirements and grant Ofcom the responsibility for establishing any spectrum caps on 4G spectrum. David Meyer, *Government Sets Out 4G Spectrum Auction Plans*, ZDNet, July 28, 2010. On September 17, 2010, Irish Commission for Communications Regulation released a consultation paper proposing several options for spectrum cap for the 800 MHz band. *See* "Consultation Paper for 800 MHz, 900 MHz & 1800 MHz Spectrum Release," at 40-42, http://www.comreg.ie/_fileupload/publications/ComReg1071.pdf.

[847] *See* Section III.D, 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 also* 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 ("The 700 MHz and Cellular bands allow a region to be covered with many fewer cell sites and thus at much lower cost."); 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 (continued….)

generally must construct more cell sites (at additional cost) than a licensee with primary holdings at a lower frequency in order to provide equivalent service coverage, particularly in rural areas. For example, T-Mobile estimates 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.[848] 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. It concluded that the favorable propagation characteristics meant that coverage using the same transmission power differed significantly, translating into the need for less infrastructure: while it required nine cells at 2.4 GHz and four cells at 1.9 GHz to span 100 meters squared, it was projected to require only one cell at 700 MHz.[849] 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.[850]

294. In addition, many wireless providers, including Verizon Wireless and AT&T in other contexts, have recognized the relative advantages of deploying lower frequency spectrum in urban areas due to its superior in-building coverage characteristics.[851] For instance, in response to network issues stemming from its extensive introduction of smartphones, one of the key steps taken by AT&T to improve its network performance in large cities was modifying its network to put 3G traffic on its 850 MHz Cellular spectrum, which provided better in-building coverage than did its PCS spectrum.[852] In addition, according to one estimate from Verizon Wireless, spectrum in the 700 MHz and Cellular bands

(Continued from previous page)
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); *T-Mobile Dec. 2, 2010 Ex Parte Letter* at 1-2 (cell sites using lower frequencies are capable of reaching more customers, which translates to lower capital costs); *T-Mobile Nov. 25, 2009 Ex Parte Letter*, Attachment at 8-9 (a network built using lower frequencies requires many fewer cell sites for the same coverage using higher frequencies).

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

[849] NIST, *700 MHz Band Channel Propagation Model*, http://www.nist.gov/itl/antd/emntg/700mhz.cfm (visited Apr. 29, 2010). *See T-Mobile Apr. 26, 2010 Ex Parte Letter* (stating that lower band spectrum is widely considered "beachfront" spectrum because of its propagation characteristics, and citing the NIST model).

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

[851] *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"); Lowell McAdam, President and Chief Operating Office, Verizon, Keynote Presentation at CTIA Enterprise & Applications Conference, Oct. 10, 2010, *available at* http://news.vzw.com/investor/20101006_transcript.pdf ("[with] 700 MHz, the in-building penetration is the best in the market"); John Stankey, President and CEO, 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. It is very effective penetrating buildings…As customers make the shift to more data-intensive devices, we think this is important for the perceived quality of their overall experience"); *AT&T Invests Nearly $40 Million to Expand Wireless Capacity for Chicago's 3G Mobile Broadband Network*, Press Release, AT&T, Apr. 7, 2010 (discussing AT&T's deployment of 850 MHz spectrum, which can "better penetrate buildings," in the Chicago area in order to increase the coverage and capacity of its 3G network); *T-Mobile Dec. 2, 2010 Ex Parte Letter* at 2, Attachment at 10; Letter from Kathleen O'Brien Ham, T-Mobile, to Marlene H. Dortch, Secretary, FCC, WT Docket No. 09-66 (filed June 9, 2010) (*T-Mobile June 9, 2010 Ex Parte Letter*), at 3.

[852] 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).

can provide in-building penetration approximately two to three times farther than that of spectrum in the PCS, AWS, and BRS bands.[853]

295. A comparison of spectrum prices for the recent auctions of AWS and 700 MHz spectrum (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 impact 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.[854] 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.[855]

296. 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.[856] 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.[857] In addition, capacity enhancement technologies such as multiple-input and multiple-output (MIMO) may perform better at higher frequencies.[858] We also note that while spectral efficiency is the same for all spectrum bands when using a given technology (and bandwidth),[859] there currently is significantly more spectrum above 1 GHz that is potentially available for use (as shown by Table 26 above), and, in many parts of these higher bands, spectrum is licensed in larger contiguous blocks.[860]

[853] *See* Barclays Capital, Lowell McAdam, President and CEO of Verizon Wireless, May 26, 2010, at 8, *available at* http://investor.verizon.com/news/20100526/20100526.pdf (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). According to Verizon Wireless, "[e]ach frequency has a different rate of energy decay, with higher frequencies decaying faster." *Id.*

[854] As observed by Verizon Wireless, auction prices depend on not only spectrum frequencies but also other factors such as when the spectrum would be available, service rules (including deployment schedule, block size, and market area of spectrum), potential interference from neighboring bands, market demand, and conditions in credit markets. *See* Verizon Wireless Comments at 146-147.

[855] *See generally* FCC, *Auction 66 – Advanced Wireless Services*, http://wireless.fcc.gov/auctions/default.htm?job=auction_summary&id=66.

[856] *T-Mobile Dec. 2, 2010 Ex Parte Letter* at 2; Verizon Wireless Comments at 137-140; *Verizon Wireless May 12, 2010 Ex Parte Letter* at 2-3; AT&T Comments at 25. *See also* Letter from Jeanine Poltronieri, AT&T, to Marlene H. Dortch, Secretary, FCC, WT Docket No. 09-66 (filed May 6, 2010) (*AT&T May 13, 2010 Ex Parte Letter*) at 2-3.

[857] 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."

[858] Verizon Wireless Comments at 140-141 ("these advanced antenna systems are most effective if they are well separated, and shorter wavelengths allow more antennas to be used in close proximity while maintaining needed separation"); *Verizon Wireless May 12, 2010 Ex Parte Letter* at 3; *AT&T May 13, 2010 Ex Parte Letter* at 3. T-Mobile points out that, although it is more challenging to build MIMO systems on devices for lower frequency bands, for broadband type devices such as a modem or a router, it is still possible to implement MIMO in lower frequency bands. Moreover, T-Mobile states that MIMO is likely to provide only limited benefit in rural deployment where there are fewer multiple paths between a transmitter and a receiver. *T-Mobile June 9, 2010 Ex Parte Letter*, at 2-3.

[859] *AT&T May 13, 2010 Ex Parte Letter* at 2.

[860] *Id. at 3*; Verizon Wireless Comments at 139-140.

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.[861]

297. Some observers have noted that there can be important complementarities that come with holding spectrum assets in different frequency bands, noting that combination of sub-1 GHz and higher frequency spectrum may be optimal.[862] For example, low frequency spectrum can be deployed ubiquitously with relatively few cell sites, providing a base layer of coverage that extends to wide areas in rural America. In addition, in urban areas, such spectrum can provide superior in-building coverage. In urban areas where traffic concentration is high, this base coverage layer may be complemented with a capacity layer using high frequency spectrum.[863] In this sense, to some degree, higher-frequency spectrum may be made more valuable by being combined with lower-frequency spectrum, and vice versa. Given these different spectrum characteristics, a licensee's particular mix of spectrum holdings may affect its ability to provide efficient mobile wireless services.

298. *Spectrum Holdings Below 1 GHz.* Three nationwide providers – Verizon Wireless, AT&T, and Sprint Nextel – hold licenses for CMRS/mobile broadband spectrum below 1 GHz, as do regional providers, such as US Cellular and Cellular South, MetroPCS, 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.[864]

299. Of the sub-1 GHz spectrum, Verizon Wireless and AT&T each hold a significant amount of the available Cellular and 700 MHz spectrum, which is well suited for the provision of mobile broadband. Specifically, when measured on a licensed MHz-POP basis, Verizon Wireless holds 47.7 percent of the Cellular spectrum and 42.8 percent of the 700 MHz spectrum, while AT&T holds 43.6 percent of the Cellular spectrum and 24.4 percent of the 700 MHz band spectrum. Adding these two bands together, Verizon Wireless holds 45 percent of the licensed MHz-POPs of the combined Cellular and 700 MHz band spectrum, AT&T holds approximately 33 percent. US Cellular holds approximately 3 percent of these bands. Several other, smaller providers' combined holdings total less than five percent of the Cellular and not quite 30 percent of the 700 MHz spectrum. Sprint Nextel holds approximately 93 percent of the SMR spectrum.

300. As discussed in previous reports, providers have been utilizing Cellular spectrum for mobile voice and data services for many years, using CDMA-based and GSM-based technologies (which continue to evolve), while providers have been utilizing SMR spectrum to offer mobile voice and data services using iDEN-based technologies. Sprint Nextel, however, has announced that it intends to repurpose some of its 800 MHz SMR spectrum for CDMA service.[865] In recent years, providers have

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[861] *See* 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.

[862] *See, e.g., 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.

[863] 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 ("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.")

[864] 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).

[865] Sprint Nextel, *Sprint Announces Network Vision – A Cutting-Edge Network Evolution Plan With Partners Alcatel-Lucent, Ericsson and Samsung*, Press Release, Dec. 6, 2010.

been upgrading their Cellular-based networks from 2G and 2.5G technologies to mobile broadband technologies in most markets across the United States. As discussed earlier, SMR spectrum generally is not as suitable for broadband operations.[866] In addition, as described above in more detail, Verizon Wireless has recently launched LTE networks in 38 markets using 700 MHz paired spectrum blocks, and AT&T has announced plans to deploy LTE service using 700 MHz and AWS spectrum, with its initial LTE launch to cover around 75 million POPs by mid-2011.[867] In the past, deployment of networks in the 700 MHz unpaired spectrum blocks has generally been limited to mobile multichannel one-way video programming services.[868] However, in December 2010, Qualcomm announced that it expects its FLO TV network, which is operated in the 700 MHz unpaired spectrum bands, will be shut down in March 2011, and has entered into an agreement with AT&T for AT&T to acquire the licenses in these bands.[869]

301. *Spectrum Holdings Above 1 GHz.* 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 Nextel holds significant amounts of PCS spectrum. In the PCS and AWS spectrum bands, no licensee holds more than 23 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 15.1 percent of the PCS and 14.9 percent of the AWS spectrum; AT&T holds around 26.1 percent of the PCS and 7.9 percent of the AWS spectrum; Sprint Nextel approximately 26.8 percent of the PCS and none of the AWS; and T-Mobile approximately 19.5 percent of the PCS and approximately 27.4 percent of the AWS. US Cellular, MetroPCS, and Leap each hold some PCS and a somewhat higher percentage, relative to their PCS holdings, of the more recently auctioned AWS spectrum. Finally, other smaller providers hold approximately 5.8 percent of the PCS spectrum and nearly 30 percent of the AWS spectrum. Each of the nationwide providers, along with many others, offers mobile broadband and data services on networks using some of this spectrum. As of February 2011, MetroPCS has launched LTE in thirteen cities using its AWS spectrum.[870]

302. Finally, as noted above, Clearwire, in which Sprint Nextel holds a majority interest, holds a predominant amount of 2.5 GHz spectrum, comprised of the BRS and EBS spectrum, which is the highest frequency band potentially usable for the provision of mobile broadband service. As described earlier, Clearwire offers mobile broadband services using WiMAX technology and, as of November 2010, covers 82 million POPs in the United States. None of the other nationwide providers has any interests in BRS or EBS spectrum. Several smaller providers, including Xanadoo and Digital Bridge, are, like Clearwire, deploying WiMAX in their 2.5 GHz spectrum holdings.[871]

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[866] *See supra* ¶ 290.

[867] *See* Section IV.B.1, Service Provider Technology Deployments, *supra*.

[868] *See, e.g.*, MediaFLO, *Enabling the Wireless Ecosystem*, http://www.mediaflo.com/about_us.html (visited Oct. 27, 2010). *See also Statement from Qualcomm Regarding FLO TV*, PR Newswire, Oct. 5, 2010, *available at* http://www.prnewswire.com/news-releases/statement-from-qualcomm-regarding-flo-tv-104362108.html.

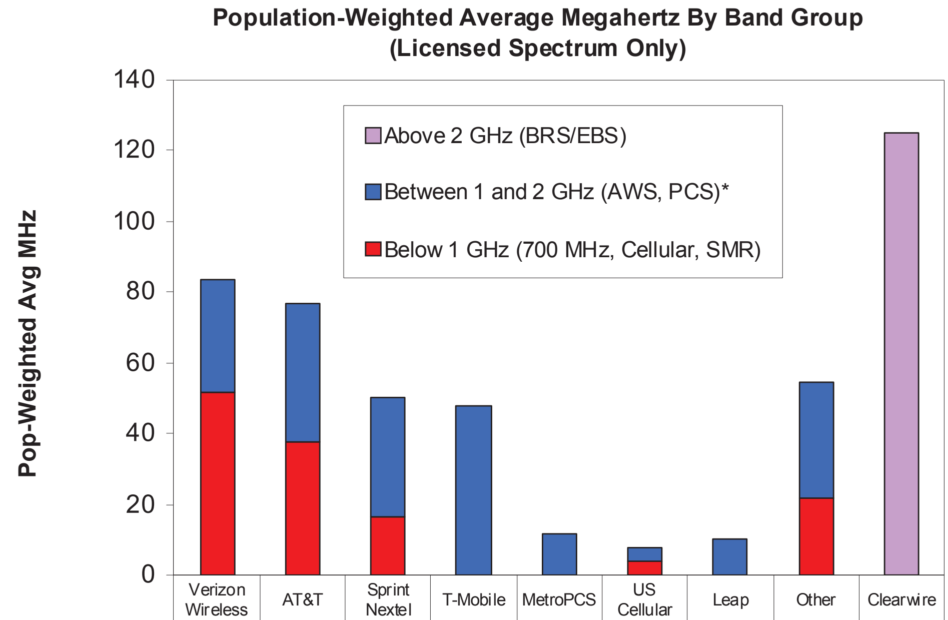
[869] *AT&T Agrees to Acquire Wireless Spectrum from Qualcomm*, Press Release, Qualcomm, Dec. 20, 2010. According to Qualcomm, the spectrum covers more than 300 million people nationwide: 12 megahertz of Lower 700 MHz D and E block spectrum covers more than 70 million people in five of the top 15 U.S. metropolitan areas – New York, Boston, Philadelphia, Los Angeles, and San Francisco; 6 megahertz of Lower 700 MHz D block spectrum covers more than 230 million people across the rest of the United States. *Id.* As part of its longer-term LTE plans, AT&T intends to deploy this spectrum as supplemental downlink, using carrier aggregation technology. *Id.*

[870] *Id.*

[871] Digital Bridge Communications, *About DBC: Bringing Broadband to Underserved or Rural Communities Nationwide*, http://www.digitalbridgecommunications.com/AboutDBC/tabid/84/Default.aspx (visited Nov. 30, 2010); Xanadoo Company, *About Xanadoo*, http://www.xanadoo.com/about.html (visited Nov. 30, 2010).

303. *Relative Distribution of Spectrum Holdings Below and Above 1 GHz.* Chart 39 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 GHz.

Chart 39
Population-Weighted Average Megahertz Under/Over 1 GHz (Licensed Spectrum Only)

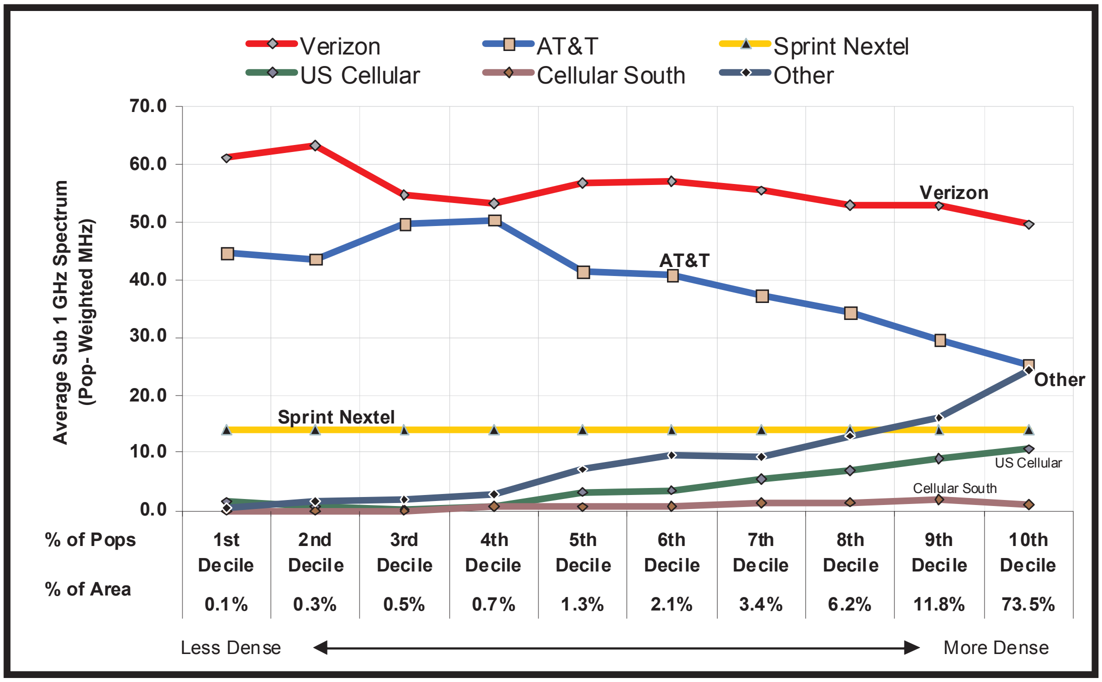


	Verizon Wireless	AT&T	Sprint Nextel	T-Mobile	MetroPCS	US Cellular	Leap	Other	Clearwire
Above 2 GHz (BRS/EBS)	0	0	0	0	0	0	0	0	125
Between 1 and 2 GHz (AWS, PCS)*	32	39	33	48	11	4	10	33	0
Below 1 GHz (700 MHz, Cellular, SMR)	52	38	17	0	0	4	0	22	0

*Based on frequencies used for mobile to base transmissions (i.e., uplink)

304. *Distribution of Spectrum by Population Density.* Chart 40 below 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.

Chart 40
Average Under-1 GHz Spectrum by Population Density Deciles



e. Competitive Effects of Spectrum Holdings

305. The Commission's competition policies with respect to spectrum holdings have been designed to preserve competitive opportunities in the mobile wireless marketplace and retain 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.

306. The mobile CMRS marketplace for mobile telephone services in 1995, when the *First Report* was issued, was very different from today's 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.[872] 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.[873] Since the Commission first began applying a "spectrum screen" as part of its competitive analysis, the Commission has determined that additional

[872] *See AT&T-Dobson Order*, 22 FCC Rcd at 20311-312 ¶¶ 26-27 (2007).

[873] *Id*. at ¶ 26.

spectrum should be part of its spectrum input analysis – including 700 MHz,[874] AWS, and BRS spectrum[875] – and periodically has modified the spectrum screen as more spectrum has become available.[876] 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.[877]

307. 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. For instance, given the superior propagation characteristics of spectrum under 1 GHz, particularly for providing coverage in rural areas and for penetrating buildings, providers whose spectrum assets include a greater amount of spectrum below 1 GHz spectrum may possess certain competitive advantages for providing robust coverage when compared to licensees whose portfolio is exclusively or primarily comprised of higher frequency spectrum. As discussed above, holding a mix of frequency ranges may be optimal from the perspective of providing the greatest service quality at low cost.

2. Infrastructure Facilities

a. Background

308. Infrastructure facilities are a major input into the provision of mobile wireless service. These facilities are comprised largely 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, or other structure providing sufficient height above the surrounding area.[878] The number of cell sites in use by wireless providers continues to grow in order to satisfy the increased demand created by new subscribers, accommodate additional airtime usage per subscriber largely caused by increased use of data services including broadband wireless and mobile Internet, expand geographic service area coverage and improve coverage in existing service areas, and accommodate newer technologies. According to CTIA, the total number of cell sites in use by CTIA's members was 247,081 as of December 31, 2009.[879] This represents an increase in the number of cell sites of 2.04 percent since December 31, 2008, 40.6 percent since December 31, 2004, and 51.6 percent since December 31, 2003.[880] According to *Above Ground Level*, a

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[874] *Id.* at ¶ 31.

[875] *Sprint Nextel-Clearwire Order*, 23 FCC Rcd at 17596-17600, ¶¶ 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.

[876] *See id.*

[877] *See id.* at 17596 ¶ 61; *Verizon Wireless-ALLTEL Order*, 23 FCC Rcd at 17469-470, ¶¶ 45-47.

[878] An alternative to the use of tall structures for cell sites is distributed antenna systems (DAS). DAS are comprised of a relatively large 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, in geographic areas where either constructing towers is not feasible or wireless traffic demands are too great to be met with fewer, large cells. Because DAS sites are not visible beyond the immediate vicinity, they may be particularly desirable in areas with stringent siting regulations, such as historic districts. Providers of such networks include most of the major tower companies, as well as independent firms like NextG Networks, ExteNet, and Mobilitie.

[879] *See* CTIA*, Top Line 2009 Semi-Annual Wireless Industry Survey Results*, at 10 (2010), http://files.ctia.org/pdf/CTIA Survey Year End 2009.

[880] *Id*.

trade publication, there were a total of 266,623 cell sites in the United States as of April 1, 2010.[881] One analyst report indicated that of the 247,081 cell sites reported by CTIA, 207,946, or about 84 percent of these cell sites, were associated with the four major wireless providers.[882] For the four major wireless service providers, the percentage increase in the number of cell sites in use between the end of March 2009 and the end of March 2010 has been as follows: AT&T (4.1 percent), Sprint Nextel (0.6 percent), T-Mobile (6.5 percent), and Verizon Wireless (3.1 percent).[883]

b. Communications Tower Industry

309. The most visible cell sites are those that are situated on relatively tall communications towers. As noted above, cell sites may also be located on buildings, municipal water towers, and church steeples, and 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. With the growth of cell sites required to meet the needs of wireless service providers and their subscribers, a communications tower industry has evolved. A typical communications tower can accommodate five to six tenants, though the current industry average of wireless tenants per tower is approximately 2.7.[884] This industry includes companies that own large numbers of towers on which they lease space to wireless service providers. In addition, there are a number of companies that help wireless service providers identify available tower or building space in needed geographic areas or, alternatively, arrange to construct towers where no appropriate facilities exist.[885]

310. Analyst reports about the communications tower industry indicate that the financial health of this industry is dependent to a large extent on the wireless service providers and whether or not they have the capital resources to expand service to new geographic areas or to enhance the quality of service in current service areas. Analysts seem to be optimistic that the expansion of new wireless providers into new areas,[886] together with the deployment of newer technologies by existing wireless service providers, bodes well for growth of the tower industry. Clearwire reportedly planned to deploy approximately 19,000 cell sites by the end of 2010, while Verizon Wireless reportedly would need to have in place a total of between 60,000 and 70,000 cell sites in order to accommodate its current needs and the deployment of its LTE network.[887] This projected level would represent an increase of between 17,400 and 27,400 cell sites from the 42,600 cell sites Verizon used as of March 31, 2010.[888] This growth potential, low churn, and the annuity-like revenue stream from long-term leases – which include standard annual price escalators of three to five percent – contribute to a favorable financial outlook for the tower

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[881] Clayton Funk and Jason Nicoly, *Trends and Forecasts for the Wireless Industry*, Above Ground Level, (July/Aug. 2010) at 40 (*Trends and Forecasts for the Wireless Industry*).

[882] Based on company reports and UBS estimates, AT&T utilized 52,370 cell sites, Sprint Nextel 66,450, T-Mobile 46,826, and Verizon Wireless 42,300 as of December 31, 2009. *US Wireless 411 1Q10*, at 54.

[883] *Id.*

[884] *See Trends and Forecasts for the Wireless Industry*, at 40.

[885] The eight largest tower companies in the United States by number of towers owned are: Crown Castle International (22,321), American Tower Corporation (20,594), AT&T Towers (10,792), SBA Communications (8,588), T-Mobile Towers (7,000), Global Tower Partners (3,700), Mobilitie L.L.C. (3,058), and TowerCo (3,000), Tracy Ford, *Top 10 Tower* Companies, RCR Wireless, Nov. 2, 2010.

[886] *Wireline & Wireless Telecom Services*, Bank of America/Merrill Lynch, Sept. 24, 2009, at 4.

[887] Presentation by Nadine Manjaro, ABI Research, *PCIA Wireless Infrastructure Show Debrief*, at 2009 Wireless Infrastructure Show, Oct. 1, 2009, *available at* http://www.rcrwireless.com/assets/pdf/PCIA_Wireless2009_Debrief.pdf.

[888] *US Wireless 411 1Q10*, at 54.

industry.[889] For example, American Tower reported that its revenue increased 11.1 percent between the first six-months of 2009 and the first six-months of 2010;[890] Crown Castle and SBA both reported increases in their revenues between second quarter 2009 and second quarter 2010 of 9 percent[891] and 13.5 percent,[892] respectively.

c. Barriers to Cell Site Deployment

311. 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.[893]

312. Collocating base station equipment on an existing structure is often the most efficient and economical solution for existing and new wireless service providers that need new cell sites. 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.[894] Collocation is also commonly encouraged by zoning authorities to reduce the number of new communications towers.[895] Due to the high cost to construct new towers, and the often considerable delay to obtain 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.

313. The issue of excessive delays in the zoning approval process was 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.[896] The Commission solicited comments on the CTIA petition and, based on the evidence in that record, agreed that the lack of timely action on a significant number of cell site applications was impeding the ability of wireless providers to improve and expand their service offerings. 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.[897]

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[889] *SBA Communications,* Bank of America/Merrill Lynch, Mar. 27, 2009, at 8.

[890] *American Tower Corporation Reports Second Quarter and First Half 2010 Financial Results*, Press Release, American Tower, Aug. 3, 2010, *available at* http://phx.corporate-ir.net/phoenix.zhtml?c=98586&p=irol-newsArticle_Print&ID=1455499&highlight=.

[891] *Crown Castle International Reports Second Quarter 2010 Results; Raises 2010 Outlook; Announces Agreement to Acquire NewPath Networks*, Press Release, Crown Castle, July 28, 2010, *available at* http://investor.crowncastle.com/phoenix.zhtml?c=107530&p=irol-newsArticle&ID=1453288&highlight=.

[892] *SBA Communications Corporation Reports 2nd Quarter 2010 Results; Provides 3rd Quarter and Updates Full Year 2010 Outlook*, Press Release, SBA, Aug. 2, 1010, *available at* http://ir.sbasite.com/releasedetail.cfm?ReleaseID=495570.

[893] There is no evidence that shortages of transmission equipment, including antennas, to install at cell sites act as a barrier to cell site deployment.

[894] *See* PCIA Comments at 7.

[895] *See, e.g.,* Guilford County, NC, *Development Ordinance on Cellular Tower Placement*, www.co.guilford.nc.us/planning_cms (visited Jan. 25, 2010).

[896] 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.

[897] 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 (continued….)

314. In its comments to the mobile wireless competition *Fifteenth Report Public Notice*, PCIA argues that many local jurisdictions continue to delay collocation application approval by subjecting these applications to the "same costly and time-consuming process" required of applications for new towers.[898] PCIA further notes that it is unclear to what extent the *Declaratory Ruling* has been effective in speeding approval of tower siting applications because applicants may conclude that it is more efficient in terms of time and money spent to agree to extend the application process than to seek judicial relief.[899] PCIA also notes that the infrastructure deployment process has been slowed by jurisdictions that enact moratoria on the siting of wireless infrastructure.[900] Finally, PCIA notes that some jurisdictions use municipal consultants to review wireless infrastructure siting applications.[901]

315. A recent report to Congress from GAO noted that there is public concern over the aesthetic, health, and safety effects of wireless infrastructure located in residential areas in particular.[902] These concerns have led a number of local jurisdictions to develop specific wireless infrastructure ordinances so that wireless service providers and tower companies are made aware of local concerns regarding wireless infrastructure.[903]

d. Competitive Effects of Infrastructure Costs and the Independent Communications Tower Industry

316. Infrastructure capital expenses for a new entrant can be higher than those for existing service providers. Infrastructure capital expenses per cell site vary depending primarily on whether the infrastructure is to be added to an existing cell site or entails building a completely new cell site. Additionally, a new entrant would need to construct a core network that includes such components as switches to connect its cell sites, gateways to access other networks, authentication capabilities, and back-office capabilities such as billing and customer service. The infrastructure operating expenses should be quite similar regardless of whether they are associated with an existing or new cell site for an existing wireless service provider, or a new cell site for a new wireless service provider.

317. When communications towers are owned by independent companies rather than wireless service providers, it may increase efficiency in the industry, ease entry, and enhance wireless service competition. Unlike wireless service providers that may have an economic incentive to forestall competition in a given area by restricting or delaying competitors' access to towers or antenna structures that they own, tower companies independent of wireless service providers have an incentive to maximize revenues by leasing space to as many service providers as possible. Therefore, it may be easier for wireless service providers to add cell sites on independently-owned towers in order to expand their geographic coverage area or to enhance service within a current coverage area. In addition, the ability of wireless service providers to lease space for new cell sites on established towers can ease and speed their entry into new geographic areas by eliminating the need to build a new tower. The use of existing towers

(Continued from previous page)
Requiring a Variance, *Declaratory Ruling*, WT Docket No. 08-165, 24 FCC Rcd 13994, 14021 ¶ 71 (2009); *Order on Reconsideration*, 25 FCC Rcd 11157 (2010); adopted Aug. 3, 2010*, petition for review pending*, City of Arlington, Texas v. FCC, No. 10-60039 (5th Cir., filed Jan. 12, 2010).

898 *See* PCIA Comments at 9.

899 *See* PCIA Comments at 9-10.

900 *See* PCIA Comments at 12. These moratoria often apply to collocations as well as new wireless sites.

901 *See* PCIA Comments at 13.

902 *Enhanced Data Collection Could Help FCC Better Monitor Competition in the Wireless Industry*, U.S. Government Accountability Office (GAO), July 2010, at 36.

903 *Id.* at 37. We note that state and local governments are preempted from regulating the siting of personal wireless service facilities based on the environmental effects of radio frequency emissions to the extent the facilities comply with the Commission's regulations concerning such emissions. *See* 42 U.S.C. § 332(c)(7).

also reduces the capital requirements for both new entrants and existing wireless service providers because they only need to finance the purchase and installation of the transmission equipment to be used at the cell site.

318. However, we note that, in many geographic areas, the most desirable positions for antennas on communications towers are occupied by existing tenants, leaving subsequent tenants with a choice of antenna positions that may not be optimal for their needs. Even with the reduced entry costs associated with an independent tower industry, tower siting costs and scarcity of desirable antenna positions may constitute significant entry barriers to new providers.[904]

3. Backhaul Facilities

a. Background

319. Backhaul connections are an integral component of a wireless service provider's network. Backhaul facilities link mobile providers' cell sites to wireline networks, carrying wireless voice and data traffic for routing and onward transmission. As wireless data services increase as a percentage of a mobile wireless provider's overall traffic, consuming vastly greater bandwidth, existing backhaul solutions are increasingly strained. Wireless providers must have access to sufficient backhaul, in terms of capacity and speed, to avoid creating a communications bottleneck.[905] As discussed above, estimates of average monthly backhaul costs range from hundreds of dollars (for a T1 line) to several thousand dollars per month.[906] Cell site backhaul capacity is forecast to increase fourfold between 2007 and 2011.[907]

320. Currently, there are three major technologies for backhaul transmission: copper lines, microwave (fixed wireless), and optical fiber.[908] Historically, copper circuits have been the predominant choice for backhaul traffic. The heavy reliance on copper transmission is diminishing. For example, one study estimated that 70.9 percent of backhaul traffic in 2009 would be carried via copper, 16.8 percent via fiber, and 12.3 percent via fixed wireless (including microwave).[909] In comparison, in 2005, 85.5 percent of backhaul traffic was carried via copper, 5.8 percent by fiber, and 8.7 percent by fixed wireless.[910] In other words, the incidence of copper as the medium for backhaul transmission is estimated to have decreased by nearly 15 percent over four years.

b. Competitive Landscape

321. Providers of backhaul services include incumbent local exchange carriers, independent wireline companies, cable providers, and independent wireless operators. Wireless providers may purchase special access services,[911] including DS1s and DS3s, from third parties for backhaul.[912]

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[904] *See* Section III.D, Entry and Exit Conditions, *supra*.

[905] 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.

[906] *See MSV 700 MHz Comments* (hundreds of a 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). *See* Section III.D, Entry and Exit Conditions, *supra.*

[907] SNL Kagan, Communications Industry News, June 26, 2008, at 1 (citing Infonetics Research Analyst, Michael Howard).

[908] Different protocols for data transmission (*e.g.*, TDM, Ethernet) can run over each type of physical facility.

[909] *Wireless Backhaul Market Study*, New Paradigm Resources, Oct. 2008.

[910] *Id*. This study estimated that as of mid-2009, there were about 530,000 backhaul lines, for 230,000 cell sites in the United States. *Id*.

[911] Special access services do not use local switches; instead they employ dedicated facilities that run directly between two designated locations. The Commission is examining the current state of competition for special access (continued….)

Wireless providers that are unaffiliated with a wireline provider often purchase special access services from the incumbent local exchange carriers against whose wireless affiliates they compete. One wireless service provider has claimed that over 98 percent of all DS1 circuits are purchased from incumbent local exchange carriers (LECs), as are the vast majority of DS3 connections.[913]

322. Backhaul costs currently constitute a significant portion of a mobile wireless operator's network operating expense,[914] and the demand for backhaul capacity is increasing.[915] In light of the growing need for backhaul, cost-efficient access to adequate backhaul will be a key factor in promoting robust competition in the wireless marketplace.

c. The Growing Need for Backhaul Solutions and Alternatives

323. Several recent trends in the mobile wireless industry have led to increased demands on 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. As discussed above, it is estimated that global mobile data traffic grew 157 percent, from 33 terabytes in 2008 to 85 terabytes in 2009.[916] Second, the proliferation of fixed-rate mobile Internet access plans enables subscribers to consume more services and greater bandwidth.[917] As noted earlier, AT&T reported its network has seen an 18-fold increase in data traffic since the iPhone was introduced, with mobile data traffic increasing by over four times during the June 2008 to June 2009 period alone.[918] Third, mobile wireless network data speeds have increased as technology has evolved, with current and future launches of WiMAX and LTE networks supporting even higher data throughput rates and lower latencies.

324. In light of the foregoing factors, identifying solutions to satisfy the growing demand for mobile backhaul is taking on increasing importance. The special access proceeding affects services

(Continued from previous page)
services to ensure that rates for these services are just and reasonable. *See* Special Access Rates for Price Cap Local Exchange Carriers, WC Docket No. 05-25, RM-10593, *Order and Notice of Proposed Rulemaking*, 20 FCC Rcd 1994, 1997, ¶ 7 (2005) (*Special Access NPRM*), *Parties Asked to Comment on Analytical Framework Necessary to Resolve Issues in the Special Access NPRM*, WC Docket No. 05-25, Public Notice, 24 FCC Rcd 13638, 13639 (2009) (Notice), *Data Requested in Special Access NPRM*, WC Docket No. 05-25, Public Notice, DA 10-2073, released Oct. 28, 2010.

[912] Other options, including higher bandwidth Ethernet services, are currently unavailable in a number of markets.

[913] Sprint Nextel Comments, WC Docket No. 05-25 (filed Jan. 19, 2010), at ii.

[914] A backhaul report by Infonetics Research claims that globally backhaul operations can account for up to 30 percent of a wireless carrier's total operations costs. *See* Dan Meyer, *Backhaul options diverse for 4G networks*, RCR Wireless, Mar. 1, 2010 http://www.rcrwireless.com/ARTICLE/20100301/INFRASTRUCTURE/100309990/backhaul-options-diverse-for-4g-networks, (last visited Sept. 2, 2010).

[915] Verizon Wireless Comments, Docket No. 09-66, at 95-96 (citing a study by Raymond James which estimates that the size of the backhaul market will grow from $3 billion annually to $8 to $10 billion in the next three to five years, driven in large part by increases in wireless data traffic).

[916] *See* Section V.C.3, Mobile Data Traffic (Non-Messaging), *infra*; *Cisco Visual Networking Index: Global Mobile Traffic Forecast Update*, Cisco, Jan. 29, 2009, at 6.

[917] 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.

[918] *MobileData: Traffic Jam Ahead?*, Bank of America/Merrill Lynch, Feb. 2, 2010.

generally provided over copper by wireline carriers regulated under price caps.[919] Many wireless providers also use point-to-point microwave transmission for backhaul, particularly in cases in which copper or fiber is not available or is not an economically feasible alternative. For example, in order to satisfy the projected backhaul needs of its new broadband data network, Clearwire decided to use Ethernet-based microwave radios.[920] The National Broadband Plan, recognizing the importance of wireless backhaul, recommends that the Commission take action to ensure that sufficient microwave spectrum is available to meet current and future demand for wireless backhaul, especially in the bands below 12 GHz.[921] The National Broadband Plan also recommends that the Commission take further actions to enhance the flexibility and speed with which companies can obtain access to spectrum to use for wireless backhaul, which is critical to the deployment of wireless broadband and other wireless services.[922] The National Broadband Plan also 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 wireless backhaul capacity.[923] In August, 2010, the Commission initiated a proceeding to address a number of the National Broadband Plan recommendations to remove regulatory barriers to the use of microwave spectrum for wireless backhaul.[924] In the combined *Notice of Proposed Rulemaking and Notice of Inquiry* the Commission proposes a number of modifications to the Part 101 Rules governing microwave spectrum to permit and encourage more intensive, efficient, and cost-effective use of these resources for wireless backhaul.[925]

B. Downstream Segments

1. Mobile Wireless Handsets/Devices and Operating Systems

325. Handsets and devices are becoming increasingly central to consumers of mobile wireless services. Recent studies show handsets play an important role for consumers as a basis for choosing providers, although these studies differ as to their level of importance. For example, a recent report from Consumers Union provides data that suggests that many consumers switched to new wireless service providers in order to obtain a particular handset. Specifically, the report states that during the period 2008 - 2009, 38 percent of respondents who had switched providers did so because it was the only way to obtain the handset that they wanted.[926] The same report also indicates that 27 percent of all respondents had a specific wireless handset in mind when they went shopping for a new handset.[927] A first quarter

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[919] We note that some carriers are increasingly interested in transitioning from TDM to Ethernet and other packet based services, and that existing facilities – including copper and fiber facilities – may often be converted from TDM to IP to address increased demand at particular sites. In addition, evolving technologies may provide wireless carriers with more alternatives to using special access services, including deploying their own facilities.

[920] *See Report Excerpt: Clearwire's Microwave Strategy*, Sidecut Reports, https://www.sidecutreports.com/order-sidecut-reports/free-report-download/?rid=6 (last visited Oct. 26, 2010). A small rural wireless carrier, Viaero Wireless, also recently noted that it relies almost exclusively on microwave for backhaul from its cell sites, http://fjallfoss.fcc.gov/ecfs/document/view?id=7020912563 (last visited Oct. 26, 2010).

[921] *National Broadband Plan*, at 93.

[922] *Id*.

[923] *Id.* at 130 and 132-3.

[924] Amendment of Part 101 of the Commission's Rule 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, *Notice of Proposed Rulemaking and Notice of Inquiry*, WT Docket No. 10-153, 25 FCC Rcd 11246 (2010).

[925] *Id.* at para. 5.

[926] *Best Cell Phone Service*, Consumer Reports, Jan. 2010.

[927] *Id*.

2009 survey by Nielsen Company shows handsets were the seventh most important factor in choosing a service provider.[928] Recent analyst reports also identify access to handsets as an increasing challenge faced by mid-sized and small providers.[929] An examination of the handsets/devices and operating systems segments reveals their importance to mobile wireless consumers and service providers.

a. Handsets/Devices

326. *Number of Manufacturers*. From 2006 to 2010, the number of mobile wireless handset manufacturers that distribute in the U.S. market increased from eight to 21 (see Table 29).[930] As of June 2010, these 21 handset manufacturers offered a total of 302 handset models to mobile wireless service providers in the United States.[931] Eleven of these handset manufacturers offered at least ten handset models each.

Table 29
Handset Manufacturers and Handset Models Offered, U.S., 2006-2009

Reporting Handset Manufacturers	2006 (Nov.)	2007 (Nov.)	2008 (Dec.)	2009 (June)	2010 (June)
Total Number	*8*	*12*	*12*	*16*	*21*
Total Number Offering Ten or More Handset Models	5	8	8	9	11
Total Number of Handset Models Offered	124	168	346	260	302

327. *Innovation*. Over the past three years handset manufacturers have introduced a growing number of smartphones with the following features: an HTML browser that allows easy access to the Internet, an operating system that provides a standardized interface and platform for application developers, and a larger screen size than a traditional handset.[932] In contrast to traditional handsets with applications that include voice and messaging, smartphones have more user-friendly interfaces that facilitate access to the Internet and software applications. Ten handset manufacturers offered a total of 144 smartphones in June 2010, compared to 56 in June 2009.[933] Table 30 lists the top five smartphone and handset manufacturers, by number of models offered, that distributed in the United States in June 2010. Table 30 shows that in June 2010, Samsung, LG, and Motorola offered the most smartphone

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[928] Roger Entner, *When Choosing A Carrier Does the iPhone Really Matter?*, Nielsen Wire, Aug. 10, 2009.

[929] *See, e.g., USM/TDS, 4Q09 Preview: Wireless Remains Challenging*, Morgan Stanley, Feb. 23, 2010; *Company Update, Cincinnati Bell, Inc. (CCB)*, Goldman Sachs, Feb. 11, 2010)

[930] These figures based on data from hearing aid compatibility reports filed by handset manufacturers from 2006 to 2010. 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. These reports include information (such as handset maker, model name, starting available date and end available date) for each handset model offered by the handset manufacturer during the reporting period.

[931] Handset manufacturers filed their hearing aid compatibility status reports by July 15, 2009, for the reporting period from January 1 to June 30, 2009. 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. *See also* http://wireless.fcc.gov/hac/index.htm?job=home for more details on these reports. 47 C.F.R. § 20.19.

[932] *See* Section IV.B.3, Differentiation in Mobile Wireless Handsets/Devices, *supra* (defining smartphone for purposes of this report).

[933] Based on data from hearing aid compatibility status reports filed by handset manufacturers in July 2009 and July 2010, *available at* http://wireless.fcc.gov/hac/index.htm?job=home.

models as well as the most handset models.[934]

Table 30
Smartphone Manufacturers Offering Largest Number of Smartphone Models (U.S., June 2010)

Top Five Smartphone Manufacturers	Number of Smartphone Models
Samsung	38
LG	18
Motorola	15
Research In Motion	13
HTC	12
Total	**96**

Table 31
Handset Manufacturers Offering Largest Number of Handset Models (U.S., June 2010)

Top Five Handset Manufacturers	Number of Handset Models
Samsung	73
Motorola	55
LG	41
Nokia	22
Kyocera	16
Total	**207**

328. Since Apple entered the smartphone business with the iPhone in June 2007*,* many handset manufacturers have responded with various smartphone innovations, such as touch screens, mobile web browsing capabilities, and QWERTY keypads.[935] Notable smartphone launches in 2009 - 2010 include Palm's Pre device*,* which is based on the Palm webOS platform and includes a touchscreen,[936] as well as Motorola's touchscreen DROID devices, which are based on the Android platform.[937] In addition, Garmin, a leading Global Positioning System (GPS) device provider, entered the smartphone business with its touchscreen Nuviphone G60 in October 2009, [938] and Huawei introduced its touchscreen smartphone Tap in October 2009[939] and an Android-based smartphone Ideos for the global

[934] Based on data from hearing aid compatibility status reports filed by handset manufacturers July 2010, *available at* http://wireless.fcc.gov/hac/index.htm?job=home.

[935] *See* Section IV.B.3, Differentiation in Mobile Wireless Handsets/Devices, *supra*; *Fourteenth Report,* 25 FCC Rcd at 11495, ¶ 136.

[936] *See Sprint to Offer Palm Pre Nationwide on June 6*, Press Release, Sprint Nextel, May 19, 2009, *available at* http://newsreleases.sprint.com/phoenix.zhtml?c=127149&p=irol-newsArticle_newsroom&ID=1289761&highlight.

[937] *See Hello Humans: DROID by Motorola Arrives Next Week*, Press Release, Motorola, Oct. 28, 2009, *available at* http://mediacenter.motorola.com/content/detail.aspx?ReleaseID=12058&NewsAreaID=2.

[938] *See AT&T and Garmin Announce a New Mobile Navigation Era with Nuvifone, the Navigation Phone,* Press Release, AT&T, Sept. 29, 2009, *available at* http://www.att.com/gen/press-room?pid=4800&cdvn=news&newsarticleid=27177&mapcode.

[939] *See* Brian James Kirk, *T-Mobile Tap - a new affordable touchscreen handset*, MOBILE BURN, Oct. 7, 2009 at http://www.mobileburn.com/news.jsp?Id=7976.

market in September 2010.[940] With the convergence of mobile wireless handsets and portable computing technologies, other traditional computer manufacturers (besides Apple) have entered the handset/device business and are offering touchscreen smartphones. Lenovo, another computer manufacturer, introduced its first Android-based smartphone, *LePhone,* in January 2010.[941] Acer, a computer manufacturer, offered 10 touchscreen smartphones in June 2010.[942] Dell introduced its first Android-based smartphone, *Aero*, in August 2010.[943]

329. *Share of Mobile Devices*. According to comScore, a marketing information company, in August 2010, the top five handset manufacturers in the United States accounted for 80.2 percent of mobile devices currently in use, and all other manufacturers accounted for the remaining 19.8 percent (see Table 32).[944] SNL Kagan estimated that the top nine manufacturers shipped 48.7 million handsets, or 85 percent of the total shipments of 57.6 million in the second quarter of 2010 (see Chart 41).[945]

Table 32
Share of Mobile Devices in Use, U.S.

Handset Manufacturer	Share of Mobile Devices in Use, December 2009[946]	Share of Mobile Devices in Use, August 2010
Samsung	21.2%	23.6%
LG	21.9%	21.2%
Motorola	23.5%	18.8%
RIM	7.0%	9.0%
Nokia	9.2%	7.6%
All Others	17.2%	19.8%

[940] *See* David Barboza, *Chinese Company Aims Big With Android Smartphone,* New York Times, Sept. 2, 2010, at http://bits.blogs.nytimes.com/2010/09/02/chinese-company-aims-big-with-android-smartphone/?ref=technology.

[941] *See* Gabriel Madway, *Lenovo Enters Smartphone Fracas with "LePhone,"* Reuters, Jan. 6, 2010, at http://www.reuters.com/article/idUSTRE6060JF20100107.

[942] *See Hearing Aid Compatibility Status Report, Acer,* July 2010, at http://wireless.fcc.gov/hac_documents/100720/Acer%20America%20Corporation_8.PDF.

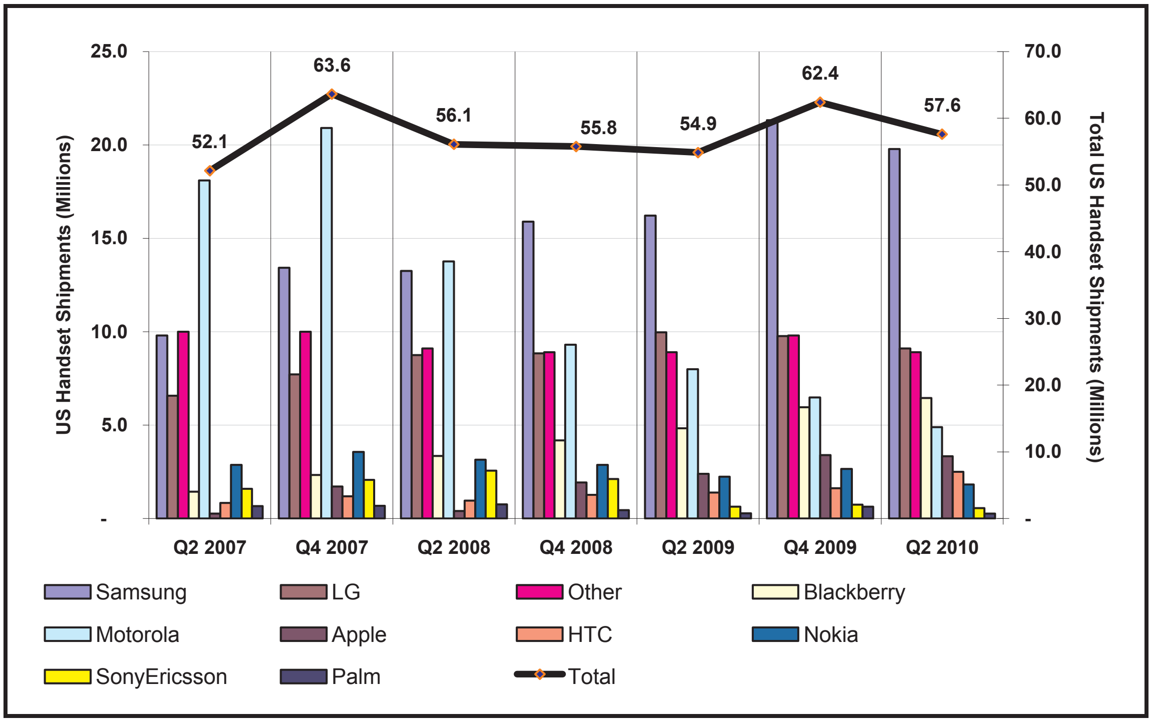
[943] *See Dell Starts Selling First U.S. Smartphone*, Wall Street Journal, Aug. 24, 2010, *available at* http://content.dell.com/us/en/corp/d/press-releases/2010-01-07-dell-at-ces-2010.aspx.

[944] *See comScore Reports August 2010 U.S. Mobile Subscriber Market Share,* Press Release, comScore, Oct. 6, 2010, available at http://www.comscore.com/Press_Events/Press_Releases/2010/10/comScore_Reports_August_2010_U.S._Mobile_Subscriber_Market_Share.

[945] *See 910 Handsets Q2 2010 SNLK, USA Handset Shipments.*

[946] *See Fourteenth Report*, 25 FCC Rcd at 11586, ¶ 304.

Chart 41
U.S. Handset Shipments, Q2 2009 – Q2 2010[947]



330. *Technological Standards*. Handsets are manufactured for each of the commonly used wireless families of air interface standards, including the CDMA family (including 1xRTT and EV-DO), the GSM/WCDMA family (including GSM, GPRS, EDGE, WCDMA, HSDPA, and HSUPA), and iDEN. 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 2010, handset variety was greatest for the GSM/WCDMA family, followed by the CDMA 1xRTT/EV-DO family. The iDEN standard has a comparatively small number of handsets.[948]

[947] SNL Kagan.

[948] Sprint Nextel has announced that it plans to eventually shut down the iDEN network. *See* Section IV.B.1, Network Coverage and Technology Upgrades, *supra.*

Table 33
Handset Models Offered by Air Interface, U.S., 2006-2010

	Total Handset Models Offered by Reporting Handset Manufacturers				
Air Interface	**2006 (Nov.)**	**2007 (Nov.)**	**2008 (Dec.)**	**2009 (June)**	**2010 (June)**
CDMA/1xRTT/ EV-DO[949]	81	118	146	115	134
CDMA/WCDMA	0	0	0	0	1
GSM/WCDMA[950]	40	42	177	129	148
GSM/CDMA	0	0	0	2	3
iDEN	11	8	21	14	16
Total	**124**	**168**	**346**	**260**	**302**

Table 34
Smartphone Models Offered by Handset Manufacturers by Air Interface, U.S., June 2009 and June 2010

Air Interface Type	Estimated Smartphone Models	
	June 2009	**June 2010**
CDMA/1xRTT/EV-DO	19	67
CDMA/WCDMA	0	1
GSM/WCDMA[951]	35	80
GSM/CDMA	1	2
iDEN	1	2
Total	**56**	**152**

331. *Operating Systems*. 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. Applications and services may not be available for all operating systems, and applications that work with one operating system may not be readily transferable to another operating system. Smartphone operating systems are discussed more extensively in the section on mobile applications. Table 35 states that 96.8 percent of smartphones in use in August 2010 have an operating system from a top-five mobile operating system provider, while the remaining 3.2 percent of smartphones in use have other operating systems.[952]

[949] Our data currently cannot separate 1xRTT with EV-DO handsets from 1xRTT only handsets.

[950] The number of handset models with WCDMA was 3 in November 2006, 9 in Nov. 2007, 52 in Dec. 2008, 50 in June 2009, and 88 in June 2010.

[951] The number of smartphone models with WCDMA was 25 in June 2009 and 65 in June 2010..

[952] *See comScore Reports August 2010 U.S. Mobile Subscriber Market Share,* Press Release, comScore, Oct. 6, 2010, *available at* http://www.comscore.com/Press_Events/Press_Releases/2010/10/comScore_Reports_August_2010_U.S._Mobile_Subscriber_Market_Share (last visited Oct. 15, 2010).

Table 35
Share of Smartphones in Use by Operating System, U.S., December 2009 and August 2010

Operating System Developer[953]	Share of Smartphones in Use	
	December 2009[954]	August 2010
RIM	41.6%	37.6%
Apple	25.3%	24.2%
Google	5.2%	19.6%
Microsoft	18.0%	10.8%
Palm	6.1%	4.6%
All Others	3.8%	3.2%

332. 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.[955] Generally, handset manufacturers make their handsets available to many service providers and consumers have a wide choice of handsets from different service providers. However, there are two types of contractual arrangements that affect the distribution of handsets. The first is bundling contracts, which are contracts between a service provider and a consumer for a handset-service subscription bundle. The second is exclusive handset arrangements, where handset manufacturers grant exclusive distribution territories to providers. Both of these types of contracts potentially affect outcomes in the handset/device and mobile wireless services businesses and are discussed below.[956]

333. Service providers carry diverse handset portfolios and offer their customers a wide selection of handsets. Chart 42 shows the number of handset models and smartphone models offered by each of the top eight facilities-based service providers from November 2006 to December 2009.[957] Each of the top eight providers sells at least one smartphone, except Leap, which began offering its first Android based touchscreen smartphone in August 2010.[958] Table 36 shows the number of service providers (including resellers) offering a particular manufacturer's smartphone models.

[953] Google's operating system is Android. *See* Section IV.B.3, Differentiation in Mobile Wireless Handsets/Devices, *supra*, for additional information on mobile wireless smartphone operating systems.

[954] *See Fourteenth Report*, 25 FCC Rcd at 11588, ¶ 306, fn. 819.

[955] There are other distribution channels for mobile wireless handsets, such as third-party retailers. *See* Section IV.B.2.c, Retailing, *supra.*

[956] *See* Section VII.B.1.b, Key Factors Affecting Mobile Wireless Competition, *infra.*

[957] These figures are based on data from hearing aid compatibility status reports filed by service providers in January 2010.

[958] *Cricket Adds a Human Touch to the Smartphone Market with Its First Android (R) Phone, the Sanyo ZIO by Kyocera*, Press Release, Leap Wireless, Aug. 26, 2010, *available at* http://phx.corporate-ir.net/phoenix.zhtml?c=191722&p=irol-newsArticle&ID=1463697&highlight=.

Chart 42
Total Handset and Smartphone Models Offered by the Top Eight Facilities-Based Service Providers, December 2009

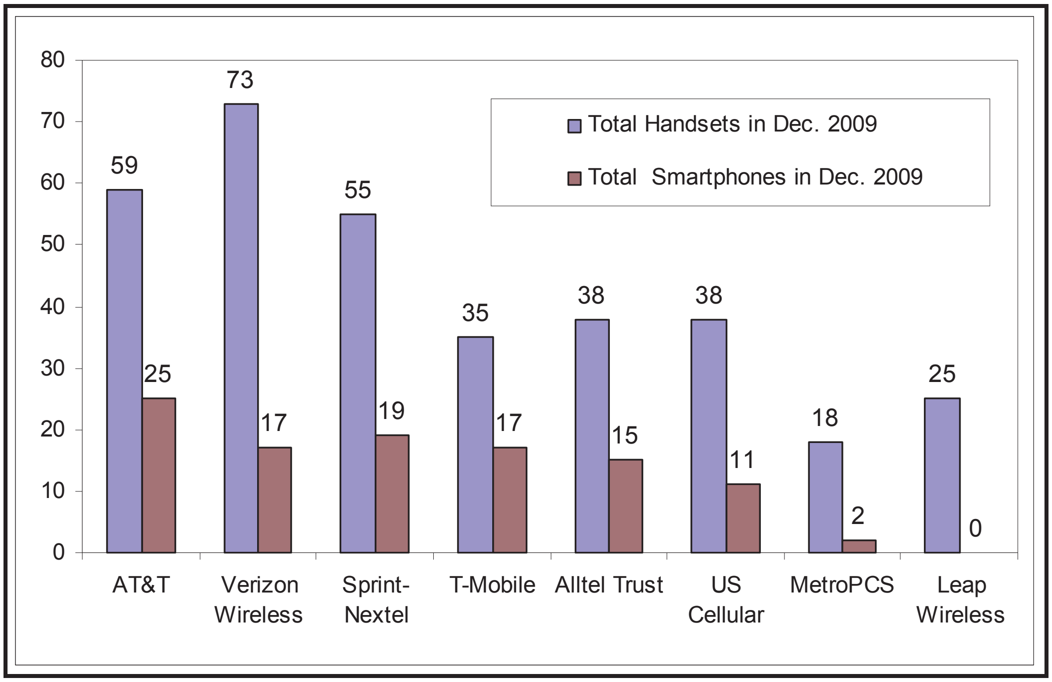


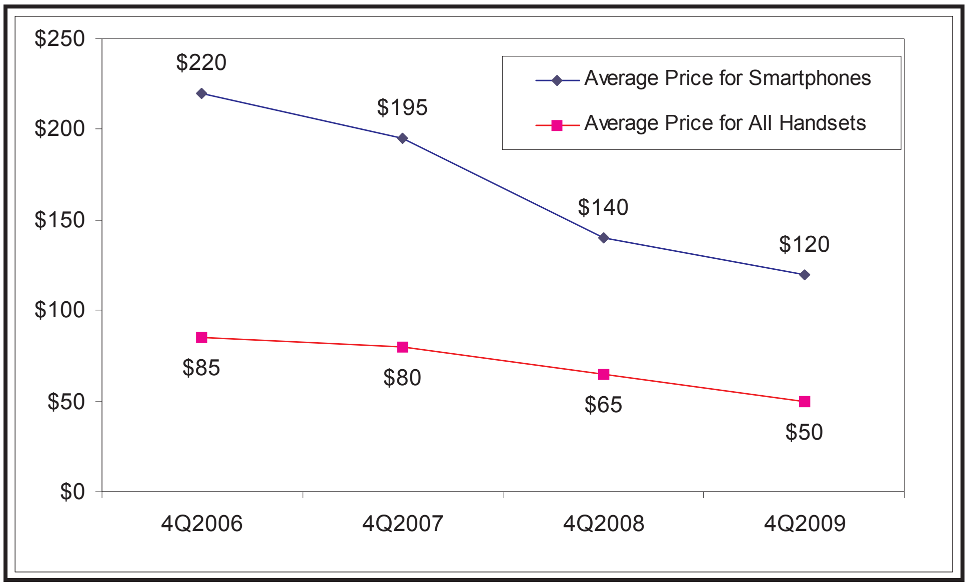
Table 36
Number of Service Providers (including Resellers) Offering a Manufacturer's Smartphones[959]

Manufacturer	Number of Service Providers (including Resellers)
HTC	128
RIM	116
Pantech	66
Samsung	66
Palm	55
Nokia	44
LG	40
Hewlett Packard	27
Motorola	14
Apple	5
Garmin	4
Sony Ericsson	3
Acer	1
Sharp	1

[959] Hearing aid compatibility annual status reports filed by Jan. 15, 2010. 220 service providers offered at least one handset model in December 2009.

334. According to one analyst, the average retail prices for all handsets and the smartphone subset, net of provider subsidies, decreased between 2006 and 2009. Chart 43 shows that the average price of smartphones after discounts (with a two year contract) decreased from $220 in the fourth quarter of 2006 to $120 in the fourth quarter of 2009, while the average price of all handsets after discounts decreased from $85 in the fourth quarter of 2006 to $50 in the fourth quarter in 2009.[960] This analyst also estimates that the average discount offered on the original price (the advertised price before contract-related discounts) of available handsets was 80 percent for the U.S. wireless industry in the last quarter of 2009, up from an average discount of 60 percent in late 2006.[961]

Chart 43
Average Price After Discount for PDAs/Smartphones and All Handsets[962]



335. Smartphone penetration has accelerated in recent quarters. According to a recent Nielson report, among those who acquired a new cell phone in the third quarter of 2010, 41 percent opted for a smartphone, up from 30 percent in the fourth quarter of 2009. As of the third quarter of 2010, 28 percent of U.S. mobile subscribers now own smartphones (see Chart 44).[963]

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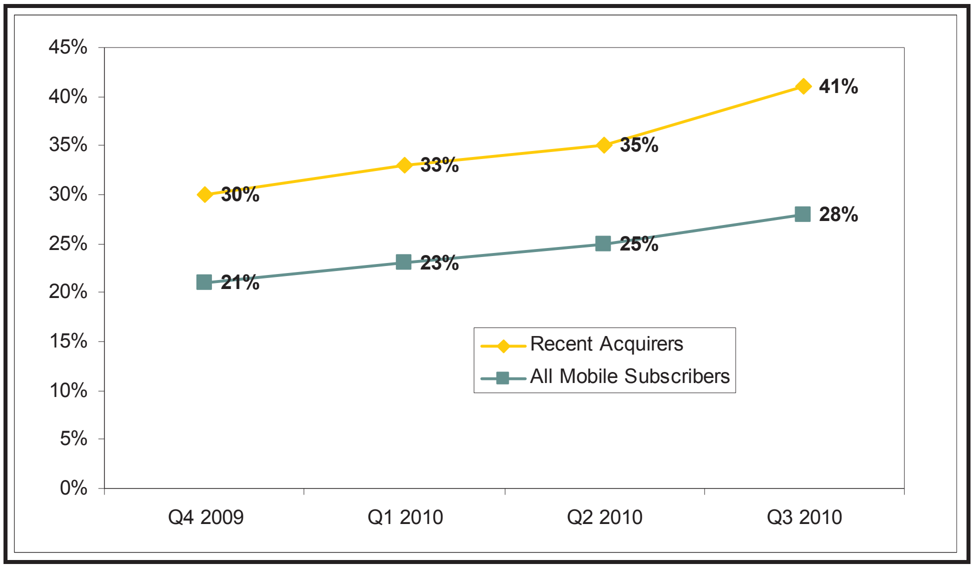
960 *Wireless Service & Handset Pricing – Tick Tock*, at 2, 8.

961 *Id.* at 7.

962 *Wireless Service & Handset Pricing – Tick Tock*, at 8.

963 See Nielson Wire at http://blog.nielsen.com/nielsenwire/online_mobile/mobile-snapshot-smartphones-now-28-of-u-s-cellphone-market/ (last visited November 4, 2010).

Chart 44
Smartphone Penetration Rates in the United States Q4 2009 – Q3 2010[964]



b. Key Factors Affecting Mobile Wireless Competition

336. Competition among the mobile wireless handset manufacturers (discussed above) not only affects competitive outcomes in the mobile wireless services market, but is also shaped by the provider-as-retailer model of handset distribution. Bundling contracts and exclusive handset arrangements are examples of firm conduct that occur frequently in the provider-as-retailer model of handset distribution.[965] Bundling is discussed first, followed by exclusive handset arrangements.

(i) Bundling of Wireless Service Subscriptions with the Purchase of Handsets

337. 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.[966] 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, and by charging early termination fees for subscribers who break the contract early.[967]

338. 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

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[964] *Id*

[965] *See* FTC, *An FTC Guide to Dealings in the Supply Chain*, http://www.ftc.gov/bc/antitrust/factsheets/antitrustlawsguide.pdf, at 17-22 (*FTC*).

[966] *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.

[967] *See* Section VI.A.3, Handsets, Handset Locking, and Handset Applications, *supra*.

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.[968] 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.

339. Wireless service plans are generally available without bundled contracts, but most postpaid subscribers have strong incentives to buy a subsidized device. Most GSM providers allow customers to use a compatible unlocked handset with a postpaid network service plan.[969] Unlocked devices, while not widely distributed through the major retail channels, are available in some stores and through some manufacturer websites (*e.g.,* Motorola and Nokia).[970] However, when customers bring an unlocked device to a postpaid plan, they generally do not receive a device subsidy from the provider nor do they typically receive a lower-priced service plan that would reflect the fact that the provider does not have to recoup the cost of the subsidy. Therefore, most customers have incentives to purchase subsidized devices from the provider, and this is the overwhelming U.S. industry practice.

340. The pricing plan options offered by one provider are a notable exception to standard industry practice. In 2009, T-Mobile introduced its "Even More Plus" plan that offers a lower monthly service price for customers that use unsubsidized handsets.[971] This appears to be the first attempt by a national provider to provide a more meaningful alternative for consumers to select a postpaid plan without purchasing a subsidized device.

(ii) Exclusive Handset Arrangements

341. 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. EHAs fall within a class of contractual arrangements known as territorial restraints or exclusive territory agreements.[972] EHAs may also involve sharing financial commitments and sharing market risks, with the manufacturer typically assuming some research and development commitments and the provider typically assuming some marketing and minimum volume commitments.

342. There is some data available on the prevalence and duration of EHAs, although confidentiality clauses in EHAs have restricted the availability of certain data. First, EHAs are often

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[968] *See*, *e.g.*, David Pogue, *The Irksome Cell Phone Industry*, The New York Times, July 22, 2009, at B1.

[969] T-Mobile, for example, offers SIM cards that can be inserted into any unlocked GSM phone. *See* T-Mobile, *T-Mobile SIM Card*, http://www.t-mobile.com/shop/phones/?shape=simalone&uid=Shop_1_10 (visited Feb. 16, 2011). AT&T states that for non-stocked, certified devices (*e.g.*, a GSM phone purchased overseas), it will "provide network, billing, ticketing, and provisioning support." *See* AT&T, *Answer Center*, http://www.wireless.att.com/answer-center/main.jsp?solutionId=KB59257&t=solutionTab (visited Feb. 16, 2011).

[970] *See*, *e.g.*, the online stores of handset manufacturers Motorola and Nokia at http://www.motorola.com/Consumers/US-EN/Home and http://www.nokiausa.com/, respectively. The unbundled model of handset manufacturers distributing unlocked handsets has not yet been widely embraced by U.S. consumers even though some handset manufacturers directly sell unlocked handsets in their Internet shops and through non-provider retailers.

[971] *See Fourteenth Report*, 25 FCC Rcd at 11473, ¶ 97. As of November 8, T-Mobile was still offering the "Even More Plus" plan.

[972] *Territorial restraints* involve manufacture-dealer relationships. They are distinct from *exclusive dealing* where the manufacturer requires the distributor not to distribute products of competing manufacturers. *See Antitrust Law and Economics*, at 308, 345. *See FTC* at 17. *See also Competition Policy*, at 301.

employed in the launch of innovative handsets that are on the technological frontier, *e.g.*, smartphones. Second, the duration of EHAs, although typically private contractual information, appears to have ranged from six months or less[973] to a few years or more.[974] Third, many handset manufacturers use EHAs to distribute some, but not all, of their smartphones. EHAs apply to particular handset models. EHAs do not prevent a manufacturer or vendor from selling other handset models to other providers, and they do not block a provider from selling handsets made by other manufacturers or vendors.[975] For instance, inspection of providers' online stores reveals that many handset manufacturers and vendors – including RIM, HTC, LG, Palm, Samsung, Motorola, and Nokia – sell many of the same smartphone models, or variants, to multiple U.S. service providers, including non-nationwide service providers.[976] In contrast, prior to 2011, Apple distributed its iPhone through AT&T (and its affiliates) only.[977] However, in January 2011, Verizon Wireless announced that it would begin selling the iPhone 4 for use on its EV-DO network in February 2011.[978] Fourth, handset manufacturers generally employ EHAs with providers that have larger customer bases and extensive network penetration. For instance, all nationwide providers have some EHAs, while non-nationwide service providers typically do not have EHAs.

2. Mobile Applications

343. A range of different communication functionalities is now available to mobile wireless consumers, depending on the capabilities of the device they use and the network to which they connect. These functionalities include both voice and data services, with devices increasingly being used for data services. According to one estimate, in 2009, mobile data traffic accounted for 52 percent of the total mobile wireless traffic, up from 30.6 percent in 2008, and is expected to grow to nearly 73 percent in

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[973] *See* Verizon Wireless, Written Ex Parte Presentation, RM-11497, July 17, 2009 (stating that, applicable to small wireless carriers (those with 500,000 customers or less), any new exclusivity arrangement it enters with handset makers will last no longer than six months – for all manufacturers and all devices). *See also* T-Mobile Reply Comments, RM-11497, Feb. 20, 2009, at 6-7 (stating that most of T-Mobile's exclusive agreements last less than a year and some are as short as 90 days). In October 2008, the Commission sought comment on a petition for rulemaking, filed by the Rural Cellular Association, regarding exclusivity arrangements between commercial wireless service providers and handset manufacturers. *See* "Wireless Telecommunications Bureau Seeks Comment on Petition for Rulemaking Regarding Exclusivity Arrangements Between Commercial Wireless Carriers and Handset Manufacturers," RM-11497, *Public Notice*, 23 FCC Rcd 14873 (WTB 2008).

[974] The original iPhone was released in June 2007. *See* Apple Inc., SEC Form 10-K, for fiscal year 2008, filed Nov. 5, 2008, at 5. The third generation iPhone, called iPhone 3GS, was released in June 2009. Apple reports that the iPhone 3GS is sold in the United States through an exclusive arrangement. *See* Apple Inc., SEC Form 10-K, for fiscal year 2009, filed Oct. 27, 2009, at 4, 20.

[975] Hence, EHAs do not involve exclusive dealing where the distributor is prohibited from carrying products of competing manufacturers.

[976] For example, on February 5, 2010, the HTC Touch smartphone (or a variant with similar capabilities) was carried by at least Cellular One, Cellular 29 Plus (Chatmobility), Cellular South, T-Mobile, Copper Valley Wireless, Golden State Cellular, Verizon Wireless, Cellcom, Illinois Valley Cellular, Alaska Digitel, Inland Cellular, AT&T, Iowa Wireless Services, Nex-Tech Wireless, North Eastern Pennsylvania Wireless, Northwest Missouri Cellular, Sprint Nextel, Appalachian Wireless, Carolina West Wireless (HTC Hero arriving soon), Panhandle Telecommunications Systems, Alaska Communications Systems, Leaco, Nemont Telephone Cooperative (Sagebrush Cellular), US Cellular, Bluegrass Cellular, Strata Wireless, Thumb Cellular, United Wireless, and West Central Wireless. This data were collected directly from the websites of these providers.

[977] *See* Apple, *Apple Store – iPhone 3G*, http://store.apple.com/us/browse/home/shop_iphone?mco=OTY2ODQyMQ (visited May 14, 2010). The Wall Street Journal reports that Apple is readying an iPhone for Verizon Wireless that will be sold to consumers in 2011. See Wall Street Journal, *Apple Readies Verizon iPhone*, October 7, 2010.

[978] *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.

2010.[979] Data use among all devices is increasing but is particularly high among the growing segment of smartphone users. One recent study found that average monthly wireless data consumption for Verizon Wireless smartphones is 421 MB per month, compared to 338 MB per month for AT&T's iPhone, and approximately 68 MB per month for feature phones.[980] In addition, the same study found that approximately 48 percent of iPhone users, and approximately 46 percent of Verizon Wireless smartphone users, consume more than 200 MB per month.[981]

344. Mobile data functionalities include text and multimedia messaging, which typically do not require a highly sophisticated device or high mobile network speed, as well as e-mail access, web browsing, and mobile applications, which typically require a more advanced device (*e.g.,* a smartphone, tablet, or laptop) and a mobile broadband network connection. Thousands of different mobile applications – software programs that can be used on a mobile device[982] – are now available to consumers through various channels. They may be accessed through web browsers, operating system application stores, or service provider-branded platforms.[983] In addition, certain applications may be native to, or pre-loaded on, a device, or may be side-loaded from a PC.

345. Both the number of mobile applications launched and the number of applications downloaded by consumers has grown significantly over the past three years. According to CTIA, by the end of 2009, U.S. consumers had access to more than 130,000 applications, a number that has grown to well over 300,000 today and continues to grow daily.[984] As shown in Table 37 below, several application stores have launched within the last three years, with each offering thousands of applications for download. For example, by September 2010, there were over 250,000 applications available from the Apple App Store, a number that more than doubled in less than a year (see Chart 45).[985] In addition, the total number of applications downloaded from Apple's App Store grew from 100,000 in 2008 to over 2 billion in 2009,[986] and had surpassed 6.5 billion by September 2010, with App Store developers earning over one billion dollars from the sales of their applications in the process.[987] In comparison, by September 2010, the Android Market had over 80,000 available applications[988] and had passed one billion

[979] *U.S. Telecommunications and Global Telecom Equipment: The Wireless Data Exaflood*, at 12.

[980] *See Validas Reports Verizon Wireless Smartphones Consume More Data Than iPhones*, Press Release, PR Newswire, July 26, 2010; Validas, *Verizon Wireless Smartphones Consumer More Data Than iPhones*, http://blog.myvalidas.com/index.php/2010/07/verizon-wireless-smartphones-consume-more-data-than-iphones/ (visited Oct. 13, 2010).

[981] *Validas Reports Verizon Wireless Smartphones Consume More Data Than iPhones*, Press Release, PR Newswire, July 26, 2010.

[982] *Morgan Stanley Mobile Internet Report*, at 134.

[983] *Fourteenth Report*, 25 FCC Rcd at 11596, ¶ 319.

[984] CTIA Comments at 28.

[985] *See Statement by Apple on App Store Review Guidelines*, Press Release, Apple, Sept. 9, 2010, *available at* http://www.apple.com/pr/library/2010/09/09statement.html. *(Statement by Apple on App Store Review Guidelines)*

[986] *Morgan Stanley Mobile Internet Report*, at 134, 136.

[987] *See Statement by Apple on App Store Review Guidelines*.

[988] *See* Jerry Hildenbrand, *Android Market Has More Than 80,000 Apps, Android's Rubin Says*, AndroidCentral, Sept. 9, 2010, *available at* http://www.androidcentral.com/googles-andy-rubin-says-over-80k-apps-now-android-market. (*Android Market Has More Than 80,000 Apps*).

total downloads.[989]

Table 37
Select Application Stores Available to U.S. Consumers[990]

Application Store	Date Launched	Approximate Number of Applications Available
Apple App Store	July 2008	250,000[991]
Android Market	October 2008	80,000[992]
BlackBerry App World	April 2009	12,000[993]
Nokia Ovi Store	May 2009	13,000[994]
Palm App Catalog	June 2009	3,000[995]
Windows Mobile Marketplace	October 2009	1,350[996]

[989] *See* Laura June, *Android Market Now Has 100,000 Apps, Passes 1 Billion Download Mark*, Engadget, July 15, 2010, *available at* http://www.engadget.com/2010/07/15/android-market-now-has-100-000-apps-passes-1-billion-download-m/.

[990] CTIA Comments at 31.

[991] *See Statement by Apple on App Store Review Guidelines*.

[992] *See Android Market Has More Than 80,000 Apps*.

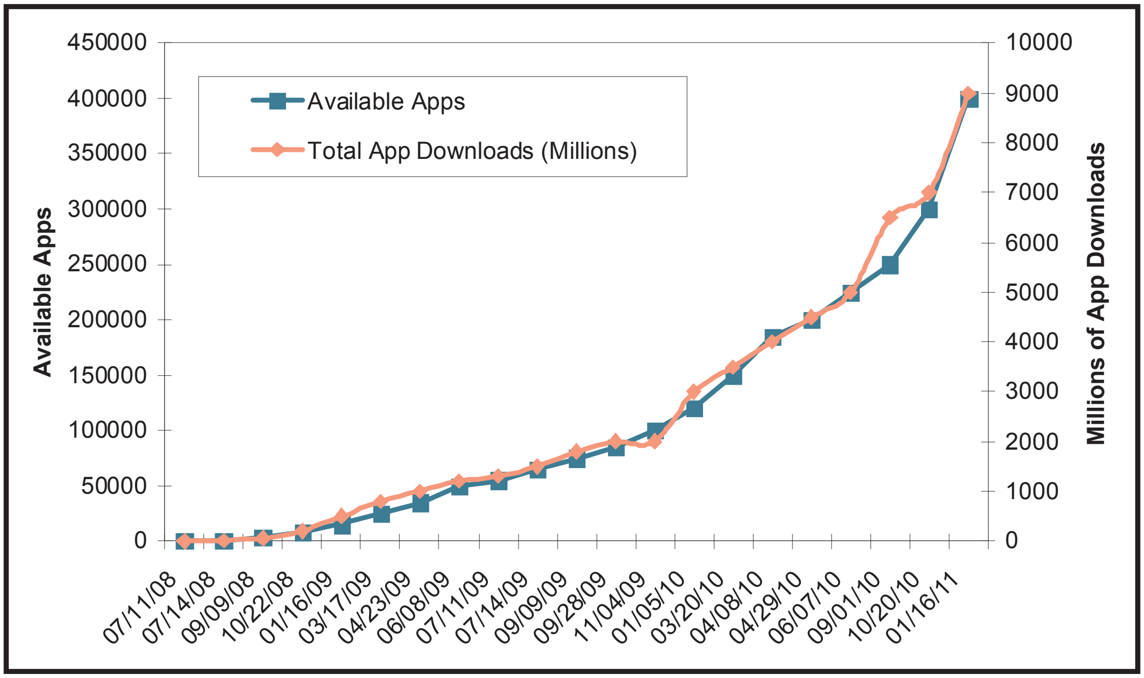
[993] *See* BlackBerry, *BlackBerry App World – Browse All Categories*, http://appworld.blackberry.com/webstore/ (visited Oct. 13, 2010).

[994] *See* Gustav Sandstrom, *Nokia Improves Life for App Developers*, THE SOURCE, Sept. 17, 2010, *available at* http://blogs.wsj.com/source/tag/ovi-store/.

[995] *See* Dieter Bohn, *Palm's US App Catalog Tops 3,000 Apps, Total Apps Over 4,000*, PRECENTRAL.NET, July 27, 2010, *available at* http://www.precentral.net/palms-us-app-catalog-tops-3000-apps-total-apps-over-4000.

[996] *See* Windows Phone, *Windows Marketplace for Mobile: Shop Apps*, http://marketplace.windowsphone.com/Default.aspx (visited Oct. 13, 2010).

Chart 45
Apple App Store – Available Apps and App Downloads[997]



346. Many different types of mobile applications, developed by a range of different third-party developers, are available through mobile application stores and web browsers. 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. Thousands of niche applications have been designed for specific uses, hobbies, interests, and industries by various third-party application developers.

347. Certain applications require a mobile Internet connection in order to be downloaded on a mobile device, but then may not rely on an Internet connection when used thereafter. One example of such an application would be a non-networked game that is played only by the individual user on his or her device. Many other applications require a mobile Internet connection in order to function on a device. These would include applications related to specific web sites or web-based content, such as news and information content, mapping and location-based applications, and social networking sites. Moreover, certain applications – such as VoIP and video conferencing applications – may require a low-latency Internet connection in order to function properly.

348. In order to provide an overview of the structure of the mobile applications segment, we provide below data on the adoption and usage of different types of mobile applications across the entire United States and applications sector, regardless of the device or operating system used. In addition, because certain devices are designed to facilitate the use of mobile applications, we provide data on mobile application use and adoption by type of device as well.

349. Adoption rates for mobile data services vary significantly by type of application. According to Pew Research, as of May 2010, 59 percent of all adult Americans go online wirelessly using

[997] *See* Wikipedia, *App Store*, http://en.wikipedia.org/wiki/App_Store (visited Jan. 21, 2011) (sources for the numbers on each date are provided on that page).

either a laptop or a mobile phone, an increase over the 51 percent of Americans who did so at a similar point in 2009.[998] In addition, comScore reports that slightly more Americans use a browser to access the mobile web than mobile applications.[999] According to comScore, nearly 73 million mobile users accessed a browser in April 2010, up 31 percent from the previous year.[1000] By comparison, comScore found that 69.6 million mobile users accessed an application in April 2010, an increase of 28 percent from the previous year.[1001] Data from Pew Research indicate year-over-year growth in the use of non-voice mobile data applications in every category examined in the survey (see Table 38).[1002] In particular, Pew Research found that, as of May 2010, 72 percent of mobile phone owners use their phone to send or receive text messages, 34 percent use it to send or receive email, and 30 percent use instant messaging capabilities.[1003]

Table 38
Use of Non-Voice Data Applications By Mobile Phone Users[1004]

Application	April 2009	May 2010
Take a picture	66%	76%
Send or receive text messages	65%	72%
Play a game	27%	34%
Send or receive email	25%	34%
Access the internet	23%	38%
Play music	21%	33%
Send or receive instant messages	20%	30%
Record a video	19%	34%

350. Analysts believe that one of the major applications driving mobile data usage is social networking.[1005] According to comScore, social networking ranked as the fastest-growing mobile content category between April 2009 and April 2010, with the number of mobile consumers using an application to access a social networking website increasing 240 percent to 14.5 million users.[1006] The major social networking sites include Facebook, MySpace, Twitter, LinkedIn, and Foursquare. Facebook is the segment leader with more than 500 million active users worldwide as of November 2010, about 30 percent of which are in the United States.[1007] In addition, Facebook reports that more than 200 million

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998 Pew Research, *More Cell Phone Owners Use an App for That*, July 7, 2010. (*More Cell Phone Owners Use an App for That*).

999 *Social Networking Ranks as Fastest-Growing Mobile Content Category*, Press Release, comScore, June 2, 2010 (*Social Networking Ranks as Fastest-Growing Mobile Content Category)*.

1000 *Social Networking Ranks as Fastest-Growing Mobile Content Category*.

1001 *Social Networking Ranks as Fastest-Growing Mobile Content Category*.

1002 *More Cell Phone Owners Use an App for That*.

1003 *More Cell Phone Owners Use an App for That*.

1004 *More Cell Phone Owners Use an App for That*.

1005 *Morgan Stanley Mobile Internet Report*, at 185-221.

1006 *Social Networking Ranks as Fastest-Growing Mobile Content Category*.

1007 Facebook, *Statistics*, http://www.facebook.com/press/info.php?statistics (visited Nov. 29, 2010).

active users currently access Facebook through mobile devices.[1008] In comparison, MySpace has more than 100 million users worldwide, about half of which are in the United States.[1009] According to MySpace, its mobile users spend over 40 minutes per week on its service, with more than five million monthly unique visitors and more than three billion monthly impressions on iPhone, Blackberry, and Android combined.[1010] Twitter reports 175 million registered users as of September 2010 and offers several SMS-based services as well as mobile applications for iPhone, iPad, Blackberry, Windows7, and Android.[1011] According to Twitter, its total mobile users increased 62 percent between April and September 2010, with 46 percent of active users participating via a mobile device, and 16 percent of all new users to Twitter starting on a mobile platform.[1012] Foursquare is a social networking site that combines GPS and location functionalities, allowing users to see where their friends are located at any time.[1013]

351. Video is another significant mobile data application, particularly due to the bandwidth requirements of streaming video applications. According to Nielsen, the number of consumers watching video on a mobile phone grew to more than 20 million in the first quarter of 2010, an increase of 51.2 percent over the previous year.[1014] However, the average monthly usage per consumer remained flat between the first quarter of 2010 and the same period in 2009, at 3 hours and 37 minutes per month.[1015] Globally, YouTube is among the most popular mobile video applications. By one estimate, YouTube alone accounted for 10 percent of total global mobile bandwidth in the second half of 2009.[1016]

352. Certain 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, the Android Market, or the Blackberry App World. Users can access these application stores on mobile devices that run the operating system that supports them. The application stores are specific to particular operating systems, and, in many cases, the application stores may be available only on devices running a certain, more recent version of an operating system or on devices with certain hardware features. For instance, the Blackberry App World is available on Blackberry smartphones running BlackBerry Device Software v4.5 or higher with a trackball, trackpad, or touch screen.[1017]

353. Consumer adoption and usage of mobile data applications may vary according to the device and/or the operating system used. For instance, according to Nielsen, among consumers who downloaded an application during May 2010, the percentage of smartphone users accessing mobile data applications exceeded that of non-smartphone users in every one of 13 categories listed (see Table 39). In addition, Nielsen found that although popularity varied between iPhone OS, Blackberry OS, and Android

[1008] *Id*.

[1009] MySpace, *Fact Sheet – Press Room*, http://www.myspace.com/pressroom/fact-sheet/ (visited Nov. 29, 2010).

[1010] *Id*.

[1011] Twitter, *About*, http://twitter.com/about (visited Nov. 29, 2010).

[1012] Twitter Blog, *The Evolving Ecosystem,* Sept. 2, 2010, http://blog.twitter.com/2010/09/evolving-ecosystem.html (visited Nov. 30, 2010).

[1013] *Morgan Stanley Mobile Internet Report*, at 204.

[1014] Nielsen, *Three Screen Report*, Vol. 8, 1Q 2010.

[1015] *Id*.

[1016] Allot MobileTrends, *Global Mobile Broadband Traffic Report*, H2 2009, at 7.

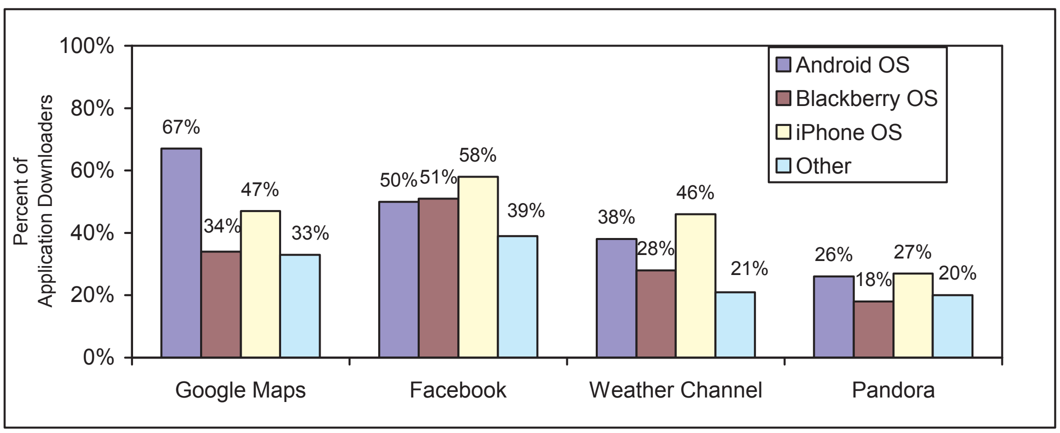
[1017] BlackBerry, *BlackBerry App World FAQ*, http://us.blackberry.com/developers/appworld/faq.jsp, (visited Nov. 29, 2010).

OS, applications for Facebook, Google Maps, the Weather Channel, and Pandora were among the five most popular applications used on all three operating systems (see Chart 46).[1018]

Table 39
Categories of Applications Used By Application Downloaders[1019]

Category of Application	Smartphone Users	Non-Smartphone Users
Games	65%	59%
Music	46%	45%
Social Networking	54%	36%
News/Weather	56%	32%
Maps/Navigation/Search	55%	30%
Video/Movies	25%	21%
Entertainment/Food	38%	21%
Sports	30%	20%
Communication	25%	15%
Banking/Finance	31%	15%
Shopping/Retail	29%	14%
Productivity	30%	12%
Travel/Lifestyle	21%	11%

Chart 46
Most Popular Mobile Applications Used By Operating System[1020]



[1018] Nielsen, *The State of Mobile Apps*, June 1, 2010. Other applications ranked among the five most popular applications used on the three operating systems include Google Search (ranked fifth on Android OS), ESPN (ranked fourth on the Blackberry OS), and iPod/iTunes (ranked second on the iPhone OS). YouTube ranked as the fifth most popular application among users of other operating systems. *Id.*

[1019] Nielsen, *The State of Mobile Apps*, June 1, 2010. Using its recently launched App Playbook, Nielsen surveyed more than 4200 consumers (1914 feature phone users and 2351 smartphone users) who had downloaded an application during the previous 30 days.

[1020] Nielsen, *The State of Mobile Apps*, June 1, 2010. Among consumers who had downloaded an application during the past 30 days, Nielsen surveyed 1121 iPhone OS users, 665 Blackberry OS users, 62 Android OS users, and 503 users of other smartphone operating systems.

354. In order to provide an application through an application store, third-party application developers must design their products in accordance with the specifications of a particular application store and operating system, and must abide by the conditions of the operating system and, in some cases, the mobile wireless service provider. As discussed below, the conditions set by the operating system developers and their level of control over the applications available through their application stores vary from provider to provider.

355. As noted in the *Fourteenth Report*, aside from the parameters placed on third-party applications by operating system developers, the emergence of mobile web browsers and a handful of mobile operating systems in recent years has brought greater efficiency and standardization to the mobile application segment, to the benefit of both third-party developers and consumers.[1021] Under the typical mobile application distribution model of previous years, an application developer seeking to provide a product to mobile consumers often had to design an application differently for each handset on each mobile network, and the launch of an application required the approval of the wireless service provider, which acted as a gatekeeper for its "walled garden" content. As discussed above, mobile wireless service providers have to some degree opened their networks to smartphone devices with web browsers and application stores. With the emergence of applications stores, developers can design their products for each application store, rather than each device. The *Fourteenth Report* noted that while the application development system has become more accessible and less fragmented than in previous years, some mobile wireless service providers and application stores act as gatekeepers, deciding which applications are allowed to run on particular devices or networks, and approval processes are not always transparent or predictable.[1022] In December 2010, the Commission adopted rules that require mobile broadband providers to disclose their network management practices, which includes enforceable disclosure obligations regarding device and application certification and approval processes.[1023] The rules also prohibit mobile broadband providers from blocking lawful websites or applications that compete with the provider's voice or video telephony services.[1024]

356. Mobile applications are a downstream segment within the mobile wireless ecosystem. Factors influencing the development of mobile applications – such as the ways in which consumers can access applications, technological innovations, and the barriers to entry faced by application developers – are, for the most part, common across all applications. However, the entire mobile application segment is also fragmented into many different types of applications, and the applications themselves may be part of separate product markets. For instance, mobile mapping applications may compete with GPS devices and even printed maps in the larger market for road navigation or mobile gaming applications may compete with portable and fixed gaming platforms as part of the larger gaming market.

[1021] *Fourteenth Report*, 25 FCC Rcd at 11599, ¶ 331.

[1022] *Fourteenth Report*, 25 FCC Rcd at 11600, ¶ 331. *See, e.g.*, Jeffrey Glueck, Perspective of a Mobile Application Developer & Entrepreneur, Presentation at FCC Workshop on Innovation, Investment and the Open Internet, Jan. 13, 2010), at 4-6, *available at* http://www.openinternet.gov/workshops/innovation-investment-and-the-open-internet.html (discussing the challenges that service provider and/or application store gatekeepers present to mobile application developers); *iPhone Facebook App Developer Quits over Apple Process*, Daily Tech, Nov. 12, 2009, *available at* http://www.dailytech.com/IPhone+Facebook+App+Developer+Quits+Over+Apple+Policies/article16805.htm

[1023] *See Open Internet Order*. Although the order does not require mobile broadband providers to allow third-party devices or all third-party applications on their networks, it nonetheless requires mobile broadband providers to disclose their third-party device and application certification procedures, if any; to clearly explain their criteria for any restrictions on use of their network; and to expeditiously inform device and application providers of any decisions to deny access to the network or of a failure to approve their particular devices or applications. *Id.* at ¶ 98.

[1024] *See Open Internet Order*. The order declines to apply a no unreasonable discrimination rule to mobile broadband at this time, instead preferring to wait and see how the mobile broadband marketplace develops. *Id.* at ¶ 104.

3. Mobile Commerce

357. Mobile commerce refers to commercial transactions made using a mobile wireless device. Examples of mobile commerce include mobile banking, shopping via mobile applications and/or the mobile web, and using a mobile device to make payments as a substitute for credit cards and cash. With consumers using mobile devices to browse the web and access application stores, rather than only for simpler functionalities such as texting, there is a greater potential for these devices to be used for mobile commerce.[1025] Mobile commerce is just emerging but is expected to grow quickly. Estimates of mobile commerce spending range from $500 million to $1.3 billion in 2009 to $12 billion in 2013.[1026]

358. *Mobile Banking.* Mobile banking is a growing area of mobile commerce that provides consumers with new means to access their financial information. According to one estimate, more than half of U.S. consumers, and almost 80 percent of those between the ages of 18 and 34, will use mobile financial services within five years.[1027] Mobile banking allows consumers to check account balances, pay bills, and transfer funds on a variety of mobile devices. For example, banks such as Bank of America, Chase, and Citibank offer consumers text banking, access to accounts via the mobile web, and mobile banking applications for use on several platforms and devices.[1028] Despite the emergence of mobile banking, survey data suggest that concerns about transaction security remain a potential barrier that may prevent some consumers from adopting mobile banking.[1029]

359. *Mobile Shopping.* Mobile devices have distinct attributes that enable them to expand electronic commerce beyond fixed devices.[1030] Some vendors have designed mobile websites that allow consumers to browse, search, and purchase products via the mobile web,[1031] while others allow consumers to make purchases via text messages.[1032] Still others have created mobile applications to facilitate commerce via mobile devices. For example, although not yet widely adopted, location-based applications on mobile devices can enable real-time physical retail and service opportunities.[1033] Shopkick offers an application that allows users to share their locations with retailers and receive coupons via their mobile

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[1025] *Finding Value in Smartphones*, at 30.

[1026] *Finding Value in Smartphones*, at 33.

[1027] *See* Peter Eichenbaum and Margaret Collins, *AT&T, Verizon to Target Visa, MasterCard with Smartphones*, Bloomberg, Aug. 2, 2010, http://www.bloomberg.com/news/2010-08-02/at-t-verizon-said-to-target-visa-mastercard-with-smartphones.html (visited Oct. 13, 2010).

[1028] *See generally* Bank of America, *Mobile Banking*, (visited Aug. 31, 2010) http://www.bankofamerica.com/onlinebanking/index.cfm?template=mobile_banking; Chase, *Chase Mobile Banking*, https://www.chase.com/index.jsp?pg_name=ccpmapp/shared/assets/page/Chase_Mobile_Banking (visited Aug. 31, 2010); Citibank, *Citi Mobile Banking*, https://online.citibank.com/US/JRS/pands/detail.do?ID=CitiMobile (visited Aug. 31, 2010).

[1029] *See* Deutsche Bank Research, *Mobile Banking Is Still Not Widespread But Has Become Much More Interesting*, Feb. 2010 (finding that more than 30 percent of U.S. adults refrain from using mobile banking because of security concerns); VeriSign, *New Mobile Banking Survey Reveals Untapped Market Among Offline Banking Consumers*, Oct. 7, 2009 (finding that 53 percent of respondents cited concerns about transaction security as a key barrier that would prevent them from using mobile banking).

[1030] *Morgan Stanley Mobile Internet Report*, at 218.

[1031] *See* Bill Siwicki, *For Neiman Marcus, M-Commerce Is an 'Extremely Important' Part of E-Commerce*, Internet Retailer, Aug. 17, 2010.

[1032] *See* Subports, http://www.subports.com/ (allowing consumers to buy and sell products by texting a product-specific subcode to a specified number).

[1033] *See Morgan Stanley Mobile Internet Report*, at 218; Claire Cain Miller and Jenna Wortham, *Technology Aside, Most People Still Decline to Be Located*, NY Times, Aug. 29, 2010.

devices when they walk into the retailer's store.[1034] In addition, certain mobile applications provide better, more transparent information on pricing by, for example, allowing consumers to compare instantly local and online prices.[1035] ShopSavvy and Amazon.com offer applications that allow users to scan a bar code using their device cameras and compare the price of a product in the physical store with its price online.[1036] Mobile applications can also allow consumers to take advantage of time-based Internet auctions and sales more easily.[1037] For example, eBay offers applications for the iPhone, iPad, and Android devices which allow consumers to buy and sell products through its website. In total, the eBay iPhone application had been downloaded ten million times by July 2010, and eBay generated $600 million through mobile commerce in 2009, a total which it expects to grow to $1.5 billion in 2010.[1038] Data from comScore suggest that the increasing prevalence of smartphones may correspond to a growth in mobile shopping, as 10 percent of smartphones and 12 percent of iPhones have been used to access online retail sites, compared to only one percent of traditional handsets.[1039]

360. *Mobile Payments.* Using mobile wireless handsets and devices to replace credit cards or cash, by making on-the-spot payments at physical retail locations is another functionality that is emerging, largely in Japan and South Korea, although not yet widely available in the United States.[1040] According to one estimate, three percent of mobile phone users in the United States used mobile payments in 2009.[1041] Technologies used to make mobile payments can include those that access mobile wireless networks to transmit payment information, such as short message service (SMS),[1042] as well as those that do not require a mobile wireless network connection, such as contactless and near-field communication (NFC) technologies.[1043] Contactless and NFC technologies use a microchip that can be

[1034] *See* Claire Cain Miller and Jenna Wortham, *Technology Aside, Most People Still Decline to Be Located*, NY Times, Aug. 29, 2010. *See generally* Shopkick, http://www.shopkick.com/.

[1035] *Morgan Stanley Mobile Internet Report*, at 218.

[1036] *Morgan Stanley Mobile Internet Report*, at 218; Amazon, *Amazon App for Android*, http://www.amazon.com/gp/anywhere/sms/android, (visited Nov. 30, 2010).

[1037] *Morgan Stanley Mobile Internet Report*, at 218.

[1038] *See eBay Takes Fashion Mobile with New iPhone App*, Press Release, eBay, July 16, 2010; *eBay Makes Selling Mobile with New iPhone Apps*, Press Release, eBay, Mar. 30, 2010.

[1039] *Finding Value in Smartphones*, at 30.

[1040] In Japan, 73 percent of mobile phones have a mobile payment capability, and 17 million people make contactless mobile payments from their mobile phones. In South Korea, 12 million mobile phones have mobile payment capability, and 4 million people use their mobile phones to make payments. A limited number of mobile payment trials have been conducted in a few U.S. cities. Stephen Ezell, *Contactless Mobile Payments*, The Information Technology & Innovation Foundation, Nov. 2009, at 2-3, 26.

[1041] Marianne Crowe, Marc Rysman, and Joanna Stavins, *Mobile Payments in the United States at Retail Point of Sale: Current Market and Future Prospects*, Federal Reserve Bank of Boston, May 17, 2010, at 13 (*Mobile Payments in the United States at Retail Point of Sale).*

[1042] *See Mobile Payments in the United States at Retail Point of Sale*, at 8-9. Mobile payments using SMS are typically transmitted via a text message or a data connection. *Id.* Obopay and PayPal are two examples of companies that offer SMS for mobile person-to-person (P2P) payments in the United States. *Id*; *see generally, Obopay – Money Transfer by Cell Phone, Web or Prepaid Card,* (visited Oct. 13, 2010) https://www.obopay.com/consumer/welcome.shtml; *Text Message Commands for Using PayPal on Your Mobile,* https://personal.paypal.com/us/cgi-bin/?&cmd=_render-content&content_ID=marketing_us/mobile_text (visited Oct. 13, 2010).

[1043] *See Mobile Payments in the United States at Retail Point of Sale*, at 5. Contactless and NFC are defined by formal open standards. The ISO/IEC 14443 standard defines contactless integrated circuit cards, while NFC is defined by ECMA-340 (under the name NFCIP-1). Contactless technology uses a microchip that can be embedded in a variety of different items. In contrast, NFC technology uses an embedded chip and antenna set and specifically (continued….)

integrated into a mobile device in a number of ways.[1044] For instance, the chip can be embedded in either the body of the device, the device's cover, a memory card that a user can insert into the device, or a sticker that can be affixed to the device.[1045] These embedded chips allow for communication between the mobile device and a merchant reader at short distances, typically less than six inches.[1046] In contrast to the magnetic strip on a typical credit card, embedded contactless and NFC chips could be used to store additional personal information, including a driver's license, an employment badge, and health insurance information, thus turning a mobile device into a fully enabled digital wallet.[1047]

361. In order for mobile payment applications to be successful, analysts argue that they must offer greater functionality than simple credit card replacement.[1048] According to a study by the Information Technology & Innovation Foundation (ITIF), mobile payment applications could be used to pay for taxis, movie tickets, parking meters, parking garages, vending machines, and subway rides.[1049] They could also potentially be used for hotel and airport check-in, taking attendance at school, and entry into health clubs or apartment buildings.[1050] The widespread use of mobile payment applications requires investment, buy-in, and coordination from several stakeholders – including mobile wireless service providers, device manufacturers, third-party application developers, financial institutions, merchants, public transit authorities, government agencies, and consumers – in order to deploy both devices that are capable of making contactless mobile payments and terminals that can accept such payments.[1051] In January 2010, the Federal Reserve Banks of Boston and Atlanta hosted an industry roundtable to discuss the state of the mobile payments environment in the United States.[1052] As part of the discussion, participants cited a number of barriers to adoption facing the industry, including the entrenched nature of credit cards in the U.S. banking system, a lack of clear regulatory oversight for mobile payments, the capital investment costs for merchants to purchase mobile payment readers, and a reluctance on the part of handset manufacturers to invest in contactless chip technology.[1053] According to a subsequent estimate by the Federal Reserve Bank of Boston, merchants must spend an estimated $200 per mobile payment reader, and updating mobile devices with embedded contactless chips increases manufacturing costs by $10 to $15 per device.[1054]

362. Despite the costs associated with implementing a mobile payment system, over 500,000 contactless credit card terminals have been deployed in the United States by 140,000 merchants, and

(Continued from previous page)
involves communication between two autonomously powered devices (e.g., a mobile phone and a merchant reader). NFC devices use the contactless communication protocol and can interact with a merchant reader designed to accept contactless cards.

[1044] *See Mobile Payments in the United States at Retail Point of Sale,* at 5.

[1045] *See Mobile Payments in the United States at Retail Point of Sale*, at 5, 20.

[1046] *See Mobile Payments in the United States at Retail Point of Sale*, at 5.

[1047] *See Mobile Payments in the United States at Retail Point of Sale*, at 6.

[1048] Stephen Ezell, *Contactless Mobile Payments*, The Information Technology & Innovation Foundation, November 2009, at 2.

[1049] *Id*. at 11.

[1050] *Id*.

[1051] *Id*., at 2.

[1052] *See Mobile Payments Industry Roundtable Summary*, Federal Reserve Banks of Boston and Atlanta, January 27-28, 2010.

[1053] *Id.*

[1054] *See Mobile Payments in the United States at Retail Point of Sale*, at 7.

contactless credit cards have been issued to more than 100 million Americans.[1055] Several financial services companies have begun test programs designed to let customers use mobile devices to pay for purchases in stores. For example, MasterCard has begun running pilot programs that allow mobile devices, linked to a customer's account, to make contactless mobile payments at MasterCard's PayPass terminals.[1056] Likewise, in conjunction with Visa, Bank of America, US Bank, and Wells Fargo have announced plans to begin testing similar programs through the end of 2010.[1057] Recent developments also indicate interest on the part of wireless service providers to begin allowing payments via smartphones. In August 2010, AT&T, Verizon Wireless, and T-Mobile announced a partnership with Discover Financial Services and Barclays to test a system at stores in Atlanta and three other U.S. cities that would let consumers pay with the contactless wave of a smartphone.[1058] In addition, Starbucks recently announced that customers at select stores will be able to pay for their purchases using a barcode displayed on their mobile device.[1059]

VIII. INTERMODAL COMPETITION

A. Voice Services

363. The number of adults who rely exclusively on mobile wireless for voice service has increased significantly in recent years. According to the January – June 2010 National Health Interview Survey (NHIS), 24.9 percent of adults, or one in every four, lived in households with wireless phones only during the first half of 2010.[1060] This compares to 22.9 percent of adults in the second half of 2009, 18.4 percent in the second half of 2008, 14.5 percent in the second half of 2007, and 11.8 percent in the second half of 2006.[1061]

364. The results of this survey, which are shown in Chart 47 below, also reveal that the proportion of wireless-only adults aged 30 years and older has steadily increased in recent years. Thus, in the first half of 2010, the majority of wireless-only adults (60.2 percent) were aged 30 and over, up from 49.3 percent in the first half of 2007. However, when looking across age groups, the survey finds that the percentage of adults living in households with wireless-only decreases with age. To expand, 27 percent of adults aged 35-44, 16.9 percent of adults aged 45-64, and 5.4 percent of adults aged 65 years and over

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[1055] Stephen Ezell, *Contactless Mobile Payments*, The Information Technology & Innovation Foundation, November 2009, at 4.

[1056] *Finding Value in Smartphones*, at 45-46.

[1057] *See* Maria Aspan, *Wells Fargo, Visa to Test Phone Payments*, Reuters, Sept. 1, 2010, http://www.reuters.com/article/idUSTRE6804KO20100901 (visited Oct. 13, 2010).

[1058] *See* Peter Eichenbaum and Margaret Collins, *AT&T, Verizon to Target Visa, MasterCard with Smartphones*, Bloomberg, Aug. 2, 2010, http://www.bloomberg.com/news/2010-08-02/at-t-verizon-said-to-target-visa-mastercard-with-smartphones.html (visited Oct. 13, 2010).

[1059] *Fact Sheet: Starbucks Card Mobile App & Mobile Payment*, Press Release, Starbucks, Jan. 24, 2011.

[1060] Stephen J. Blumberg and Julian V. Luke, *Wireless Substitution: Early Release of Estimates From the National Health Interview Survey, January – June 2010*, National Center for Health Statistics, Centers for Disease Control, Dec. 21, 2010, *available at* http://www.cdc.gov/nchs/data/nhis/earlyrelease/wireless201012.pdf. (*Wireless Substitution: Early Release of Estimates From the National Health Interview Survey, January – June 2010*). Adults and children with "no telephone service" include those in households with neither wireline nor wireless service.

[1061] Stephen J. Blumberg and Julian V. Luke, *Wireless Substitution: Early Release of Estimates From The Data from the National Health Interview Survey, January – June 2009*, National Center for Health Statistics, Centers for Disease Control, Dec. 16, 2009, *available at* http://www.cdc.gov/nchs/data/nhis/earlyrelease/wireless200912.pdf. (*Wireless Substitution: Early Release of Estimates From The Data from the National Health Interview Survey, January – June 2009*).

are wireless-only. Nevertheless, the percentage of wireless-only adults within each age group has increased over time.[1062] For adults aged 25-29, more than half (51.3 percent) lived in households with wireless-only telephones, which is the first time that wireless-only households have exceeded landline households in any of the age ranges examined. For adults aged 18-24 years or 30-34 years, approximately 40 percent lived in households with wireless-only telephones.[1063]

365. In the first half of 2010, according to the NHIS survey, 26.6 percent of households in the United States, or more than one in every four, were wireless-only.[1064] This compares to 24.5 percent of U.S. households in the second half of 2009, 20.2 percent in the second half of 2008, 15.8 percent in the second half of 2007, and 12.8 percent in the second half of 2006.[1065] A Nielsen Company survey shows a similar rising trend in households who have "cut the cord."[1066] In the second quarter of 2009, according to the Nielsen survey, 21 percent of households, or over one in five, reported they are wireless-only, a three percentage point increase from 18 percent of households in 2008, and up six percentage points from 15 percent of households in both 2006 and 2007.[1067]

[1062] *Wireless Substitution: Early Release of Estimates From the National Health Interview Survey, January – June 2010*.

[1063] *Id.*

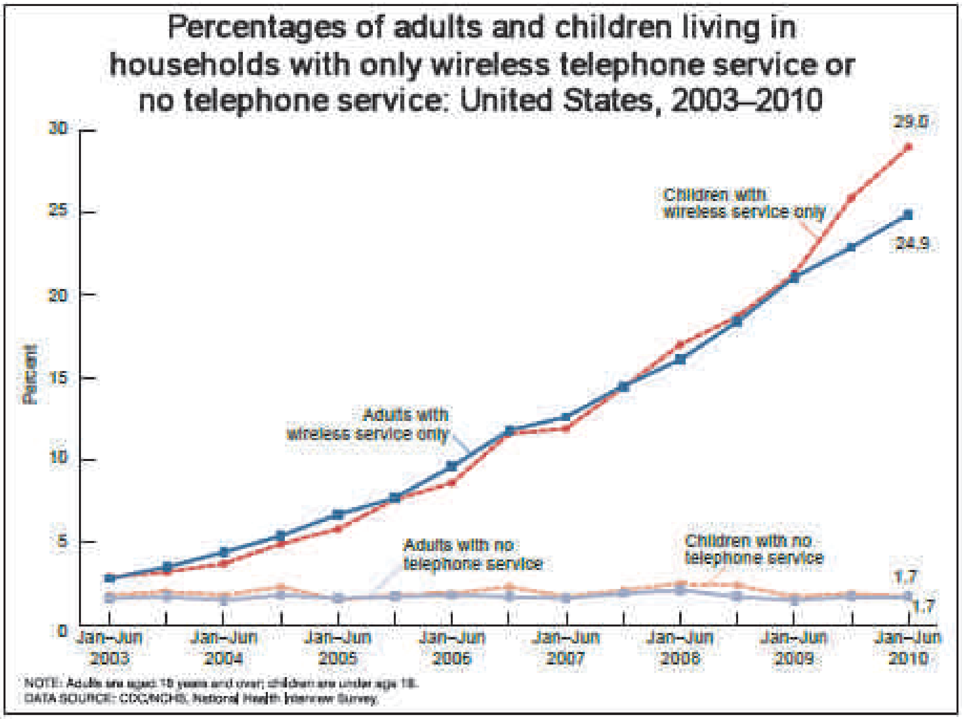
[1064] *Id.*

[1065] *Wireless Substitution: Early Release of Estimates From The Data from the National Health Interview Survey, January – June 2009*.

[1066] *Study: More Cellular-only Homes as Americans Expand Mobile Media Usage*, Nielsen Wire, Dec. 21, 2009.

[1067] *Id*. According to the Nielsen Company, the increase comes from the two-thirds of households who have dropped their landlines as well as from young adults who started new households with just a wireless phone service.

Chart 47
Wireless-Only Households[1068]



B. Broadband Services

366. As noted previously in this *Report*, the Commission estimates that there were approximately 55.8 million subscribers to terrestrial mobile wireless Internet access services, at speeds exceeding 200 kbps in at least one direction, at the end of 2009.[1069] Mobile wireless connections represented approximately 41 percent of the 136.5 million data connections at speeds exceeding 200 kbps in the United States in December 2009.[1070] In addition, at the end of 2009, there were more than 116 million mobile devices in use capable of sending or receiving information at speeds exceeding 200 kbps in at least one direction, up from approximately 86 million at the end of 2008.[1071]

367. For reasons first elaborated in the *Fourteenth Report*, it is still not yet clear whether mobile wireless Internet access services can substitute completely for fixed wireline Internet access technologies such as cable modem, DSL, or fiber.[1072] The extent to which mobile wireless services can impose some competitive discipline on wireline providers will depend on how technology, costs, and

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[1068] *Wireless Substitution: Early Release of Estimates From The Data from the National Health Interview Survey, January – June 2009*). Adults and children with "no telephone service" include those in households with neither wireline nor wireless service.

[1069] *See* Section V.A.2, Mobile Wireless Subscribers by Type of Service and Device, *supra*.

[1070] Commission estimates based on Form 477 data.

[1071] *See* Section V.A.2, Mobile Wireless Subscribers by Type of Service and Device, *supra*.

[1072] *See Fourteenth Report*, 25 FCC Rcd at 11604-05, ¶ 342; *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.

consumer preferences evolve, and on the business strategies of providers that offer both wireless and wireline Internet access services.[1073] Mobile wireless Internet access service could provide an attractive alternative to wireline offerings for consumers who are willing to trade off speed for mobility, and also consumers who are relatively indifferent with regard to the attributes, performance, and pricing of mobile and fixed platforms.[1074] Moreover, while mobile wireless service currently is not competitive with wireline for those consumers who value high speeds over other attributes, advances in wireless technologies, coupled with increases in the supply of spectrum, have the potential to make mobile wireless service a more viable competitor at higher data speeds at some future date.[1075]

C. Local Wireless Networks

368. Wireless coverage is being increased with technologies that create local wireless networks, some accessing primary voice and data networks through cable access points instead of mobile wireless networks. These local-network wireless technologies typically are designed to provide wireless coverage in a specific 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. Local wireless networks that employ unlicensed spectrum (discussed below) can operate independently of a mobile wireless service network, raising questions about whether they can, by themselves or integrated into non-mobile wireless networks, create new competition to mobile wireless service providers.

369. When deployed to complement mobile wireless networks, local-network wireless 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,[1076] 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. Local wireless networks that access data and voice networks through cable access points enable mobile wireless service providers to offload mobile traffic onto non-mobile wireless networks.[1077]

370. The roles that local wireless networks play in existing telecommunication networks are a dynamic and developing segment of the telecommunications sector. Local wireless networks complement existing cable and wireless networks, exemplifying how next generation communication networks efficiently connect together multiple co-existing transmission technologies. Two local wireless network technologies, wireless local area networks (WLANs) and femtocells, are discussed below.

[1073] *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.

[1074] *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.

[1075] *National Broadband Plan*, at 43.

[1076] *See*, W. Gerhardt and R. Medcalf, *Femtocells: Implementing a Better Business Model to Increase SP Profitability*, Cisco, March 2010.

[1077] In September, 2010, the Commission finalized rules to make unused spectrum in the TV bands (TV "white spaces") available for unlicensed broadband wireless devices. 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 congestion on existing networks. *See* Unlicensed Operation in the TV Broadcast Bands, *Second Memorandum Opinion and Order*, ET Docket Nos. 04-186, 02-380, 2010 WL 3726622 (rel. Sept. 23, 2010) at ¶ 1.

371. 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.[1078] 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 Wi-Fi enabled wireless handsets, as well as other Wi-Fi capable devices such as the Amazon Kindle, the Apple iPad, and the Barnes & Noble Nook.[1079]

372. WLAN networks are being deployed by mobile wireless companies, cable companies, businesses, universities, municipalities, households and other institutions.[1080] 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.[1081] Many places of businesses offer Wi-Fi hot spots to their customers.[1082] Amtrak offers Wi-Fi access on all of its Acela Express trains between Washington, DC and Boston.[1083] According to one report, the top ten U.S. airlines have all begun deploying in-flight Wi-Fi and about 2,000 commercial aircraft will offer this service by the end of 2010, up from about 700 at the end of 2009.[1084] In November 2010, the communication company Comcast served its customers with 21,629 hotspots and is deploying more.[1085] Online Wi-Fi directories assist consumers in finding public Wi-Fi hot spots.[1086]

[1078] Services provided over WLANs are not CMRS services. *See* 47 C.F.R. §§ 20.3, 20.9 for a discussion of commercial mobile radio services. WLANs are permitted to operate on an unlicensed basis under Part 15 of the Commission's rules. *See* 47 C.F.R. §15, et seq.

[1079] CTIA Reply at 27.

[1080] Nat Worden, *Cable Companies Reach Wi-Fi Pact*, Wall Street Journal, Apr. 15, 2010. Cablevision, Comcast and Time Warner have deployed thousands of Wi-Fi hot spots, with Cablevision alone investing $300 million on Wi-Fi network deployment and averaging more than two million Wi-Fi sessions a month on its network. *Id.* In addition, the three companies have agreed to allow their broadband Internet subscribers to roam freely across the Wi-Fi deployments of all three major cable operators in the New York metro area. *Id.*

[1081] *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.

[1082] *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.*

[1083] Verizon Wireless Comments at 30; *see generally* Amtrak, *AmtrakConnect Wi-Fi*, http://www.amtrak.com/servlet/ContentServer/AM_Content_C/1246044325520/1237405732514 (visited Sept. 16, 2010).

[1084] *See* In-Stat, *Build It and They Will Come? The In-Flight Broadband Market*, July 2010, *available at* http://www.instat.com/mp/10/IN1004767WS_Sample.pdf; Danny King, *WiFi in the Sky: Airlines Bring More Internet Access on Board*, DAILY FINANCE, Aug. 28, 2010, *available at* http://www.dailyfinance.com/story/wifi-airplanes-airlines-internet/19611600/. Aircell, the industry leader in providing in-flight Wi-Fi access, typically offers service starting at $4.95 per flight and up depending on the device used and the duration of the flight. *Id.*

[1085] *See* Comcast, http://comcast.cellmaps.com/wifi.html, visited November 16, 2010.

[1086] *See* Hotspotr, *WiFi Cafes and Hotspots*, *available at* http://hotspotr.com/wifi (17,528 hot spots) (visited Sept. 15, 2010); Jiwire, *Global Wi-Fi Finder*, *available at* http://v4.jiwire.com/search-hotspot-locations.htm (visited Sept. 15, 2010) (77,780 hot spots in the United States).

373. Mobile wireless service providers AT&T, Verizon Wireless, and T-Mobile each currently offer wireless internet access at thousands of publicly accessible Wi-Fi hotspot locations.[1087] AT&T owns more than 23,000 Wi-Fi hotspots in the United States.[1088] Through agreements with AT&T, national chains such as Starbucks, McDonald's, and Barnes & Noble offer complimentary Wi-Fi access in their establishments.[1089] Verizon has more than 16,000 hotspots.[1090] Borders signed an agreement with Verizon for Verizon to provide free Wi-Fi access in more than 500 of Borders' stores nationwide.[1091] AT&T, T-Mobile, and Verizon Wireless include Wi-Fi hot spot access with some mobile wireless service plans.[1092] Whereas Verizon Wireless's 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.[1093] Other mobile wireless providers

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[1087] *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. 16, 2010) (advertising the nation's largest Wi-Fi network, with more than 20,000 locations in all fifty states); Verizon Wireless, *Verizon Wi-Fi Hotspot Directory,* http://vzw.jiwire.com/ (visited Sept. 16, 2010) (listing more than 12,000 Verizon Wi-Fi hot spots across the United States); T-Mobile, *T-Mobile HotSpot Locations,* https://selfcare.hotspot.t-mobile.com/locations/viewLocationMap.do (visited Sept. 16, 2010) (advertising over 10,000 locations in the United States). *See generally* AT&T, *AT&T Wi-Fi,* http://www.att.com/gen/general?pid=5949 (visited Sept. 16, 2010); T-Mobile, *Wireless Internet Access – T-Mobile HotSpots,* https://content.hotspot.t-mobile.com/AssetProcess.asp?asset=com.default.main.001 (visited Sept. 16, 2010); Verizon Wireless, *Hit the Hotspots with Verizon Wi-Fi,* https://www.verizonwireless.com/b2c/mobilebroadband/?page=wifiaccess (visited Sept. 16, 2010).

[1088] *See AT&T Media Kit: Wi-Fi*, http://www.att.com/gen/press-room?pid=17541 (visited Sept. 29, 2010). In the second quarter of 2010, AT&T handled 68.1 million connections on its public Wi-Fi network, compared to 15 million connections during the same period in 2009. In total, AT&T customers made 121.2 million connections in the first half of 2010, surpassing the 85.5 million connections made in all of 2009. *Use of AT&T's Wi-Fi Network Grows to More Than 68 Million Connections in the Second Quarter*, Press Release, AT&T, July 22, 2010.

[1089] *See* Starbucks, *Wireless Internet*, http://www.starbucks.com/coffeehouse/wireless-internet (visited Sept. 16, 2010) (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. 16, 2010) (advertising free Wi-Fi hot spot 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. 16, 2010).

[1090] *See* Verizon, *Wi-Fi Access HotSpot Directory*, http://www.verizon.com/hotspots (visited Nov. 17, 2010).

[1091] *Borders Signs Agreement with Verizon to Offer Free Wi-Fi,* PR NEWSWIRE, Sept. 29, 2009, *available at* http://www.prnewswire.com/news-releases/borders-signs-agreement-with-verizon-to-offer-free-wi-fi-62675172.html (visited Sept. 16, 2010); *see also* Borders, *Customer Care Borders Stores*, http://www.borders.com/online/store/CustomerServiceView_storeinfo#wifi (visited Sept. 16, 2010).

[1092] *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. 16, 2010) (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"); Verizon Wireless, *Hit the Hotspots with Verizon Wi-Fi,* https://www.verizonwireless.com/b2c/mobilebroadband/?page=wifiaccess (visited Sept. 16, 2010) (stating that Verizon Wi-Fi is "included for our Mobile Broadband customers."); T-Mobile, *T-Mobile Hotspot – Service Plans,* https://selfcare.hotspot.t-mobile.com/services_plans.do (visited Sept. 16, 2010) (advertising $9.99 per month as a "discount for T-Mobile voice plan customers only").

[1093] *See* Verizon Wireless, *Hit the Hotspots with Verizon Wi-Fi,*https://www.verizonwireless.com/b2c/mobilebroadband/?page=wifiaccess (visited Sept. 16, 2010); 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. 16, 2010) (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. 16, 2010) (advertising a "DayPass" plan with no term commitment).

sell customers personal mobile Wi-Fi hotspots (discussed below) that access the providers' respective wireless networks.[1094]

374. Some mobile wireless service providers use WLANs to complement the coverage of their mobile wireless networks. AT&T has recently deployed "hotzone" pilot programs in New York City, Charlotte, North Carolina, and Chicago, Illinois using Wi-Fi to provide an additional mobile broadband option in areas of each city that experience consistently high mobile data use.[1095] AT&T has experienced significant growth in hot spot usage in the first half of 2010,[1096] with an estimated 40 percent of iPhone traffic in the United States being transmitted over a Wi-Fi connection.[1097] T-Mobile and Cincinnati Bell Wireless offer Wi-Fi-based services – "T-Mobile@Home" and "Fusion WiFi," respectively – that provide improved, in-building voice coverage and unlimited calling through a specified home or office Wi-Fi router or at provider-branded hot spot locations. According to T-Mobile, as of October 2010, its Wi-Fi hotspots transmit approximately 40 million calls per month.[1098]

375. To facilitate access of mobile wireless users to their Wi-Fi hotspots, a number of mobile wireless providers now offer dual-mode handsets that operate on both cellular and Wi-Fi networks.[1099]

[1094] Sprint Nextel sells mobile Wi-Fi devices that connect up to five devices. *See* Sprint Nextel http://shop.sprint.com/NASApp/onlinestore/en/Action/DisplayPhones?phoneSKU=SWW8013G4G (visited Nov. 17, 2010). Clearwire, Clearwire Announces Nationwide Availability of 4G/Wi-Fi Personal Mobile Hotspots, http://newsroom.clearwire.com/phoenix.zhtml?c=214419&p=irol-newsArticle&ID=1445088&highlight (visited Nov. 17, 2010).

[1095] *See AT&T Launches Wi-Fi Hotzone in Chicago*, Press Release, AT&T, Aug. 4, 2010; *AT&T Expands Wi-Fi Hotzone Pilot Project to Additional Cities*, Press Release, AT&T, July 26, 2010; *AT&T Launches Pilot Wi-Fi Project in Times Square*, Press Release, AT&T, May 25, 2010. AT&T installed Wi-Fi service in the north central portion of New York City's Times Square as well as along part of South Brevard Street in Charlotte, NC and in the Wrigleyville neighborhood around Wrigley Field in Chicago. *Id.* The service is available at no additional charge for nearly 32 million AT&T customers with qualifying smartphone, 3G LaptopConnect, and AT&T High Speed Internet plans. *Id.*

[1096] *See AT&T Media Kit: Wi-Fi*, http://www.att.com/gen/press-room?pid=17541 (visited Sept. 29, 2010). In the second quarter of 2010, AT&T handled 68.1 million connections on its public Wi-Fi network, compared to 15 million connections during the same period in 2009. In total, AT&T customers made 121.2 million connections in the first half of 2010, surpassing the 85.5 million connections made in all of 2009. *Use of AT&T's Wi-Fi Network Grows to More Than 68 Million Connections in the Second Quarter*, Press Release, AT&T, July 22, 2010.

[1097] *See* AdMob Mobile Metrics Report (Nov. 2009), *available at* http://metrics.admob.com/wp-content/uploads/2009/12/AdMob-Mobile-Metrics-Nov-09.pdf, (visited Sept. 17, 2010) at 3 (stating that 36 percent of U.S. iPhone traffic is transmitted via Wi-Fi); *see also* AdMob Mobile Metrics Report (Nov. 2008), *available at* http://www.admob.com/marketing/pdf/mobile_metrics_nov_08.pdf, at 2 (stating that 42 percent of iPhone traffic was transported over Wi-Fi).

[1098] *T-Mobile Extends Wi-Fi Calling to Android*, Press Release, T-Mobile, Oct. 6, 2010. In October 2010, T-Mobile announced the upcoming availability of built-in Wi-Fi calling solutions for its smartphones using the Android OS. *Id*.

[1099] *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. 17, 2010) (listing 27 Wi-Fi capable phones or devices 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. 17, 2010) (listing 9 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. 17, 2010) (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,* (continued….)

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.[1100] With the increasing prevalence of Wi-Fi enabled handsets, such as the iPhone, hotspot usage by handsets has increased significantly.[1101] According to one study, handsets accounted for 35 percent of all hotspot connections in 2009, up from 20 percent in 2008, and are projected to account for half of all hotspot connections by 2011.[1102] AT&T reports that 69 percent of its Wi-Fi connections in the first quarter of 2010 were made from smartphones and integrated devices, up from 35 percent in the first quarter of 2009.[1103]

376. A femtocell is a microcell – a small wireless transmitter that functions similar to a cell in a mobile wireless network – that uses the service provider's licensed spectrum and accesses voice and data networks through a DSL or cable access point. Femtocells are compatible with the same mobile handsets that consumers use on the service provider's mobile wireless network. Typically, calls can be handed-off from the femtocell to the provider's mobile wireless network, but not vice-versa. Approximately 350,000 femtocells were shipped in 2009.[1104] One report estimates that over one million femtocells will be shipped in 2010.[1105] Another report states that adoption of femtocells has been hindered by customer reluctance to incur additional costs and service provider indecision over the best business strategies to cope with current and projected increases in mobile traffic.[1106] Three nationwide service providers distribute and support femtocells 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.[1107] The Verizon Wireless Network Extender, unveiled in January 2009, is designed to enhance indoor coverage and be used with a customer's existing service

(Continued from previous page)
http://www.cincinnatibell.com/consumer/wireless/phones_and_devices/?view=fusionwifi (visited Sept. 17, 2010) (listing four handsets available for use with Cincinnati Bell Wireless' Fusion WiFi service).

[1100] *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.

[1101] *See* AdMob Mobile Metrics Report (Nov. 2009), *available at* http://metrics.admob.com/wp-content/uploads/2009/12/AdMob-Mobile-Metrics-Nov-09.pdf (visited Sept. 17, 2010). According to the study, the percentage of mobile advertising requests from devices with Wi-Fi capability increased from 19 percent to 55 percent between November 2008 and November 2009. In addition, the percentage of requests over a Wi-Fi network in the United States tripled – from 8 percent to 24 percent – during the same period. *Id.* at 3.

[1102] *Hotspot Usage Is Increasingly Shifting Away From Notebooks and Laptops and Toward Handhelds*, Press Release, In-Stat, Dec. 23, 2009.

[1103] *AT&T Wi-Fi Network Usage Soars to More Than 53 Million Connections in the First Quarter*, Press Release, AT&T, Apr. 22, 2010.

[1104] *2009 Femtocell Shipment Numbers Cut by 55%*, Press Release, ABI Research, Nov. 12, 2009.

[1105] In-Stat, quoted in The New York Times, *Network Congestion Lifts Home 3G Station Market*, November 15, 2010.

[1106] *See*, W. Gerhardt and R. Medcalf, *Femtocells: Implementing a Better Business Model to Increase SP Profitability*, Cisco, March 2010. *See* AT&T, *AT&T 3G Microcell*, http://www.wireless.att.com/learn/why/3gmicrocell/ (visited Nov. 15, 2010).

[1107] Sprint Nextel, *Sprint Airave*, http://shop.sprint.com/en/services/airave/index.shtml (visited Sept. 17, 2010). Customers pay $99.99 to purchase the Airave base station plus a $4.99 per month enhanced coverage charge as well as an optional monthly fee of $10 per line for unlimited calling. *Id.* *See also* Sprint Nextel, *Airave Frequently Asked Questions*, at 3, http://www.nextel.com/assets/pdfs/en/services/sprint_airave_faqs.pdf (visited Sept. 17, 2010). The Airave includes voice, not data, services. *Id.* at 3.

plan.[1108] The AT&T 3G MicroCell, introduced in late 2009,[1109] is also used with a customer's existing service plan.[1110]

377. Several mobile wireless providers have also introduced personal mobile (i.e. portable) Wi-Fi hotspots that access the Internet through the provider's mobile wireless network. For instance, the Sprint Personal Hotspot PHS300S tethers to Sprint Nextel USB modems to provide Wi-Fi access anywhere within Sprint Nextel's mobile broadband coverage.[1111] The Novatel Wireless MiFi 2200, available to both Verizon Wireless and Sprint Nextel customers, is "about the size of eight stacked credit cards" and supports up to five Wi-Fi enabled devices.[1112] Additionally, Sprint Nextel has introduced the Overdrive 3G/4G Mobile Hotspot by Sierra Wireless, which functions similarly to the MiFi 2200 but also includes access to 4G data speeds.[1113] In July of 2009, Novatel Wireless unveiled the MiFi 2372 HSPA, a newer version of its Intelligent Mobile Hotspot with multi-mode operation, including HSPA, UMTS, EDGE and GPRS.[1114] Additionally, in August 2010, Cricket announced that it will be offering Crosswave, a personal hot spot device that allows users to connect several wireless devices at the same time from up to 30 feet away from the Crosswave device's location.[1115]

[1108] *See Verizon Wireless "Network Extender" Enhances In-Home Call Capabilities*, Press Release, Verizon Wireless, Jan. 26, 2009. *See also* Verizon Wireless, *Verizon Wireless Network Extender,* http://www.verizonwireless.com/b2c/store/accessory?action=gotoFeatures (visited Sept. 17, 2010). Customers pay $249.99 for the Network Extender base station but pay no additional monthly access fee. *Id. See also* Verizon Wireless, *Answers to FAQs,* http://support.vzw.com/faqs/Equipment/network_extender.html (visited Sept. 17, 2010). The Network Extender does not support EVDO data speeds. *Id.*

[1109] *See* Prince McLean, *AT&T MicroCell to Cost $150, Require No Monthly Fee,* AppleInsider, Sept. 21, 2009, *at* http://www.appleinsider.com/articles/09/09/21/att_3g_microcell_to_cost_150_require_no_monthly_fees.html. Under AT&T's trial pricing, AT&T wireless customers pay $20 per month for unlimited calling with the 3G Microcell, while AT&T landline phone or Internet customers pay $10 per month, and customers with all three services can use the device for free. *Id.*

[1110] *See* AT&T, *AT&T 3G MicroCell,* http://www.wireless.att.com/learn/why/3gmicrocell/ (visited Sept. 17, 2010). The AT&T 3G MicroCell supports 3G data speeds. *Id.*

[1111] Sprint Nextel, *Sprint Personal Hotspot PHS300S,* http://shop.sprint.com/en/solutions/mobile_broadband/personal_hotspot.shtml (visited Sept. 17, 2010). The Sprint Personal Hotspot PHS300S currently sells for $159.99. *Id.*

[1112] Verizon Wireless, *Verizon Wireless – Mobile Broadband – Products,* http://www.verizonwireless.com/b2c/mobilebroadband/?page=products_mifi(visited Sept. 17, 2010); Sprint Nextel, *Info on the MiFi™ 2200 by Novatel Wireless,* http://support.sprint.com/support/device/Novatel_Wireless/MiFi_2200_by_Novatel_Wireless-novatel_2200, (visited Nov. 8, 2010).

[1113] *See* Sprint Nextel, *Overdrive™ 3G/4G Mobile Hotspot by Sierra Wireless,* http://shop.sprint.com/NASApp/onlinestore/en/Action/DisplayPhones?phoneSKU=SWW8013G4G&id16=overdrive (visited Sept. 17, 2010).

[1114] *Novatel Wireless Announces MiFi 2372 Intelligent Mobile Hotspot Optimized for North American HSPA Broadband Networks*, BUSINESS WIRE, July 28, 2009, *available at* http://www.businesswire.com/portal/site/home/permalink/?ndmViewId=news_view&newsId=20090728005338&newsLang=en (visited Sept. 17, 2010).

[1115] *Cricket Announces New Device Lineup*, Press Release, Cricket Wireless, Aug. 3, 2010.

IX. URBAN-RURAL COMPARISONS

378. Since the release of the *Sixth Report,*[1116] 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.[1117] 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."[1118] 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.[1119] For this reason, we adopt this same definition to analyze service availability in rural areas in this *Report*.

379. By this definition, roughly 61 million people, or 21 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.[1120] The distribution of rural counties across the United States can be seen in Map 4 below. Approximately 79 percent of the U.S. population lives on 14 percent of the land, while 21 percent live on the remaining 86 percent of the land.

[1116] *Sixth Report*, 16 FCC Rcd at 13350.

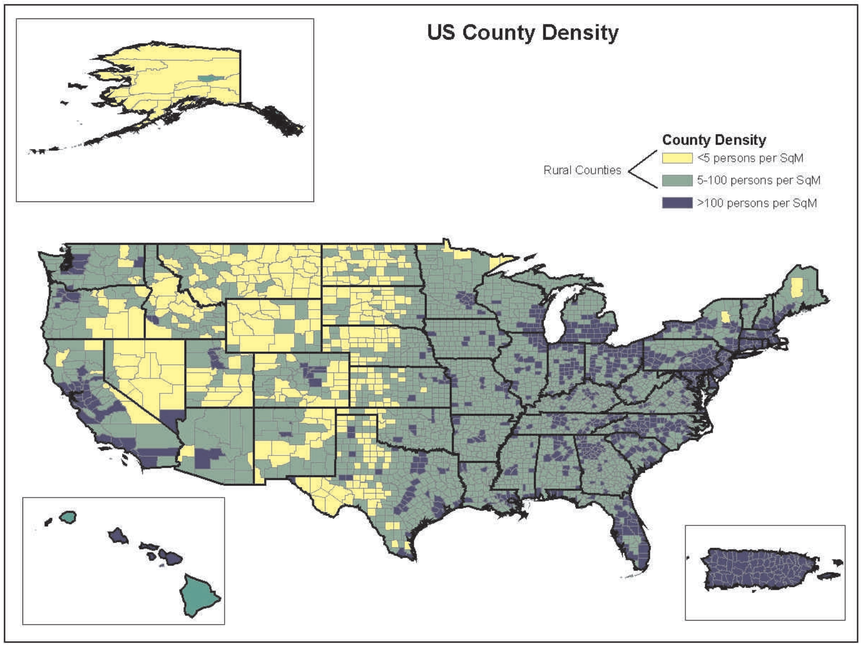
[1117] The federal government has multiple ways of defining rural, reflecting the multiple purposes for which the definitions are used. *Eighth Report*, 18 FCC Rcd at 14834; Facilitating the Provision of Spectrum-Based Service to Rural Areas and Promoting Opportunities for Rural Telephone Companies to Provide Spectrum-Based Services, *Notice of Proposed Rulemaking*, 18 FCC Rcd 20802, 20808-11 (2003).

[1118] 1998 Biennial Regulatory Review, Spectrum Aggregation Limits for Wireless Telecommunications Carriers, *Report and Order*, 15 FCC Rcd 9219, 9256 ¶ 84, n.203 (1999).

[1119] 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").

[1120] Including the populations of Puerto Rico and the Virgin Islands.

Map 4
County Density in the United States[1121]



380. Using American Roamer data, we have analyzed mobile wireless network coverage in rural areas.[1122] We note that these data reflect network coverage, rather than the number of providers offering service to consumers living in these areas. Table 40 shows that 99.2 percent of the U.S. rural population has coverage by at least one mobile wireless service provider, which is slightly lower than the percentage of the entire U.S. population, 99.6 percent, with coverage by at least one service provider.[1123] Just over 500,000 people in rural areas had no mobile wireless coverage as of July 2010, down from just over 900,000 in October 2009. The rural population with coverage by only one provider fell from 2.5 million in October 2009 to approximately 1.6 million in July 2010. Over 96 percent of the rural population was covered by at least two providers in July 2010 compared to 94.5 percent in October 2009.[1124] Further, 88.4 percent was covered by at least three providers and 77.4 percent by at least four

[1121] A larger version of this map may be found in Appendix D.

[1122] We note that American Roamer likely overstates the coverage actually experienced by consumers, because it reports advertised coverage as reported to it by many wireless service providers, each of which uses a different definition of 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).

[1123] *See* Section III.C.1, Number of Competitors, *supra*. There are 8 million census blocks in the United States, where a census block is the smallest geographic area for which population data are available. Note we consider a census block to be covered even if only a portion of the block has mobile wireless coverage. Further, different service providers may provide coverage in different areas within a census block. Any over counting of coverage may be accentuated in rural areas where census blocks are larger. *See* RTG PN Comments, at 6.

[1124] *See Thirteenth Report*, 24 FCC Rcd at 6239, ¶ 104.

providers in July 2010, compared to 83.1 and 65.5 percent respectively in October 2009. Overall network coverage in rural areas has increased since the *Fourteenth Report*. However, there remains a disparity in rural coverage (see Chart 48). The percentage of the rural population with coverage by one or more or two or more providers (99.2 percent and 96.6 percent respectively) is comparable to coverage for the entire U.S. population,[1125] but the coverage gap widens as the number of service providers increases.

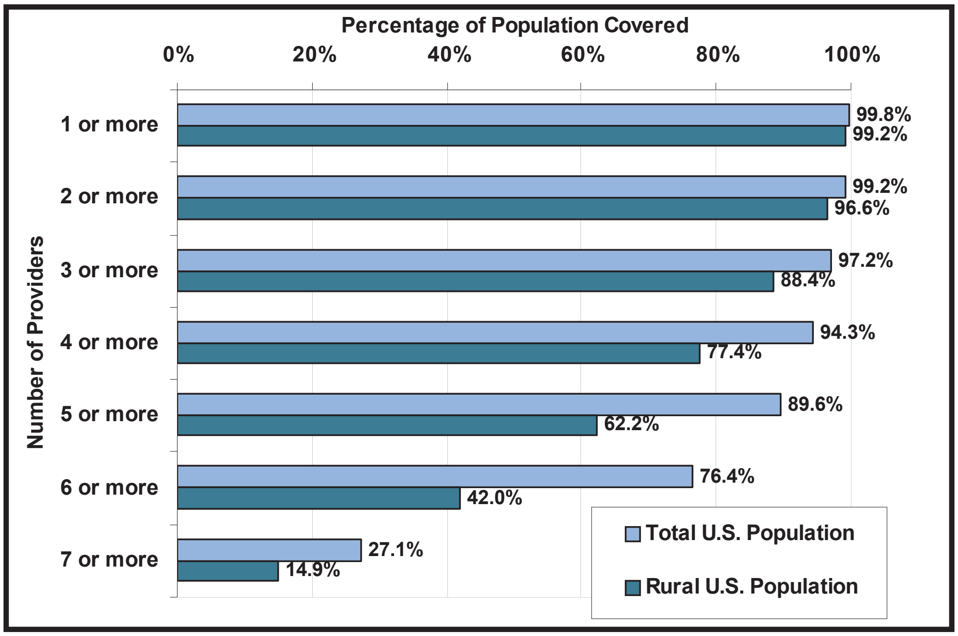
Table 40
Estimated Mobile Voice Coverage in Rural Areas by Census Block[1126]

Total Number of Providers with Coverage in a block	***Number of Rural Census Blocks***	***POPs Contained in Rural Census Blocks***	***% of Total U.S. POPs***	***Square Miles Contained in Those Blocks***	***% of Total U.S. Square Miles***
Total for Rural U.S.	*4,169,790*	*60,836,650*	*21.3%*	*3,367,687*	*88.6%*
			% of Total Rural U.S. POPs		***% of Total Rural U.S. Square Miles***
1 or More	3,995,938	60,321,254	99.2%	2,408,065	71.5%
2 or More	3,723,236	58,739,413	96.6%	1,942,219	57.7%
3 or More	3,190,052	53,792,178	88.4%	1,461,559	43.4%
4 or More	2,534,278	47,098,092	77.4%	969,740	28.8%
5 or More	1,826,229	37,825,370	62.2%	578,163	17.2%
6 or More	1,089,048	25,523,263	42.0%	291,328	8.7%

[1125] *See* Table 5 in Section III.C.1, Number of Competitors, *infra*, for the nationwide analog of Table 40.

[1126] Commission analysis, using American Roamer database, July 2010, and Census 2000 population figures. The square miles include the United States and Puerto Rico. There are approximately 8 million census blocks and 300 million people in the entire United States (based on the 2000 Census).

Chart 48
Mobile Voice Coverage in Rural Areas



381. Looking at mobile broadband service, Table 41 and Chart 49 below show the extent of mobile broadband network coverage in rural areas and the disparity between coverage in rural areas versus the entire United States.[1127] Based on a census block analysis of August 2010 American Roamer data, 94 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 percent of the total U.S. population is covered by at least one mobile broadband provider. While rural mobile broadband coverage has improved, 3.8 million people in rural areas have no mobile broadband access. In addition, the U.S. population in rural areas is not covered by as many mobile broadband providers as other areas of the country. While 82 percent of the total U.S. population lives in census blocks with coverage by three or more mobile broadband providers, this is true for only 38 percent of the rural population. In addition, 68 percent of the total U.S. population lives in census blocks with coverage by four or more mobile broadband providers, while only 17 percent of the rural population is covered by four or more providers.[1128]

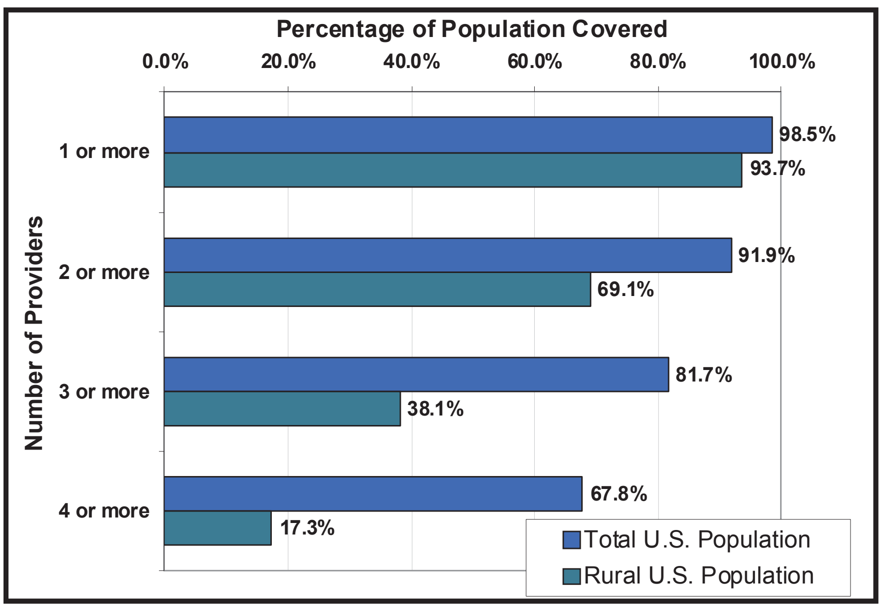
[1127] See also National Broadband Map, Broadband Statistics Report, Broadband Availability in Urban versus Rural Areas, *available at* http://www.broadbandmap.gov/download/reports/national-broadband-map-broadband-availability-in-rural-vs-urban-areas.pdf, visited Feb. 28, 2011.

[1128] *See* Section III.C.1, Number of Competitors – Coverage and Service Offerings, *supra.* For purposes of this analysis, Sprint and Clearwire are considered to be a single mobile broadband competitor. If the companies were considered as separate competitors, as in the *Fourteenth Report*, 35 percent of the total U.S. population would be covered by four or more mobile broadband providers, while 12 percent of the rural population would be covered by four or more such providers. The figures for the percentage of the total U.S. population and the rural population covered by three or more providers would be the same (when rounded) whether or not Sprint and Clearwire were considered separate mobile broadband providers.

Table 41
Estimated Mobile Broadband Coverage in Rural Areas by Census Block[1129]

Total Number of Providers with Coverage in a Block	*Number of Rural Census Blocks*	*POPs Contained in Rural Census Blocks*	*% of Total U.S. POPs*	*Square Miles Contained in Those Blocks*	*% of Total U.S. Square Miles*
Total for Rural U.S.	*4,169,790*	*60,836,650*	*21.3%*	*3,367,687*	*88.6%*
			% of Total Rural U.S. POPs		*% of Total Rural U.S. Square Miles*
1 or More	3,539,318	56,991,088	93.7	1,788,137	53.1
2 or More	2,212,589	42,024,607	69.1	855,268	25.4
3 or More	904,648	23,158,908	38.1	222,982	6.6
4 or More	295,099	10,509,664	17.3	52,305	1.6

Chart 49
Mobile Broadband Coverage in Rural Areas



382. On the basis of NRUF data, we provide a comparison of the number of wireless service providers offering service in rural and non-rural CMAs in the United States, which is shown in Table 42 below. For this purpose, we consider a CMA to be rural if the CMA has a population density less than or equal to 100 people per square mile.[1130] Under this definition, 399 CMAs are rural and 317 CMAs are

[1129] Commission estimates based on data supplied by American Roamer, Aug. 2010 (EV-DO/HSPA/WiMAX Coverage). For purposes of this analysis, Sprint and Clearwire are considered to be a single provider. POPs are from the 2000 Census, and the square miles include the United States and Puerto Rico.

[1130] The Communications Act does not include a statutory definition of what constitutes a rural area. Since 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. Because of the limitations of NRUF data, as discussed above, it would be inaccurate to analyze the number of (continued….)

non-rural. As discussed above, when looking at all of the CMAs of the entire United States – both rural and non-rural – no CMA has fewer than two providers offering service in at least some portion of the CMA (see Table 8).

383. Table 42 shows that non-rural CMAs generally have more providers offering service than rural CMAs. For instance, 16 percent of rural CMAs have only two providers offering service in at least some part of the CMA, whereas all non-rural CMAs have more than two service providers. Similarly, 28 percent of rural CMAs have three providers offering service somewhere in the CMA, as compared to 8.5 percent of non-rural CMAs. Thus, consumers in 44 percent of rural CMAs have at most a choice of three facilities-based service providers, while only those consumers in 8.5 percent of non-rural CMAs are so limited. Finally, approximately 91 percent of non-rural CMAs, as opposed to close to 56 percent of rural CMAs, have four or more providers offering service somewhere in the CMA.

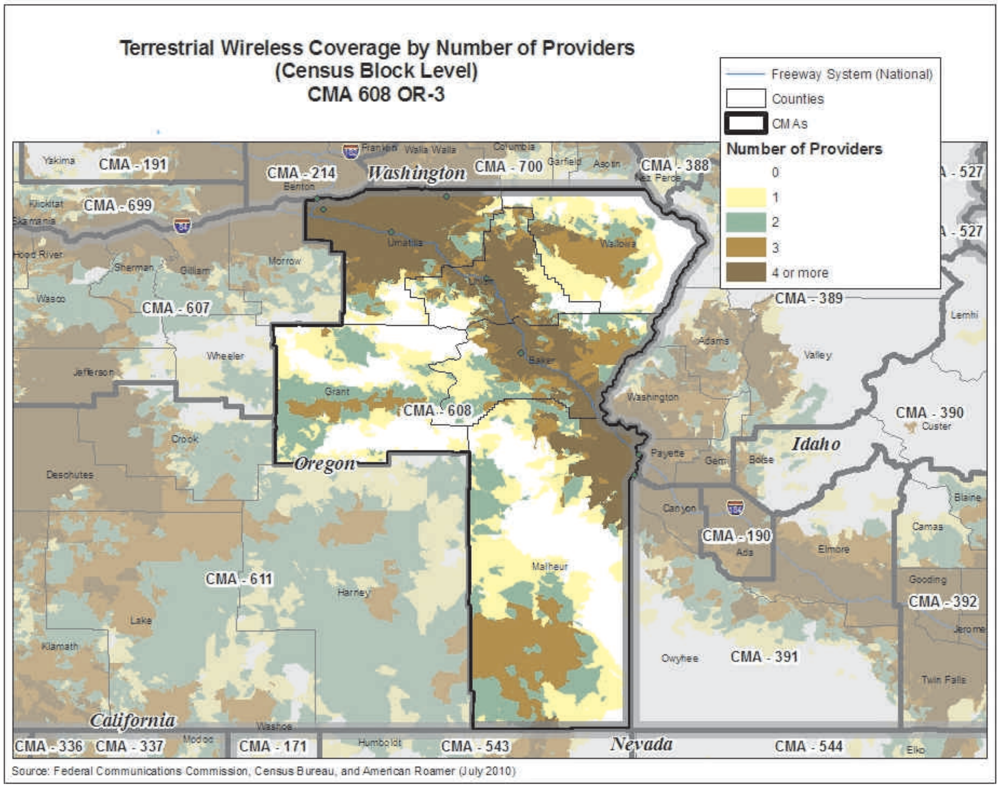
384. We also note that any given CMA is often made up of several counties, and a facilities-based service provider may offer service to consumers in only part of a CMA dependent on where that service provider has coverage. Therefore, a consumer may have fewer choices of service providers than the total number of providers offering service in his or her CMA. This is illustrated in Map 4 below, which presents coverage according to American Roamer.

Table 42
Estimated Mobile Wireless Providers Offering Service
Anywhere In Urban and Rural CMAs, Excluding Territories

	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	*317*	*100%*	*399*	*100%*
1 provider	0	0%	0	0%
2 providers	0	0%	64	16.0%
3 providers	27	8.5%	113	28.3%
4 providers	107	33.8%	124	31.1%
5 providers	158	49.8%	92	23.1%
6 or more providers	25	7.9%	6	1.5%

(Continued from previous page)
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.

Map 4
Service Provider Coverage in an Illustrative Rural CMA



385. In the winter of 2009, the National Telecommunications Cooperative Association (NTCA) surveyed its members regarding their provision of wireless services.[1131] Population density in most NTCA member service areas is extremely rural, between one and five persons per square mile.[1132] According to the survey report, 76 percent of survey respondents are offering wireless service to their customers.[1133] Among those respondents, 84 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, up from one and four other providers in the 2008 report.[1134] In addition, the percentage of respondents who claim that obtaining financing is "very difficult" or "virtually impossible" was 33 percent in 2009, only slightly lower than the 34 percent reported in 2008.[1135] On the other hand,

[1131] *See* NTCA, *NTCA 2009 Wireless Survey Report*, Apr. 2010, at 3, *available at* http://www.ntca.org/images/stories/Documents/Advocacy/SurveyReports/2009ntcawirelesssurveyreport.pdf, (*2009 NTCA Wireless Survey*).

[1132] *2009 NTCA Wireless Survey*, at 5.

[1133] *2009 NTCA Wireless Survey*, at 8.

[1134] *2009 NTCA Wireless Survey*, at 13.

[1135] *2008 NTCA Wireless Survey*, at 10.

the percentage of respondents who reported that obtaining financing is "very easy" or "relatively easy" rose from 31 percent in 2008 to 43 percent in 2009.[1136]

386. When looking at the features and services offered to wireless customers, the percentage of the NTCA survey respondents that provide text messaging rose from 83 percent to 90 percent in 2009, the percentage that offer Internet access rose from 67 percent to 73 percent, and the percentage that offer email rose from 58 percent to 63 percent during the same period.[1137] On the other hand, the percentage that offer family plans, unlimited local calling, and prepaid service all declined significantly during 2009.[1138]

387. As discussed above, key inputs for the provision of mobile wireless services include spectrum, infrastructure, and backhaul, and such access to such inputs can affect entry into the mobile wireless services market in both urban and rural areas.[1139] 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.[1140] In the recent 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 detailed a one-time $5 billion investment supporting the 4G build out in rural areas.[1141]

388. Spectrum below 1 GHz can be crucial for the deployment of mobile wireless service in rural areas because its propagation characteristics allow providers to cover a relatively large geographic area with a relatively small number of cell sites.[1142] Therefore, we have examined the current spectrum holdings of service providers in rural areas across the various frequency bands (700 MHz, Cellular, PCS/AWS, and 2.5 GHz (BRS and EBS)).[1143] Table 43 below shows that from the frequency bands below 1 GHz, 51 percent of the MHz-POPs in the 700 MHz frequency band and 78 percent of the MHz-POPs in the cellular frequency band are held by the two largest service providers, Verizon Wireless and AT&T. Looking at the spectrum held above 1 GHz (PCS/AWS and 2.5 GHz), a significant percentage of the MHz-POPs above 1 GHz are held by Sprint/Clearwire. However, the remaining spectrum above 1 GHz is held by a range of different service providers, and the two largest providers combined hold no 2.5 GHz spectrum and approximately 31 percent of the MHz-POPs in the PCS/AWS frequency bands.

[1136] *2008 NTCA Wireless Survey*, at 10.

[1137] *2009 NTCA Wireless Survey*, at 14.

[1138] *2009 NTCA Wireless Survey*, at 14.

[1139] *See* Section III.D.2, Non-Regulatory Entry and Exit Conditions, *supra.*

[1140] *See Id*.

[1141] *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 Feb. 10, 2011.

[1142] *See* Section VII.A.1, Spectrum, *supra.*

[1143] As discussed above, a "rural area" is defined, for purposes of this *Report*, as a county with a population density of 100 persons or fewer per square mile.

Table 43
Percentage Spectrum Holdings in Rural Areas on a MHz-POPs Basis by Provider and Frequency Band[1144]

Licensee	700 MHz	Cellular (850 MHz)	PCS/AWS (1.9 GHz; 1.7/2.1 GHz)	2.5 GHz (BRS and EBS)
Verizon Wireless	38.2%	43.6%	13.1%	0.0%
AT&T	13.4%	34.8%	17.5%	0.0%
Sprint Nextel/Clearwire	0.0%	0.0%	16.0%	100.0%
T-Mobile	0.0%	0.1%	19.5%	0.0%
MetroPCS	0.1%	0.0%	3.9%	0.0%
US Cellular	6.4%	10.1%	2.5%	0.0%
Leap	0.0%	0.0%	5.3%	0.0%
Other	42.0%	11.5%	22.3%	0.0%
Grand Total	100.0%	100.0%	100.0%	100.0%

X. INTERNATIONAL COMPARISONS

389. This section compares mobile market structure and performance in the United States, Western Europe, and Asia-Pacific countries of comparable income levels.[1145] To ensure that a consistent 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.[1146] 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 many 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;[1147] (3) the average monthly subscriber bill in the United States is much higher than the average bill in Western Europe, although Japan has a higher average monthly bill than either the United States or Western Europe; and (4) 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.

[1144] Commission estimates.

[1145] 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 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.

[1146] *See* Glen Campbell *et al.*, *Global Wireless Matrix 4Q09,* Bank of America Merrill Lynch, Global Equity Research, Apr. 13, 2010 (*Global Wireless Matrix 4Q09*). 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.C.2, Herfindahl-Hirschman Index , *supra*, differs from the Merrill Lynch estimate discussed in Section X.E, Concentration, *infra*.

[1147] *See Thirteenth Report,* 24 FCC Rcd at 6290, ¶ 223.

Table 44
Mobile Market Performance in Selected Countries[1148]

Country	Penetration (% of Pops)	Prepaid (% of Subs)	MOUs	RPM ($) Voice Only	ARPU ($)	Data (% of ARPU)
Receiving Party Pays						
USA	93	19	824	0.04	49.91	29.3
Canada	68	20	426	0.09	55.14	22.1
Singapore	144	50	380	0.06	33.01	31.0
Calling Party Pays						
UK	129	59	194	0.11	33.52	33
Germany	132	56	109	0.16	22.08	29.8
Italy	147	87	141	0.15	29.12	26.1
Sweden	131	35	211	0.10	31.11	25.3
France	96	33	237	0.15	48.40	23.7
Finland	144	13	218	0.13	33.52	20.5
Japan	88	1	137	0.25	58.06	44.5
South Korea	99	3	311	0.09	33.63	19.1
Australia	115	42	222	0.14	47.27	36.1

A. ARPU

390. The average monthly subscriber bill (ARPU) in the United States, at $49.91, is much higher than the Western European average of $35.09.[1149] As explained below, however, although U.S. subscribers on average spend more per month for mobile services than their European counterparts, they also consume more mobile services, on average, compared to Europe. We note that Canada and Japan have a higher ARPU than either the United States or Western Europe. As indicated below and in Table 44 above, the relatively high average monthly subscriber bill in Japan reflects two key factors – a relatively high price per minute of voice service and relatively higher monthly spending per subscriber on data services.

B. Average RPM (Voice Only)

391. As noted above, some analysts regard RPM as a good proxy for mobile pricing.[1150] RPM (voice only) in Western Europe averaged about $0.16 in the fourth quarter of 2009, and ranged from a

[1148] *Global Wireless Matrix 4Q09.*

[1149] *Global Wireless Matrix 4Q09*, at 2.

[1150] *See* Section V.D.1, Price Indicators, *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 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.

low of $0.10 in Sweden to a high of $0.31 in Switzerland.[1151] This compares with an estimated U.S. RPM of $0.04, a quarter of the European average.[1152] Revenue per minute in Japan, at $0.25, was more than six times the U.S. figure at the end of 2009.[1153]

C. Usage

392. Bank of America Merrill Lynch estimates that U.S. mobile subscribers talked an average of 824 minutes per month on their mobile phones in the fourth quarter of 2009.[1154] This compares with 137 MOUs in Japan and an average across Western Europe of 160 MOUs, with estimated MOUs in individual European countries ranging from a low of 109 in Germany to a high of 251 in Norway.[1155]

D. Penetration Rates

393. According to Bank of America Merrill Lynch, mobile penetration in the United States rose to 93 percent in the fourth quarter of 2009.[1156] In comparison, Japan finished 2009 with mobile penetration at 88 percent, while mobile penetration averaged an estimated 131 percent in Western Europe at the end of 2009 and ranged from 96 percent in France to nearly 224 percent in Greece.[1157] Estimated mobile penetration continued to exceed 100 percent in most of Western Europe at the end of 2009, due in part to a high percentage of prepaid subscribers and ownership of multiple devices or subscriber identity module (SIM) cards.[1158]

E. Concentration

394. The Bank of America Merrill Lynch's *Global Wireless Matrix* provides a cross-country comparison of industry concentration using HHIs calculated at national level.[1159] This methodology can produce misleading measures of concentration in industries such as mobile wireless services, where the

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[1151] *Global Wireless Matrix 4Q09*, at 2.

[1152] *Global Wireless Matrix 4Q09*, 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.

[1153] *Global Wireless Matrix 4Q09*, at 2.

[1154] *Global Wireless Matrix 4Q09*, at 2. This is higher than the 696 average monthly MOUs estimated by CTIA for the second half of 2009. *See* Section V.C.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.

[1155] *Global Wireless Matrix 4Q09*, at 2.

[1156] *Global Wireless Matrix 4Q09*, at 2.

[1157] *Global Wireless Matrix 4Q09*, at 2.

[1158] *Global Wireless Matrix 4Q09*, 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 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.

[1159] *See Global Wireless Matrix 4Q09*, at 2.

relevant geographic market is local rather than nationwide, and where the choice of competing providers is not relatively 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. Moreover, 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*.[1160]

395. As shown in Table 45 below, the Bank of America Merrill Lynch study indicates that the United Kingdom had the least concentrated mobile market at the end of 2009, with an estimated HHI of 2220.[1161] The U.S. mobile market had the next lowest concentration level at an HHI of 2350. Among countries of comparable income levels in Western Europe and the Asia Pacific region, those with the highest levels of mobile market concentration at the end of 2009 were Switzerland, where the HHI was 4580, and New Zealand, at 4620.[1162] As discussed above, we estimated an average HHI for the United States of 2811 at the end of 2009, based on EA subscriber market shares.[1163] If this HHI estimate were substituted for the Bank of America Merrill Lynch estimate, the United States would still rank second lowest in concentration among the countries surveyed.

Table 45
Mobile Market Structure in Selected Countries (Merrill Lynch Calculation)[1164]

Country	Nationwide HHI	Number of Competitors[1165]	Top 2 Share (%)
UK	2220	5	50.6%
USA	2350	5	61.2%
Germany	2840	4	68.2%
Italy	2910	4	68.8%
Canada	3090	3	67.1%
Sweden	3320	4	75.4%
France	3340	3	77.2%
Australia	3450	3	76.9%

[1160] *See* Section III.C, 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.

[1161] *See Global Wireless Matrix 4Q09*, at 2.

[1162] *See Global Wireless Matrix 4Q09*, at 2.

[1163] *See* Section III.C, Horizontal Concentration, *supra.*

[1164] *Global Wireless Matrix 4Q09.* 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*.

[1165] 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.

Finland	3460	3	76.0%
Japan	3570	4	76.9%

XI. CONCLUSION

396. 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 new waves of 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 the structure of the mobile wireless industry, the conduct of service providers, industry performance metrics, and consumer responses to mobile wireless service offerings. Like the *Fourteenth Report*, it also analyzes competition throughout the entire mobile wireless ecosystem, including key mobile wireless service inputs – such as spectrum and backhaul facilities – as well as downstream products, such as handsets/devices and mobile applications.

397. As discussed in the various sections of the *Report* above, there has continued to be a marked shift from voice to data within the industry, as consumers have dramatically increased their use of mobile data services and applications, and their adoption of data-centric devices. With this transformation to data, promoting and ensuring an active competitive marketplace must remain a key imperative for the Commission. The increased demand for mobile data is contributing to the spectrum crunch, and a gap between mobile broadband network deployment in rural and urban areas persists. In addition, the *Report* highlights the increasing importance of industry data on mobile broadband services to the Commission's analysis of mobile wireless competition.

XII. PROCEDURAL MATTERS

398. This *Fifteenth 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).

399. 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.

400. It is FURTHER ORDERED that the proceeding in the WT Docket No. 10-133 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 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 up to eight different mobile wireless licenses (two cellular in the 800 MHz band and six broadband PCS in the 2 GHz band) in every geographical area of the country.[1] However, over the years, additional services have been created that allow similar operations in different bands – including 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, there is an additional 157.7 megahertz of mobile satellite spectrum 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

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[1] As a result of partitioning and disaggregation, there often are more than eight cellular and broadband PCS licenses in a market. However, in a few areas, there may be fewer than eight active licenses because certain auction winners or licensees have defaulted on payments to the Commission, because some licensees did not meet their buildout requirements, some licensees returned their licenses, or some licenses remained unsold in an auction.

[2] The discussion in this *Report* 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* Applications of AT&T Inc. and Dobson Communications Corporation, *Memorandum Opinion and Sprint Nextel/Clearwire Order*, FCC 07-19608-259, at 17 ¶ 26 (rel. Nov. 19, 2007) ¶ 53; *Verizon Wireless/Alltel Order*, FCC 08-258, at ¶ 53 ("[S]uitability is determined 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 mobile telephony/broadband service.")

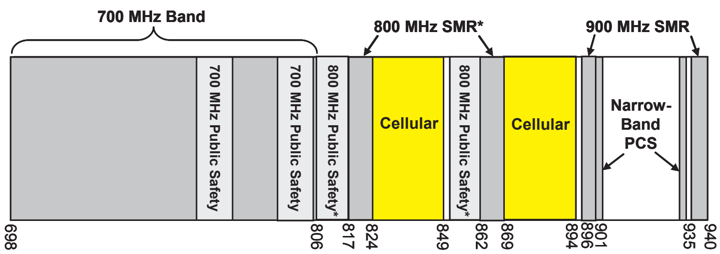
[3] *See* 47 C.F.R. §§ 1.948(e), (f), 22.948, 24.104, 27.15, 24.714, 27.904, 90.813, 90.911.

[4] While no longer in operation, at one time the Commission's CMRS spectrum cap restricted the distribution of certain spectrum licenses. Recently, licensees have requested that the Commission take measures to restrict the ability of current major 700 MHz license holders to acquire additional 700 MHz spectrum rights.

[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 (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.

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.[6] 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 Iinternet access and media applications.

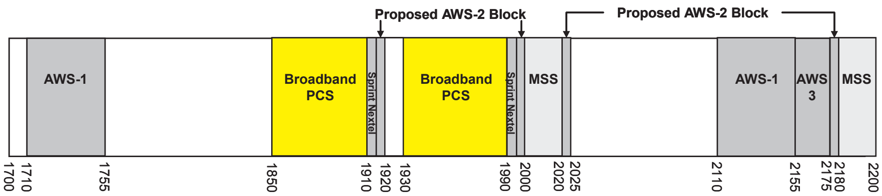
4. This spectrum was divided originally into three blocks of 30 megahertz each (blocks A, B, and C) and three blocks of 10 megahertz each (blocks D, E, and F).[7] Two of the 30 megahertz blocks

(Continued from previous page)
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 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] 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 Mar. 16, 2010).

[7] 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).

(A and B blocks) are assigned on the basis of 51 Major Trading Areas (MTAs).[8] One of the 30 megahertz blocks (C block)[9] and all three of the 10 megahertz blocks are assigned on the basis of 493 Basic Trading Areas (BTAs).[10]



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.[11] The Commission has since licensed additional SMR spectrum through auctions.[12] 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.[13] While Commission policy permits flexible use of this spectrum, including the

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[8] 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.

[9] The Commission also has reconfigured returned C block licenses. *See Tenth Report*, 20 FCC Rcd at 15935, ¶ 71, n.150.

[10] 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.

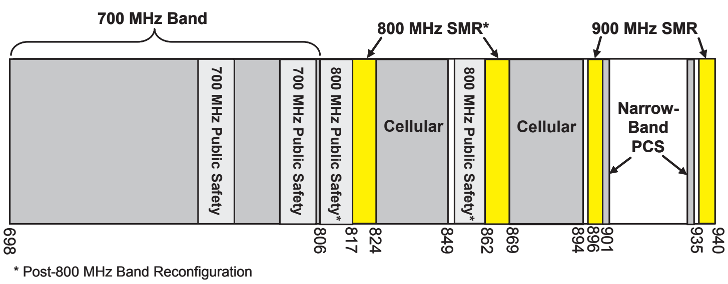
[11] The "900 MHz" SMR band refers to spectrum allocated in the 896-901 and 935-940 MHz bands; the "800 MHz" band refers to spectrum allocated in the 806-824 and 851-869 MHz bands. *See* 47 C.F.R. § 90.603; *see also* 47 C.F.R. § 90.7 (defining "specialized mobile radio system").

[12] The Commission has held multiple auctions for SMR licenses. *See* FCC, *Auctions Home*, http://wireless.fcc.gov/auctions/ (visited Mar. 16, 2010).

[13] 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 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 (continued….)

provision of paging, dispatch, mobile voice, mobile data, facsimile, or combinations of these services,[14] the primary use for SMR traditionally was dispatch services.[15] With the development of digital technologies that increased spectral efficiency, SMR providers such as Sprint Nextel (on its iDEN network) 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



1. 800 MHz Band Reconfiguration and 1.9 GHz Spectrum Exchange

6. 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.[16] The new band plan addresses the root cause of the interference problem by separating generally incompatible technologies, with the costs of 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

(Continued from previous page)
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.A.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.

[14] 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).

[15] 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.

[16] FCC Adopts Solution to Interference Problem Faced by 800 MHz Public Safety Radio Systems, *News Release*, FCC, July 8, 2004.

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.

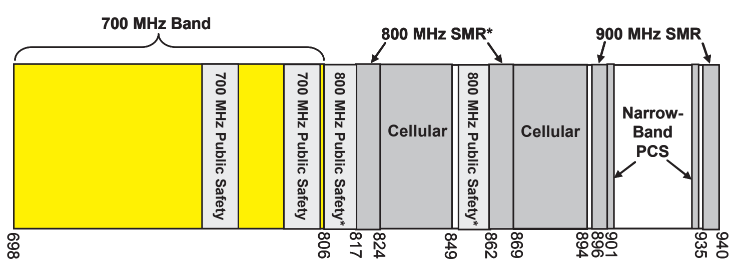
7. Significant progress has been made reconfiguring licensees to the new 800 MHz band plan in non-border regions of the country. In March 2010, the Public Safety and Homeland Security Bureau released an Order addressing supplemental waiver requests pursuant to a June 2009 Order that addressed requests for further extension, beyond July 1, 2009, of the June 26, 2008 deadline to complete 800 MHz rebanding.[17] Furthermore, the Commission, in conjunction with the State Department, is continuing to discuss a modified 800 MHz band plan with Mexico for U.S. licensees operating along the U.S.-Mexico border.[18]

D. 700 MHz Band

8. 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).[19] The Digital Television Transition and Public Safety Act of 2005 (DTV Act)[20] 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.[21] This spectrum is being made available for wireless services, including public safety and commercial services.[22]

9. 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.[23] The Commission met both of these statutory deadlines.

698-940 MHz: 700 MHz Band Spectrum



[17] *See* Improving Public Safety Communications in the 800 MHz Band; Supplemental Requests for Waiver of June 26, 2008 Rebanding Deadline, WT Docket No. 02-55, *Order*, 25 FCC Rcd 3246 (2010).

[18] *See* "Public Safety and Homeland Security Bureau Extends 800 MHz Rebanding Negotiation Period for Wave 4 Border Area NPSPAC and Non-NPSPAC Licensees Along the U.S.-Mexico Border," *Public Notice*, WT Docket No. 02-55, 25 FCC Rcd 3244 (2010)

[19] *See 700 MHz Second R&O*, 22 FCC Rcd at 15291, ¶ 1.

[20] Deficit Reduction Act of 2005, Pub. L. No. 109-171, 120 Stat. 4 (2006) (DRA). Title III of the DRA is the DTV Act.

[21] DTV Delay Act, S. 328, 111th Cong. (2009), amending 47 U.S.C. §§ 309, 337(3)(1) (DTV Delay Act).

[22] *See 700 MHz Second R&O*, 22 FCC Rcd at 15291, ¶ 1 & 15295-96, ¶ 14.

[23] *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, 2010. DTV Act § 3003(b).; DTV Delay Act § 5.

10. 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.[24] 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.[25] The new band plan provided a balanced mix of geographic service area licenses and spectrum blocks sizes for the commercial spectrum to be auctioned.[26] 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.[27] 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)."[28] In addition, C Block 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."[29] The Commission also took two steps to promote the rapid construction and deployment of a nationwide, interoperable broadband public safety network. First, in the public safety spectrum, the band plan established a spectrum block designated for broadband communications, the public safety broadband spectrum, and provided that the spectrum would be licensed on a nationwide basis to a non-profit entity (the Public Safety Broadband Licensee) representative of the public safety community in accordance with a specific selection process.[30] Second, the Commission 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.[31]

11. The auction of the 700 MHz Band licenses, designated Auction 73, closed on March 18,

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[24] *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).

[25] *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*).

[26] 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.

[27] *See 700 MHz Second R&O*, 22 FCC Rcd at 15361, ¶ 195.

[28] *See id.* at 15360, ¶ 206.

[29] *Id.*

[30] *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 (2008) (*700 MHz Second Further Notice*).

[31] *See 700 MHz Second Report and Order*, 22 FCC Rcd at 15295, ¶ 13.

2008.[32] 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.[33]

12. The total 84 megahertz of commercial spectrum in the 700 MHz band will generally be available for a broad range of flexible uses.[34] This spectrum has many permissible uses: new licensees may use the spectrum for fixed, mobile (including mobile wireless commercial services), and broadcast services.[35] In addition, the Commission optimized the power rules in the remaining paired spectrum specifically for mobile use.[36] The Commission expects that many of the new technologies to be developed and deployed in this band will support advanced wireless applications.[37]

13. Because the auction of the D Block did not result in a winning bid, on May 14, 2008, the Commission issued the *700 MHz Second Further Notice*, revisiting the rules governing the D Block licensee, the mandatory public/private partnership, and the Public Safety Broadband Licensee.[38] The Commission sought comment broadly on how it might modify those rules to achieve the goal of a nationwide, interoperable public safety network, whether it should continue to mandate a public/private partnership between the D Block licensee and Public Safety Broadband Licensee, and if so, under what terms and conditions.[39]

14. On September 25, 2008, the Commission adopted the *700 MHz Third Further Notice* that proposed licensing the D Block spectrum as part of a revised 700 MHz Public/Private Partnership, with modifications to the rules governing both the D Block and the Public Safety Broadband License, in order to maximize the public safety and commercial benefits of a nationwide, interoperable broadband network in the 700 MHz band.[40] Although the D Block proceeding still is pending, the recent National Broadband

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[32] FCC, *Auction* 73, http://wireless.fcc.gov/auctions/73 (visited Sept. 18, 2008).

[33] "Auction of 700 MHz Band Licenses Closes," *Public Notice*, 23 FCC Rcd 4572, 4572-73 ¶ 2 (2008).

[34] *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.

[35] *See generally id.* In addition, in February 2010, the Commission sought comment on a petition for rulemaking requesting that the Commission require that all mobile units for the 700 MHz band be capable of operating over all frequencies in the band. "Wireless Telecommunications Bureau Seeks Comment on Petition for Rulemaking Regarding 700 MHz Band Mobile Equipment Design and Procurement Practices," RM-11592, *Public Notice,* 25 FCC Rcd 1464 (WTB 2010).

[36] *See 700 MHz Report and Order*, 22 FCC Rcd at 8067-68, ¶ 6.

[37] *See, e.g., Lower 700 MHz Report and Order*, 17 FCC Rcd at 1032, ¶ 20.

[38] *See 700 MHz Second Further Notice*, 23 FCC Rcd at 8047.

[39] *Id.* The Commission also indicated that, prior to adopting final rules, it would present for public comment a detailed proposal regarding specific proposed rules to address these issues. *Id.* at 8052, ¶ 7.

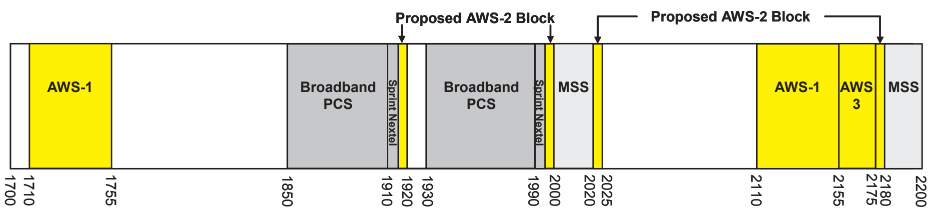
[40] *See generally* Service Rules for the 698-746, 747-762 and 777-792 MHz Bands, WT Docket No. 06-150, (continued….)

Plan report to Congress recommended that the D Block should be auctioned for commercial use with limited technical requirements that would ensure technical compatibility between the D Block and the adjacent public safety broadband spectrum block. The Plan also contended that the commercial D Block should enable, but not obligate, the licensee to enter into a spectrum-sharing partnership with the neighboring Public Safety Broadband Licensee.[41]

E. 1710 – 2180: Advanced Wireless Services

15. 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.[42] 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.[43]

1700-2200 MHz: Advanced Wireless Services Spectrum



16. Subsequently, the Commission completed the process of establishing service rules for the 1710-1755 MHz and 2110-2155 MHz bands. This included a the 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,[44] and also a band plan that provided for a significant amount of the spectrum to be licensed on a small geographic basis to encourage the participation of small and rural providers in the AWS auction.[45]

17. The Commission held Auction 66 in 2006.[46] Of the 1,122 licenses offered, 104 winning bidders won 1,087 licenses, with net bids of more than $13.7 billion,[47] and all 1,087 licenses were

(Continued from previous page)
Implementing a Nationwide, Broadband, Interoperable Public Safety Network in the 700 MHz Band, PS Docket No. 06-229, *Third Further Notice of Proposed Rulemaking*, 23 FCC Rcd 14301 (2008).

[41] *See National Broadband Plan*, at 86, 315-316.

[42] 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.

[43] *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).

[44] *Eleventh Report*, 21 FCC Rcd at 10977-10978, ¶ 74; 47 C.F.R. Part 27.

[45] *Eleventh Report*, 21 FCC Rcd at 10978, ¶ 74.

[46] *See* "Auction of Advanced Wireless Services Closes: Winning Bidders Announced for Auction 66," Report AUC-06-66-F, *Public Notice*, 21 FCC Rcd 10521 (2006).

[47] *Id.*

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.[48] Winning bids were submitted for all 35 AWS-1 licenses, with net winning bids for those licenses of $13,372,850.[49] As of early November 2010, the Commission has granted licenses to 9 out of 14 AWS applicants.

18. The Commission also has taken significant steps toward licensing other bands of spectrum for use by AWS. In 2004, the Commission allocated an additional twenty megahertz of spectrum in the 1915-1920 MHz, 1995-2000 MHz, 2020-2025 MHz and 2175-2180 MHz bands ("AWS-2").[50] The Commission additionally released the *AWS-2 Service Rules NPRM*, which sought comment on appropriate service rules for the1915-1920 MHz, 1995-2000 MHz, 2020-2025 MHz and 2175-2180 MHz bands, and also offered some tentative conclusions consistent with existing AWS service rules, such as allowing flexible use of this spectrum and licensing this spectrum under Part 27 of the Commission's rules.

19. In 2005, the Commission designated yet another 20 MHz of spectrum for AWS, specifically the 2155-2175 MHz band ("AWS-3"), thus establishing 70 MHz of contiguous AWS spectrum in the 2.1 GHz band (from 2110 to 2180 MHz).[51] On September 19, 2007, the Commission released a Notice of Proposed Rulemaking (NPRM), seeking comment on service rules for the AWS-3 spectrum.[52] On June 20, 2008, the Commission released a Further Notice of Proposed Rulemaking (FNPRM), seeking comment on the Commission's proposed AWS-3 rules, which include adding 5 megahertz of spectrum (2175-80 MHz) to the proposed AWS-3 band (2155-75 MHz). The FNPRM proposes to require licensees of that spectrum to provide – using up to 25 percent of its wireless network capacity – free, two-way broadband Internet service at engineered data rates of at least 768 kbps downstream.[53] In October 2008, the Commission's Office of Engineering and Technology released the *Advanced Wireless Service Interference Tests Results and Analysis*, which analyzed data from earlier laboratory bench tests performed by FCC staff together with interested parties.[54]

F. Broadband Radio Service

20. The Commission has transformed the 2496-2690 MHz band by providing licensees with

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[48] *See* "Auction of AWS-1 and Broadband PCS Licenses Rescheduled for August 13, 2008," *Public Notice*, 23 FCC Rcd 7496 (2008).

[49] *See* "Auction of AWS-1 and Broadband PCS Licenses Closes," *Public Notice*, 23 FCC Rcd 12749 (2008).

[50] 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); 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).

[51] *See* Amendment of Part 2 of the Commissions 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).

[52] Service Rules for Advanced Wireless Services in the 2155-2175 MHz Band, *Notice of Proposed Rulemaking*, 22 FCC Rcd 17035 (2007).

[53] 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).

[54] *See Advanced Wireless Service Interference Tests Results and Analysis*, October 10, 2008 (WT Docket Nos. 07-195 and 04-356). *See* also "The FCC's Office of Engineering and Technology Releases Analysis of AWS-3 Interference Tests," WT Docket Nos. 07-195 and 04-356, *Public Notice*, 23 FCC Rcd 14669 (OET 2008).

greater flexibility and establishing a more functional band plan.[55] 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 reduces the likelihood of interference caused by incompatible uses. The new band plan also creates incentives for the development of low-power, cellularized broadband operations, which were inhibited by the prior band plan.

21. 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 for all licensees in the band, which will allow increased flexibility while reducing administrative burdens on both licensees and the Commission.

22. 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.[56] BRS and EBS licensees have largely completed the process of transitioning the 2.5 GHz band to the new band plan. As of November 4, 2010, the transition had been completed in 471 out of 493 BTAs.[57] In the remaining BTAs, virtually all other licensees are subject to a pending transition plan or have filed self-transition plans.

23. 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.[58] In 2010, the Commission gave new BRS licensees four years from the date of initial license grant to demonstrate substantial service.[59] The Commission held Auction 86, the auction of available BRS licenses, in the fourth quarter of 2009.[60] Of the 78 licenses

[55] 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.

[56] 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).

[57] *See* WT Docket No. 06-136.

[58] 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).

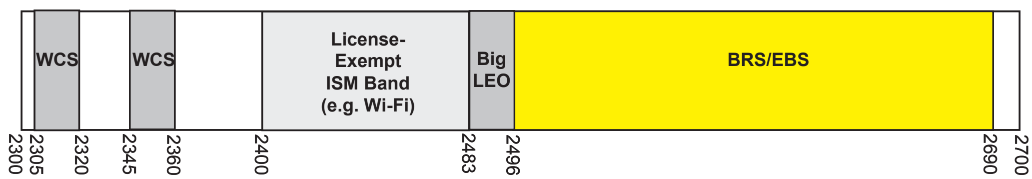
[59] Amendment of Parts 1, 21, 73, 74 and 101 of the Commission's Rules to Facilitate the Provision of Fixed and Mobile Broadband Access, Educational and Other Advanced Services in the 2150-2162 and 2500-2690 MHz Bands, *Third Report and Order*, 25 FCC Rcd 7743 (2010).

[60] 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).

offered in Auction 86, ten winning bidders won 61 licenses, with net bids of $19,426,600.[61]

24. The changes made to the 2496-2690 MHz band, together with technological and business developments, is facilitating the development of a nationwide WiMAX network by Clearwire that has the potential to compete with cable and DSL broadband providers. The 2496-2690 MHz band can speed the arrival of a wireless broadband pipe that will increase competition and consumer choice, make possible new services, and promote the availability of broadband for all Americans. This band also can play an important role in extending broadband service to rural and underserved areas. Moreover, the changes to this band have enabled BRS/EBS providers to use this spectrum in a more technologically and economically efficient manner.

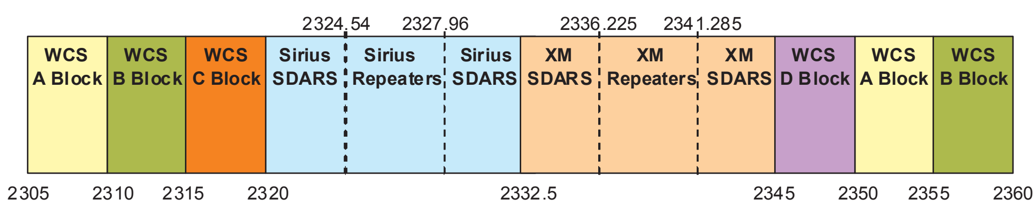
2300-2700 MHz: BRS/EBS Spectrum



G. Wireless Communications Service (WCS)

25. 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. 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 updated the service rules governing WCS to enable licensees to provide mobile broadband services in 25 megahertz of the WCS band without risking harmful interference to neighboring SDARS operations. 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).[62]

2305-2360 MHz: WCS Spectrum



[61] *Id.*

[62] *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*, para. 3, released May 20, 2010.

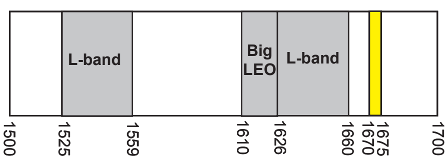
H. 1.4 GHz Bands

26. 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.[63] The paired spectrum was offered as two 3-megahertz blocks in the six REAGs.[64] The unpaired spectrum was auctioned as one 2-meghertz block in each MEA.[65] 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.[66]

I. 1670-1675 MHz

27. 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).[67] 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.[68]

1500-1700 MHz: 1670-1675 MHz Spectrum



J. 3650-3700 MHz

28. The Commission adopted service rules for the 3650 – 3700 MHz band in June 2007[69] and began accepting applications licenses in the service in November 2007.[70] 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

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[63] *See* "Auction of 1.4 GHz Band Licenses Closes," *Public Notice*, 22 FCC Rcd 4714 (2007).

[64] *See* "Auction of 1.4 GHz Bands Licenses Scheduled for February 7, 2007," *Public Notice*, 21 FCC Rcd 9494 (2006)

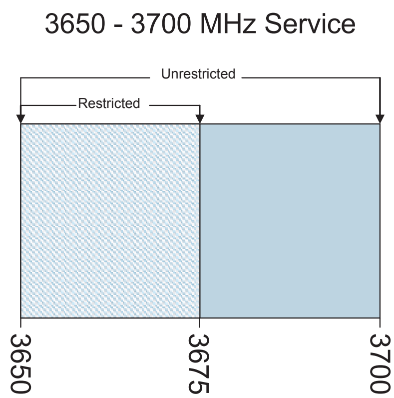
[65] *Id.*

[66] *See* "Auction of 1.4 GHz Band Licenses Closes," *Public Notice*, 22 FCC Rcd 4714 (2007).

[67] 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.

[68] 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).

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.[71]



K. MSS Spectrum Bands

29. The Commission has approved mobile satellite systems for operation in four MSS spectrum bands—the L-Band, Big LEO,[72] 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).

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

(Continued from previous page)
[69] *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).

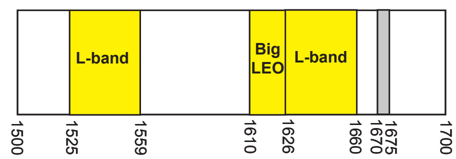
[70] *See* "Wireless Telecommunications Bureau Announces Start State for Licensing and Registration Process for the 3650 – 3700 MHz Band," *Public Notice*, 22 FCC Rcd 19802 (WTB 2007).

[71] *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.

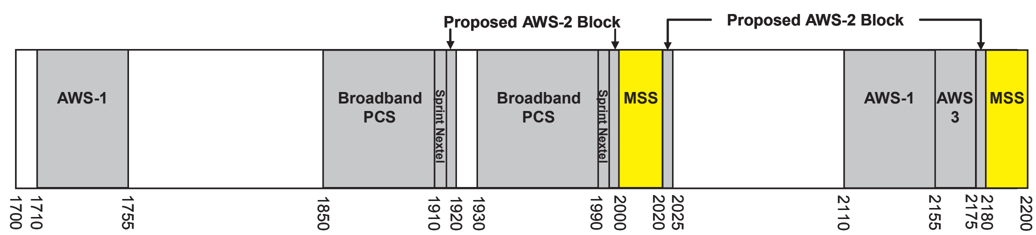
[72] LEO refers to "Low-Earth Orbit."

30. *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.[73] 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.[74] 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.[75] The Commission allocated this spectrum in 1997 for the provision of new and expanded regional and global data, voice and messaging MSS.[76]

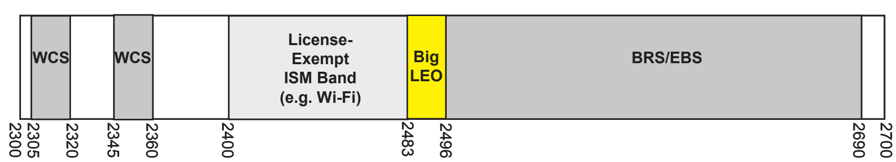
1500-1700 MHz: MSS Spectrum



1700-2200 MHz: MSS Spectrum



2300-2700 MHz: MSS Spectrum



31. *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.[77]

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[73] *See* 47 C.F.R. § 2.106.

[74] *See* 47 C.F.R. § 2.106.

[75] *See* 47 C.F.R. § 2.106.

[76] 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). In April 2011, the Commission added Fixed and Mobile as co-primary allocations in the band. *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, *Report and Order*, ET Docket No. 10-142, *Report and Order*, FCC 11-57 (rel. Apr. 6, 2011).

[77] *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 (continued….)

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.[78] To date, four MSS operators have obtained ATC authority.[79] Ninety (90) megahertz of MSS spectrum has been identified as potentially available for terrestrial broadband use.[80]

(Continued from previous page)
(2003), *reconsidered in part in Memorandum Opinion and Order and Second Order on Reconsideration*, 20 FCC Rcd 4616 (2005), *further recon. pending*.

[78] *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*.

[79] *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, at ¶¶ 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, at ¶¶ 1, 18 (IB, WTB, OET 2010).

[80] *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.*

APPENDIX B

Mobile Wireless Network Technologies

1. Cellular, PCS, and digital SMR networks use the same basic design. All use a series of low-power transmitters to serve relatively small areas ("cells"), and reuse spectrum to maximize efficiency.[1] In the past, cellular and SMR networks have used both analog and digital cellular technologies, while PCS and AWS networks were designed from the start to use a digital format. Digital technology provides better sound quality and increased spectral efficiency than analog technology. From a customer's perspective, digital service in the cellular band or SMR bands is virtually identical to digital service in the PCS and AWS bands. After the sunset of analog cellular service in February 2008, only digital cellular technologies are used in the mobile wireless industry.

2. The two main digital technologies used in the United States are Code Division Multiple Access (CDMA) and Global System for Mobile Communications (GSM). In addition, there are two other, less-widely used (by subscribers), technologies: integrated Digital Enhanced Network (iDEN) and the once-common Time Division Multiple Access (TDMA). These four technologies are commonly referred to as Second Generation, or 2G, because they succeeded the first generation of analog cellular technology, Advanced Mobile Phone Systems (AMPS). U.S. service providers have been phasing out TDMA service over the past several years.[2]

3. Beyond the 2G digital technologies, mobile wireless providers have been deploying network technologies[3] that allow them to offer mobile data services at higher data transfer speeds and, in some cases, to increase voice capacity.[4] For GSM/TDMA providers, the first step in the migration to next-generation network technologies is General Packet Radio Service (GPRS), a packet-based data-only network upgrade that allows for faster data rates by aggregating up to eight 14.4 kbps channels.[5] Beyond GPRS, many U.S. GSM/TDMA providers deployed Enhanced Data Rates for GSM Evolution (EDGE)

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[1] PCS, digital SMR, and cellular networks are all "cellular" systems since all divide service regions into many small areas called "cells." Cells can be as small as an individual building or as large as 20 miles across. Each cell serves as a base station for mobile users to obtain connection to the fixed network and is equipped with its own radio transmitters/receivers and associated antennas. Service regions are divided into cells so that individual radio frequencies may be reused in different cells ("frequency reuse"), in order to enhance frequency efficiency. When a person makes a call on a wireless phone, the connection is made to the nearest base station, which connects with the local wireline phone network or another wireless operator. When a person is using a wireless phone and approaches the boundary of one cell, the wireless network senses that the signal is becoming weak and automatically hands off the call to the base station in the next cell. *See Sixth Report*, 16 FCC Rcd at 13361, n.55.

[2] AT&T, for example, discontinued TDMA service on February 18, 2008, and on Mar. 1, 2008 TDMA service was discontinued on the former Dobson TDMA network. AT&T, *Answer Center*, http://wireless.att.com/answer-center (visited Sept. 19, 2008). Cincinnati Bell Wireless discontinued its TDMA service in June 2006. Cincinnati Bell, Inc., SEC Form 10-K, filed Mar. 1, 2007, at 5.

[3] For purposes of this *Report*, all of the network technologies beyond 2G that carriers have deployed, as well as those that they plan to deploy in the future, are generally referred to as "next-generation network technologies." The International Telecommunication Union (ITU) has defined 3G network technologies as those that can offer maximum data transfer speeds of 2 Mbps from a fixed location, 384 kbps at pedestrian speeds, and 144 kbps at traveling speeds of 100 kilometers per hour. *See Fifth Report*, 15 FCC Rcd at 17695. There is ambiguity among other industry players, however, as to which network technologies constitute 3G and which constitute interim technologies, often labeled "2.5G." *See Seventh Report*, 17 FCC Rcd at 12990 and 13038. Therefore, this *Report* uses a more general label to describe all of the technologies beyond 2G.

[4] *See* Section IV.B.1, Network Coverage and Technology Upgrades, *supra.*

[5] *See Seventh Report*, 17 FCC Rcd at 12990. This upgrade is also labeled GSM/GPRS because many GSM/TDMA carriers are upgrading their TDMA markets with GSM and GPRS simultaneously.

technology, which offers average data speeds of 100-130 kbps. Wideband CDMA (WCDMA, also known as Universal Mobile Telecommunications System, or UMTS) is the next migration step for GSM providers beyond EDGE and allows maximum data transfer speeds of up to 2 Mbps and average user speeds of 220-320 kbps.[6] Finally, deployment of WCDMA with HSPA (High Speed Packet Access, which includes both High Speed Downlink Packet Access, HSDPA, and High Speed Uplink Packet Access, HSUPA) technology allows average download speeds of 400-700 kbps with burst rates of up to several Mbps,[7] average upload speeds of 500-800 kbps, when HSUPA technology is deployed.[8] Some service providers have deployed, or announced plans to deploy, additional HSPA upgrades that allow for faster peak and average data transfer speeds, such as HSPA 7.2 Mbps and HSPA+, which allows peak download speeds of 14.4 Mbps or 21 Mbps.[9]

4. Many CDMA providers have upgraded their networks to CDMA2000 1xRTT (also referred to as CDMA2000 1X or 1xRTT), CDMA2000 EV-DO (evolution-data optimized, EV-DO) Revision 0, and EV-DO Revision A (Rev. A) technologies. 1xRTT doubles voice capacity and delivers peak data rates of 307 kbps in mobile environments and typical speeds of 40-70 kbps.[10] EV-DO allows maximum data throughput speeds of 2.4 Mbps, while EV-DO Rev. A increases maximum data throughput speeds to 3.1 Mbps.[11] Typical, user-experienced download speeds with EV-DO range from 400 to 800 kbps, while upload speeds average 50-70 kbps.[12] The EV-DO Rev. A network upgrade increases average download speeds to 600 kbps to 1.4 Mbps and significantly improves average upload speeds to 350-800 kbps.[13] Whereas WCDMA and WCDMA/HSDPA are incompatible with earlier technologies on the GSM migration path, the more advanced technologies on the CDMA migration path are backwards compatible.[14] Deployment of these various technologies by service providers is discussed above. Maps showing CDMA and GSM network coverage, as well as mobile broadband coverage, can be found in Appendix D.

5. Beyond WCDMA, HSPA, HSPA+, and EV-DO, there are two main technologies for the next generation of mobile wireless broadband networks: Long Term Evolution (LTE) and mobile WiMAX. Both of these technologies are generally based on the Orthogonal Frequency Division Multiple

[6] *Tenth Report*, 20 FCC Rcd at 15951, ¶ 111. Although WCDMA and WCDMA/HSPA are not backwards compatible with GPRS/EDGE, wireless modem cards that are compatible with both WCDMA/HSPA and GPRS/EDGE, and enable handoff between the two types of networks, are available for use with laptop computers. *See, e.g.*, Novatel Wireless, *Products: Merlin U730 Wireless PC Modem Card, available at* www.novatelwireless.com (visited Oct. 8, 2008).

[7] *Tenth Report*, 20 FCC Rcd at 15951, ¶ 111.

[8] *AT&T Nears Completion of 3G Wireless Technology Deployment that Delivers Broadband Wireless Speeds – For Downloads and Uploads*, Press Release, AT&T, May 21, 2008.

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

[10] *See Seventh Report*, at 12990; *Ninth Report*, 19 FCC Rcd at 20650, ¶ 129.

[11] *Id*. *See also*, CDMA Development Group NOI Comments at 3-4.

[12] *Sprint Powers Up Faster Mobile Broadband Network in 10 More Markets, Upgraded Coverage Reaches 60 Million People*, News Release, Sprint Nextel, Dec. 12, 2006; 3G Americas, *3G Technologies*, *available at* http://www.3gamericas.com/English/PDFs/3G_technology_comparison.pdf (visited Dec. 15, 2008), (*3G Technology Comparison*). The maximum peak download speed for EV-DO is 2.4 Mbps. *Id*.

[13] *America's Largest and Fastest Mobile Broadband Network Just Got Even Larger – Sprint Customers Can Do More, In More Places, And At Fast Speeds*, News Release, Sprint Nextel, June 19, 2007; *Verizon Wireless: 100 Percent of Wireless Broadband Network Now Enhanced with Faster Speeds*, News Release, Verizon Wireless, June 29, 2007. The maximum peak download speed for EV-DO Rev A is 3.1 Mbps. *3G Technology Comparison*.

[14] *Standards in Wireless Telephone Networks*, at 328.

Access (OFDMA) modulation technology.[15] LTE can support theoretical peak speeds of 58 Mbps for upper link transmission and 173 Mbps for downlink transmission with 20 megahertz of spectrum and a 2x2 Multiple Input Multiple Output (MIMO) antenna structure.[16] The Mobile WiMAX technology can support peak downlink data rates up to 63 Mbps and peak upper link data rates up to 28 Mbps in a 10 MHz channel.[17]

[15] *See EDGE, HSPA and LTE—The Mobile Broadband Advantage,* Rysavy Research and 3G Americas, Sept. 2007, at 16, *available at* http://www.3gamericas.com/pdfs/2007_Rysavy_091007.pdf. Because OFDM allows signals to pass through buildings and trees, providers can use the technology to offer wireless broadband services without a direct line-of-sight between the transmitter and the end user's receiver. *Eleventh Report*, 21 FCC Rcd at 10995, ¶ 119.

[16] *See EDGE, HSPA and LTE—The Mobile Broadband Advantage,* Rysavy Research and 3G Americas, Sept. 2007, at 81, *available at* http://www.3gamericas.com/pdfs/2007_Rysavy_091007.pdf.

[17] *See Mobile WiMAX – Part I: A Technical Overview and Performance Evaluation,* Mobile WiMAX Forum, August 2006, at 10, *available at* http://www.wimaxforum.org/documents/downloads/Mobile_WiMAX_Part1_Overview_and_Performance.pdf.

APPENDIX C

Tables

Table of Contents

Table C-1: CTIA's Semi-Annual Mobile Wireless Industry Survey

Date	Estimated Total Subscribers	Year End over Year End Subscriber 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	248,247	$48.16

Source**:** CTIA, *Background on CTIA's Semi-Annual Wireless Industry Survey* http://files.ctia.org/pdf/CTIA__Survey_Midyear_2010_Graphics.pdf (visited Nov. 30, 2010).

Table C-2: FCC's Semi-Annual Local Telephone Competition Data Collection: Mobile Telephone Subscribership, in Thousands

State	Dec 2009		2006		2007		2008		2009	
	Carriers	% Resold	Jun	Dec	Jun	Dec	Jun	Dec	Jun	Dec
Alabama	13	9 %	3,276	3,375	3,605	3,765	3,887	3,960	4,003	4,228
Alaska	11	6	397	412	432	460	480	383	544	586
American Samoa	*	*	*	*	*	*	*	*	*	*
Arizona	11	5	4,153	4,405	4,637	4,800	4,936	4,983	5,005	5,101
Arkansas	8	10	1,924	2,044	2,149	2,288	2,446	2,530	2,576	2,519
California	15	7	27,497	29,717	30,204	32,247	31,946	32,177	32,215	32,938
Colorado	11	8	3,428	3,608	3,756	3,968	4,066	4,311	4,357	4,503
Connecticut	7	6	2,582	2,705	2,787	2,884	2,959	3,030	3,047	3,123
Delaware	8	6	650	683	724	751	775	778	779	803
District of Columbia	8	7	879	880	966	936	1,047	1,096	1,116	1,183
Florida	11	10	14,177	14,762	15,255	15,605	15,809	16,158	16,425	16,744
Georgia	14	7	6,865	7,282	7,598	7,941	8,142	8,322	8,562	8,863
Guam	*	*	*	*	*	*	*	*	*	*
Hawaii	7	3	1,010	1,035	1,067	1,096	1,115	1,184	1,196	1,216
Idaho	14	5	901	973	1,019	1,086	1,125	1,167	1,180	1,221
Illinois	14	7	9,148	9,589	9,949	10,330	10,634	10,919	11,070	11,523
Indiana	12	8	3,973	4,271	4,448	4,675	4,824	4,956	4,983	5,205
Iowa	71	7	1,867	2,010	2,058	2,166	2,245	2,319	2,336	2,432
Kansas	15	11	1,905	2,047	2,133	2,261	2,326	2,421	2,430	2,466
Kentucky	12	10	2,821	2,966	3,101	3,291	3,343	3,445	3,439	3,631
Louisiana	10	7	3,356	3,492	3,612	3,765	3,896	4,012	4,053	3,993
Maine	8	17	787	845	882	941	972	1,012	1,006	1,065
Maryland	10	5	4,471	4,691	4,818	5,024	5,124	5,234	5,260	5,338
Massachusetts	8	9	4,917	5,129	5,289	5,470	5,624	5,749	6,027	6,171
Michigan	12	12	6,863	7,094	7,333	7,608	7,821	8,027	8,171	8,576
Minnesota	11	6	3,543	3,702	3,834	4,048	4,164	4,345	4,254	4,439
Mississippi	10	7	1,923	2,030	2,070	2,196	2,252	2,312	2,361	2,345
Missouri	12	8	4,068	4,322	4,480	4,674	4,835	4,940	4,985	5,129
Montana	9	8	575	620	650	694	723	748	707	802
Nebraska	11	5	1,199	1,272	1,325	1,387	1,451	1,496	1,508	1,515
Nevada	12	8	1,883	1,990	2,093	2,167	2,249	2,268	2,325	2,393
New Hampshire	8	10	897	943	973	1,022	1,045	1,080	1,075	1,125
New Jersey	8	5	6,954	7,207	7,419	7,654	7,834	8,008	8,036	8,158
New Mexico	10	5	1,253	1,333	1,416	1,489	1,555	1,536	1,550	1,624
New York	11	10	14,574	15,262	15,901	16,395	17,260	16,702	18,193	18,882
North Carolina	12	9	6,209	6,627	6,962	7,306	7,428	8,024	8,193	8,108
North Dakota	9	6	457	473	492	513	541	581	562	618
Northern Mariana Isl.	*	*	*	*	*	*	*	*	*	*
Ohio	12	10	7,939	8,380	8,723	9,099	9,357	9,565	9,456	10,059
Oklahoma	17	6	2,317	2,480	2,572	2,723	2,808	2,889	2,988	3,077
Oregon	11	6	2,484	2,656	2,781	2,923	3,007	3,084	3,112	3,235
Pennsylvania	14	10	8,349	8,831	9,201	9,615	9,895	10,214	10,455	10,867
Puerto Rico	6	2	2,171	2,301	2,323	2,411	2,502	2,624	2,706	2,807
Rhode Island	7	6	765	798	829	848	874	888	880	893
South Carolina	13	8	3,001	3,209	3,340	3,500	3,573	3,323	3,374	3,896
South Dakota	8	7	514	548	570	596	611	631	613	681
Tennessee	13	10	4,731	5,127	4,971	5,246	5,791	5,518	5,676	5,914
Texas	26	6	16,928	17,822	18,792	19,677	20,390	21,008	21,403	21,849
Utah	13	5	1,649	1,775	1,874	1,971	2,046	2,095	2,109	2,166
Vermont	7	15	334	358	375	402	421	435	398	463
Virgin Islands	*	*	*	*	*	*	*	*	*	*

Virginia	10	8		5,325	5,607	6,148	6,416	6,242	6,856	6,596	7,250
Washington	11	6		4,495	4,799	5,035	5,292	5,461	5,624	5,671	5,816
West Virginia	11	16		965	1,040	1,095	1,173	1,236	1,295	1,315	1,386
Wisconsin	13	9		3,517	3,510	3,641	3,842	3,966	4,265	4,317	4,546
Wyoming	13	9		359	387	410	441	457	484	429	517
Nationwide	180	8	%	217,418	229,619	238,316	249,332	255,729	261,284	265,332	274,283

Source: FCC Form 477.

* = Data withheld to maintain firm confidentiality. Some data for June 2008 have been revised.

% Resold reflects the percentage of mobile telephony subscribers purchasing their service subscriptions from a mobile wireless reseller.

Table C-3: Economic Area Penetration Rates

EA	EA Name	Subscribers	2009 Estimated EA Population	2009 Penetration Rate	2009 HHI	2008 HHI	EA Density
57	Detroit-Ann Arbor-Flint, MI	7,882,122	6,915,601	114%	2815	3049	364.1
78	Birmingham, AL	1,862,516	1,679,665	111%	2568	2542	137.1
155	Farmington, NM-CO	233,710	215,888	108%	4008	6536	16.0
13	Washington-Baltimore, DC-MD-VA-WV-PA	9,888,125	9,367,024	106%	2683	2731	402.8
22	Fayetteville, NC	579,042	558,549	104%	2826	2980	164.6
87	Beaumont-Port Arthur, TX	459,993	447,070	103%	3303	3184	89.2
83	New Orleans, LA-MS (see note 1)	1,666,503	1,636,225	102%	3188	3261	171.9
10	New York-North New Jersey-Long Island, NY-NJ-CT-PA	27,018,157	26,752,421	101%	2556	2640	890.6
20	Norfolk-Virginia Beach-Newport News, VA-NC	1,859,299	1,835,017	101%	2760	2775	289.9
37	Albany, GA	504,963	500,752	101%	2985	4165	62.7
71	Nashville, TN-KY	2,877,422	2,835,094	101%	2562	2679	105.1
79	Montgomery, AL	501,498	494,140	101%	2654	3006	66.9
82	Biloxi-Gulfport-Pascagoula, MS	398,813	394,375	101%	2545	2465	143.5
85	Lafayette, LA	636,775	632,979	101%	4703	6497	100.0
122	Wichita, KS-OK	1,202,862	1,190,209	101%	2943	3011	20.5
161	San Diego, CA	3,071,856	3,053,793	101%	2543	2574	660.5
31	Miami-Fort Lauderdale, FL	6,253,316	6,252,464	100%	2238	2250	483.2
81	Pensacola, FL	690,312	688,680	100%	2732	2657	154.1
97	Springfield, IL-MO	514,352	513,449	100%	3824	3910	58.2
44	Knoxville, TN	1,089,348	1,100,819	99%	2713	2816	165.6
80	Mobile, AL	710,187	719,848	99%	3148	3106	74.8
90	Little Rock-North Little Rock, AR	1,677,439	1,700,495	99%	4174	4210	46.1
121	North Platte, NE-CO	58,221	59,033	99%	5304	5577	5.0
12	Philadelphia-Wilmington-Atlantic City, PA-NJ-DE-MD	7,522,039	7,713,384	98%	2498	2614	778.8
29	Jacksonville, FL-GA	2,122,948	2,175,495	98%	2342	2540	112.5
132	Corpus Christi, TX	548,067	559,067	98%	2144	2471	46.5
135	Odessa-Midland, TX	405,305	412,858	98%	3521	3671	10.1
141	Denver-Boulder-Greeley, CO-KS-NE	4,545,023	4,623,277	98%	2387	2370	52.0
172	Honolulu, HI	1,268,715	1,295,178	98%	2372	2365	187.2
15	Richmond-Petersburg, VA	1,558,242	1,608,573	97%	3216	3366	124.0
73	Memphis, TN-AR-MS-KY	1,923,617	1,977,533	97%	2585	2709	103.0
86	Lake Charles, LA	526,662	543,482	97%	3397	5327	52.4
3	Boston-Worcester-Lawrence-Lowewell-Brockton, MA-NH	7,923,813	8,278,493	96%	2752	2800	421.8
35	Tallahassee, FL-GA	758,243	791,953	96%	3116	3772	63.5
45	Johnson City-Kingsport-Bristol, TN-VA	578,094	601,030	96%	3801	3936	144.5
51	Columbus, OH	2,443,296	2,545,136	96%	3157	3135	190.4
55	Cleveland-Akron, OH-PA	4,411,646	4,592,908	96%	3763	3959	427.8
89	Monroe, LA	318,653	330,757	96%	4386	4364	56.1
131	Houston-Galveston-Brazoria, TX	6,572,649	6,840,330	96%	2268	2281	169.3
133	McAllen-Edinburg-Mission, TX	1,168,451	1,220,589	96%	2758	3025	222.0
34	Tampa-St. Petersburg-Clearwater, FL	2,607,865	2,747,272	95%	2257	2291	891.0
36	Dothan, AL-FL-GA	332,880	351,564	95%	2709	4613	53.7
38	Macon, GA	782,385	821,390	95%	3884	4197	62.9
39	Columbus, GA-AL	496,486	522,421	95%	3063	2911	84.1

EA	EA Name	Subscribers	2009 Estimated EA Population	2009 Penetration Rate	2009 HHI	2008 HHI	EA Density
50	Dayton-Springfield, OH	1,059,551	1,115,251	95%	2607	2615	318.5
93	Joplin, MO-KS-OK	265,187	278,248	95%	3464	3584	74.7
127	Dallas-Fort Worth, TX-AR-OK	8,609,409	9,107,967	95%	2614	2623	119.0
143	Casper, WY-ID-UT	429,532	449,779	95%	5350	7653	5.2
170	Seattle-Tacoma-Bremerton, WA	4,409,480	4,643,110	95%	2702	2615	190.5
27	Augusta-Aiken, GA-SC	597,328	638,707	94%	3249	3960	89.8
28	Savannah, GA-SC	731,409	777,504	94%	2450	3312	92.0
40	Atlanta, GA-AL-NC	6,459,664	6,886,313	94%	2452	2409	246.0
42	Asheville, NC	463,902	493,170	94%	4273	4132	128.6
64	Chicago-Gary-Kenosha, IL-IN-WI	10,268,875	10,875,669	94%	2070	2146	556.5
70	Louisville, KY-IN	1,426,145	1,525,268	94%	2471	2520	180.9
84	Baton Rouge, LA-MS	766,799	819,964	94%	4896	5007	140.3
111	Minot, ND	101,445	107,605	94%	4360	7745	7.0
128	Abilene, TX	205,186	217,433	94%	3539	3457	20.4
23	Charlotte-Gastonia-Rock Hill, NC-SC	2,353,511	2,524,998	93%	3044	3097	240.5
24	Columbia, SC	959,242	1,030,810	93%	3218	3692	126.0
30	Orlando, FL	4,146,283	4,464,397	93%	2426	2486	265.8
53	Pittsburgh, PA-WV	2,681,258	2,898,241	93%	3185	3157	284.8
99	Kansas City, MO-KS	2,531,126	2,719,973	93%	2289	2290	88.7
125	Oklahoma City, OK	1,707,641	1,838,406	93%	3100	3444	65.0
142	Scottsbluff, NE-WY	83,114	88,945	93%	6572	6973	7.8
153	Las Vegas, NV-AZ-UT	2,189,513	2,347,051	93%	2137	2341	23.7
8	Buffalo-Niagara Falls, NY-PA	1,324,113	1,446,063	92%	3240	3324	212.9
88	Shreveport-Bossier City, LA-AR	533,512	581,587	92%	3871	3957	58.0
130	Austin-San Marcos, TX	1,669,505	1,818,555	92%	2633	2640	156.1
134	San Antonio, TX	2,372,703	2,566,061	92%	2162	2220	83.0
5	Albany-Schenectady-Troy, NY	1,091,428	1,205,523	91%	3435	3352	134.7
17	Roanoke, VA-NC-WV	781,545	862,958	91%	2384	2439	97.8
25	Wilmington, NC-SC	941,677	1,032,795	91%	2837	2760	107.4
26	Charleston-North Charleston, SC	639,035	698,437	91%	3011	2969	149.8
43	Chattanooga, TN-GA	722,276	792,821	91%	3719	3494	145.3
49	Cincinnati-Hamilton, OH-KY-IN	2,134,182	2,353,401	91%	2287	2247	294.1
69	Evansville-Henderson, IN-KY-IL	788,971	862,384	91%	4380	4590	75.3
95	Jonesboro, AR-MO	280,812	307,391	91%	5041	5032	51.3
96	St. Louis, MO-IL	3,358,878	3,691,421	91%	2669	2733	127.0
124	Tulsa, OK-KS	1,339,303	1,466,450	91%	3080	3222	72.4
137	Lubbock, TX	356,776	392,653	91%	2750	2832	27.2
163	San Francisco-Oakland-San Jose, CA	8,812,967	9,683,498	91%	2662	2610	271.1
41	Greenville-Spartanburg-Anderson, SC-NC	1,250,088	1,389,094	90%	3367	4097	183.6
77	Jackson, MS-AL-LA	1,332,856	1,485,097	90%	3451	3534	49.7
103	Cedar Rapids, IA	381,493	424,398	90%	2588	2561	101.3
107	Minneapolis-St. Paul, MN-WI-IA	4,387,117	4,867,600	90%	2689	2735	83.0
171	Anchorage, AK	614,485	683,946	90%	3604	3865	1.1
6	Syracuse, NY-PA	1,669,807	1,885,052	89%	4033	3986	104.7
7	Rochester, NY-PA	1,310,404	1,480,252	89%	4368	4389	167.2
18	Greensboro-Winston-Salem-High Point, NC-VA	1,812,660	2,025,527	89%	2751	3155	189.1
19	Raleigh-Durham-Chapel Hill, NC	2,038,630	2,286,793	89%	2859	2965	188.4

EA	EA Name	Subscribers	2009 Estimated EA Population	2009 Penetration Rate	2009 HHI	2008 HHI	EA Density
67	Indianapolis, IN-IL	2,934,533	3,296,788	89%	3135	3118	171.4
98	Columbia, MO	353,160	397,345	89%	3991	4082	58.0
101	Peoria-Pekin, IL	468,350	529,129	89%	3512	3424	91.0
126	Western Oklahoma, OK	122,783	137,861	89%	2306	3170	12.0
160	Los Angeles-Riverside-Orange County, CA-AZ	17,471,704	19,686,186	89%	2365	2488	286.1
9	State College, PA	700,119	798,328	88%	4116	4204	92.4
21	Greenville, NC	776,939	887,786	88%	2599	2641	87.7
56	Toledo, OH	1,135,873	1,295,678	88%	4739	5360	163.9
118	Omaha, NE-IA-MO	981,985	1,111,783	88%	2950	3537	62.4
136	Hobbs, NM-TX	176,578	199,640	88%	3144	3896	11.2
138	Amarillo, TX-NM	434,607	493,283	88%	2681	2668	11.8
156	Albuquerque, NM-AZ	923,994	1,047,578	88%	2943	2845	20.9
157	El Paso, TX-NM	928,888	1,060,233	88%	2278	2433	33.0
167	Portland-Salem, OR-WA	2,932,146	3,328,126	88%	2546	2469	76.0
2	Portland, ME	685,209	784,721	87%	2852	2812	98.6
32	Fort Myers-Cape Coral, FL	787,851	905,445	87%	2403	2429	234.3
63	Milwaukee-Racine, WI	2,042,368	2,342,714	87%	2100	2123	366.9
66	Fort Wayne, IN	648,222	745,537	87%	3563	3543	158.5
72	Paducah, KY-IL	200,125	230,246	87%	5457	5945	70.0
102	Davenport-Moline-Rock Island, IA-IL	488,549	559,146	87%	2640	2585	108.3
110	Grand Forks, ND-MN	191,816	219,646	87%	4824	*	10.2
115	Rapid City, SD-MT-ND-NE	196,370	226,418	87%	4954	9658	5.0
119	Lincoln, NE	349,974	404,463	87%	4825	4909	50.2
154	Flagstaff, AZ-UT	417,045	480,160	87%	4202	3893	8.2
11	Harrisburg-Lebanon-Carlisle, PA	1,053,716	1,221,803	86%	3297	3235	292.4
75	Tupelo, MS-AL-TN	541,245	628,046	86%	5319	5403	49.8
91	Fort Smith, AR-OK	298,891	349,542	86%	4084	4121	46.5
106	Rochester, MN-IA-WI	291,097	337,571	86%	3528	3267	55.7
120	Grand Island, NE	245,267	284,811	86%	6209	6672	11.6
144	Billings, MT-WY	383,959	446,354	86%	5408	8486	4.9
148	Idaho Falls, ID-WY	308,716	358,114	86%	4512	4472	10.9
16	Staunton, VA-WV	300,630	352,381	85%	2886	2881	51.0
68	Champaign-Urbana, IL	535,129	629,446	85%	3546	3434	73.5
94	Springfield, MO	815,858	957,072	85%	3662	3690	48.1
100	Des Moines, IA-IL-MO	1,465,413	1,727,660	85%	2998	2967	47.3
123	Topeka, KS	398,302	468,159	85%	2665	2623	35.6
129	San Angelo, TX	175,256	207,355	85%	2049	2237	10.1
140	Pueblo, CO-NM	247,638	290,867	85%	3202	3850	8.7
149	Twin Falls, ID	152,964	179,994	85%	4400	4175	14.1
151	Reno, NV-CA	655,836	774,965	85%	2624	2910	7.6
33	Sarasota-Bradenton, FL	740,325	880,375	84%	2676	2733	273.6
52	Wheeling, WV-OH	255,721	304,530	84%	4446	4538	124.5
62	Grand Rapids-Muskegon-Holland, MI	1,655,384	1,966,438	84%	2817	3384	206.8
139	Santa Fe, NM	232,137	275,290	84%	4258	4676	13.1
159	Tucson, AZ	1,004,865	1,193,489	84%	2732	2622	60.0
166	Eugene-Springfield, OR-CA	717,806	849,683	84%	2454	2322	43.1
169	Richland-Kennewick-Pasco, WA	658,922	780,554	84%	2757	2723	27.7

EA	EA Name	Subscribers	2009 Estimated EA Population	2009 Penetration Rate	2009 HHI	2008 HHI	EA Density
48	Charleston, WV-KY-OH	976,545	1,180,068	83%	3575	3442	85.4
61	Traverse City, MI	249,511	299,280	83%	2951	4365	50.7
112	Bismarck, ND-MT-SD	148,846	180,389	83%	5047	*	6.3
116	Sioux Falls, SD-IA-MN-NE	467,241	560,434	83%	5160	8893	15.1
117	Sioux City, IA-NE-SD	207,352	249,101	83%	4209	5777	39.5
146	Missoula, MT	367,196	439,819	83%	6359	*	10.8
147	Spokane, WA-ID	767,173	926,112	83%	3553	3356	23.6
150	Boise City, ID-OR	594,114	718,161	83%	3050	2912	13.7
1	Bangor, ME	439,606	533,580	82%	4015	4250	20.9
46	Hickory-Morganton, NC-TN	451,236	550,763	82%	2795	4160	131.9
59	Green Bay, WI-MI	560,681	681,951	82%	2476	2837	34.2
113	Fargo-Moorhead, ND-MN	318,935	387,284	82%	4470	6536	16.4
152	Salt Lake City-Ogden, UT-ID	2,126,109	2,581,642	82%	2333	2408	35.7
158	Phoenix-Mesa, AZ-NM	3,709,196	4,523,383	82%	2792	2734	93.9
14	Salisbury, MD-DE-VA	334,084	414,004	81%	5769	5507	111.2
65	Elkhart-Goshen, IN-MI	779,351	958,250	81%	3022	3158	185.7
104	Madison, WI-IA-IL	818,458	1,009,469	81%	3316	3442	71.3
108	Wausau, WI	395,982	488,995	81%	1903	2477	34.1
109	Duluth-Superior, MN-WI	285,429	350,305	81%	4179	*	18.5
60	Appleton-Oshkosh-Neenah, WI	370,326	461,535	80%	2545	2618	143.6
165	Redding, CA-OR	290,625	362,225	80%	3036	2888	14.4
47	Lexington, KY-TN-VA-WV	1,538,900	1,943,408	79%	3406	3869	80.4
54	Erie, PA	403,388	509,887	79%	4196	4241	116.4
58	Northern Michigan, MI	206,918	265,214	78%	4229	*	28.5
145	Great Falls, MT	127,452	163,968	78%	5104	8303	4.2
162	Fresno, CA	1,279,408	1,642,331	78%	2926	2962	98.6
76	Greenville, MS	170,285	222,248	77%	3941	3575	41.0
92	Fayetteville-Springdale-Rogers, AR-MO-OK	404,378	527,035	77%	4654	4729	88.4
114	Aberdeen, SD	59,321	77,157	77%	4914	*	5.4
168	Pendleton, OR-WA	153,760	205,791	75%	3068	2894	8.7
4	Burlington, VT-NY	450,191	619,614	73%	5443	8263	57.6
105	La Crosse, WI-MN	185,357	253,647	73%	3863	3823	53.7
164	Sacramento-Yolo, CA	1,927,296	2,698,718	71%	2831	2621	188.1
74	Huntsville, AL-TN (see note 2)	*	1,082,680	*	*	*	119.1

* = Data withheld to maintain firm confidentiality.
Source: Federal Communications Commission internal analysis based on year-end 2009 filings for Numbering Resource Utilization in the United States, adjusted for porting. Density is persons per square mile. EA populations are based on Census estimates as of July 1, 2009.

Note 1: As discussed in the *Twelfth Report*, the penetration rate in EA83 (New Orleans) appears to be an aberration. That EA lost over 260,000 people between 2000 and 2006, while its subscriber count remained relatively unchanged, creating a large increase in its penetration rate. One explanation for this may be that, after the flooding, people leaving the area took their cell phones (and cell phone numbers) with them. Thus, those numbers may still be associated with New Orleans rate centers, even though the people actually no longer live anywhere near there.

Note 2: We believe there was a discrepancy in the data for this EA, making the subscriber data and HHI for this market unreliable.

Table C-4: Selected Smartphone Launches in 2009

Smartphone	Date Launched	Wireless Service Provider(s)	Offered Exclusively at Launch?[1]	Handset Manufacturer	Platform/ Operating System
E63[2]	Jan. 2009	Unlocked	No	Nokia	Symbian OS 9.2, S60 v. 3.1 UI
5800 Xpress Music[3]	Feb. 2009	Unlocked	No	Nokia	Symbian OS 9.4, S60 rel. 5
BlackBerry Curve 8900[4]	Feb. 2009	AT&T T-Mobile Cellular One (Montana) Cellular One of East Texas Corr Long Lines MTPCS/Cellular One/Chinook Viaero West Central	No	RIM	BlackBerry
E75[5]	Apr. 2009	Unlocked	No	Nokia	Symbian OS 9.3, S60 rel. 3.2
Propel Pro[6]	Apr. 2009	AT&T	Yes	Samsung	Windows Mobile 6.1
Nokia E71x[7]	May 2009	AT&T	Yes	Nokia	Symbian OS 9.2, S60 rel. 3.1 UI
Jack[8]	May 2009	AT&T	Yes	Samsung	Windows Mobile 6.1

[1] Based on reviewing company websites and press releases.

[2] *Messaging made simple – the Nokia E63 heads to the United States*, Press Release, Nokia, Jan. 7, 2009, *available at* http://www.nokia.com/press/press-releases/showpressrelease?newsid=1280903.

[3] *Nokia 5800 XpressMusic hits shelves in the United States*, Press Release, Nokia, Feb. 27, 2009, *available at* http://www.nokia.com/press/press-releases/archive/archiveshowpressrelease?newsid=1293991).

[4] *T-Mobile USA to Offer Customers the Thinnest and Lightest Full-QWERTY BlackBerry Smartphone*, Press Release, RIM, Jan. 7, 2009, *available at* http://press.rim.com/release.jsp?id=1984. U.S. providers carrying the Curve 8900 listed on RIM's page for the device at http://na.blackberry.com/eng/devices/blackberrycurve8900/curve_wheretobuy.jsp.

[5] *Email the way you want it – Nokia E75 begins shipping*, Press Release, Nokia Apr. 6, 2009, *available at* http://www.nokia.com/press/press-releases/showpressrelease?newsid=1303620).

[6] *AT&T Unveils New Integrated Devices for Texting, Email and More*, Press Release, AT&T, Mar. 30, 2009, *available at* http://www.att.com/gen/press-room?pid=4800&cdvn=news&newsarticleid=26664. U.S. exclusivity through AT&T indicated by Samsung's website at http://www.samsung.com/us/consumer/mobile/mobile-phones/at-t-phones/SGH-I627MAAATT/index.idx?pagetype=prd_detail (identifying the Propel Pro as an AT&T device).

[7] *Nokia E71x with AT&T in stores across the U.S. today*, Press Release, Nokia, May 4, 2009, *available at* http://www.nokia.com/press/press-releases/showpressrelease?newsid=1310666). Exclusivity indicated by AT&T's page for the device at http://www.wireless.att.com/businesscenter/NokiaE71x/index.jsp.

[8] *AT&T Completes Its Full House of Smart Devices with the New Samsung Jack*, Press Release, AT&T, May 14, 2009, *available at* http://www.att.com/gen/press-room?pid=4800&cdvn=news&newsarticleid=26818&mapcode (indicates exclusivity).

Smartphone	Date Launched	Wireless Service Provider(s)	Offered Exclusively at Launch?[1]	Handset Manufacturer	Platform/ Operating System
Pre[9]	June 2009	Sprint Nextel Verizon Wireless	No	Palm	Palm OS
iPhone 3G S[10]	June 2009	AT&T	Yes	Apple	iPhone OS
BlackBerry Pearl Flip 8230[11]	June 2009	Verizon Wireless ACS Alltel Appalachian Bluegrass Carolina West Cellcom Cellular One of NEPA Cellular South Inland Nex-Tech/United nTelos Panhandle/PTCI US Cellular	No	RIM	BlackBerry
Snap[12]	June 2009	Sprint Nextel US Cellular	No	HTC	Windows Mobile 6.1
Ozone[13]	June 2009	Verizon Wireless	Yes	HTC	Windows Mobile 6.1
N97[14]	June 2009	Unlocked	No	Nokia	Symbian OS 9.4, S60 rel. 5
N86[15]	July 2009	Unlocked	No	Nokia	Symbian OS 9.3, S60 rel. 3.2

[9] Charlie Sorrel, *It's Official: Palm Pre to Launch June 6th for $300*, Gadget Lab Blog, WIRED, May 19, 2009, at http://www.wired.com/gadgetlab/2009/05/boom-palm-pre-to-launch-june-6th-300.

[10] *iPhone 3G S Available at AT&T Tomorrow*, Press Release, AT&T, June 18, 2009, *available at* http://www.att.com/gen/press-room?pid=4800&cdvn=news&newsarticleid=26868&mapcode. U.S. exclusivity with AT&T of the iPhone 3G S indicated in the fine print/footnote on Apple's iPhone purchase page at http://www.apple.com/iphone/buy.

[11] *Verizon Wireless Customers Will Flip For The New 3G-Enabled BlackBerry Pearl Flip Smartphone*, Press Release, RIM, June 4, 2009, *available at* http://press.rim.com/release.jsp?id=2345. U.S. providers carrying the Pearl Flip 8230 listed on RIM's page for the device at http://na.blackberry.com/eng/devices/blackberrypearl8200.

[12] *Sprint Strengthens Social Network Connections with Customers*, Press Release, Sprint Nextel, June 22, 2009, *available at* http://newsreleases.sprint.com/phoenix.zhtml?c=127149&p=irol-newsArticle_newsroom&ID=1300933&highlight). US Cellular subsequently made the HTC Snap available on its network and for purchase on its website at http://www.uscellular.com/uscellular/cell-phones/phoneDetailsPopup.jsp?IDparam=prod680004).

[13] *HTC Ozone Brings Verizon Wireless' Smartphone Lineup to New Heights*, Press Release, Verizon Wireless June 25, 2009, *available at* http://news.vzw.com/news/2009/06/pr2009-06-25.html. Exclusivity indicated by Verizon Wireless's webpage at http://www.verizonwireless.com/b2c/store/controller?item=phoneFirst&action=viewPhoneDetail&selectedPhoneId=4848&cmp=KNC-PaidSearch.

[14] *Nokia N97 mobile computer to begin selling worldwide in June*, Press Release, Nokia, June 2, 2009, *available at* http://www.nokia.com/press/press-releases/showpressrelease?newsid=1319081.

[15] *The ultimate imaging device – the Nokia N86 8MP – coming to the United States*, Press Release, Nokia, July 17, 2009, *available at* http://pressbulletinboard.nokia.com/2009/07/17/the-ultimate-imaging-device-%E2%80%93-the-nokia-n86-8mp-%E2%80%93-coming-to-the-united-states/.

Smartphone	Date Launched	Wireless Service Provider(s)	Offered Exclusively at Launch?[1]	Handset Manufacturer	Platform/ Operating System
Dash 3G[16]	July 2009	T-Mobile	Yes	HTC	Windows Mobile 6.1
Surge[17]	July 2009	AT&T	Yes	Nokia	Symbian OS, S60 3.2 Edition
myTouch 3G[18]	Aug. 2009	T-Mobile	Yes	HTC	Google Android
BlackBerry Curve 8520[19]	Aug. 2009	AT&T T-Mobile Iowa Wireless Long Lines MTPCPS/Cellular One/Chinook	No	RIM	Blackberry
Touch Pro 2[20]	Aug. 2009	T-Mobile Sprint Nextel Verizon Wireless US Cellular	No	HTC	Windows Mobile 6.1 Professional

[16] *T-Mobile USA To Offer New 3G-Enabled Smartphone*, Press Release, T-Mobile, June 17, 2009, *available at* http://www.t-mobile.com/company/PressReleases_Article.aspx?assetName=Prs_Prs_20090618&title=T-Mobile%20USA%20To%20Offer%20New%203G-Enabled%20Smartphone. T-Mobile's U.S. exclusivity indicated by name being "T-Mobile Dash 3G" and by the Dash 3G being a new generation of the T-Mobile Dash, which was exclusively available through T-Mobile. *See T-Mobile Unveils a New Full-Featured Smartphone, the T-Mobile Dash*, Press Release, T-Mobile, Oct. 11, 2006, *available at* http://www.t-mobile.com/company/PressReleases_Article.aspx?assetName=Prs_Prs_20061011&title=T-Mobile%20Unveils%20a%20New%20Full-Featured%20Smartphone,%20the%20T-Mobile%20Dash.

[17] *AT&T and Nokia ride a social wave into summer with Nokia Surge*, Press Release, Nokia, July 13, 2009, *available at* http://www.nokia.com/press/press-releases/showpressrelease?newsid=1328505. Exclusivity indicated by AT&T's page for the device at http://www.wireless.att.com/businesscenter/nokia-surge/index.jsp.

[18] *T-Mobile myTouch 3G Available in Stores Nationwide Beginning Today*, Press Release, T-Mobile, Aug. 5, 2009, *available at* http://www.t-mobile.com/company/PressReleases_Article.aspx?assetName=Prs_Prs_20090805&title=T-Mobile%20myTouch%203G%20Available%20in%20Stores%20Nationwide%20Beginning%20Today. Exclusivity indicated by full name being "T-Mobile® myTouch 3G" and HTC's site referring to it as a T-Mobile device at http://www.htc.com/us/products/t-mobile-mytouch-3g?view=1-2&sort=0.

[19] *T-Mobile USA and RIM Introduce the New BlackBerry Curve 8520*, Press Release, RIM, July 27, 2009, *available at* http://press.rim.com/release.jsp?id=2437. U.S. providers carrying the Curve 8520 listed on RIM's webpage at http://na.blackberry.com/eng/devices/blackberrycurve8500.

[20] *T-Mobile USA Debuts HTC Touch Pro2 in the U.S.*, Press Release, T-Mobile, July 29, 2009, *available at* http://www.t-mobile.com/company/PressReleases_Article.aspx?assetName=Prs_Prs_20090729&title=T-Mobile%20USA%20Debuts%20HTC%20Touch%20Pro2%20in%20the%20U.S.). U.S. providers carrying the Touch Pro2 identified on HTC's webpage at http://www.htc.com/us/products.

Smartphone	Date Launched	Wireless Service Provider(s)	Offered Exclusively at Launch?[1]	Handset Manufacturer	Platform/ Operating System
BlackBerry Tour[21]	Aug. 2009	Sprint Nextel Verizon Wireless ACS Alltel Appalachian Bluegrass Carolina West Cellcom Cellular South Credo Mobile Inland nTelos Panhandle/PTCI Pioneer US Cellular	No	RIM	BlackBerry
Touch Diamond[22]	Sept. 2008	Sprint Nextel Verizon Wireless	No	HTC	Windows Mobile 6.1 Professional
Pure[23]	Oct. 2009	AT&T	Yes	HTC	Windows Mobile 6.5
Imagio[24]	Oct. 2009	Verizon Wireless	Yes	HTC	Windows Mobile 6.5
Hero[25]	Oct. 2009	Cellular South Sprint Nextel	No	HTC	Google Android
BlackBerry Storm 2[26]	Oct. 2009	Verizon Wireless	Yes	RIM	BlackBerry

[21] *RIM Introduces the BlackBerry Tour Smartphone*, Press Release, RIM, June 16, 2009, *available at* http://press.rim.com/release.jsp?id=2393. U.S. providers carrying the Tour listed on RIM's page for the device at http://na.blackberry.com/eng/devices/blackberrytour/tour_wheretobuy.jsp.

[22] *Sprint Gives the Gift of Choice with a Diverse Holiday Lineup for Consumers and Businesses Offering the Benefits of the Now Network™ - Speed, Ease of Use, Exclusive Content and Worry-Free Pricing*, Press Release, Sprint Nextel, Sep. 10, 2008, *available at* http://newsreleases.sprint.com/phoenix.zhtml?c=127149&p=irol-newsArticle_newsroom&ID=1195804&highlight=diamond. Verizon Wireless subsequently offered the Touch Diamond for its network. *See HTC Touch Diamond Available On Nation's Most Reliable Wireless Network*, Press Release, Verizon Wireless, Apr. 9, 2009, *available at* http://news.vzw.com/news/2009/04/pr2009-04-09.html.

[23] *AT&T and HTC Debut HTC Tilt 2 and HTC Pure Windows Phones*, Press Release, AT&T, Oct. 5, 2009, *available at* http://www.att.com/gen/press-room?pid=4800&cdvn=news&newsarticleid=27204&mapcode. Exclusivity of Pure indicated by AT&T's product page for the device at https://www.wireless.att.com/businesscenter/HTC-PURE/index.jsp.

[24] *Imagine The Possibilities For Work And Play With The HTC Imagio Exclusively From Verizon Wireless*, Press Release, Verizon Wireless, Oct. 1, 2009, *available at* http://news.vzw.com/news/2009/10/pr2009-09-30b.html (indicates exclusivity).

[25] *The Innovation and Openness of a True Mobile Internet Experience Coming Soon to America's Most Dependable 3G Network from Sprint on HTC Hero with Google*, Press Release, Sprint Nextel, Sep. 3, 2009, *available at* http://newsreleases.sprint.com/phoenix.zhtml?c=127149&p=irol-newsArticle_newsroom&ID=1327394&highlight=. Cellular South subsequently began offering the Hero on its network, as indicated at https://www.cellularsouth.com/cscommerce/products/phones/product_phone_detail.jsp?navAction=push&navCount=0&id=prod26560022.

[26] *A Powerful New Storm Rolls Onto Verizon Wireless' Network on Oct. 28*, Press Release, RIM, Oct. 26, 2009, *available at* http://press.rim.com/release.jsp?id=2590. U.S. exclusivity of Storm2 indicated on RIM's page for the device at http://na.blackberry.com/eng/devices/blackberrystorm/storm_wheretobuy.jsp (Verizon Wireless only U.S. provider listed).

Smartphone	Date Launched	Wireless Service Provider(s)	Offered Exclusively at Launch?[1]	Handset Manufacturer	Platform/ Operating System
N97 Mini[27]	Oct. 2009	Unlocked	No	Nokia	Symbian OS 9.4, S60 rel. 5
Tilt 2[28]	Oct. 2009	AT&T	Yes	HTC	Windows Mobile 6.5
Moment[29]	Nov. 2009	Sprint Nextel	Yes	Samsung	Google Android
CLIQ[30]	Nov. 2009	T-Mobile	Yes	Motorola	Google Android
DROID[31]	Nov. 2009	Verizon Wireless	Yes	Motorola	Google Android
DROID Eris[32]	Nov. 2009	Verizon Wireless	Yes	HTC	Google Android
Pixi[33]	Nov. 2009	Sprint Nextel	Yes	Palm	Palm OS
E72[34]	Nov. 2009	Unlocked	No	Nokia	Symbian OS 9.3, S60 v. 3.2 UI
N900[35]	Nov. 2009	Unlocked	No	Nokia	Maemo 5 Linux
Behold II[36]	Nov. 2009	T-Mobile	Yes	Samsung	Google Android

[27] *Nokia N97 gets even better with a new software update; Nokia N97 mini now available in stores*, Press Release, Nokia, Oct. 28, 2009, *available at* http://www.nokia.com/press/press-releases/showpressrelease?newsid=1350820.

[28] *AT&T and HTC Debut HTC Tilt 2 and HTC Pure Windows Phones*, Press Release, AT&T Oct. 5, 2009, *available at* http://www.att.com/gen/press-room?pid=4800&cdvn=news&newsarticleid=27204&mapcode. Exclusivity of Tilt2 indicated by AT&T's product page for the device at https://www.wireless.att.com/businesscenter/HTC-Tilt-2/index.jsp.

[29] *Samsung's First Android-Powered Phone, Samsung Moment with Google, Coming Soon to America's Most Dependable 3G Network*, Press Release, Sprint Nextel, Oct. 7, 2009, *available at* http://newsreleases.sprint.com/phoenix.zhtml?c=127149&p=irol-newsArticle_newsroom&ID=1339737&highlight. Exclusivity indicated by the Moment's fact sheet available at http://phx.corporate-ir.net/External.File?item=UGFyZW50SUQ9MTgwMzZ8Q2hpbGRJRD0tMXxUeXBlPTM=&t=1.

[30] *T-Mobile USA Launches Motorola CLIQ with MOTOBLUR In Stores Beginning Today*, Press Release, T-Mobile, Nov. 2, 2009, *available at* http://www.t-mobile.com/company/PressReleases_Article.aspx?assetName=Prs_Prs_20091102&title=T-Mobile%20USA%20Launches%20Motorola%20CLIQ%20with%20MOTOBLUR%20In%20Stores%20Beginning%20Today (indicates exclusivity).

[31] *Hello Humans: Droid by Motorola Arrives Next Week*, Press Release, Verizon Wireless, Oct. 28, 2009, *available at* http://news.vzw.com/news/2009/10/pr2009-10-27.html (indicates exclusivity).

[32] *Bring An Android Device Home For The Holidays With DROID ERIS By HTC, Exclusively From Verizon Wireless*, Press Release, Verizon Wireless, Nov. 5, 2009, *available at* http://news.vzw.com/news/2009/11/pr2009-11-05.html (indicates exclusivity).

[33] *Palm Pixi Available Nov. 15 for Just $99.99 Exclusively from Sprint*, Press Release, Sprint Nextel, Oct. 26, 2009, *available at* http://newsreleases.sprint.com/phoenix.zhtml?c=127149&p=irol-newsArticle_newsroom&ID=1346184&highlight=pixi (indicates exclusivity).

[34] *Nokia E72 in stores now*, Press Release, Nokia, Nov. 16, 2009, *available at* http://www.nokia.com/press/press-releases/showpressrelease?newsid=1355243.

[35] *The Nokia N900 is now available to US consumers*, Press Release, Nokia, Nov. 18, 2009, *available at* http://www.nokia.com/press/press-releases/showpressrelease?newsid=1355897.

[36] *T-Mobile USA Launches the Samsung Behold II on November 18*, Press Release, T-Mobile, Nov. 13, 2009, *available at* http://www.t-mobile.com/company/PressReleases_Article.aspx?assetName=Prs_Prs_20091113&title=T-Mobile%20USA%20Launches%20the%20Samsung%20Behold%20II%20on%20November%2018 (indicates exclusivity).

Smartphone	**Date Launched**	**Wireless Service Provider(s)**	**Offered Exclusively at Launch?**[1]	**Handset Manufacturer**	**Platform/ Operating System**
BlackBerry Curve 8530[37]	Nov. 2009	Sprint Nextel Verizon Wireless Alltel US Cellular	No	RIM	BlackBerry
BlackBerry Bold 9700[38]	Nov. 2009	AT&T T-Mobile	No	RIM	Blackberry
Ipaq[39]	Nov. 2009	AT&T	Yes	HP	Windows Mobile 6.5
Omnia 2[40]	Dec. 2009	Verizon Wireless	Yes	Samsung	Windows Mobile 6.5
eXpo[41]	Dec. 2009	AT&T	Yes	LG	Google Android
5800 Navigation Edition[42]	Dec. 2009	Unlocked	No	Nokia	Symbian OS 9.4, S60 rel. 5
Nexus One[43]	Jan. 2010	T-Mobile (locked or unlocked) Unlocked (other GSM providers)	No	HTC	Google Android

[37] *Verizon Wireless Introduces the BlackBerry Curve 8530 Smartphone*, Press Release, RIM, Nov. 5, 2009, *available at* http://press.rim.com/release.jsp?id=2686. U.S. providers carrying the Curve 8530 listed on RIM's page at http://na.blackberry.com/eng/devices/blackberrycurve8500.

[38] *RIM Introduces the New BlackBerry Bold 9700 Smartphone*, Press Release, RIM, Oct. 21, 2009, *available at* http://press.rim.com/release.jsp?id=2567. U.S. providers carrying the Bold 9700 listed on RIM's page at http://na.blackberry.com/eng/devices/blackberrybold9700/bold_wheretobuy.jsp.

[39] *AT&T and HP Introduce HP Ipaq Glisten, 3G World Phone for Mobile Professionals*, Press Release, AT&T, Nov. 24, 2009, *available at* http://www.att.com/gen/press-room?pid=4800&cdvn=news&newsarticleid=27587&mapcode. U.S. exclusivity of the iPaq through AT&T indicated at http://www.wireless.att.com/businesscenter/hp-ipaq-glisten/index.jsp.

[40] *Verizon Wireless Announces The Availability Of The Samsung Omnia II*, Press Release, Verizon Wireless, Nov. 23, 2009, *available at* http://news.vzw.com/news/2009/11/pr2009-11-23a.html. U.S. exclusivity of the Omnia II through Verizon Wireless indicated at http://phones.verizonwireless.com/samsung/omnia2.

[41] *AT&T and LG Mobile Phones Announce the First 1 GHz Smartphone in the United States, the LG Expo*, Press Release, AT&T, Nov. 30, 2009, *available at* http://www.att.com/gen/press-room?pid=4800&cdvn=news&newsarticleid=27621&mapcode (indicates exclusivity).

[42] *Over the river and through the woods, Nokia knows the way*, Press Release, Nokia, Dec. 8, 2009, *available at* http://www.nokia.com/press/press-releases/showpressrelease?newsid=1359877.

[43] *Google Offers New Model for Consumers to Buy a Mobile Phone*, Press Release, Google, Jan. 5, 2010, *available at* http://www.google.com/intl/en/press/pressrel/20100105_phone.html. The device must be purchased through Google's webstore at http://www.google.com/phone. It can be purchased either unlocked for use on any GSM network at a higher cost ($529) or for a significantly reduced amount ($179) if bundled with a two-year T-Mobile service contract.

Table C-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, 2009, in Thousands

State	Capable Devices in Service	Subscribers with Full Internet Access
Alabama	1,376	683
Alaska	273	120
American Samoa	0	0
Arizona	2,331	1,088
Arkansas	838	374
California	15,131	7,548
Colorado	2,017	993
Connecticut	1,572	739
Delaware	404	168
District of Columbia	402	332
Florida	6,140	3,409
Georgia	3,536	1,824
Guam	*	*
Hawaii	569	336
Idaho	647	224
Illinois	4,805	2,478
Indiana	2,281	917
Iowa	1,028	371
Kansas	1,013	448
Kentucky	1,108	533
Louisiana	1,505	863
Maine	403	154
Maryland	2,632	1,286
Massachusetts	2,762	1,302
Michigan	3,236	1,255
Minnesota	1,906	827
Mississippi	813	498
Missouri	1,846	936
Montana	*	*
Nebraska	705	196
Nevada	1,045	592
New Hampshire	553	188
New Jersey	4,562	1,970
New Mexico	617	267
New York	7,489	3,811
North Carolina	3,444	1,615
North Dakota	*	*
Northern Mariana Isl.	*	*
Ohio	4,354	1,608
Oklahoma	1,129	664
Oregon	1,486	689
Pennsylvania	4,855	2,020
Puerto Rico	*	*
Rhode Island	397	190
South Carolina	1,503	569
South Dakota	*	*

Tennessee	2,419	1041
Texas	8,925	5,604
Utah	972	462
Vermont	163	37
Virgin Islands	*	*
Virginia	3,734	1,647
Washington	2,928	1,471
West Virginia	476	200
Wisconsin	1,728	732
Wyoming	221	57
Nationwide	115,749	55,842

Source: FCC Form 477.

* = Data withheld to maintain form confidentiality.

Table C-6: Mobile Wireless Resellers and Mobile Virtual Network Operators (MVNOs)

Name	Number of Subscribers
7-11 Speak Out	Not Available
Advanced Communications Technology (ACT)	Not Available
Airvoice Wireless	Not Available
AirLink Mobile	Not Available
Albany Mutual Telephone	Not Available
Beaver Creek Cooperative Telephone Company	Not Available
Cbeyond/BeyondMobile	50,203 total customers as of 12/31/09*
Bratz Mobile	Not Available
Camellia Communications	Not Available
Circle K Stores Inc	Not Available
Consolidated Communications Network, Inc.	More than 20,000*
Consumer Cellular, Inc	Not Available
Credo Mobile, Inc.	Not Available
eCall Plus	Not Available
Firefly Communications, Inc.	Not Available
Garden Valley Telephone Co.	Not Available
Hawaiian Telcom Services Company, Inc.	Not Available
Hayneville Telephone Company, Inc.	Not Available
Hood Canal	Not Available
HTC	Not Available
IdeaOne	Not Available
Jitterbug	Not Available
Kennebec Telephone Co.	Not Available
KMTelecom;	Not Available
Lakedale Telephone Company	Not Available
Liberty Wireless	Not Available
Lightyear Network Solutions, LLC	More than 60,000*
Locus Telecommunications	More than 300,000
Movida	Not Available
Nehalem TeleCommunications, Inc.	Not Available
New Ulm Telecom	Not Available
One Communications Corp.	More than 160,000 businesses*
Otter Tail Telcom	Not Available
Page Plus Cellular	Not Available
PemTel Wireless	Not Available
Pend Oreille Telephone Company	Not Available
PlatinumTel Wireless	Not Available
Randolph Telephone Company	Not Available
Red River Rural Telephone Association	Not Available
Silverado	Not Available
Sleepy Eye Telephone Company	Not Available
STI Mobile	Not Available
Total Call Mobile	Not Available
TouchTone	Not Available
Tracfone	14.4 million as of Dec. 2009
Tuyo Mobile	Not Available
Venture Communications Coop.	Not Available
Warwick	Not Available
Winn Telephone Company	Not Available
Yadkin Valley Telephone	Not Available
Zapp Unlimited LLC	Not Available

Zone Telecom, Inc.	Not Available

* According to company website, the figure appears to be customers for all services, not just wireless subscribers.

Table C-7: 13-City Performance Averages for HSPA/EV-DO Networks by PCWorld/Novarum December 2009-January 2010

Provider	Laptops			Smartphones		
	Average Download Speed (kbps)	Average Upload Speed (kbps)	Average Reliability	Average Download Speed (kbps)	Average Upload Speed (kbps)	Average Reliability
AT&T	1410	773	94%	1259	215	91%
Sprint Nextel	795	396	94%	851	145	92%
T-Mobile	868	311	92%	719	134	93%
Verizon Wireless	877	434	92%	1075	116	76%

Source: *PCWorld*

Notes: A study by *PCWorld* and its testing partner, Novarum, during December 2009 and January 2010 tested the performance of the four nationwide providers' HSPA/EV-DO networks from 20 locations in each of 13 U.S. cities, using both smartphones and laptops. The study consisted of more than 51,000 individual tests that measured three metrics – download speed, upload speed, and reliability – with both laptops and smartphones. For the smartphone-based tests, testers used the Apple iPhone for AT&T, the HTC Hero for Sprint Nextel, the Motorola Droid for Verizon Wireless, and the HTC G1 for T-Mobile. The study tested reliability by recording the percentage of a one-minute test during which the service was available, uninterrupted, and faster than dial-up speed. Tests were conducted in Baltimore, Boston, Chicago, Denver, New Orleans, New York, Orlando, Phoenix, Portland, San Diego, San Francisco, San Jose, and Seattle. Additional information on the testing methodology used by *PCWorld* and Novarum is available at http://www.pcworld.com/article/189592-7/atandt_roars_back_in_pcworlds_second_3g_wireless_performance_test.html.

Table C-8: Laptop-Based Tests: National Network Performance Results
PCMag
June 2010

Provider	Average Download Speed (Mbps)	Average Upload Speed (Mbps)	Consistency
AT&T	1.79	0.28	86.20%
Cricket*	0.94	0.34	95.32%
Sprint Nextel "3G"	0.99	0.30	95.90%
Sprint Nextel "4G"**	2.11	0.40	84.27%
T-Mobile	1.17	0.34	92.78%
Verizon Wireless	1.01	0.35	88.22%

Source: PCMag.com
*Cricket available in ten of 18 cities.
**Sprint Nextel "4G" available in nine of 18 cities.

Notes: In June 2010, PCMag.com published data from laptop-based network performance tests conducted in 18 cities on the HSPA/EV-DO networks of the four nationwide providers, as well as Cricket and "Sprint 4G" where available. The study tested several metrics, including download speed, upload speed, time to first byte, and consistency. The study consisted of approximately 1000 rounds of automated tests (totaling more than 10,000 individual tests) conducted using two identical HP Elitebook 2540p laptops. Tests were conducted at eight to ten locations in each of 20 cities (Atlanta, Baltimore, Boise, Boston, Charlotte, Chicago, Dallas, Denver, Las Vegas, Los Angeles, Miami, New York City, Philadelphia, Phoenix, Portland, Raleigh, San Antonio, San Francisco, St. Louis, and Washington, DC). The results from two cities – Philadelphia and Las Vegas – were removed due to technical problems. The Cricket network was available in ten of the 18 cities included in the study, and "Sprint 4G" service was available in nine cities. Download tests used 1 MB and 5 MB ZIP files, and upload tests used 1 MB ZIP files. The speed tests were conducted using the Ookla Speedtest, available at http://www.speedtest.net.

Table C-9: Download and Upload Rates in kbps for Data Networks
Smartphone-Based Tests
by RootMetrics
August-September 2010

		AT&T	Sprint	T-Mobile	Verizon
Chicago	Down	422	245	430	329
	Up	368	182	300	285
Dallas	Down	462	236	499	342
	Up	386	175	336	278
Los Angeles	Down	382	287	497	343
	Up	337	225	430	307
New York City	Down	418	272	451	298
	Up	297	194	393	247
Oakland	Down	455	309	447	372
	Up	344	233	363	295
Orange County	Down	399	316	504	366
	Up	355	229	450	304

Notes: In August and September 2010, performance testing firm RootMetrics tested data download and upload rates on the data networks of the four nationwide providers in six major metro markets using off-the-shelf smartphones. For its tests, RootMetrics used an application designed to measure how users experience each provider's network in a specific market. These tests were not meant to display maximum speeds, but rather, to show the average speed of consumer file uploads and downloads. Drive testing conducted throughout six metropolitan areas – Chicago, Dallas, Los Angeles, New York, Oakland, and Orange County, California – provided millions of data points for analysis. Specifically, RootMetrics used four off-the-shelf handsets running the Android operating system: the Droid X (Verizon); the HTC Evo 4 (Sprint; EV-DO network tested only); and the HTC Nexus One (for both AT&T and T-Mobile). Each test used a 64k data payload and ran automatically and continuously at six-minute intervals.

APPENDIX D

Maps

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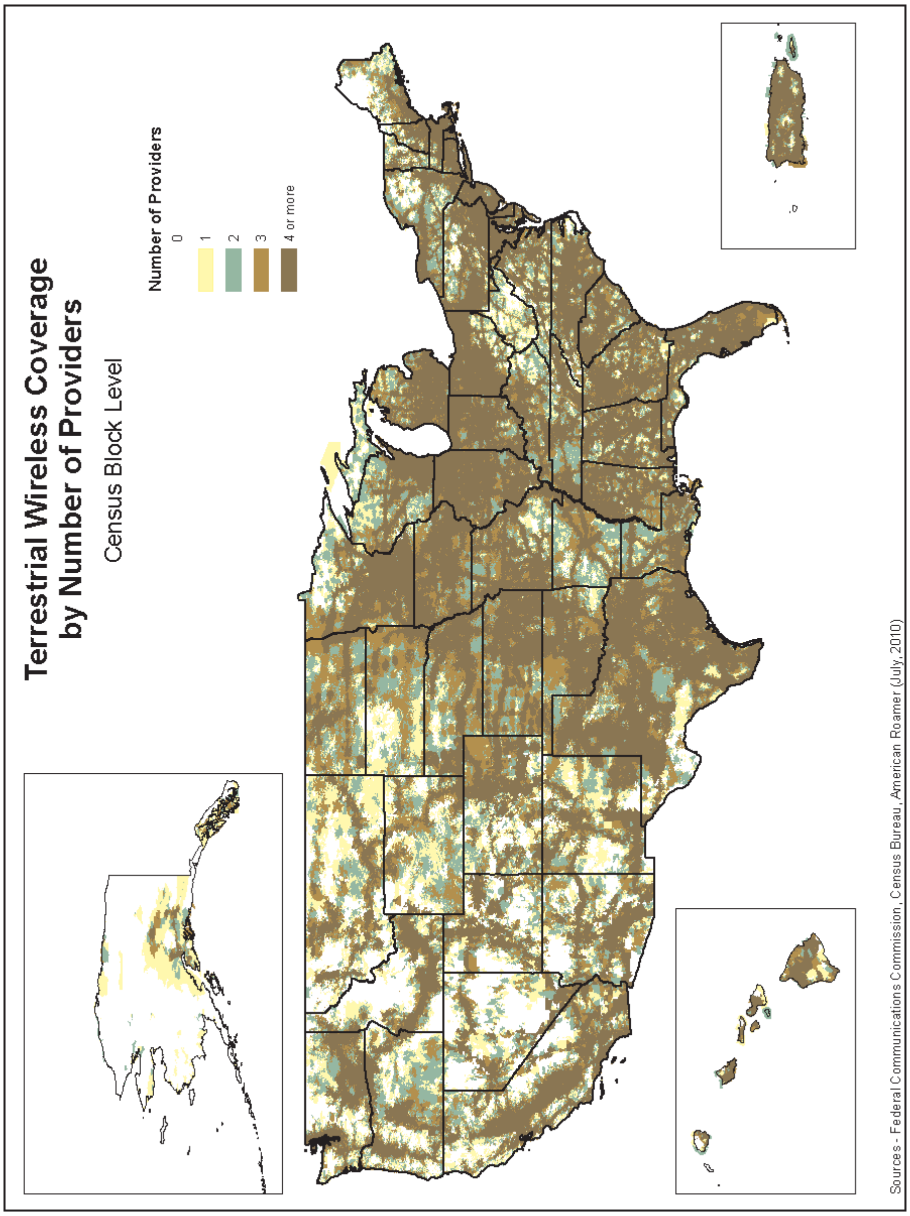
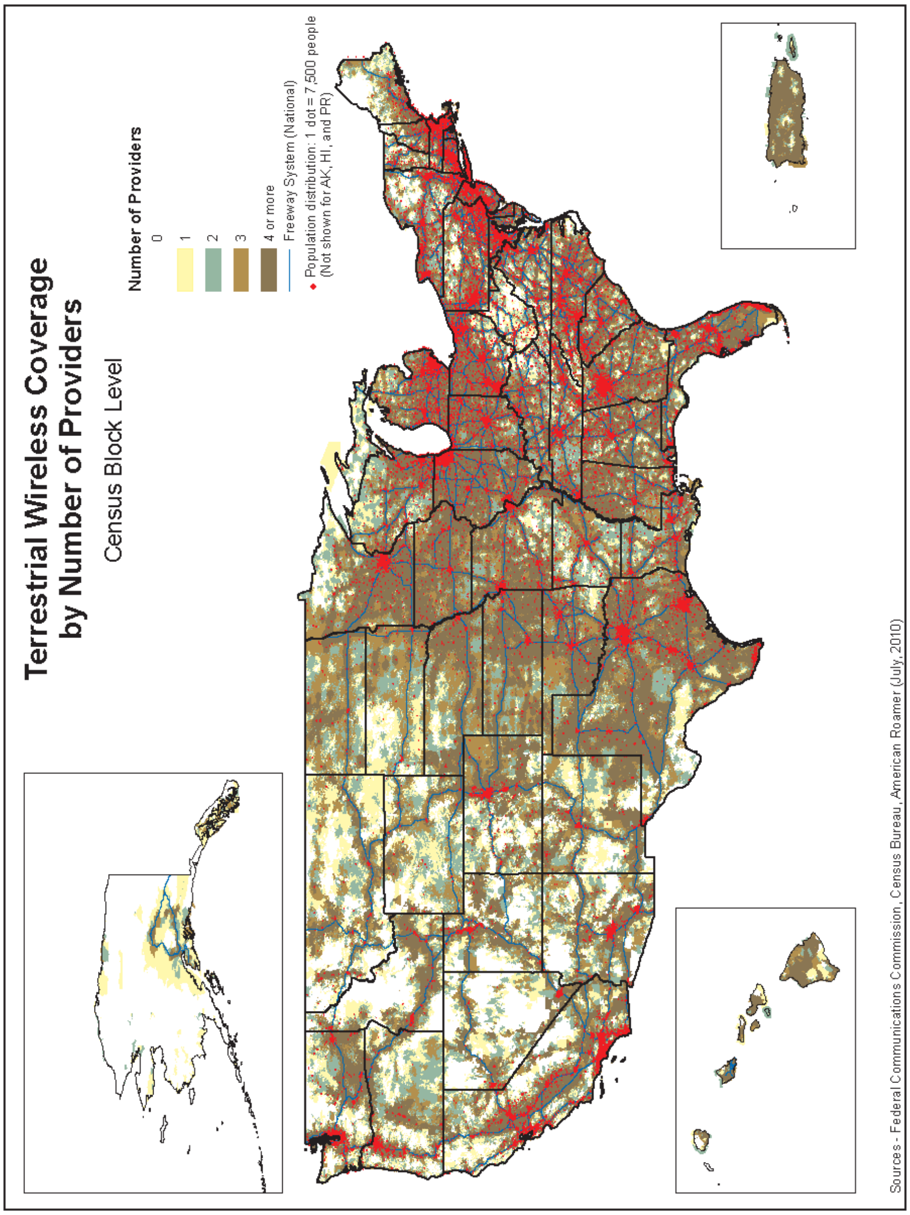
Note: Additional maps of the existing spectrum holdings of many mobile wireless service providers and licensees are now accessible through the Commission's online Spectrum Dashboard tool, available at http://www.fcc.gov/spectrumdashboard. The Spectrum Dashboard provides a public means of reviewing how 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.

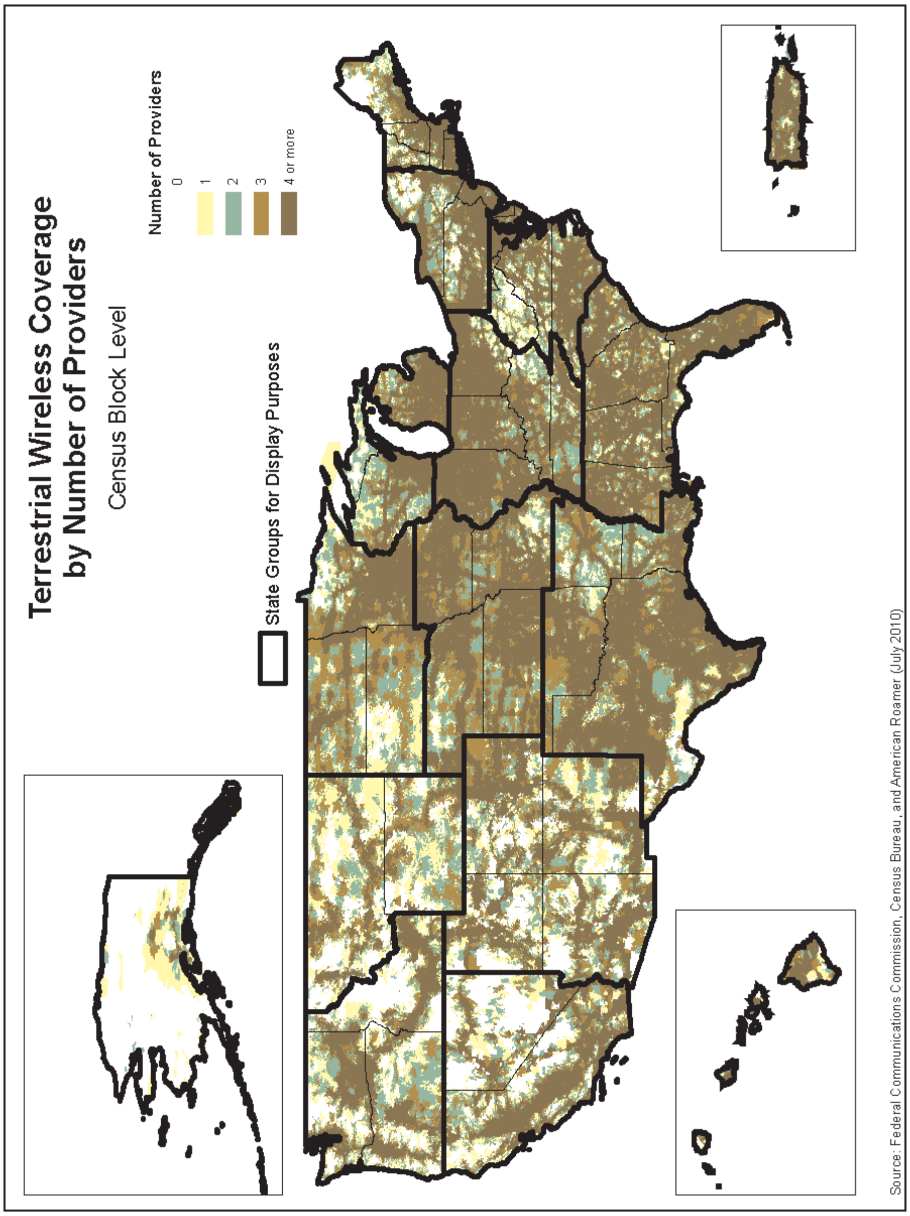
Map D-5: Mobile Wireless Coverage by Number of Providers



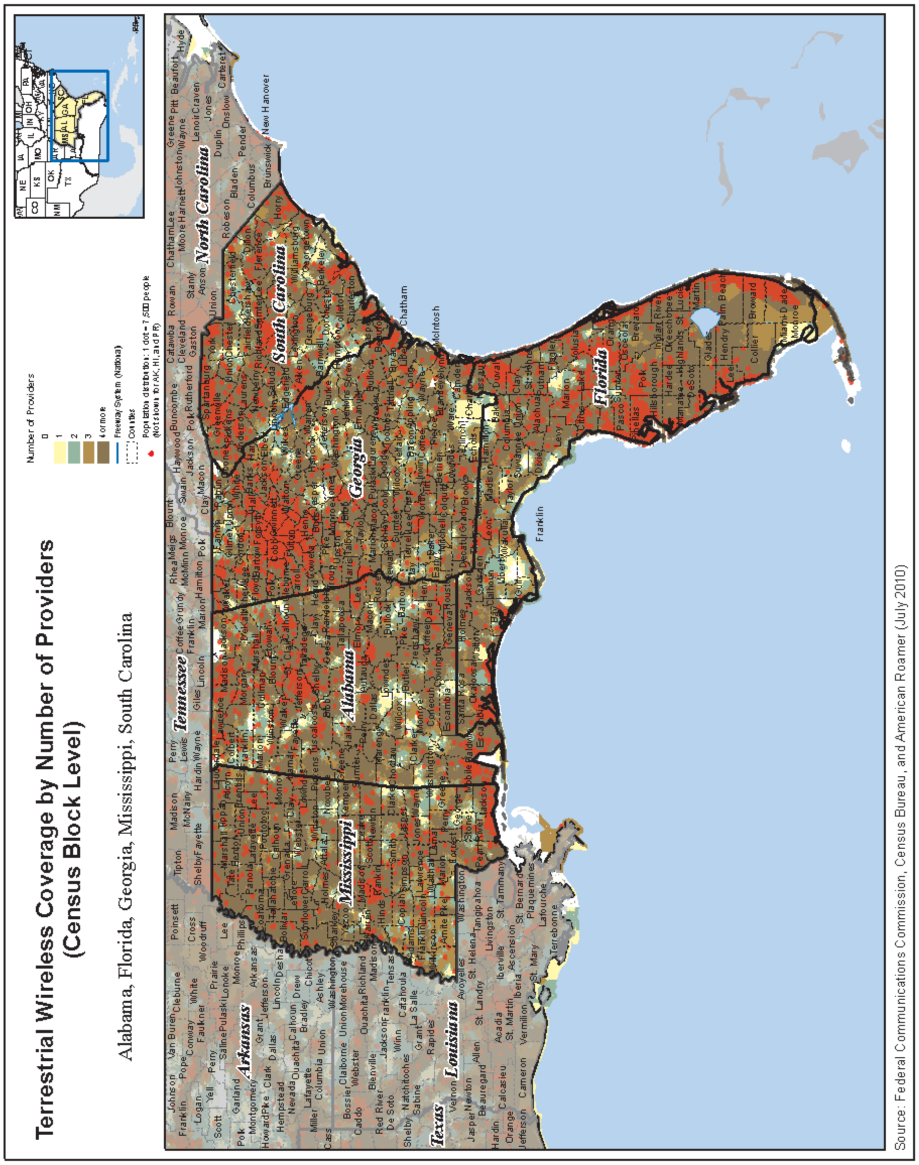
Map D-6: Wireless Coverage by Number of Providers (2)



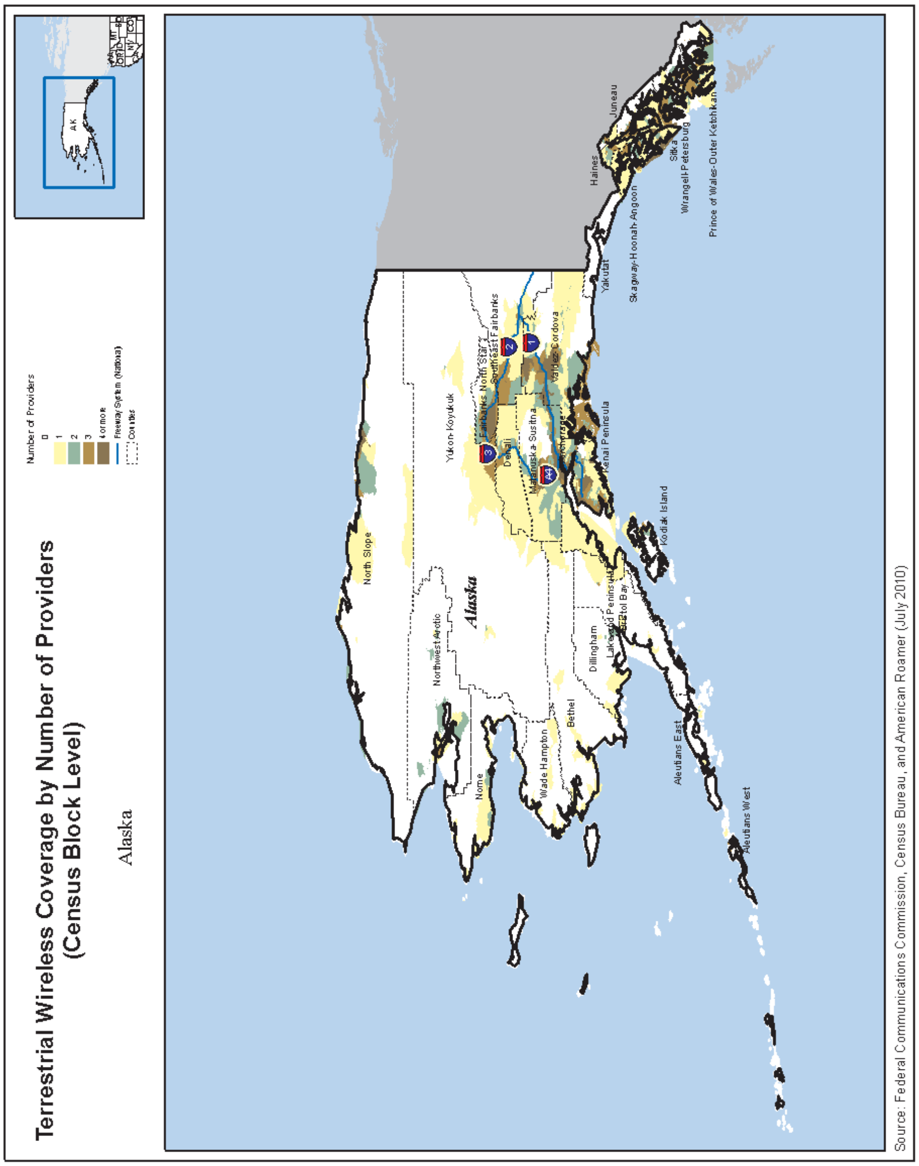
Map D-7: Wireless Coverage by Number of Providers by Region (Overview)



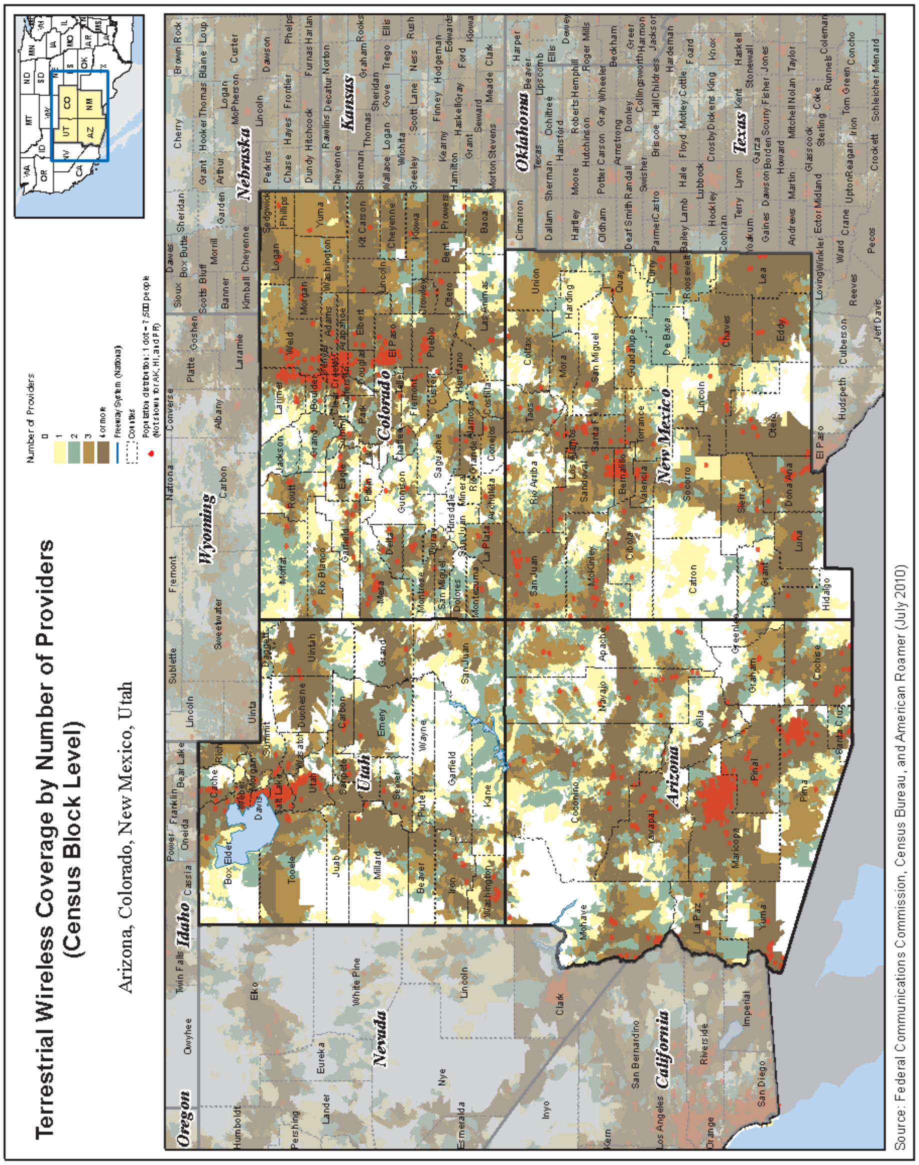
Map D-8: Wireless Coverage by Number of Providers by Region (1)



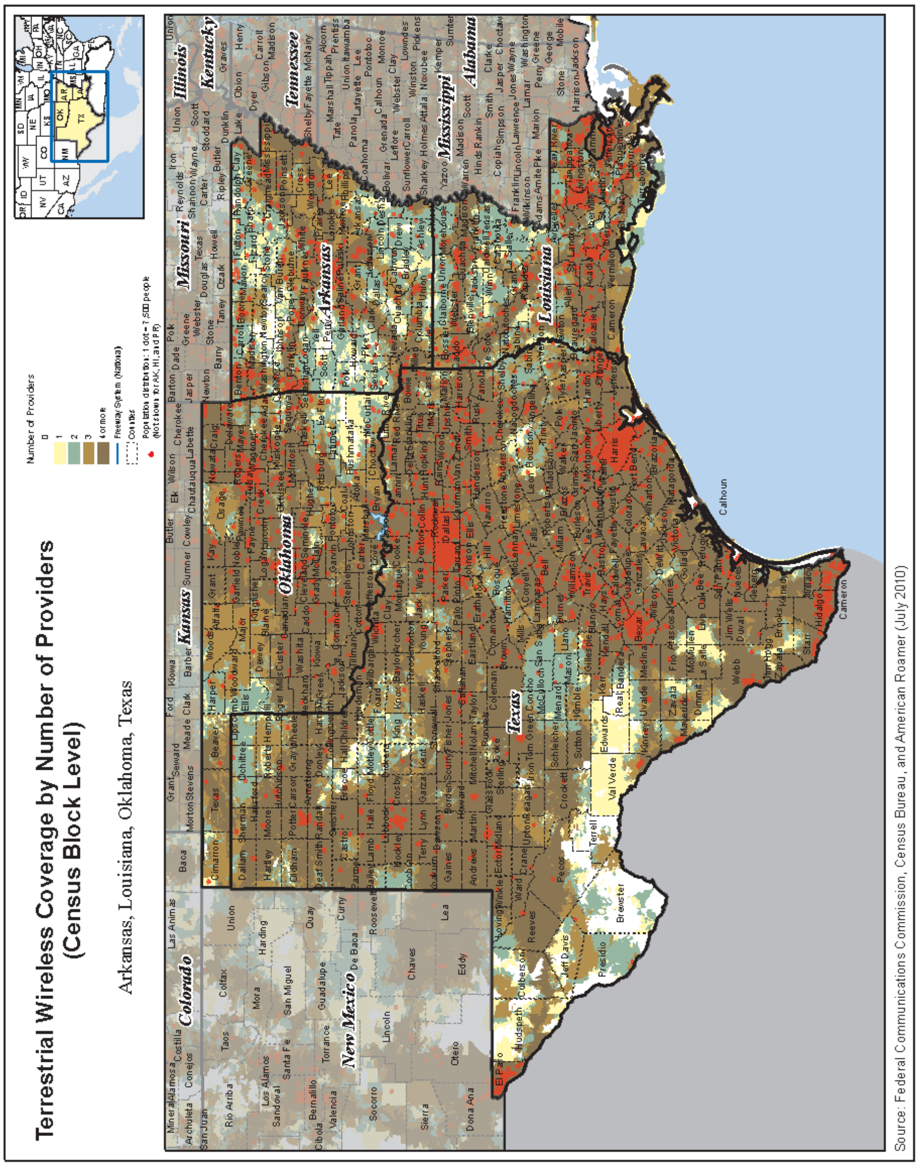
Map D-9: Wireless Coverage by Number of Providers by Region (2)



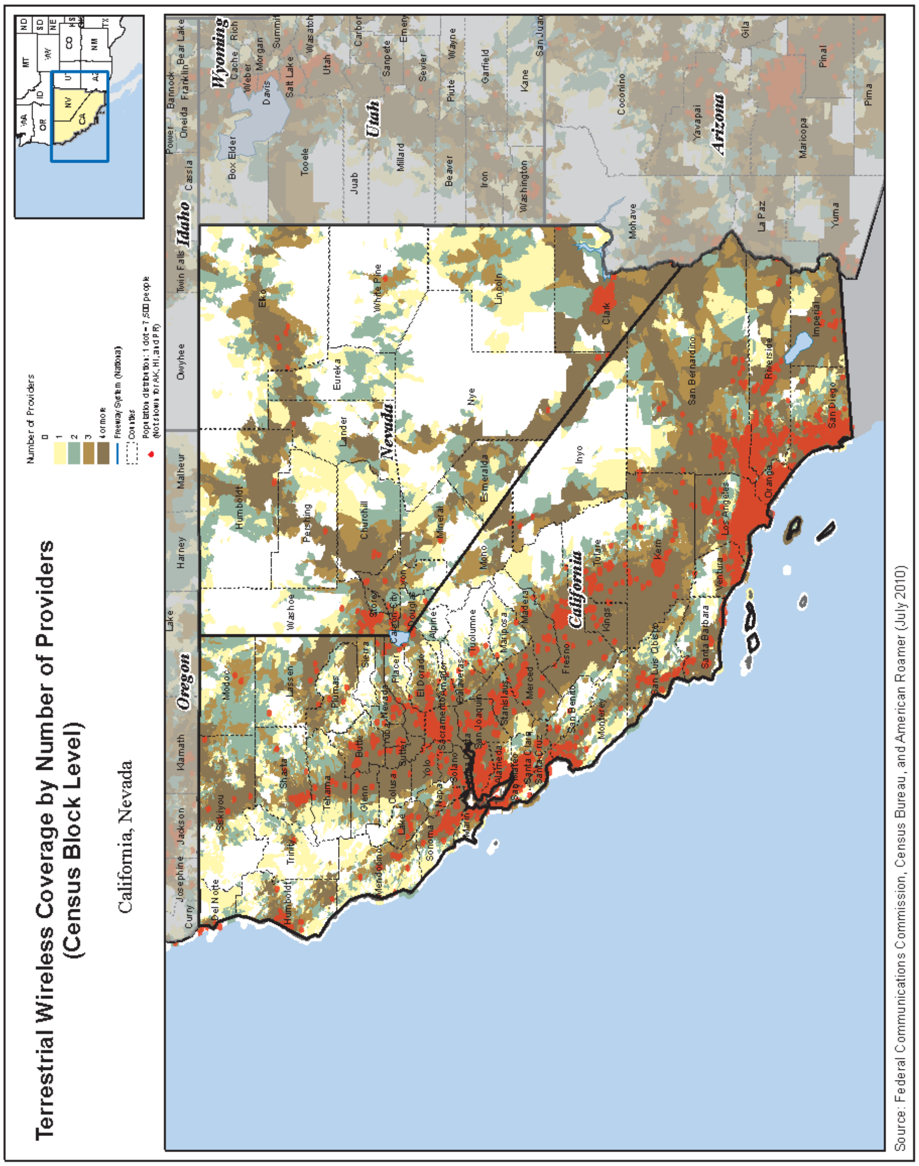
Map D-10: Wireless Coverage by Number of Providers by Region (3)



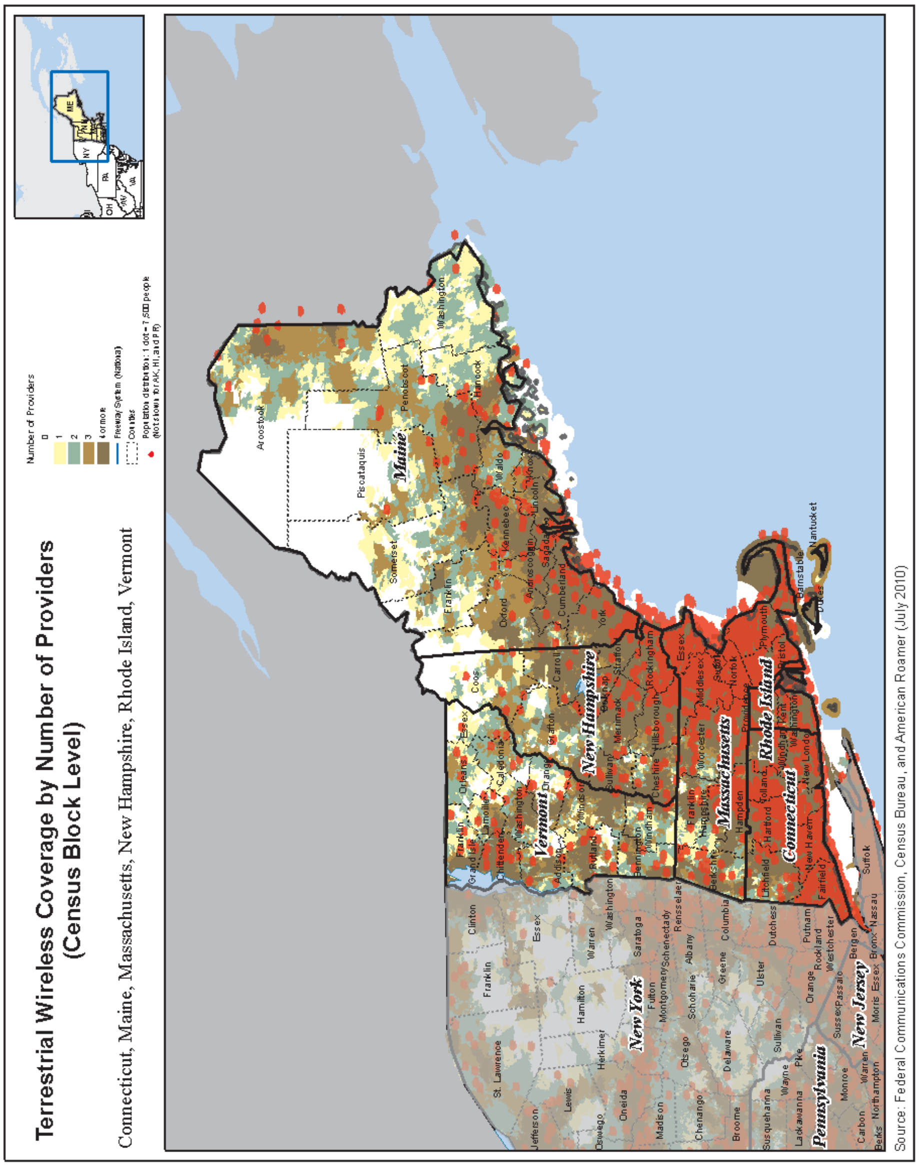
Map D-11: Wireless Coverage by Number of Providers by Region (4)



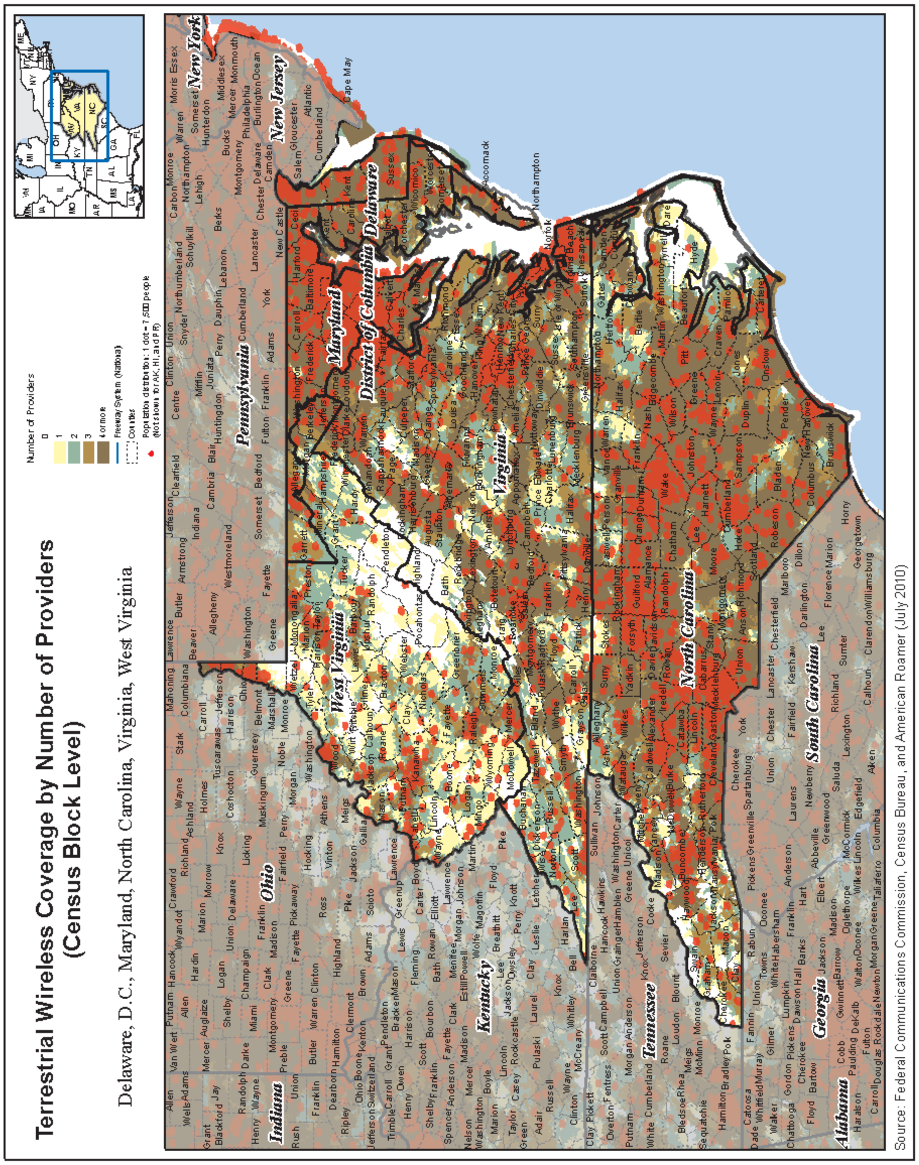
Map D-12: Wireless Coverage by Number of Providers by Region (5)



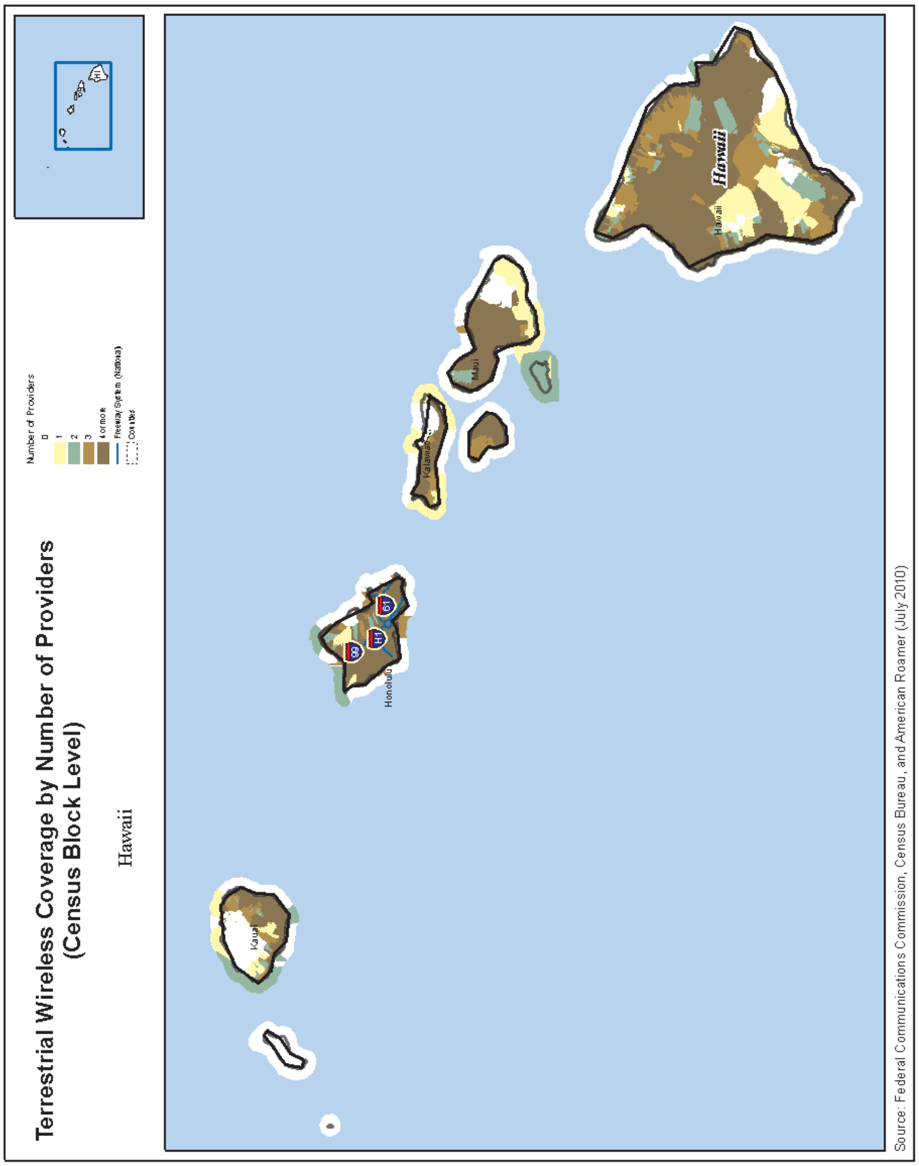
Map D-13: Wireless Coverage by Number of Providers by Region (6)



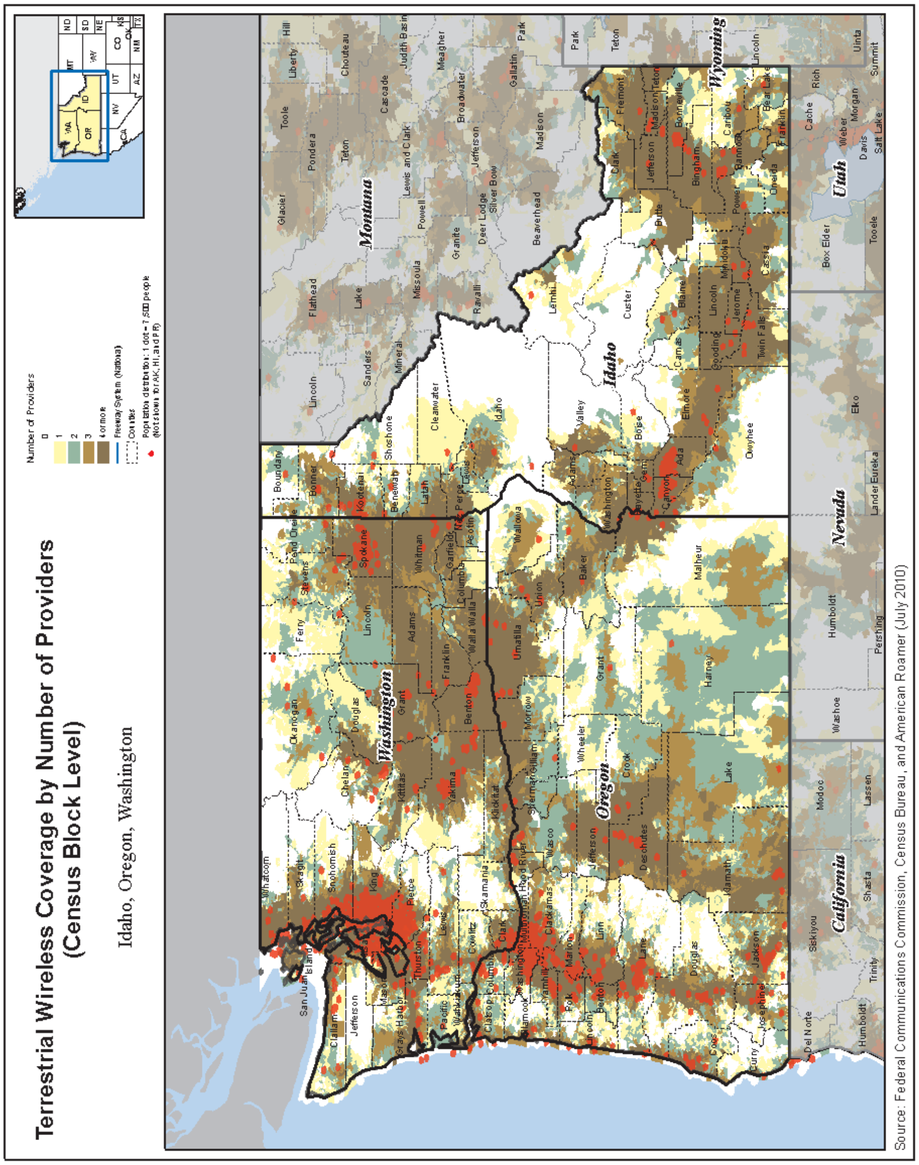
Map D-14: Wireless Coverage by Number of Providers by Region (7)



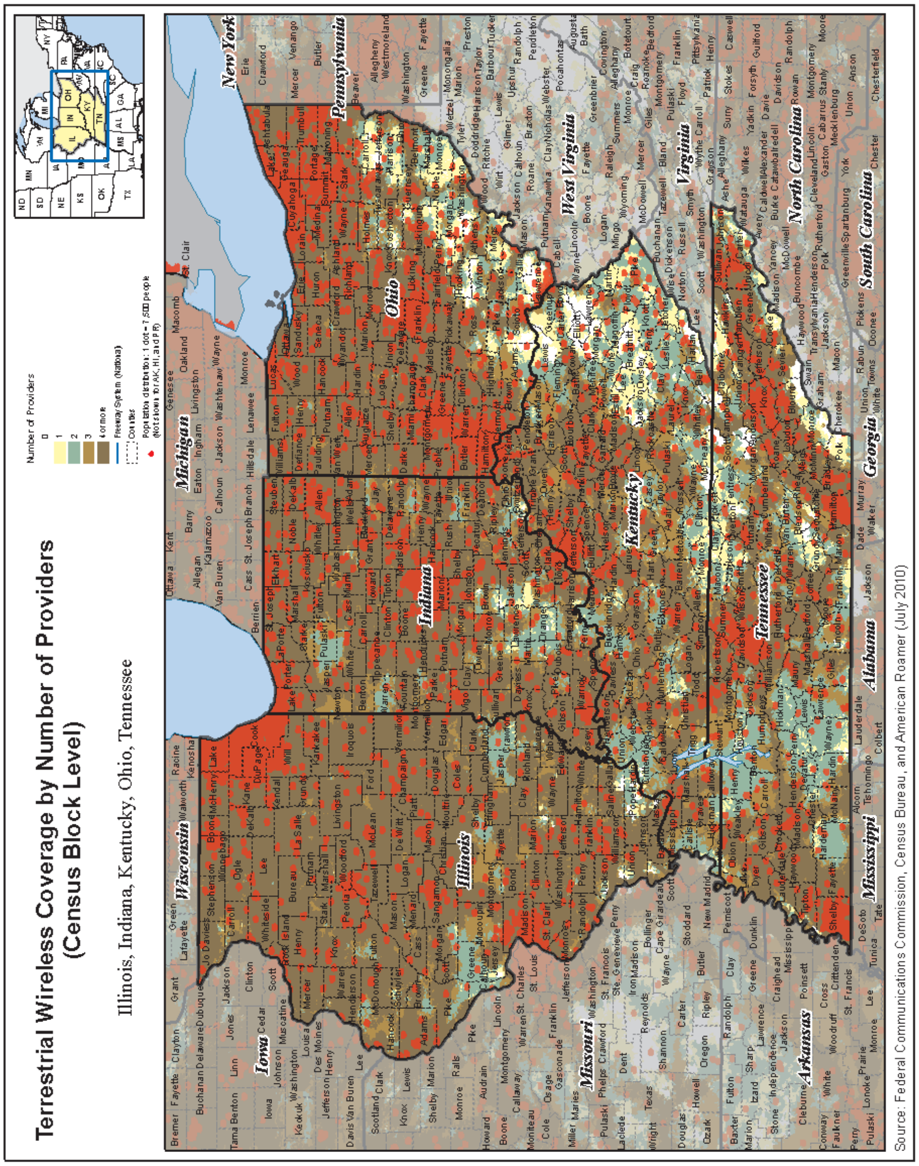
Map D-15: Wireless Coverage by Number of Providers by Region (8)



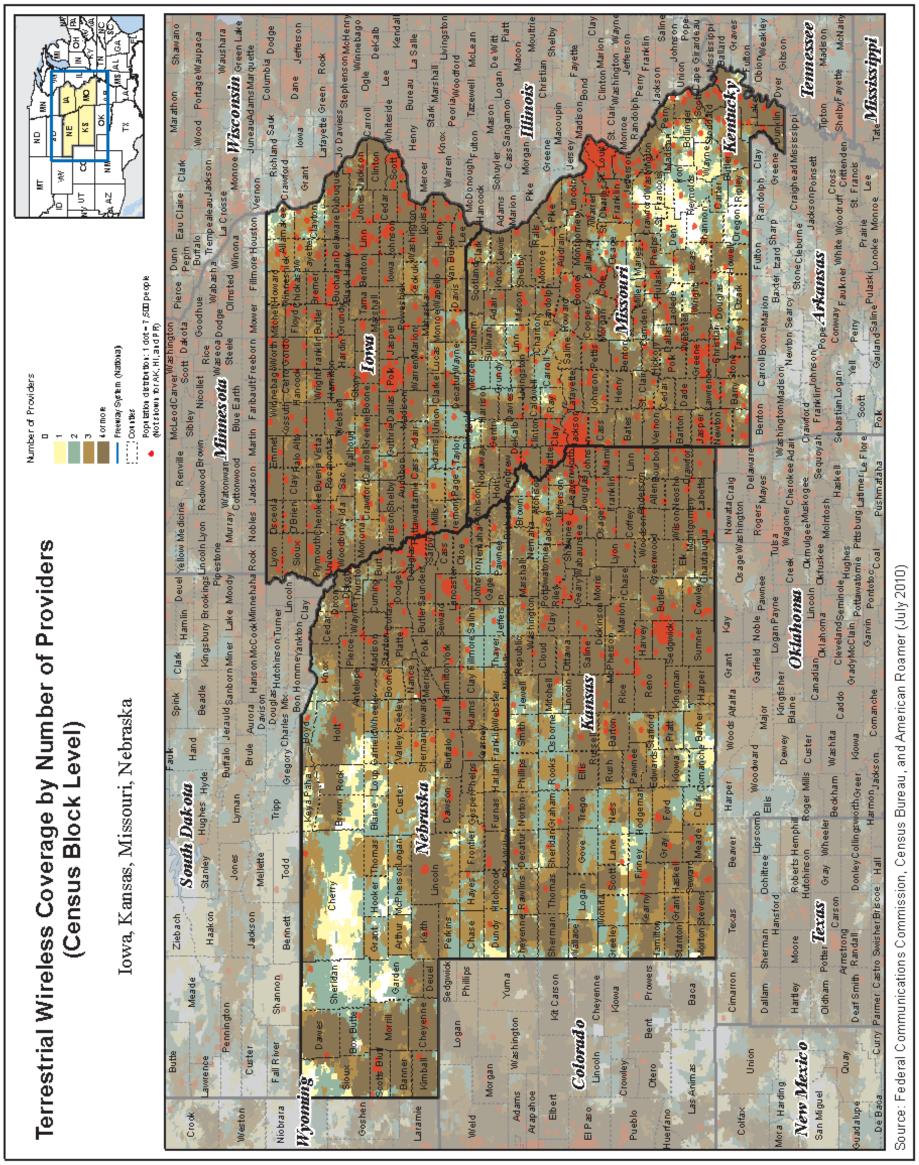
Map D-16: Wireless Coverage by Number of Providers by Region (9)



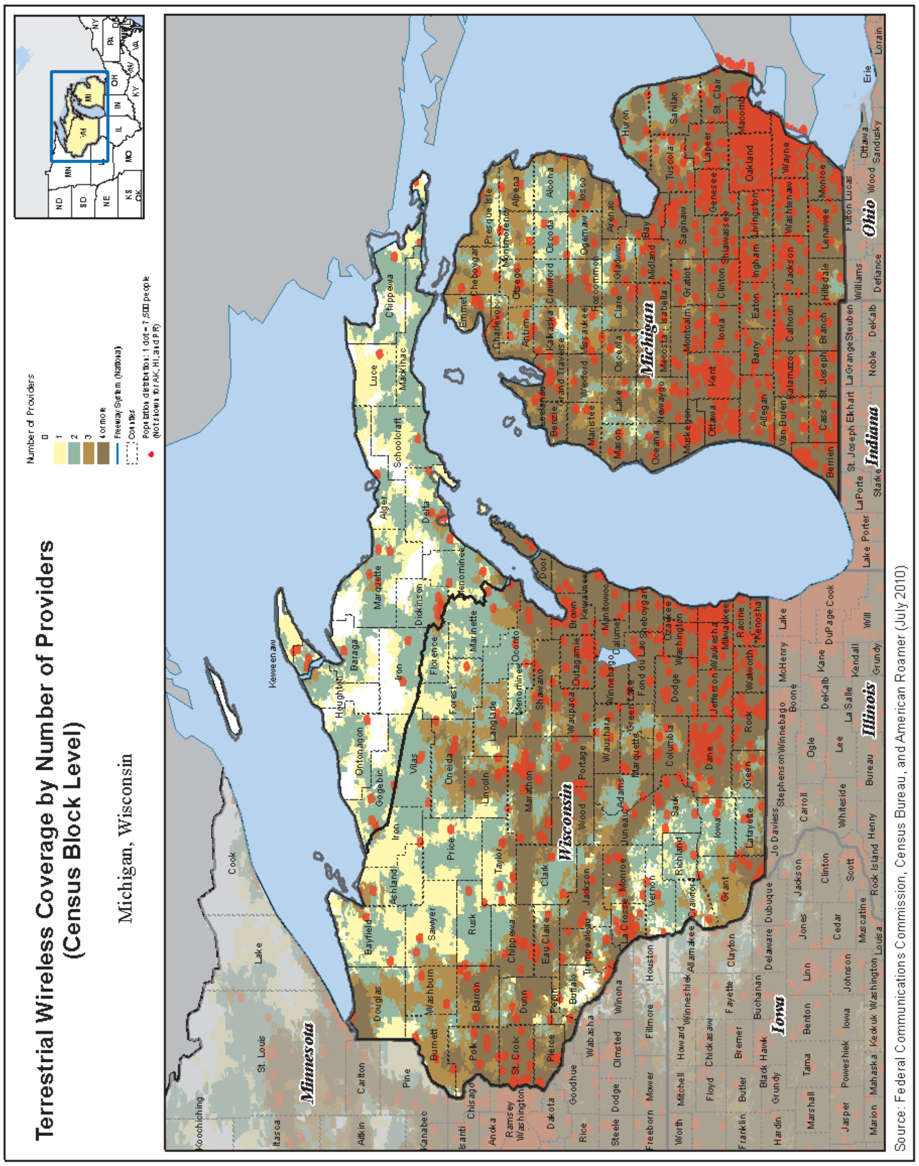
Map D-17: Wireless Coverage by Number of Providers by Region (10)



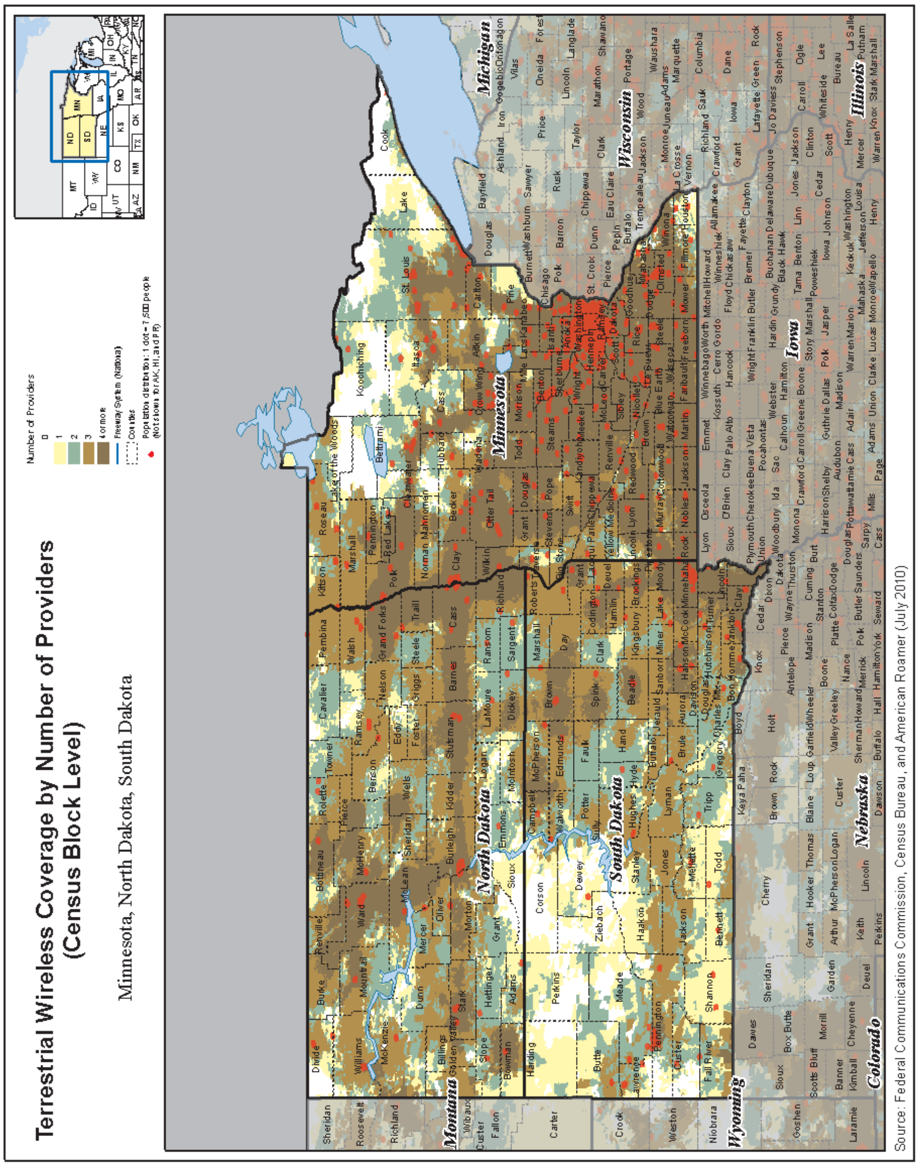
Map D-18: Wireless Coverage by Number of Providers by Region (11)



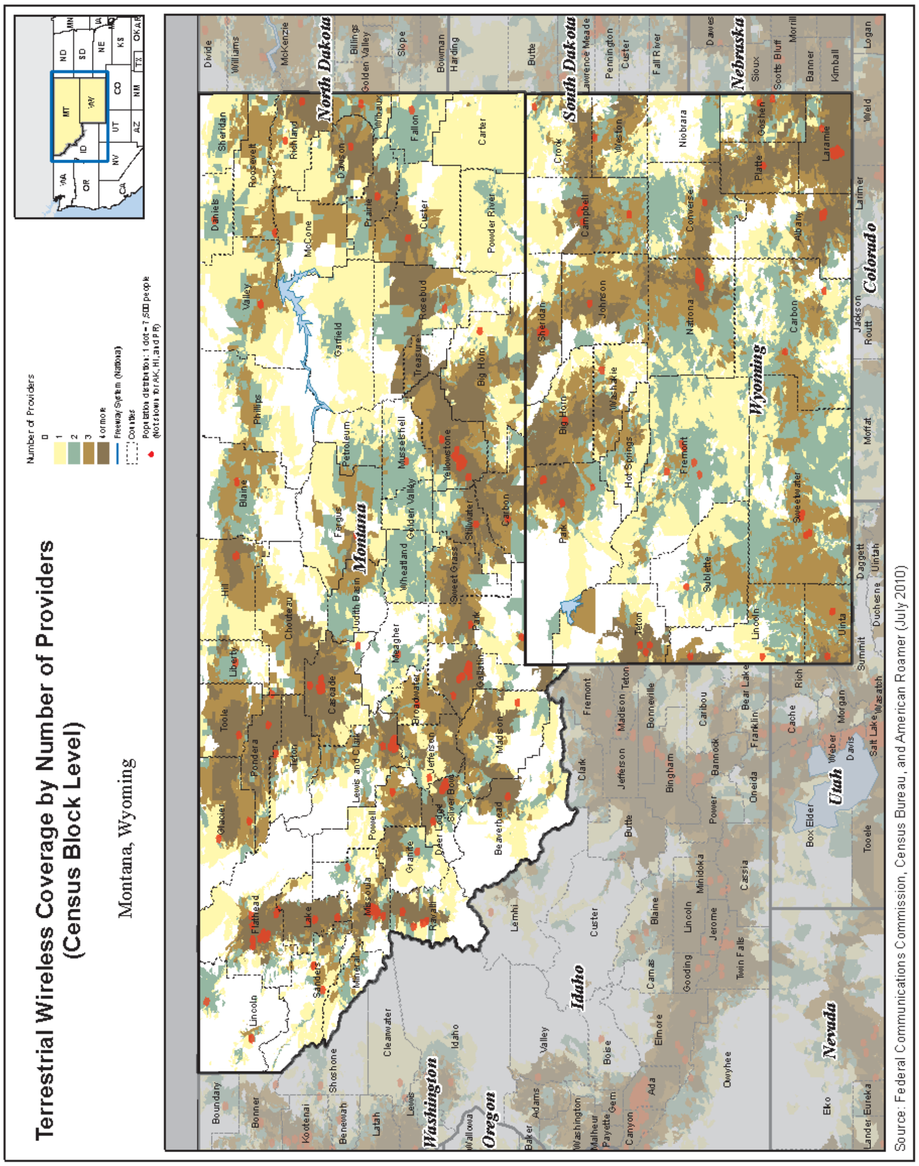
Map D-19: Wireless Coverage by Number of Providers by Region (12)



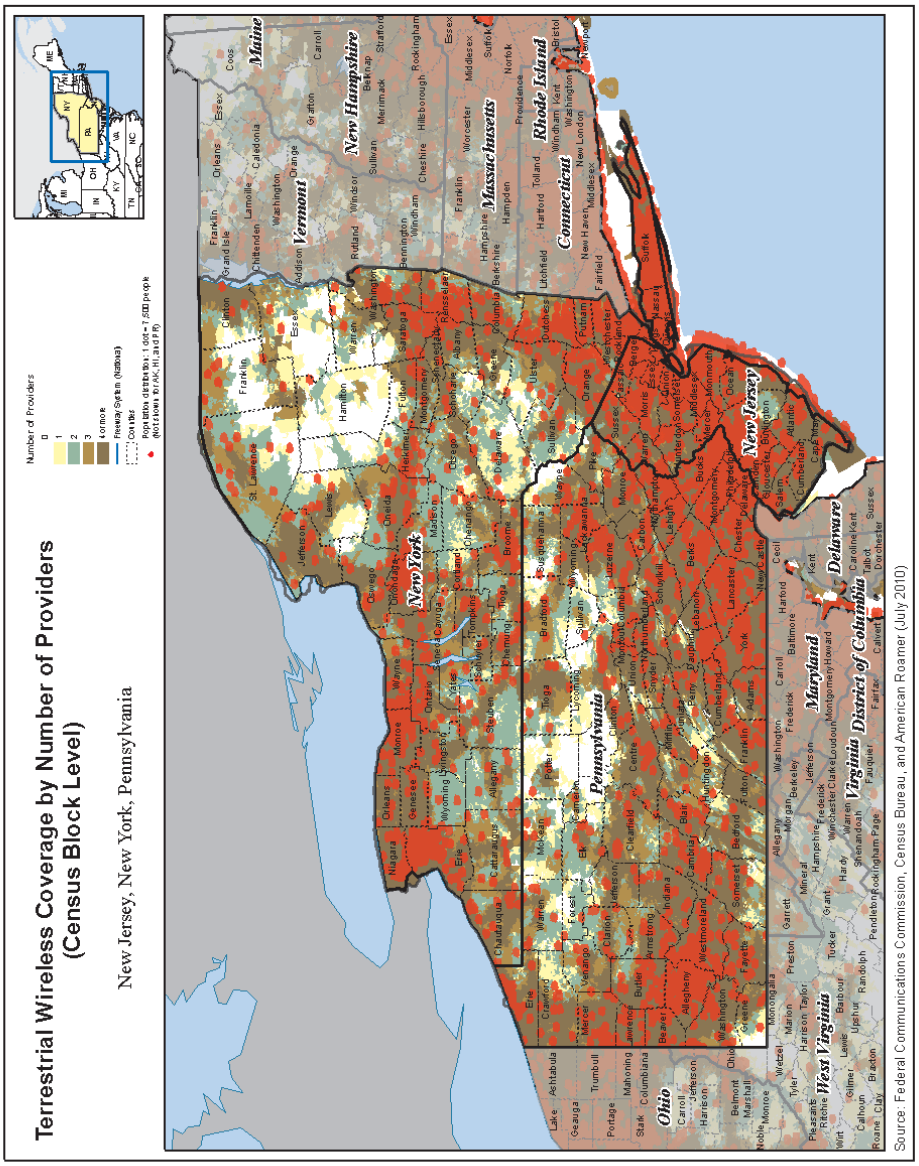
Map D-20: Wireless Coverage by Number of Providers by Region (13)



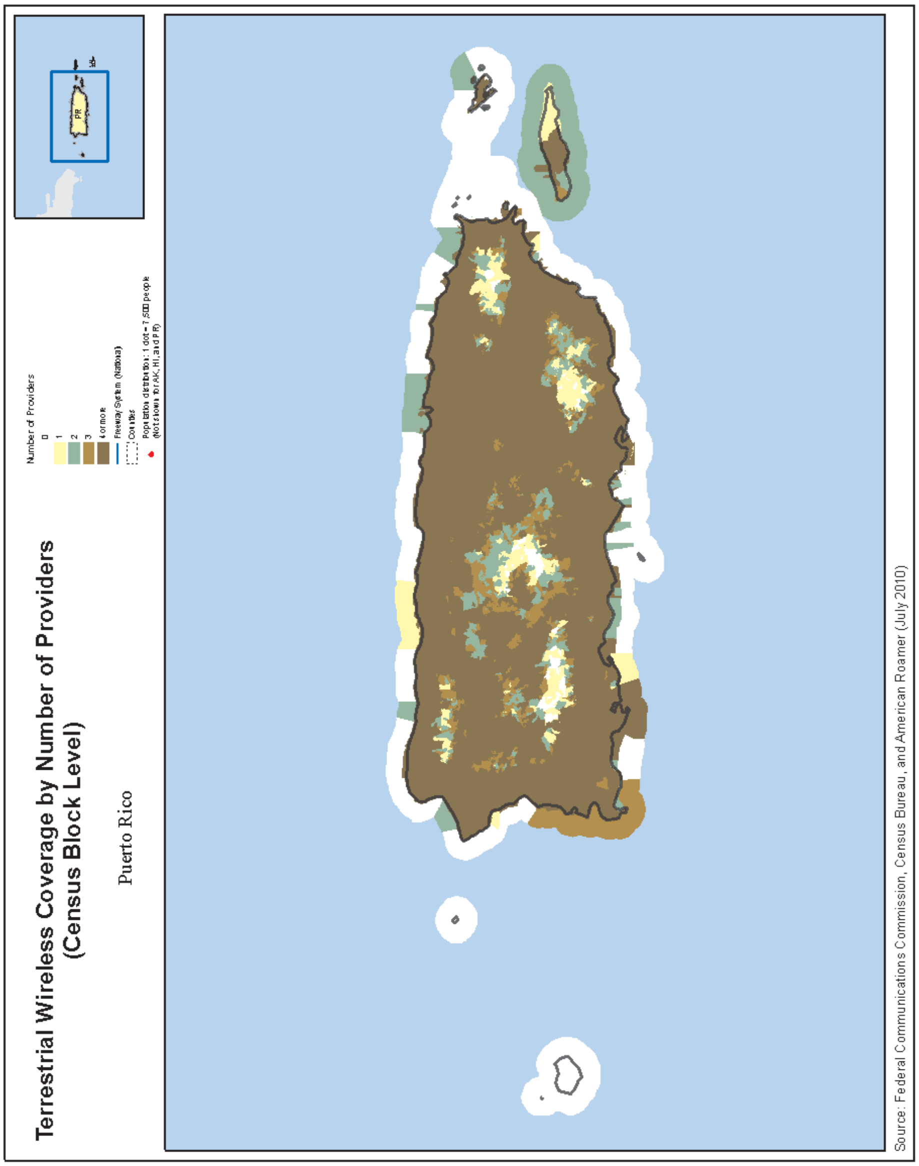
Map D-21: Wireless Coverage by Number of Providers by Region (14)



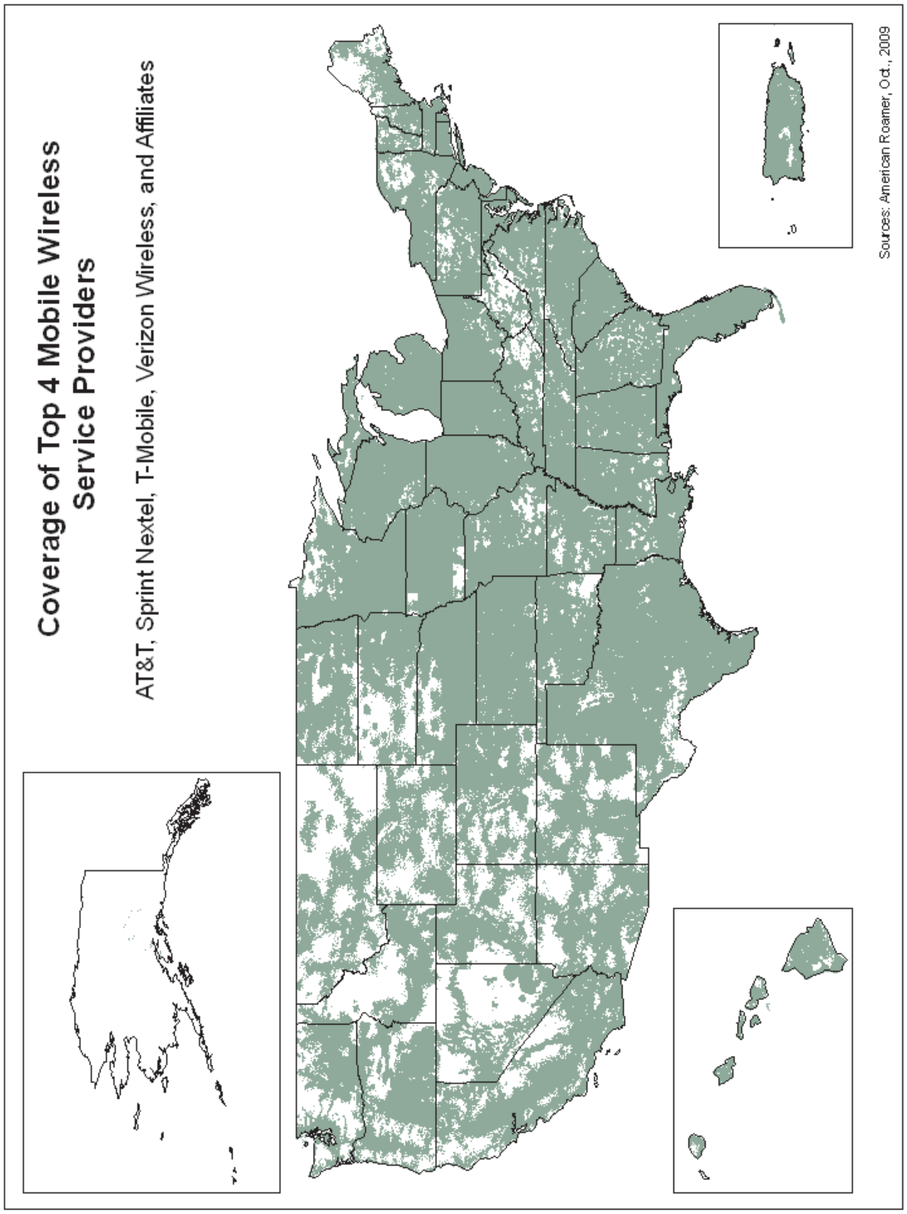
Map D-22: Wireless Coverage by Number of Providers by Region (15)



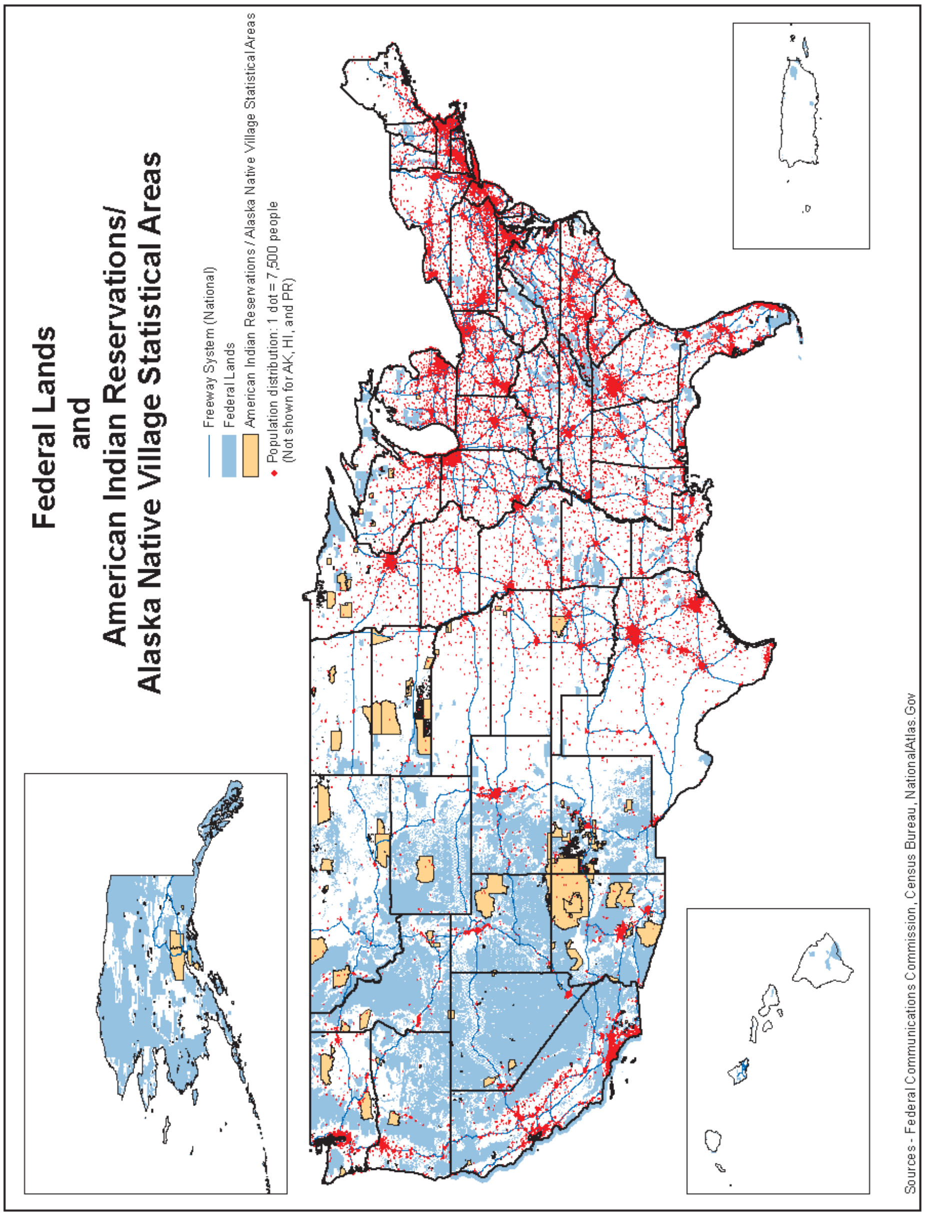
Map D-23: Wireless Coverage by Number of Providers by Region (16)



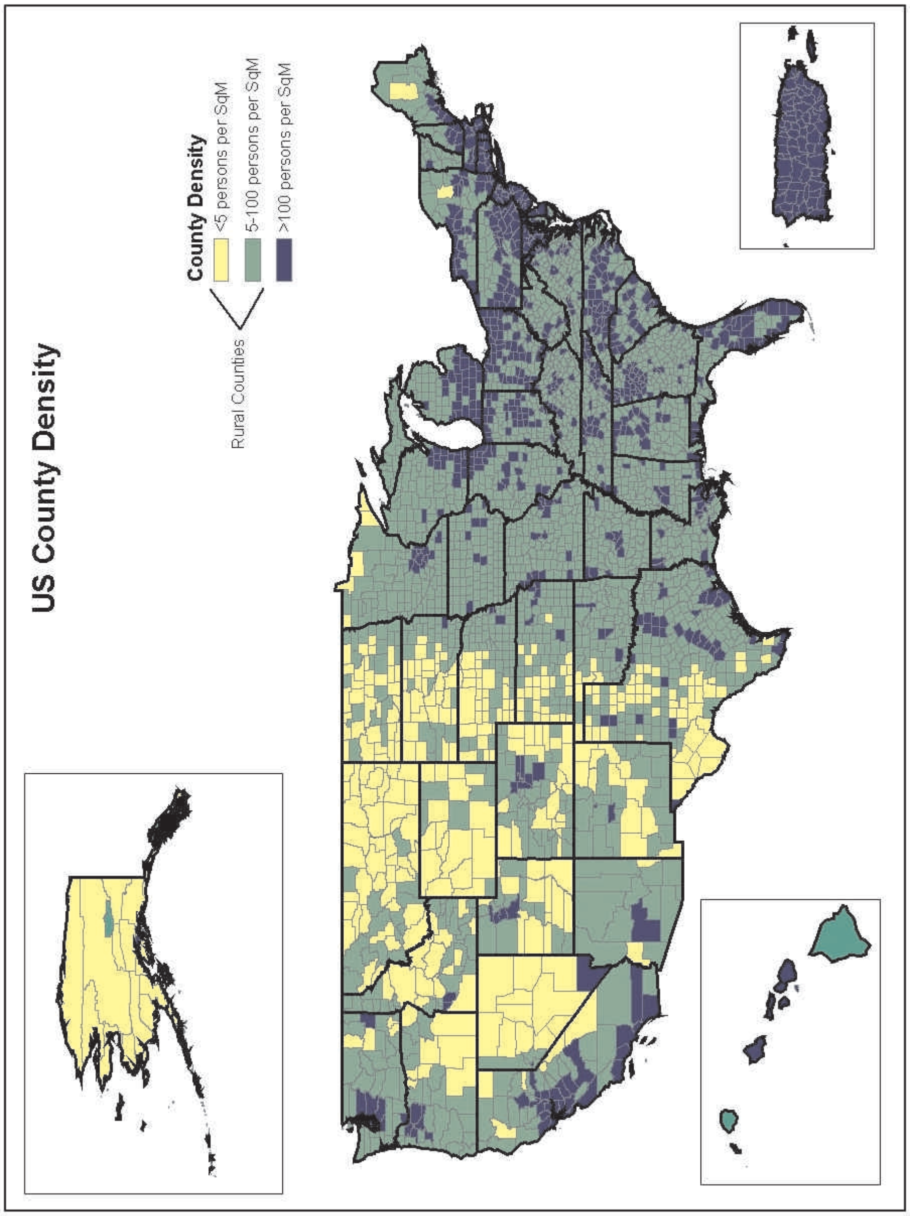
Map D-24: Coverage of the Top 4 Mobile Wireless Service Providers



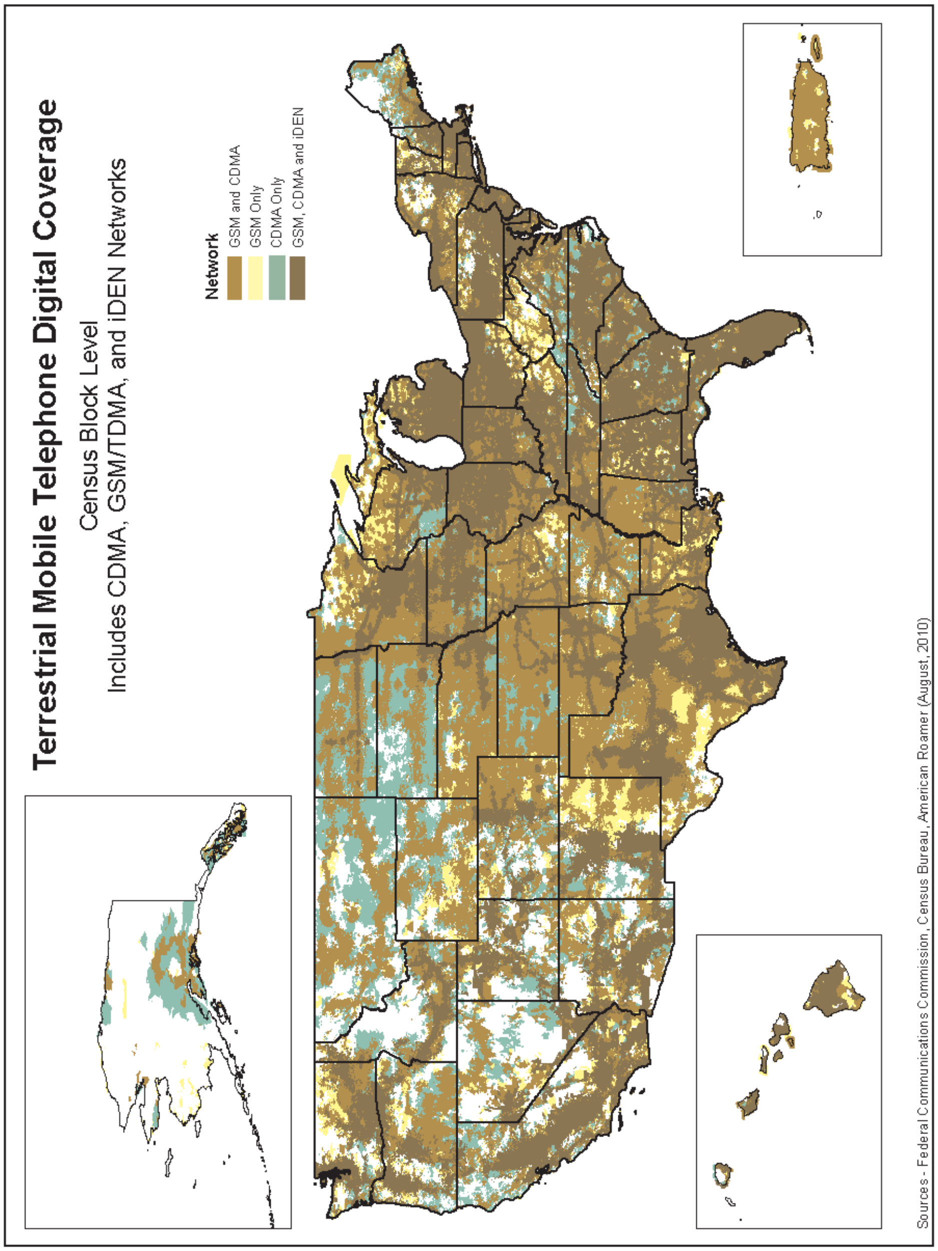
Map D-25: U.S. Federal Lands



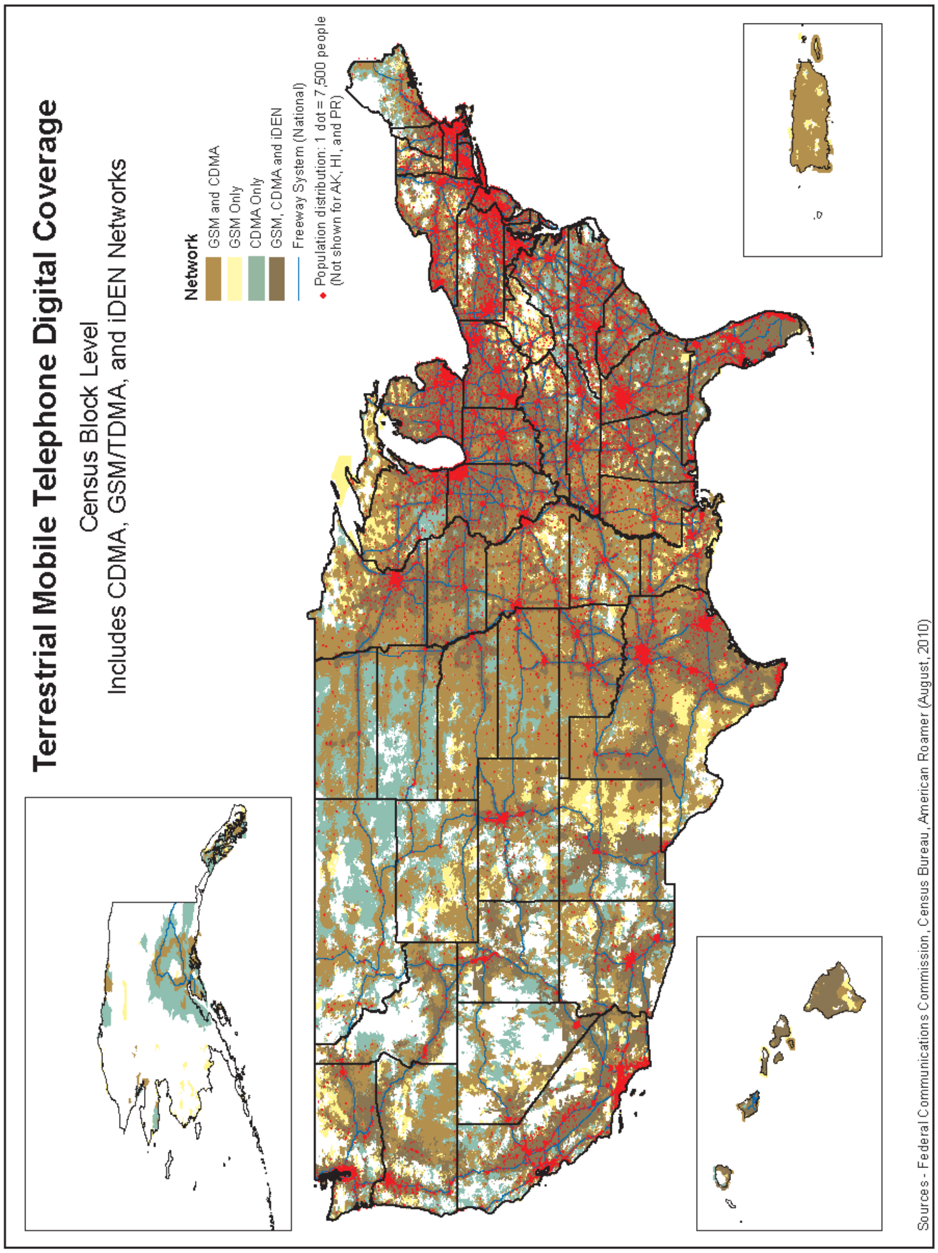
Map D-26: U.S. County Density



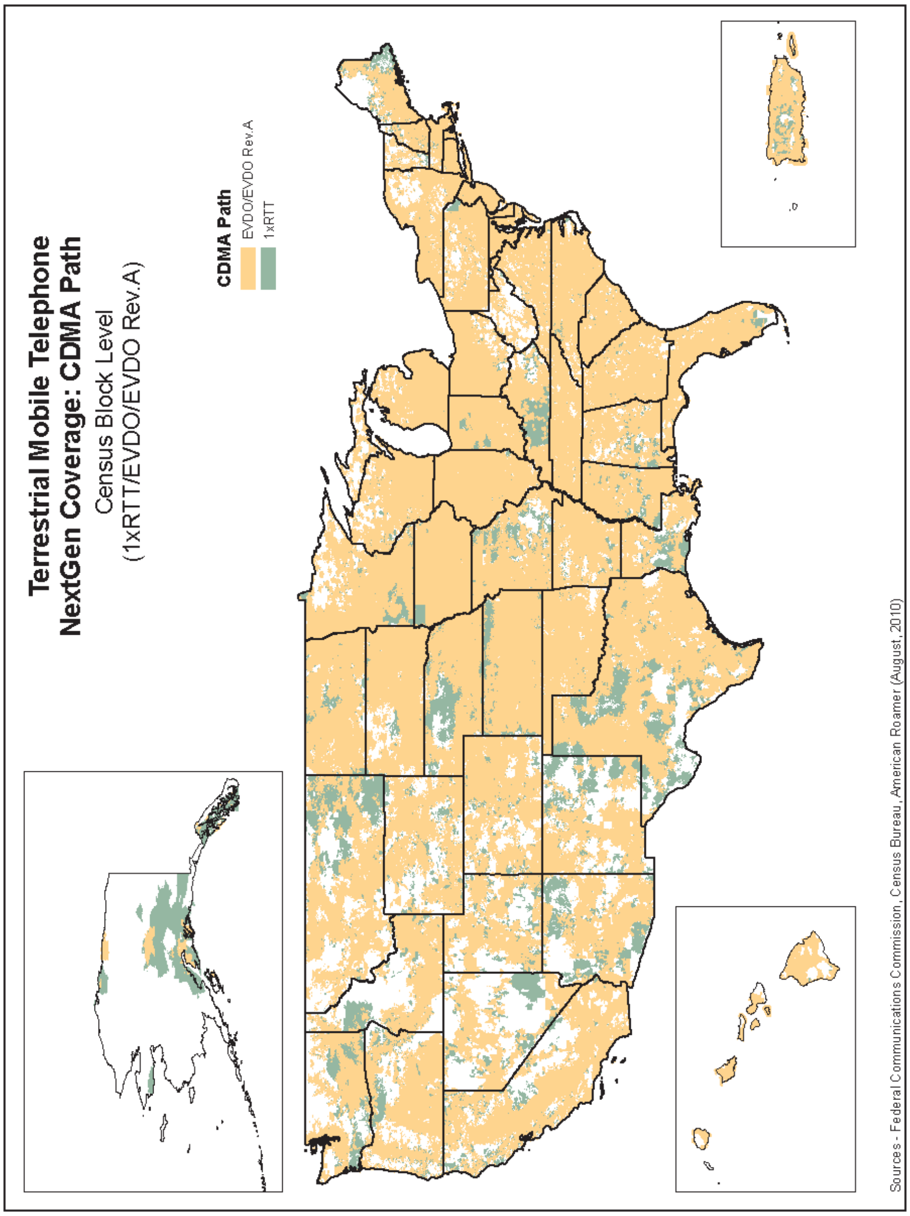
Map D-27: Mobile Wireless Digital Coverage



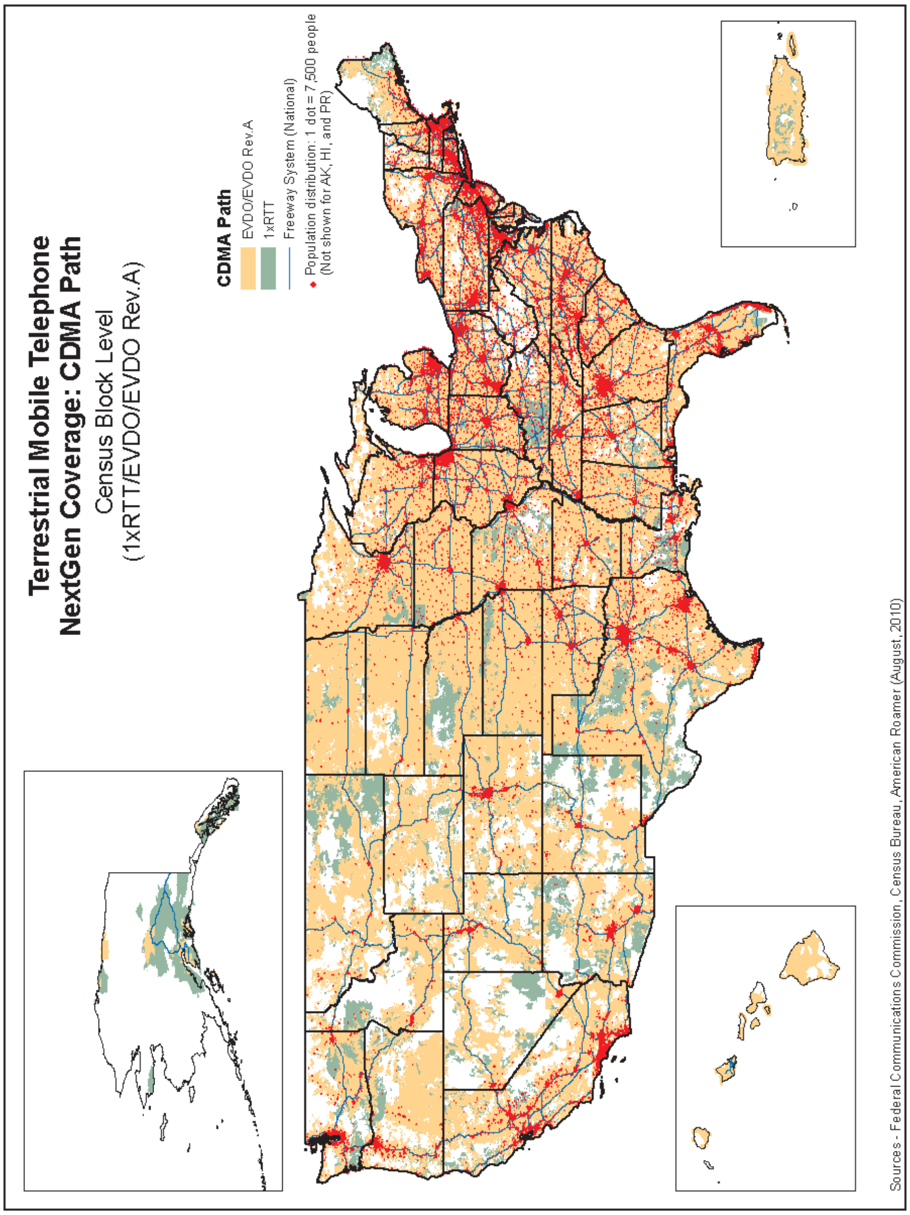
Map D-28: Mobile Wireless Digital Coverage (2)



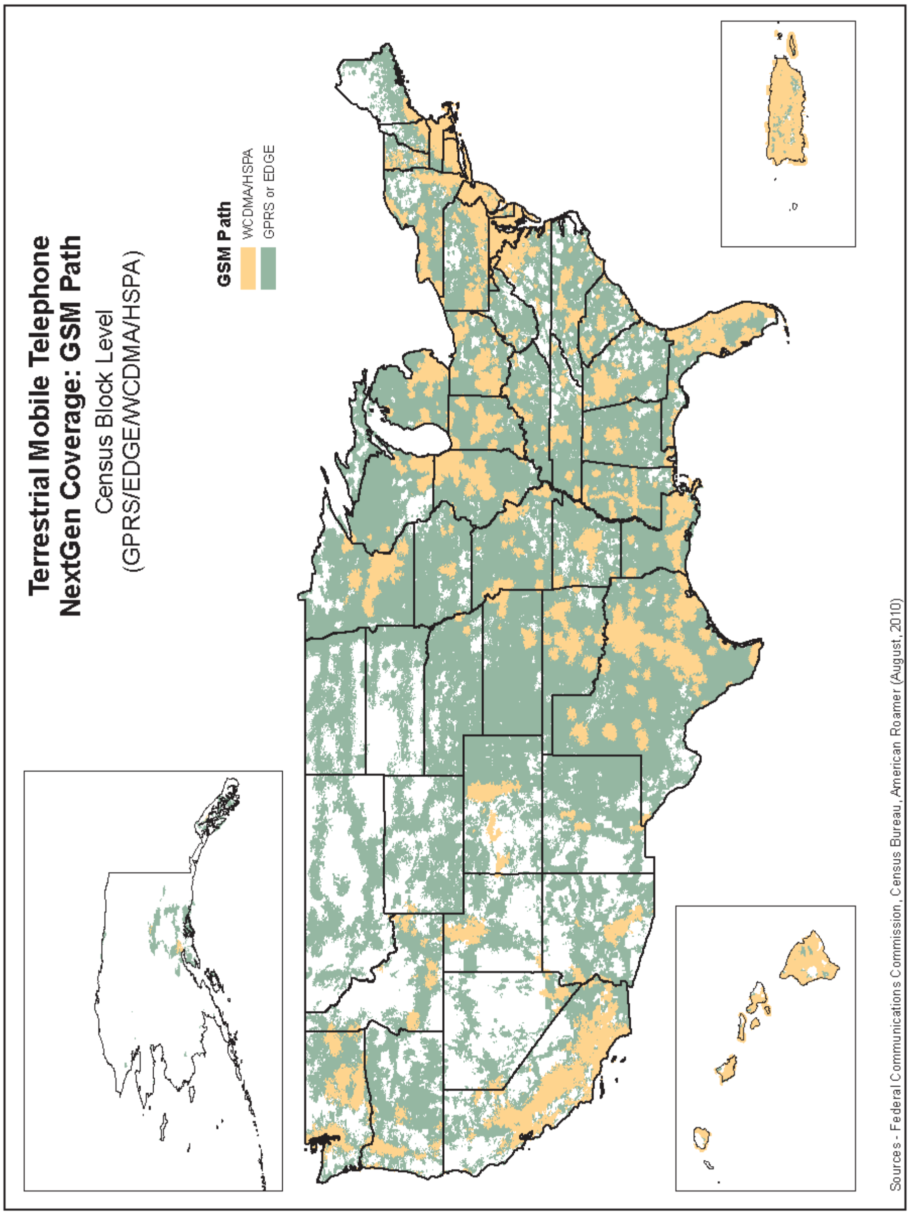
Map D-29: Mobile Wireless NextGen Coverage: CDMA Path



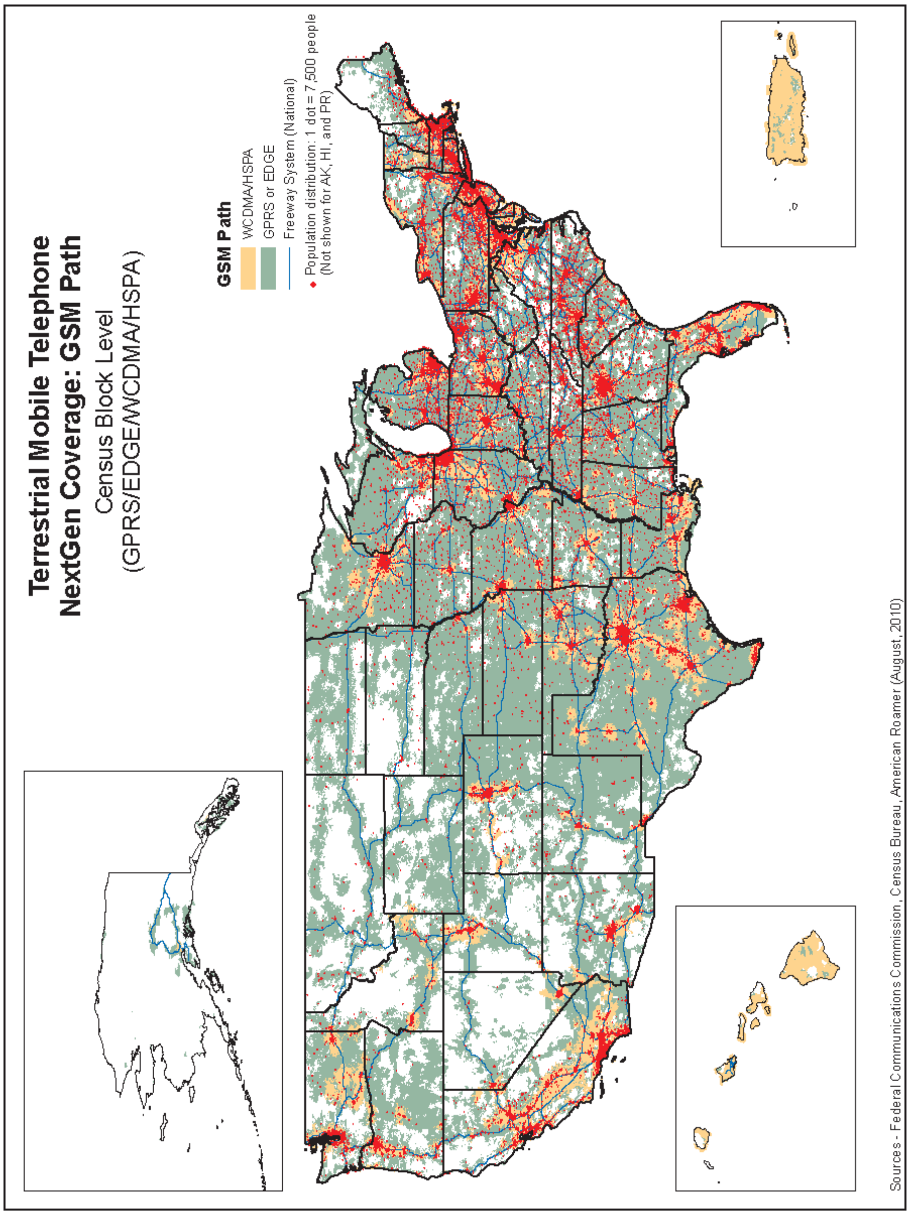
Map D-30: Mobile Wireless NextGen Coverage: CDMA Path (2)



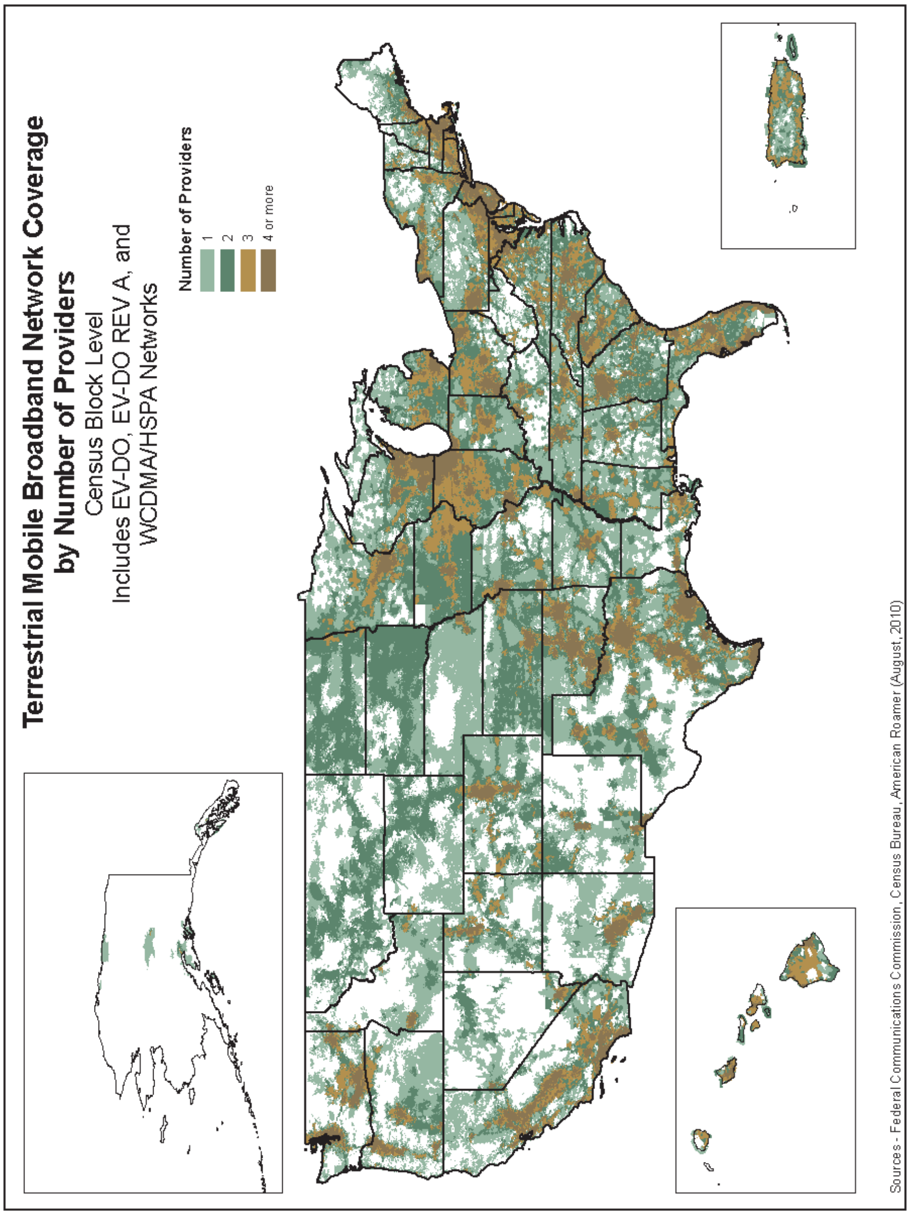
Map D-31: Mobile Wireless NextGen Coverage: GSM Path



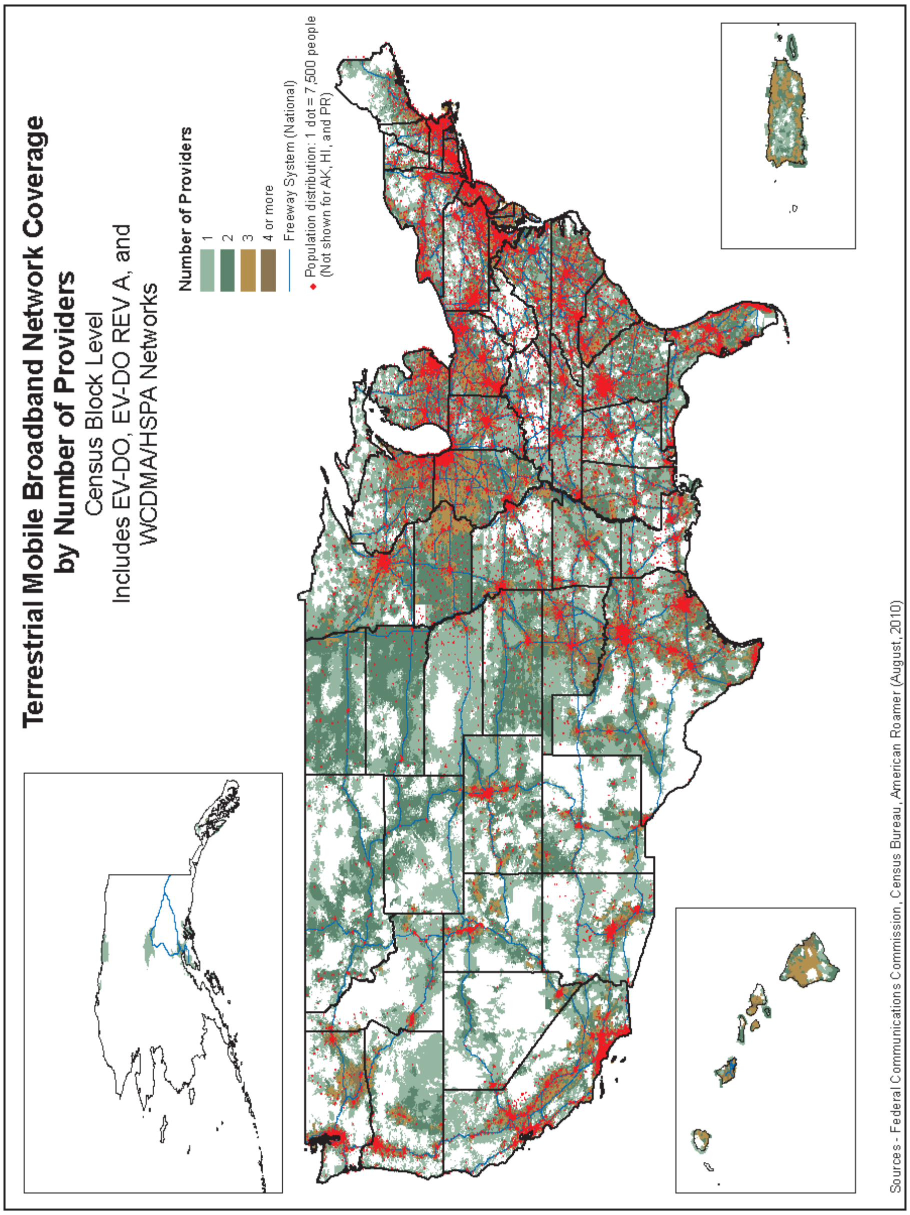
Map D-32: Mobile Wireless NextGen Coverage: GSM Path (2)



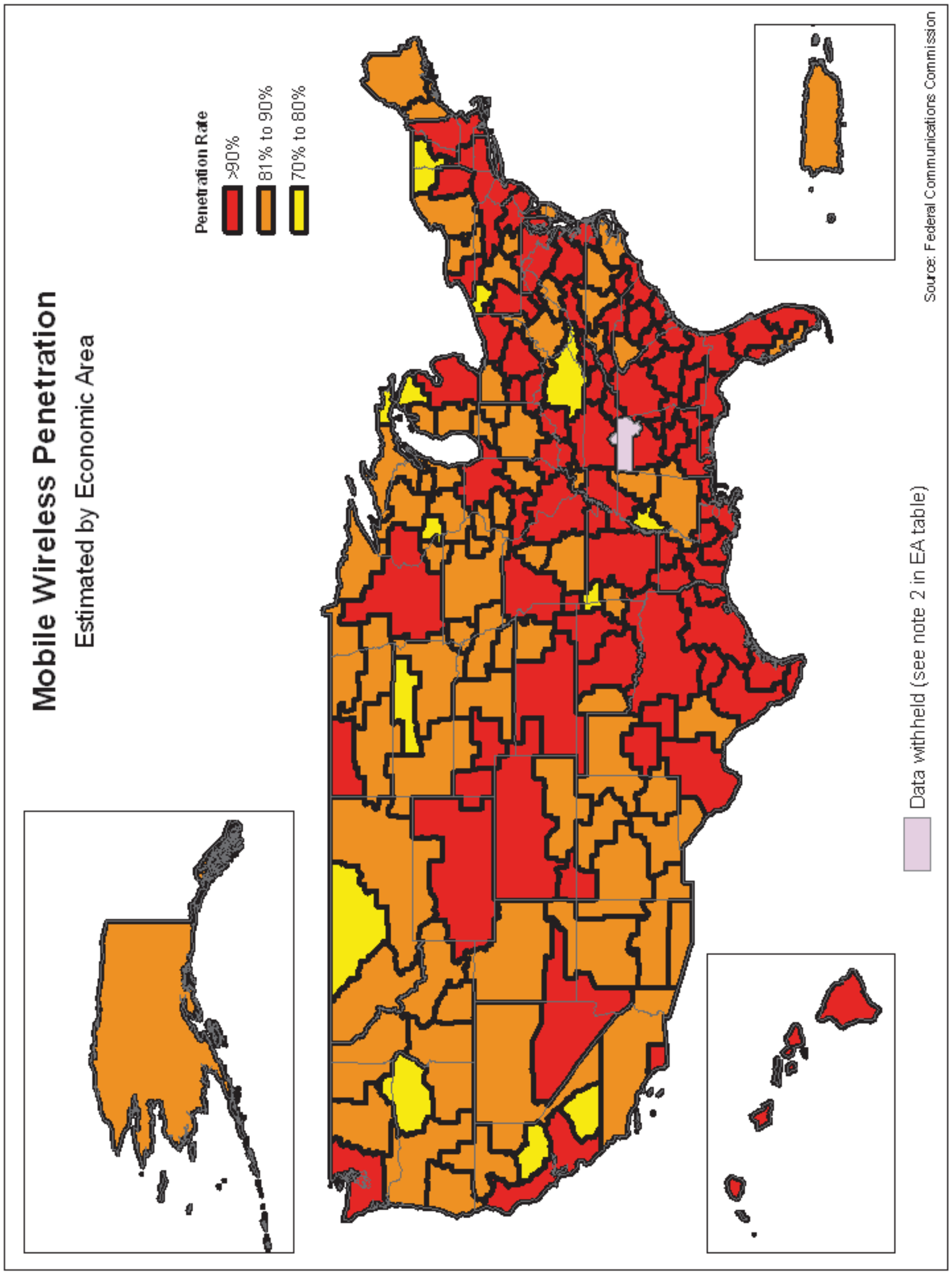
Map D-33: Mobile Broadband Network Coverage



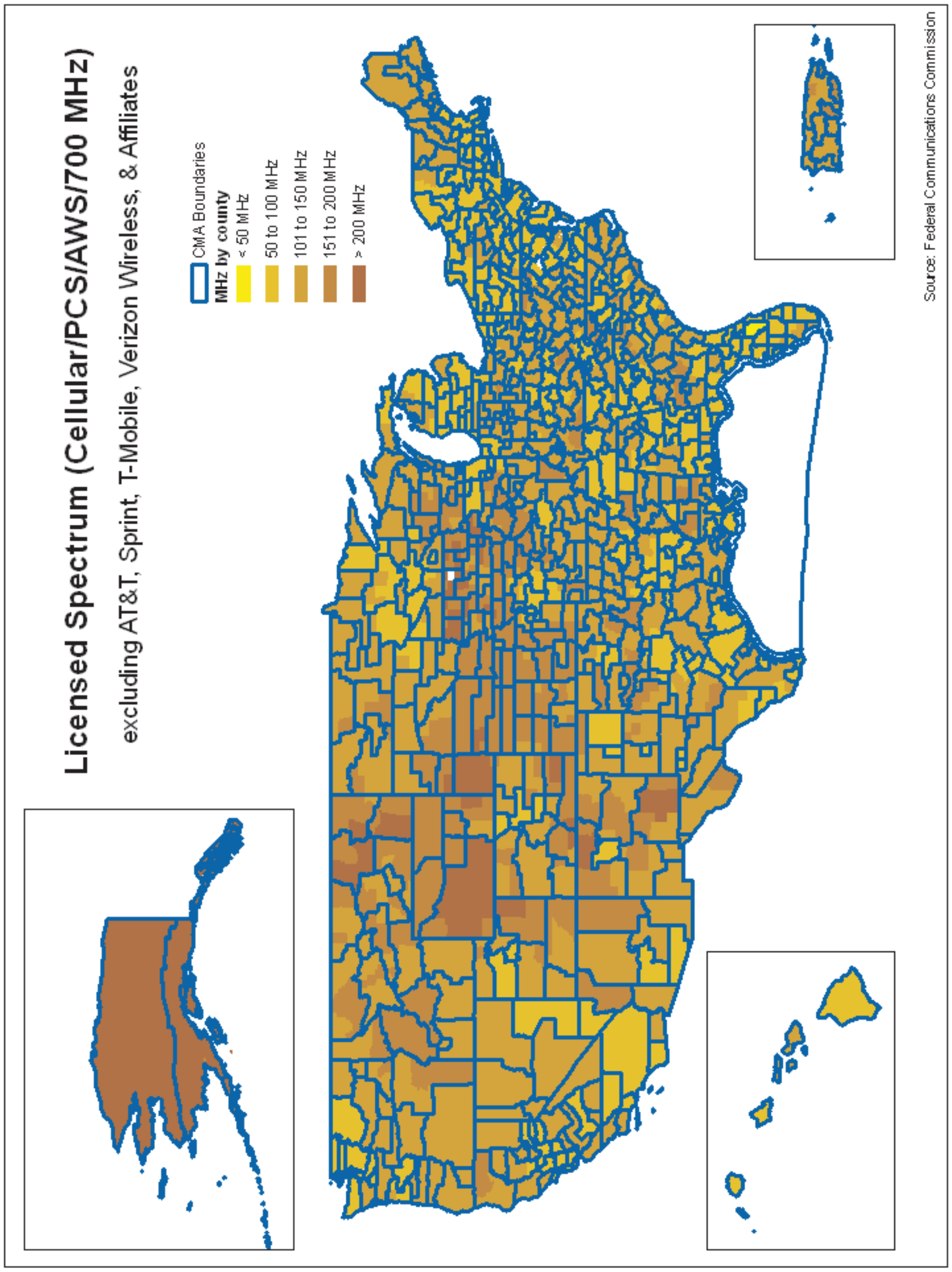
Map D-34: Mobile Broadband Network Coverage (2)



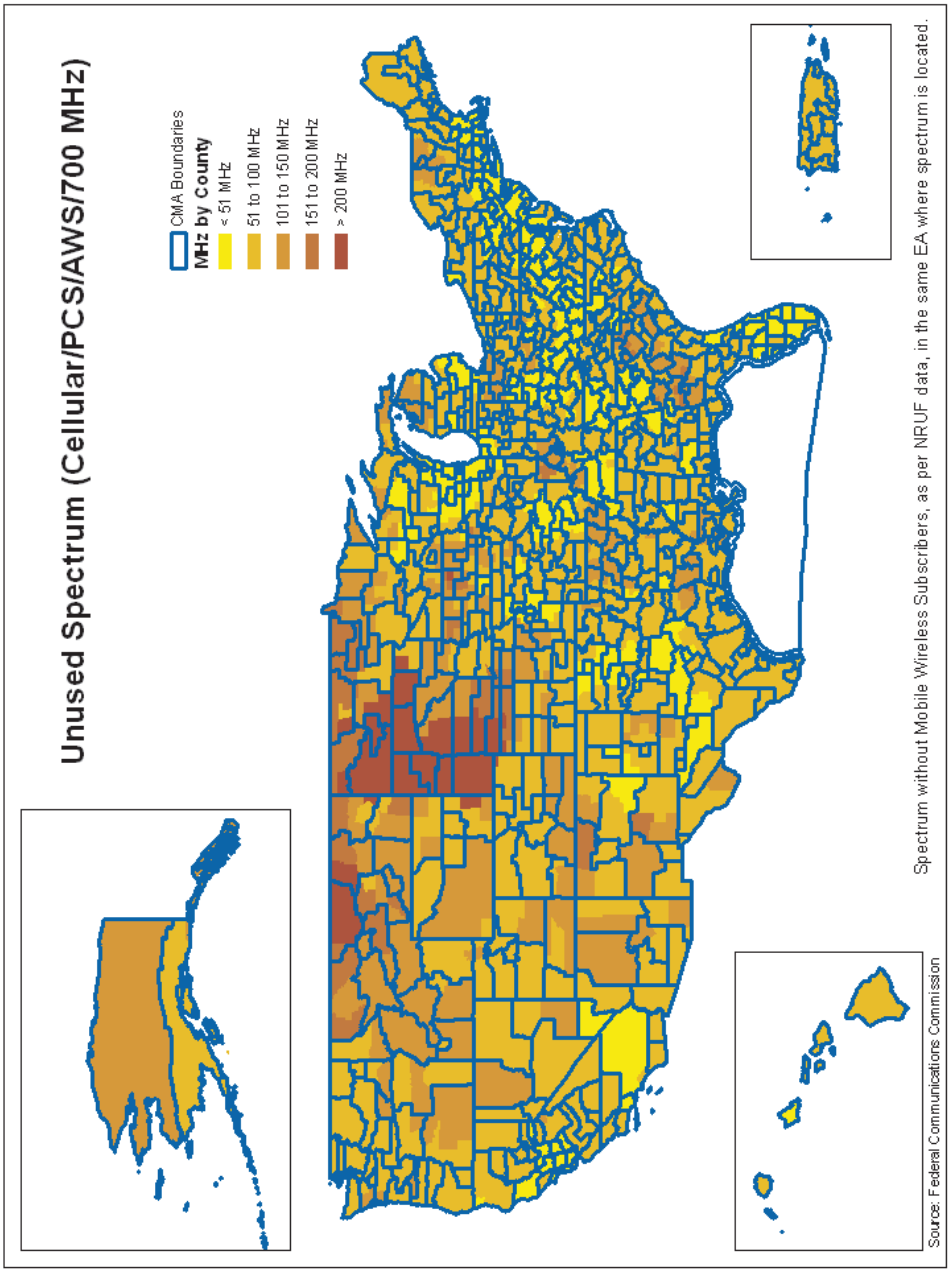
Map D-35: Mobile Wireless Penetration By EAs



Map D-36: Spectrum Not Licensed to the Nationwide Providers and Their Affiliates



Map D-37: Available Licensed Spectrum



APPENDIX E

Index of Acronyms

2G	Second Generation
3G	Third Generation
4G	Fourth Generation
ALMB	Average Local Monthly Bill
AMPS	Advanced Mobile Phone System
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
DRA	Deficit Reduction Act of 2005
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
HP	Hewlett Packard
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
ISM	Industrial, Scientific, and Medical
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
PDA	Personal Digital Assistant
PHS	Personal Hot Spot
PN	Public Notice
POPs	population (people)
PR	Public Relations
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 F

List of Commenters

Public Notice Comments

AT&T Inc. (AT&T)
CTIA – The Wireless Association (CTIA)
Free Press and Media Access Project
MetroPCS Communications, Inc. (MetroPCS)
Mobile Future
MSS ATC Coalition
National Telecommunications Cooperative Association (NTCA)
PCIA – The Wireless Infrastructure Association (PCIA)
Rural Cellular Association (RCA)
Rural Telecommunications Group, Inc. (RTG)
Satellite Industry Association (SIA)
Sprint Nextel Corporation (Sprint Nextel)
Verizon Wireless

Public Notice Reply Comments

AT&T Inc. (AT&T)
Cricket Communications, Inc. (Cricket)
CTIA – The Wireless Association (CTIA)
T-Mobile USA, Inc. (T-Mobile)
United States Cellular Corporation (US Cellular)
Verizon Wireless

STATEMENT OF
COMMISSIONER MICHAEL J. COPPS

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. 10-133*.

I am pleased that this year's mobile competition report builds on the leaps and bounds of progress over previous reports that began with last year's Fourteenth Report. This year's report again recognizes the on-the-ground reality that mobile is about much more than voice. The analysis of voice, data and text services provides Congress with an updated picture of the state of competition in commercial mobile service markets. The report brings further improvements, showing us, for example, how the number of competitors in an area varies by consumer income. Although we deliver the product to Congress, we would be remiss if we at the Commission did not use this report to consider the effects of our policy decisions on the mobile market.

But we should not allow this progress to stop us from continuing to improve the report going forward. I note, for example, that we continue to rely on third parties to furnish us most of the data on pricing and investment. I would prefer to have the Commission gather and verify this data ourselves. Good regulatory decisions depend on good data. Similarly, while I am pleased to see that mobile service covers vast swaths of our land, the report's coverage maps and network performance data are based on what carriers advertise and how each carrier defines coverage. The report acknowledges that this likely overstates actual coverage, and we have asked about actual performance for data services in our Form 477 notice. With the technology increasingly available to validate coverage and performance claims, shouldn't we, the expert agency, be moving toward a model of what consumers are actually experiencing?

Finally, I cannot ignore some of the darkening clouds over the state of mobile competition. The headline for this Report will be that the FCC neither finds nor does not find effective competition. Dig deeper and, sure enough, we find ongoing trends of industry consolidation. The well-accepted metric for market concentration, the Herfindahl-Hirschman Index, remains above the threshold for a "highly concentrated" market. It also appears that consumers are no longer enjoying falling prices, according to the CPI for cellular services. We know there is a looming spectrum crunch and a growing need for backhaul. There is no doubt that the mobile market is an American success story, and there are many ways to measure industry health. But it would be foolish and decidedly not in the public interest to ignore the facts this Report reveals. If we want Americans to continue to enjoy innovation, affordability and improved mobile coverage, we must heed these facts and continue to examine areas where the Commission can act to encourage mobile competition.

Thank you to the Chairman and the Wireless Telecommunications Bureau for bringing us this data-rich, well presented report.

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. 10-133*.

The record in this proceeding, and the report itself, contain a wealth of facts that demonstrate the important role the mobile industry plays in the lives of everyday Americans, not to mention in the U.S. economy. The wide-ranging and competitive wireless sector has and continues to deliver innovative services at low cost, all the while exhibiting some of the most impressive capital expenditure numbers of any industry in the world. The greatest beneficiaries of these investments are American consumers who have steadily incorporated advanced wireless technologies into their daily lives.

I vote to concur because we have not identified new or particularly revealing information that would prevent us from opining as to "whether or not there is effective competition," as the statute requires. In fact, the report states, "[i]t would be overly simplistic to apply a binary conclusion or blanket label to this complex and multi-dimensional industry." Nonetheless, this is what Congress asked us to do.

Yet, at its core, the report shows that the wireless sector is dynamic, ever-improving and responsive to consumer demand. With respect to mobile broadband service providers, the percentage of the population served by *four or more* providers increased from 58 percent in November 2009 to 68 percent in August 2010. And, the percentage served by *three or more* providers increased from 76 to 82 percent. In rural areas, 69 percent have a choice of *two or more* providers and 38 percent have a choice of three or more providers.

To put this progress in a historic context, for 2008, these numbers were 62 and 29 percent respectively. That said, we can and we must do better. Bringing the benefits of mobile broadband to rural America is an important priority. At the same time, given these examples of good news, we *all* should tread cautiously lest we jeopardize the compelling consumer benefits associated with the ongoing rollout of mobile broadband services.

I thank outgoing chief Ruth Milkman, incoming chief Rick Kaplan, and the entire team of the Wireless Telecommunications Bureau. This is a tremendous body of work and we are 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. 10-133*.

I commend Ruth Milkman and the talented staff of the Wireless Telecommunications Bureau, for continuing the approach they took in the Fourteenth Mobile Report. As this Fifteenth Report reaffirms, the percentage of American households which rely solely on mobile wireless providers for their phone service, increases each year. As the importance of the mobile services industry grows, so should the amount of information the Commission collects to evaluate the structure of that market. Therefore, the Commission should continue to gather more data about the key input segments such as spectrum, towers, backhaul, and transport facilities, as well as the outputs, such as voice services, text messages, Internet access services and other data applications. More information on these relevant factors improves the Commission's ability to make policy decisions to ensure that the mobile services market can bring the tremendous benefits of innovation in mobile services to all American households. In this regard, I was particularly pleased to see that this Report, for the first time, includes an analysis of how the number of mobile service providers, which have coverage in a census tract, varies according to median income levels.

I still find it troubling that despite the billions of dollars that have been invested to provide wireless coverage to most parts of our country, millions of Americans living in rural parts of our country do not enjoy the competitive choices available in metropolitan areas. As the Report points out, more than seven million Americans still live in rural census blocks with two or fewer mobile service providers. In addition, more than 37 million Americans live in rural census blocks that have two or fewer choices when it comes to mobile broadband services.

In my separate statement last year on the Fourteenth Mobile Services Report, I encouraged commenters to provide more information about how the Commission could spur deployment of networks in rural areas. I applaud the Chairman and the Bureau for presenting us, this March, with an NPRM that sought comment on creative proposals to spur more mobile network development on Tribal Lands. I also appreciate the efforts of some providers, such as Verizon Wireless, that have sought to partner with smaller service providers to deploy more advanced mobile broadband networks in rural areas. It would be great if we could see other creative solutions to provide Americans with more competitive options for mobile broadband service.

I am disappointed however, to see that just as with last year's Report, the staff could not calculate unit price measures for mobile broadband data services as this is becoming an increasingly important mobile wireless service. There is evidence before this Commission that this is especially the case for those segments of the population, such as communities of color and people living in low-income areas, which use their mobile devices to access the Internet more than other Americans.[1] Also, according to the

[1] John B. Horrigan, Broadband Adoption and Use in America at 5 (Federal Communications Commission) (2010) (Whereas 30 percent of all American adults access the Internet from a mobile device, 39 percent of African Americans and 39 percent of Latinos access the Internet from a mobile device); Letter from Latinos for Internet Freedom to Marlene H. Dortch, Secretary, FCC, GN Docket No. 09-191 (filed Dec. 2, 2010), at i ("Lower barriers to (continued….)

Report, the staff did not have sufficient information, for the first time in several years, to calculate unit prices for text messaging. The Commission needs revenue information specifically about mobile broadband use and text messaging, so that it can thoroughly evaluate if consumers are benefitting from lower prices for mobile data services -- a key element in an analysis of the mobile wireless market's performance. I encourage the industry to work with Bureau staff in arriving at the least burdensome approach to provide the Commission with the information it needs to properly evaluate the mobile data services market.

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adoption have facilitated the widespread use of the mobile Internet in communities of color and low-income areas, where many individuals would otherwise go without Internet access altogether. . . . [M]any of our constituents rely exclusively on mobile wireless Internet access as their onramp to the web.").