

**REMARKS OF
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4G AMERICAS TECHNOLOGY BRIEFING
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Thank you Chris Pearson for that kind introduction. Thank you also to 4G Americas for having me here today. More importantly, thank you for the work you do to ensure the Americas are out in front when it comes to wireless communications.

Your success is borne out in the facts. The United States—and the Americas—lead the world in 4G LTE wireless deployments. While we are home to less than 5 percent of the globe's population, we have nearly half of all LTE subscriptions worldwide.

The world has taken note. I can say this with confidence, because just last week I was in Austria, where I represented the United States at the annual gathering of the International Institute of Communications. So I was able to sit down in Vienna with colleagues from around the world and talk—over some spectacularly strong coffee—about what we have accomplished here on our shores.

We can be proud. But we also have more work to do. Because laurels are not, in fact, good resting places. Because I'll say it first—4G Americas, you are in for a name change. It's 5G Americas we need to be talking about and thinking about—and without endorsing a specific technology, it's 5G service I want to speak to you about today.

If you think I'm early on this one, I'm not. Because once you start looking, the evidence is all around. Slowly but surely, the world's wireless economies are planning for 5G. Last year, South Korea announced plans to run its first 5G trials by the time it hosts the Winter Olympics. That's just three years away. Not to be outdone, Japan's Ministry of Internal Affairs and Communications announced that it hopes to roll out 5G service in a number of cities by 2020—the year that Tokyo hosts the Summer Olympics.

Other parts of the world have stepped up their efforts, too. Earlier this year, the European Commission entered into a cooperative agreement with South Korea. They plan to work together on a global definition of 5G service and cooperate on 5G research. Meanwhile, last year in China three of the nation's ministries jointly established a group to promote the development of 5G technologies.

So we have signs that the rest of the world is on the road to 5G. There is no need for the Americas to stay in the starting gate. We need to build on our 4G success—and get going right now.

The good news is we have a terrific opportunity to get started with a Notice of Inquiry that the Federal Communications Commission will be voting on later this week. It starts the process of thinking about what airwaves are best suited for next-generation wireless networks.

This is more than some hum-drum Notice of Inquiry where we ask questions about a technology that is far off or on the margins of consideration. This is our 5G starting gun. We can line up together—operators, equipment manufacturers, and government—and get going together. Because if we work together, we are going to get further and faster down the road to 5G together.

To do this right, we cannot continue with spectrum policy limited to the same-old, same-old tools and techniques. We need to think differently about spectrum—about high-band spectrum, about federal spectrum, and about unlicensed spectrum. I want to talk to you about all three today.

First, high-band spectrum.

Today, the bulk of our wireless networks are built on spectrum ranging from 600 MHz to 3 GHz. This is the current sweet spot for mobile communications.

But the future could look different—very different. We are moving from networks designed for analog voice to networks designed for high-speed digital data. To keep up with escalating data demand, our next generation networks are going to have to do some heavy lifting. They will need to accommodate more traffic coming from more devices at higher data rates. At the same time, they will need to lower latency and conserve power to extend battery life. Well, that sounds easy, right?

So how do we meet these demands? We can meet them if we no longer limit ourselves to frequencies in the traditional range. We need to look elsewhere. The only question is where.

We can look down—and that includes spectrum in the 400 MHz band.

But I really think we need to look up. Way, way, up. Let's bust through our old 3 GHz ceiling. Let's take a look at spectrum all the way up in the 60 GHz range—and maybe all the way to 90 GHz. At these ranges, we can aggregate spectrum and allow data intensive applications to ride across hundreds of megahertz at a time.

But these stratospheric frequencies mean more than just wide channels. The physics here are different. That means real propagation challenges, but also new opportunities to think about 5G network topology. Because if you mix those wide channels with small cells packed close together, you can densify networks at lower cost. This, in turn, can mean service that reaches further into buildings at faster speeds than ever before, especially in fast-growing areas with the greatest traffic demands.

Taking advantage of these millimeter waves will require thinking through some novel technical and policy issues. But if we get them right, we will have a lot more resources to play with as we move to next generation networks. And if we get started soon, we are more likely to be successful.

Second, I want to talk about federal spectrum.

Millimeter waves can mean mobile data rates many times what we have today. But they are not, by themselves, enough to serve all of our wireless needs. Because it is important to remember that these high-band networks will need to work with our existing LTE and LTE Advanced networks—not replace them. That means we will still need to identify additional spectrum below 3GHz for commercial mobile use. But today, a significant portion of these airwaves are used by federal authorities.

In the United States, federal authorities have substantial spectrum assignments. That's because critical missions throughout the government are dependent on access to our airwaves. Federal authorities use their spectrum assignments to protect us from attack, manage our air traffic, enhance our crop productivity, and monitor our water supplies. They use them to protect against forest fires, predict weather patterns, and warn us of climate events. These activities are essential to our economic security and national well-being.

Still, we cannot be blind to the great increases in commercial wireless demand. Commercial wireless activity has been a powerful force our economy and we need to find spectrum for it to grow.

So we are on a hunt for new opportunities to fill the spectrum pipeline. We are looking for ways to take federal airwaves and repurpose them for commercial use. But our traditional process for doing so is growing creaky. It's based on sticks. We take a stick and knock on the door of federal authorities with spectrum assignments. We then urge, coax, and cajole them to provide us with some airwaves for the commercial sector. It takes time but after pressing and prodding they offer us a bit. Then we relocate the federal users and eventually get around to auctioning their old airwaves for new mobile use. This is a slow way to go when the wireless world is moving fast. It is not the steady spectrum pipeline our mobile economy needs.

That is why it is time for a federal spectrum policy that is based on carrots, not sticks. We need to develop a series of incentives to serve as the catalyst for freeing more federal spectrum for commercial use. We need to find ways to reward federal authorities for efficient use of their spectrum so that they see benefit in commercial reallocation—rather than just loss.

To do this, we have a lot of options. We could start with a valuation of all spectrum used by federal authorities to provide a consistent way to reward efficiency. We could develop incentives that are straightforward and financial—under which a certain portion of the revenue from commercial auction of their previously held spectrum would be reserved for the federal entity releasing the spectrum. We could also explore revenue opportunities from leasing or shared access, including during a period of transition to cleared rights. Or we could design auctions of imperfect spectrum rights, with the winning bidder given the opportunity to negotiate directly with the existing federal authority calling those airwaves home. This last option would require adjusting some laws, like the Miscellaneous Receipts Act. But if we made changes, we could provide updated spectrum or equipment to federal authorities being relocated—and speed the transition of their old airwaves to new commercial use.

In short, there are a lot of options and many methods for developing incentive-based federal spectrum policy. So how to decide? We could choose one approach, apply it across all federal agencies, cross our fingers, and hope for the best. But this is big. So I think there is an argument here to start small—in the sandbox. That’s because our work securing a reliable federal spectrum pipeline would benefit from some sandbox thinking.

Let me explain. Software developers often code “sandboxes” into their programs. A sandbox allows others to access a portion of the program without harming the host platform. It provides an opportunity to experiment within the program, minimizing the risk before introducing ideas on a broader scale. Entrepreneurs use sandboxes to test new ideas, assess consumer response, and study budding markets. It is a terrific tool for iterative learning. It’s no wonder, then, that the technology industry has been extending the idea of the sandbox to all sorts of developments.

So what if we applied this concept to federal spectrum? We could test incentives in a small way—maybe at a handful of agencies. We could see what works best. Then as we learn, we could expand these ideas on a broader scale. So by starting small, we can eventually go big. And given the importance of developing a federal spectrum incentive policy pipeline, I think now is not a moment too soon.

Third and finally, I want to talk about Wi-Fi.

We talk a lot in Washington about the growing demands on our airwaves. Most of this talk is about licensed spectrum. But I think it is time to give unlicensed spectrum its due. That’s because the spectrum that powers Wi-Fi and a slew of our daily activities is also getting crowded.

Why does this matter? The unlicensed spectrum economy is a big part of economic growth. By some measures, unlicensed spectrum contributes as much as \$140 billion to our economy annually. By any measure, that is a really big number. But it’s more than that, because the unlicensed economy is critical for Internet connectivity. Wi-Fi is an essential onramp to the Internet. And nearly one-half of wireless data connections in the country are now offloaded onto unlicensed spectrum. It may not be intuitive, but it means that unlicensed spectrum is essential for managing the flow of traffic on licensed airwaves.

So I think it’s time to leave behind the tired notion that we face a choice between licensed and unlicensed airwaves. Because good spectrum policy requires both.

As we migrate to 5G, I think we need to keep this front of mind. To tell you why, let me return again to Europe. Earlier this year I had the privilege of being in Barcelona at the Mobile World Congress. I saw technologies that amaze. Cars that warn you even before they break down. Wearables that monitor your health down to the microsecond. Systems that monitor crops and predict problems with livestock. None of these technologies rely on a single spectrum band to function. Instead, they overcome spectral and physical challenges by moving from frequency to frequency, sometimes on spectrum that is licensed and sometimes on spectrum that is unlicensed.

So if we want to do big things, we need to take page from this future. We should move beyond old dichotomies that pit licensed versus unlicensed spectrum. Because across the board we need to choose efficiency over inefficiency and speed over congestion—and we need to look at how more Wi-Fi can help us do it.

To this end, in the United States we recently set aside 100 megahertz of spectrum for unlicensed use in the 5 GHz band. Soon, we will also free up new guard bands in the 600 MHz band for unlicensed use. This is great for now. But going forward, the challenge will be making sure that we continue to set aside spectrum for unlicensed use. After all, in the rush for revenue there can be a bias to auction. But it is important to remember the role unlicensed spectrum plays in the broader economy. And it is important to remember the role unlicensed spectrum plays in enhancing the value of licensed spectrum. And it is absolutely vital to recognize that as we migrate to the Internet of Things and 5G service the ways we use wireless services, including unlicensed spectrum—are going to change and multiply—exponentially.

So there it is—three key policies along the road to 5G. I think getting there will require more high-band spectrum, more incentives to help fill the federal spectrum pipeline to create new opportunities for commercial use, and more creative thinking about Wi-Fi. Now my markers for the road ahead may not all pan out as I've set them out here. But what is certain is that for the rest of the world, the race to 5G is on. We need to get going. And I am certain that you—4G Americas—who have been so critical to our success to date—can also help us lead the way and make it happen.

Thank you.