

**REMARKS OF
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“FIVE IDEAS FOR THE ROAD TO 5G”
LEADERSHIP FORUM ON 5G: THE NEXT GENERATION OF WIRELESS
WASHINGTON, DC
FEBRUARY 9, 2016**

Good afternoon. Thank you for inviting me to join you today to speak about the future of connectivity, the future of wireless—and the future of 5G.

But before I get to the future, I want to quickly make note of the past. Yesterday was the twentieth anniversary of the Telecommunications Act of 1996, the last major rewrite of our nation’s communications laws. Twenty years! This law is no longer in its adolescence. Just think, in another year we’ll be able to take it out for a drink.

Two decades is a lifetime in communications. This is especially true with wireless technology. Until twenty years ago, most mobile phones were clunky and brick-like. The Motorola StarTac changed that when it was introduced in 1996. You remember this phone. It had a slim clam-shell shape that snapped closed with a satisfying clack. It was the device everyone wanted. It was modern. It was cool. But as futuristic as it seemed, it was built for voice calls. After all, in 1996 wireless service meant mainly one thing: telephony.

Twenty years later our mobile devices are even more popular and far more powerful, with data capabilities that have changed modern life. Today, the United States leads the world in deployment of the current generation of wireless technology—known as 4G. While we are home to less than five percent of the globe’s population, we have one-third of all 4G subscriptions worldwide.

So far, so good. But if we want our wireless future to be bold, we need to do more than rest on our 4G laurels. 5G service is poised to bring higher speed, lower latency services and a new world of wireless everything. Get ready for the Internet of Things. Get ready for a potent mix of licensed and unlicensed uses. Get ready for Gigabit service. And get ready because the effort to develop this next generation of wireless technology is already under way.

The race to 5G is on. I can see this very clearly from where I sit at the Commission. The world’s wireless economies are busy planning for 5G service. South Korea and Japan have plans to deploy 5G services by the time they hold the Olympics in 2018 and 2020, respectively. The European Commission committed to support 5G research with South Korea and last year signed up for the same with Japan. It also has reached an agreement with China, where three of the nation’s ministries have jointly established a group to promote the development of 5G technologies.

So it’s time for us to get out of the starting gate. This is a race we want to win. We can do this if we get creative—and get going. So here are my five ideas for the road to 5G.

Idea #1: To find spectrum for next generation networks we need to look high.

Today, the bulk of our 4G wireless networks are built on spectrum frequencies from 600 MHz to 3 GHz. This is our current sweet spot for mobile communications.

But the 5G future will look different—very different. We will need to bust through this old 3 GHz ceiling and create new possibilities for millimeter wave spectrum—in the airwaves at 24 GHz and above. This is spectrum that is way, way up there. These are the airwaves that take us to infinity and beyond.

But with stratospheric frequencies there are propagation challenges. While these super-high signals carry a significant amount of data, they do not go far. But we can turn this limitation into a strength by combining these frequencies with small cells packed close together, densifying our networks at a lower cost. All of this, in turn, can mean service that reaches further into buildings at faster speeds than ever before. This is especially useful in urban corridors and fast-growing areas with the greatest traffic demands.

It won't be simple to put these bands to use. But the Commission has already taken an important first step with a rulemaking late last year proposing action in the 28, 37, 39, and 64-71 GHz bands. Plus we have committed to seek comment on more millimeter wave bands in the future.

It would be best if we can harmonize these efforts globally, which will enhance economies of scale. But there are some places where when we look high, I believe the United States will need to go it alone. This includes the 28 GHz band. Unfortunately, at the World Radio Conference in Geneva last year this band was left off the table. It was not included in the study list for 5G spectrum. But because this band has a global mobile allocation I think the United States should continue to explore this spectrum frontier. Tests in this band are already underway in South Korea and Japan. So I don't think this is the time to hold back. I think we need to move ahead—on our own—and have a framework in place for the 28 GHz band by the end of the year.

Idea #2: When we look high for new spectrum, we cannot forget that we also need to look low.

This idea is not complicated—or especially new. But we have to remember that while we explore the big possibilities of millimeter wave, we need to continue to look for opportunities below 3 GHz. This spectrum is essential for coverage today. It will continue to be essential for coverage in the 5G future. 5G networks will incorporate multiple radio access technologies, and for seamless connectivity we will need more than millimeter wave.

Idea #3: To build a bigger wireless future, we need to focus as much on the ground as on the skies.

In wireless policy, spectrum gets all the glory. But the unsung hero of the wireless revolution is infrastructure. Because no amount of spectrum will lead to better wireless service without good infrastructure. So if we want a big and bold future for our airwaves, we need policies that support our efforts on the ground.

We can begin by taking a comprehensive look at tower siting practices and make them more consistent across the country. We can start with federal lands—which make up as much as 1/3 of our national real estate. We can expedite deployment here by creating an open data inventory of infrastructure.

But we need to think beyond traditional tower siting. 5G use of millimeter wave spectrum puts a new premium on small cells. Figuring out how to get these microcells in place is a significant effort. For outdoor deployments, we need to find ways to harmonize municipal practices from coast to coast—and should work to develop model practices. But we also need to focus on the in-building equation. I think it's time for the wireless equivalent of LEED Certification for facilities that are capable of 5G service. Because the market should reward buildings that have dense networks of small cells and fiber backhaul for Gigabit service—but we need a standardized way to certify that capability to help it develop.

Idea #4: If we want a bold wireless future, we need a better way to manage our balance sheets.

Spectrum is invisible infrastructure. We may not be able to see it, but it is where we are going to build our economic future. Because with 5G connectivity, we are looking at a world where everything is connected. We are making way not just for the Internet of Things, but for the Internet of everything. But before we get there I have a funny feeling we are going to get waylaid by accounting.

Let me explain. Perhaps the best way to do this is to reference the infrastructure of the past. The Federal Highway Act became law in 1956—a full four decades before the Telecommunications Act. It featured a bold plan to connect the nation with a new highway system—to support our economic and national security. It was not cheap. But the billions invested have reaped us rewards for generations.

What distinguishes this connectivity challenge from the past from the wireless one we face now is that the effort to develop a highway system did not require a pit stop at the Congressional Budget Office, or CBO—because it did not exist.

Today, the CBO “scores” every spending bill. That means it takes every big idea about how we use our airwaves and subjects it to a grinding review of its impact on the budget and the deficit. This analysis is important. It's useful. But in practice, these estimates can hamper creative ideas about long-term infrastructure investment, including how we can free more of our airwaves to support economic growth.

This is a problem. It is especially challenging for unlicensed spectrum to make it through this filter—because it requires disregarding the economic value of setting aside more of our airwaves for Wi-Fi. But it also can harm our ability to identify airwaves to repurpose and auction for licensed services. When auction values are not right, relocation costs are wrong, or assumptions are built into the baseline that don't reflect what is happening—we have a problem. It's a problem that slows our ability to get airwaves to market, create jobs and innovative new services—and build the infrastructure of the future. We need to find a better way to manage these balance sheets. The infrastructure of the future depends on it.

Idea #5: We need sandboxes for cities—and more experimental licenses.

5G technology will have applications everywhere—in rural areas, urban areas, and everything in between. But these applications hold special promise in our cities. That's because 5G will bring high speed, low latency technology to densely populated areas, opening up a whole new range of civic and commercial services.

Last year, the Administration kicked off a Smart Cities Initiative. It features over \$160 million in federal research support to help our cities tackle future challenges. If you look closely you will get lost in the details. But stand back and squint. In these community collaborations wireless technology is front and center because so much is dependent on sensors, data, and public policy coming together in a powerful way.

The Commission needs to support these initiatives. Here's how we can do just that:

Three years ago, the agency adopted an Order updating its experimental licensing program, putting in place new licenses for research labs, health care facilities, and more. These experimental licenses are important. They provide an early and upfront way to innovate and create. They provide a safe place to play with power levels, explore frequencies, and develop new services.

But for too long one of the ideas in this decision has been stuck in the starting gate. Three years ago, we proposed innovation zones—flexible experimental licenses that are virtual sandboxes for cities. But the Commission has yet to set up an innovation zone or take in an application to do so. It's time to put this policy in place. Because it is tailor-made for smart city initiatives. It is ideal for 5G services and it can help demonstrate the dramatic opportunities of the next generation of wireless services.

Let me finish by highlighting that last point.

We have problems to solve, resources that are constrained, and communities that need help navigating what is possible in the digital age. There is no shortage of challenges ahead. But we are on the cusp of cars that drive themselves, streets that can be safer, emergency services that are more effective, healthcare that is more personalized, and more capability across the board because we will be more connected.

Let's talk about that. Because while 4G technology brought the smartphone to pockets and purses everywhere, the benefits of 5G technology are bigger, bolder—and more diffuse. They will be felt throughout the economy—but selling communities and their residents on the benefits will not be easy if all we can do is talk about spectrum, small cells, and beam forming. I mean, I get excited by that—and you do, too—but hey, that has its limits.

Instead

What if we rewarded the city that cut commute times the most? It would take sensors in streetlights, roadside architecture, and cars to see where traffic patterns could be more efficient and public transportation more effective. 5G technology can make it happen.

What if we introduced cameras in the helmets of firefighters? They could relay video back to colleagues outside who could direct a team of firefighters in real time, enhancing safety for first responders and those they rescue. 5G technology can make it happen.

What if we monitored urban trees with sensors to help assess air quality and develop strategies for dealing with drought? Los Angeles is already looking at this in a project called the Internet of Trees. And 5G technology can make it happen.

That's what the wireless future looks like. It is so much more than the device in our palm. And we can get there and enjoy its bounty if we do more than rest on our 4G laurels. It will take spectrum that is high, spectrum that is low, infrastructure that is essential, better balance sheets, and experimental licenses that could bring us the boldest innovations yet. But it is clear that the race to 5G is on. Let's get going—because the future belongs to the connected.

Thank you.