

**REMARKS OF
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Good afternoon. It's great to be here in Los Angeles for the 2019 gathering of Mobile World Congress Americas. My favorite part of this gathering is walking the halls and hearing about what is new and next in wireless technology. There is so much coming at us so fast and so many experts predicting how new mobile services will change our world—and I believe it.

But predicting what comes next in technology is not an easy task. Go all the way back to the telephone itself. In 1876, Alexander Graham Bell was struggling to find potential buyers for his new invention. Western Union seemed like a natural fit. But after hearing the pitch, William Orton—the President of Western Union—concluded that the device “has too many shortcomings to be seriously considered as a means of communications.” He went on to say that “[t]he device is inherently of no value to us.” How's that for underrating the power of new technology? Because you know how the story goes. Like everyone else, Western Union came to rely heavily on the telephone over the years.

But Western Union was not the only company that underrated the reach of new technology. When the personal computer was first developed, IBM's leadership saw only a very limited market. One IBM executive even asked “[w]hy on earth would you care about a personal computer? It has nothing to do with automation. It isn't a product for big companies that use ‘real’ computers.” Of course, today, you can read about his early skepticism—on your personal computer.

Or you could read about it on your phone. Speaking of, in the 1980's, AT&T asked McKinsey & Company to forecast how many cellular phones would be in use by the year 2000. Their prediction? 900,000. That was a little shy of the more than 100 million cellular phones in use worldwide by the turn of the millennium. And for the record, that number now exceeds 8 billion. That means worldwide we now have more mobile phones than people.

So what can we learn from this? Well, for starters predicting communications technology is a dangerous business. Even smart people can get it wrong—really, really wrong. Technology is dynamic, evolves fast, and only a fool would predict with certainty what the communications future holds.

With that said, I want to do it anyway—but with a slight twist. Earlier this month, I was asked at an event to respond to a word or phrase and say one thing about it: was it underrated or overrated. It sounds so simple, but it forced me to distill my thoughts and sharpen my thinking about what is coming our way.

But here's the thing. I'm going to ask you, too. That's right. Today I'm going to say a word or concept—something about wireless—and I'm going to ask you to raise your hands—is it overrated or underrated? And in return, I'll share my two cents about it, too.

Let's start easy. Here's the first word: 5G.

If you said overrated, you might not have paid attention to the first part of my speech. There's a common theme running through each story. It's this: the early skeptics got it wrong every time.

Now I'm an optimist, so I believe that the next generation of wireless technology has the power to change civic and commercial life. With much higher speeds and much lower latency, these networks can kickstart the next big digital transformation. And with connectivity in so many more things and so many more places, we will have new ways to foster economic activity and improve health, education, the environment—and more.

Good stuff, right? But expectations are undeniably high. According to Gartner's Hype Cycle for Emerging Technologies, 5G is near what it calls the “peak of inflated expectations.” In part, that is because many carriers are still figuring out business cases and how these new networks will fuel new products and services that provide a real value proposition for consumers.

So we have work to do. But I think time will prove the optimists right. Because we have problems to solve, resources that are constrained, and communities that need help navigating what is possible in the digital age. And I think 5G networks can help fuel the new services that address some of our biggest challenges.

Next: Mid-band spectrum.

I say underrated. Earlier this year I wrote in *WIRED* that if the United States wants to lead in the next-generation of wireless service, the Federal Communications Commission has to change course and make it a priority to auction mid-band spectrum. It is the only way to extend the promise of competitive 5G wireless service to everyone, everywhere across the country.

Sixteen countries are way ahead of us because they already have auctioned mid-band spectrum specifically for 5G. But to date, the FCC has aggressively focused its early efforts to support 5G wireless service by bringing only high-band spectrum to market. And while we put all our early energies into these millimeter wave auctions, the rest of the world has left us behind. I fear our slow pace of bringing mid-band spectrum to market for 5G will only deepen the digital divide that already plagues too many rural communities nationwide. That's because recent commercial launches of 5G service across the country using millimeter wave spectrum are confirming what we already know—that commercializing high-band spectrum will not be easy or cheap, given its propagation challenges. The network densification these airwaves require is substantial.

That means high-band 5G service is unlikely outside only the most populated urban areas.

The good news is that we are finally paying attention to our mid-band spectrum deficit. So I'd like to speed the way for the agency to hold its first mid-band auction. Here's what I propose: we should hold the 3.5 GHz band auction this year before bringing to market more high-band spectrum in the 37, 39, and 47 GHz bands.

The World Radiocommunication Conference.

Let's make things interesting. I'm going to say overrated.

Next week 193 countries will descend on Sharm el-Sheikh, Egypt to have a wide-ranging discussion about their future spectrum needs. By aligning allocations among countries we make it possible to realize the benefits of scale and scope. This, in turn, impacts the cost of devices and infrastructure across the globe. So it's critical that the United States participates in the WRC. It's important.

But here's the problem. Spectrum policy is now outpacing the traditional five-year study cycle of the WRC. Spectrum bands are being proposed and developed for 5G in voluntary, international, consensus-based bodies like 3GPP long before they are ever proposed for study at the WRC.

This is good because it means speedier access to spectrum. But it also has consequences for what we do right here in the United States. Take the 24 GHz band. Back in 2017 the FCC opened this band for mobile service. We adopted technical rules governing its use. Then, earlier this year, we auctioned this band. Carriers invested \$2 billion to bring this spectrum to market. But now the WRC will take up some of those decisions again at the treaty level—including decisions about emission limits to protect nearby services.

The decisions at the WRC carry the force of law, so depending on what happens, the carriers that invested in this spectrum may find their earlier efforts undermined. This is not ideal. I think our licensees deserve certainty before they commit billions to participate in an FCC auction. Plus, I think they deserve the confidence of knowing that the United States will pursue a coordinated effort to win international support at the WRC. But with the 24 GHz band, it looks a lot like the right hand of government is not talking to the left. I worry that public spectrum disputes that have soured relations between the FCC and its federal partners could hamper efforts at the WRC.

If we're going to be successful on a global stage, we have to fix that. And we need to start grappling with how international decision-making structures involving spectrum are evolving so we do not end up in this kind of mess again.

Network Virtualization.

Very underrated. In fact, I think virtualization does not get the policy attention it deserves. Here's why. We face enormous challenges with network security, and with supply chain security in particular. The number of vendors supporting the wireless ecosystem has shrunk. Consider that at the turn of the century, there were 13 equipment vendors vying to serve carriers. In the run up to 4G, that number was down to seven. And now as we embark on 5G, it looks more and more like we could move to a world where there might be only one option for some 5G equipment—and that option could expose our networks to undue foreign influence.

So that's where we've been. But it doesn't have to be where we're going. That's because with 5G we can reimagine how our networks will be built. Instead of a hardware-centric network design limited by a small handful of foreign suppliers, we can move to one that is software-centric. In this new model, we can use off-the-shelf hardware and customize through software.

Here lies an opportunity. This kind of network virtualization flips our traditional way of thinking about equipment supply chains on its head. It pushes the market for equipment to where the United States is strongest—in semiconductors and software.

But we have work to do if we want to realize this vision of a more secure 5G supply chain. So think about a network as comprised of two components: the core and the radio access network—or RAN—that sits between your device and the core network. There has already been a lot of progress to virtualize the core network. But to date, we have seen less effort to do so for the RAN.

There's a good reason for that. The RAN is the most expensive and most restrictive part of the network. Today, all major components of a RAN have to come from the same vendor. There is no way to mix and match.

So here's my idea. It's time to look at unlocking the RAN. If we can diversify the equipment in this part of our networks, we can increase security and reduce network exposure. It also means carriers in other countries around the world that are locked into upgrade cycles with a single foreign vendor could also have a way out.

In addition, an open RAN could improve the market for new equipment vendors by lowering barriers to entry. That means more competition and more choice. Moreover, it could help carriers lower their own costs since they no longer have to rip and replace every time there is a network change.

Here's how the FCC can help. First, we can coordinate with other agencies to ensure no single vendor dominates networks. Second, we can help promote more open and interoperable standards for the RAN. The FCC can do that by developing testbeds in the United States that bring together operators, vendors, vertical interests, and other government agencies to support these models. We can even build this into our ongoing

effort to authorize city-wide 5G testbeds in New York and Salt Lake City. But the primary thing to do is get started—right now.

Unlicensed Spectrum.

Easy. Underrated.

Our lives run on unlicensed spectrum. Consider the laptop you pulled open this morning to check your e-mail, the baby monitor you use to keep tabs on your little one at night, or the fitness tracker you use to count your steps, or the tunes you stream over your phone to power you through a jog. No matter who you are or where you live, the odds are good that you have benefited from unlicensed airwaves and Wi-Fi.

At this gathering, the power of unlicensed spectrum does not play a starring role. But I think it should. Today, more than 60 percent of global mobile data traffic is offloaded to Wi-Fi. Moreover, many of the use cases we need to build demand and business cases for 5G—like augmented and virtual reality and the Internet of Things—will also depend on unlicensed links for some portion of their connectivity. That means more unlicensed could help bolster the business case for 5G, too.

That's why I hope we can start making progress on unlicensed spectrum again. But our 30-day delay with the 5.9 GHz band is now nearing 180 days. And even though companies are ready to deploy next-generation Wi-Fi technologies in the 6 GHz band, the FCC has not yet caught up. Plus, our early efforts to foster the use of white spaces in the 600 MHz band has stalled. We should start a further rulemaking to clear up pending issues on white spaces as soon as possible. Because it's time to recharge the effort to explore unlicensed use in these airwaves.

So there you have it. My take on what's overrated and underrated. And in the process, a few ideas about how we can help grow secure 5G opportunities for all Americans. We need to build business cases that can support the economics of widespread deployment, prioritize mid-band spectrum, update our approach to the international decision-making structures involving spectrum policy, open up the radio access network, and provide more unlicensed airwaves to power innovation.

That's a tall order. But I'll end with one last prediction—I think the future of wireless technology depends on it. And that future can be bigger, bolder, and brighter if we get these elements of wireless world right. I'm here for it—and I'm glad you are, too.

Thank you.