



Episode 139 – 5G, Satellites and Connectivity Anywhere

Speaker: Tom Stroup, President, Satellite Industry Association – 19 minutes

John Gilroy: Welcome to Constellations, the podcast from Kratos. My name is John Gilroy, and I'll be your moderator. Today we welcome Tom Stroup, President of the Satellite Industry Association. Imagine being able to download a full length, high-definition movie to your phone in seconds, whether you're in the car, ship, plane, in remote or rural areas. That is the potential that 5G brings. High bandwidth and seamless connectivity to end users across a range of networks from terrestrial to satellite. 5G is about connecting things everywhere reliably, without lag and delivering a high-quality user experience.

During this episode, Tom Stroup, President of the Satellite Industry Association, will discuss the market drivers, the opportunities and challenges that 5G presents for the satellite industry. Tom is uniquely qualified to discuss this topic. He is well versed in the regulatory and policy issues of critical importance to the satellite industry, including spectrum and licensing issues, defense and public safety matters, and export control and international trade issues. Tom, we're going to jump right in here. So, what do you see as the market drivers for 5G from a satellite perspective?

Tom Stroup: Well, John, first of all, it's great to be here, and I'd like to touch on a couple of the points that you made in the introduction, because I think that that really highlights the opportunity for the satellite industry. The first is high bandwidth and the other is seamless connectivity. And we've evolved from a world where broadband connectivity has been nice to have to where it's essential to have. And I think that the three attributes that the satellite industry provides and the opportunity that is created by 5G are ubiquity, mobility, and security. And of course, these are three features that satellites have a great advantage relative to other systems.

Ubiquity, we're really the only technology capable of providing service to large portions of the earth. With respect to mobility, we're really the only technology that can provide service to airplanes, maritime vessels when they're away from access to terrestrial facilities. And then security, of course, when systems go down, our infrastructures in the sky, and we have the ability to provide service to systems that have lost coverage as a result of natural or manmade disasters. So, I think that those are the three major drivers without getting into specific applications. And that's true with respect to satellite systems generally, but also especially when we're looking at deployment of 5G systems.

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- John Gilroy: I've had technical discussions with people at 5G, and what they say is that they realized that security was an issue, and so they baked it into the system. And so this is almost like it's the fifth generation, "Oh, we saw the mistakes we made two generations ago and we're going to correct those." So, a lot of this is better and improved from the early generations, isn't it?
- Tom Stroup: That's absolutely part of the intention with each iteration of the technology is, how do you improve on the prior generation?
- John Gilroy: Now, Tom, the satellite industry has traditionally operated in standalone networks that haven't seamlessly connected to other networks. So how does 5G potentially change this traditional mode of operation?
- Tom Stroup: Yeah, I think that 5G represents an opportunity for a shift in the relationship between the terrestrial and the satellite communications industries. And the inclusion of satellite in 3GPP standards will help to integrate the satellite in terrestrial systems needed for the demands that are placed on the 5G networks. And so we've seen standards addressing both back haul and direct connectivity to devices. I think that we're going to see the industries cooperate more because of the ability for the satellite industry to expand the coverage for broadband networks, for terrestrial networks. Whether it's for proliferation of IoT devices in remote areas, or providing coverage for devices on the move, but also being able to provide for the caching close to the network's edge for back haul purposes. I think that, again, we've seen a recognition that many of the things that are desired by 5G can only be achieved with the ubiquitous coverage that satellite networks provide.
- John Gilroy: Well, Tom, we're in the Washington DC area. It's mandatory we use acronyms every 30 seconds. I got to throw out an acronym. I'm not trying to confuse the listener, because we have listeners all over the world. And here's an acronym I'm going to use here. The key innovation of the fifth-generation standard is a new 5G NR, New Radio. Can you discuss the value of waveform in the industry?
- Tom Stroup: Yeah, so it's a new interface that's being developed for 5G. And I suspect many of your listeners know, an air interface is the radio frequency portion of the circuit between the mobile device and the base station. And 5G is initially being made available through improvements in LTE and its subsequent improvements. I mean, I think that there are three generations of LTE, but basically as non-standalone services, but it's going to be followed by a major step up with the new air interface, which is the standalone 5G. I think that the opportunity for the satellite industry is that by deploying this wave form, they'll have access to greatly increased market size. Essentially billions of devices, whether they're IoT devices or mobile phone devices. I think it will also provide access to interoperability access across networks. And this is something that's been talked about for a long time within the satellite industry.

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We have a number of companies that have deployed proprietary networks, and there's an advantage to that. Each of the companies has done their own R&D work, they've got advantages, technical advantages that they've been able to provide, but you don't get the same kind of interoperability and access to the mass markets that we'll have with the deployment of 5G systems. So, I think that that's going to be one of the major changes that we see within the satellite industry is the deployment of a standardized device, standardized networks, that we'll be able to access all of these devices.

John Gilroy: Tom, just from a mere mortal's perspective here, the way I look at it, so LTE is a standard for 4G and new radio is a standard for 5G? Is that the way it sets up, or am I getting it confused?

Tom Stroup: The 5G systems that are being deployed today are utilizing LTE. Think of them as backward compatible, but ultimately there's going to be a new interface that's deployed.

John Gilroy: So 5G not only has a bigger pipe, faster speed, but more devices, which fits into the whole IoT argument, doesn't it?

Tom Stroup: Absolutely, yes.

John Gilroy: Yeah. And I read this figure, I don't know if it's true or not, 7 billion people in the world and more than that number of IoT devices out there. So there's more devices than people. So how do you manage the madness? I mean, this is the challenge today, isn't it?

Tom Stroup: It is. And really that's one of the challenges and opportunities for 5G, is to be able to create a network that's not just dealing with one access system. I mean, in many ways 5G is described as a network of networks. And so it's not just going to be traditional mobile services or unlicensed services, but satellite services. And again, in order to achieve the vision of 5G, we need all of those systems working together. And that's absolutely one of the challenges, being able to provide interoperable service across all those different networks.

John Gilroy: I'm quite a sophisticated person. So years ago when I heard about 5G, I went to YouTube and typed in, "Simple description of 5G." And there's like a cartoon description of a lot of relays and a lot of cell towers and this going to there and the car, and it was the doctor's office and all kinds of things. So maybe listeners may have that idea, it's all terrestrial, all land based, but let's put this into perspective of satellites then. So what unique value does satellites bring to this network on the ground?

Tom Stroup: Yeah, so I think that the key is from an end user's perspective, it is seamless extension of 5G services. And so you saw a depiction, you described a depiction

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of different networks, different means of connections. But from the end user's perspective, it's really that seamless extension. Being able to access the services that are provided. Again, whether it's an IoT service, whether it's downloading videos really it's without any interruption, no matter where one might be.

There are some other things that the satellite industry is going to be able to provide. One is the quality of experience of high-capacity applications. And so there's going to be an opportunity to use intelligent routing and offloading of traffic so that satellites can allow terrestrial networks in certain places to be able to save their spectrum and improve the resiliency of the network. So just beyond the service directly to the devices that we were talking about with the seamless extension, there's the opportunity to improve the quality of service. And then the final point is something that I touched on before, and that relates to when there's a disaster, when there's some type of damage to the terrestrial portion of the network, they can take over and allow the network to keep operating.

John Gilroy: Quality of service, that was a big term back in the early days of VOIP. And now we're talking about QOS for satellites. So I'm just thinking, I'm listening to you about increased speed and reducing latency. So if I do a Zoom call with my friend Fritz in Utah, it could drop out, but not the end of the world. What if there's a doctor doing remote surgery? All of a sudden there's no room for latency in this one, Tom, especially if I'm the one getting sewed up or something remotely. More and more telemedicine, especially for veterans in rural areas, more and more doctors analyzing x-rays remotely. And so this latency, this is one of the key applications, isn't it?

Tom Stroup: It is. You gave an example. There are several other examples where whether it's latency, whether it's a seamless connectivity, making sure that there's not any interruption to the network connection, again, is one of the key promises of the technology.

John Gilroy: Tom, hundreds of thousands of people from all over the world have listened to this podcast. Go to Google and type in "Constellations Podcast" to get to our show notes page. Here, you can get transcripts for all 100 plus interviews. Also, you can sign up for free email notifications for future episodes. Well, I mentioned we're in the Washington DC area, so we got to talk about the federal government. It's everywhere. And so are there unique cases or maybe interesting use cases for 5G in the government sector?

Tom Stroup: Well, absolutely. And we'll start with the military. You think about any of the applications that we've talked about, have applications for the military. So just think about if you're a soldier in the field and the ability to be able to take a feed directly from a drone to be able to see what's happening across the horizon. IoT is another example. Just being able to monitor the functionality of all of the different pieces of equipment. And that's true whether it's a ship, whether it's

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an airplane, whether it's a tank. I think that we're actually going to see the military as one of the major customers for 5G services. And I know that they're looking at what the potential applications are for them. And it's unusual in some respects because for a long time the military has had bespoke systems. Its been designed specifically for their purposes. I think that this is a case where we're going to see them taking advantage of the many capabilities of the commercially developed technology. But that's just one example for the government.

Another is the border control, almost the same scenario that I had mentioned. Being able to utilize a feed from drones or use IoT devices to determine whether there's an intrusion at the border. Same thing for emergency services. So think about it. It could be in a military context, it could be another context where you've got the ability to be able to provide a video feed and downloading information to a hospital on the way for providing services. So there's almost an unlimited number of applications within the government. Some of the others, traffic control, I think we touched on the application for traffic, but the ability to be able to, for just local governments, to be able to determine that, "Okay, there's a tie up in one area and we need to divert traffic in a different way, or we need to change the sequencing of traffic lights." All of these are kinds of applications that will benefit from 5G.

John Gilroy: Tom when you used the word bespoke, I've thought of a lot of traditional ways that the military handles communications. And I'm seeing a parallel here. I see some people in the military taking advantage of the public cloud for certain applications. And so is that what may happen with the military? They may take advantage of, you said it, they're actually using commercial services because they're more flexible than their old bespoke manner. Do you see that happening too?

Tom Stroup: Absolutely. And I think we're seeing it in a number of areas without regard to 5G, where they're taking advantage of commercial technology. I mean, the US Military is a major customer for the commercial satellite industry. Just we are able to advance technology faster than the military has been able to do on its own. So we've definitely seen them taking advantage of technology, again, developed initially for the commercial industry, but ultimately applied to them.

John Gilroy: When the historians write about 5G, they'll say that I think it was first commercially released in 2019 in the United States, but let's move up till today. So how much progress has 5G deployments made with the satellite so far? Can you cite any examples?

Tom Stroup: Yeah, so we're going through the testing phase. So it was Release 17 of 3GPP, was released earlier this year. And so we go through the sequencing and that one of the releases that includes the satellite technology. So our companies are now going through the testing process, testing the air interfaces. So I'm not aware of any actual commercial deployments at this point, but again, given the

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infrastructure that we deploy is in space, we need to go through extensive testing. So once we know what the standard was, what the characteristics of the standard were going to be, now we have the opportunity to build it into the networks, test it, before starting to deploy it. So I would expect that sometime within the next year or two, we'll definitely see deployment of 5G capable satellite systems.

John Gilroy: The people in the satellite community have heard about all kinds of different thoughts about using satellites. And some people will say that it's possible that LEO satellites can replace cell towers, because your phone will go right to the low earth orbit satellite instead of going around. So is that possible? Is that a thing?

Tom Stroup: Well, I think that I would describe it as more of a supplement than a replacement, because there are hundreds of thousands of cell sites. And despite the deployment of thousands of satellites, we've seen a tremendous increase in the number of satellites that have been deployed, I do not ever see us having the capacity on space to be able to replace all of the cell towers that we have here, whether it's in the United States or elsewhere. But I think that there is an opportunity to be able to replace them or actually not have to build them, I guess might be a better way to put it, where you have a rural area, it's just not economically feasible to be able to build a cell tower. And there are companies that are already starting to go through the testing process, getting applications filed and approved at the FCC to provide direct connectivity from satellite to mobile devices. And some of them would describe the services that they're offering as cell towers in the sky. But again, I don't see them replacing any of the existing infrastructure that exists in major markets around the country.

John Gilroy: Tom, people who know your background know that you spent many years in the wireless industry, and it seems that today the wireless industry is demanding additional RF spectrum for this 5G. So how do you see this impacting the satellite industry?

Tom Stroup: So this is an ongoing point, I'll say a friction between our industries. We're both growing, we both have a need for more spectrum. And there are instances where we're looking at how we can share spectrum. There was actually a spectrum band that was made available, basically transitioned from the satellite industry, a portion of it to the mobile industry. But I think that we're going to continue to have to find ways that we can both grow without causing potential interference to each other. There was an instance where it was called the Spectrum Frontiers Proceeding at the FCC, where spectrum that had been designated for satellite and fixed terrestrial use was made available for mobile use. And it creates issues for the industry, because when you have millions of devices potentially coming within the service area of the satellite system, it can cause interference. So it's an area that is going to continue to be a challenge for policy makers as well as for both of our industries.

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- John Gilroy: Traditionally on the Constellations Podcast, we talk about interference with satellites, not interference with down here on the ground and these terrestrial signals, but it's really a problem, isn't it?
- Tom Stroup: It is. It definitely is. And again, as we start to try and share spectrum or decrease the amount of guard bands in between different systems, as we move to higher and higher frequencies for mobile services and satellite systems, the potential for interference exists. And there are proceedings at the FCC, addressing whether some of these bands can be shared. And it comes down to the engineering studies as to what kind of interference can be accepted, whether you need receiver standards. But it's definitely an issue. And of course, there are opportunities for companies that provide interference mitigation technology. The issue is not going away, and it's going to become an increased issue as we look at continued sharing of bands.
- John Gilroy: Well, Tom, it's crystal ball time here. So if there is a 4G, then there's a 5G, well guess what? There's going to be a 6G at the next decade. I guess every decade there's a new G. So what are your thoughts on the next G, the 6G and satellites?
- Tom Stroup: So, I think 6G is going to be designed with satellites in mind. I mean it certainly, is going to be all of the things that we've talked about that 5G is an improvement over 4G. I think we can expect to see the same expectation for 6G, but I think that one of the big differences is 6G is going to be designed with satellites in mind. The ability to provide ubiquitous coverage throughout the globe. And I think that that's probably going to be one of the big opportunities for the industry.
- John Gilroy: Tom, this is not the first time we've covered 5G on the Constellations Podcast. If you want to delve deeper into this, you can listen to episode 100 with Stacy Kubicek from Lockheed Martin. You probably know her. She talked about 5G and she touched on the Air Force. Also recently, episode 130 with Bill Ray from Gartner. He talked about 5G and more about LEO. So homework for everyone listening to the podcast here. Tom, I think you've done a good job in helping our listeners understand some of the policy involved with 5G. I'd like to thank our guest, Tom Stroup, President of the Satellite Industry Association. Thank you, Tom.
- Tom Stroup: Thank you.