Constellations Podcast

Episode 138 – Smart Phones, Dead Zones and Cell Towers in Space

Speaker: Charles Miller, CEO and Co-Founder, Lynk – 22 minutes

John Gilroy: Welcome to Constellations, the podcast from Kratos. My name is John Gilroy and I will be your moderator. Today, we welcome Charles Miller, co-founder and CEO of Lynk, L-Y-N-K. Have you ever been hiking in the mountains and you realize your cell phone has no service because you're miles away from a cell tower, and you tell yourself, "Well, I hope I don't twist my ankle." Turns out space might solve that issue. What if you could trick your cell phone into thinking that the nearest cell tower is actually a satellite passing over? Well, we'll test this theory with Charles Miller, our guest today.

John Gilroy: Charles is the co-founder and CEO of Lynk, L-Y-N K, a company developing a satellite to mobile phone satellite constellation that aims to provide a cell tower and space capability for global coverage. Wow, so many questions here. Charles, I just read in the news a few weeks ago, the FCC granted your company, Lynk, the world's first ever license for commercial satellite direct to standard mobile phone service. That's kind of a big deal. Bring us up to speed. Could you start with explaining what's your vision to bring satellite to mobile phone connectivity across the world? Was I right about the cell towers and space thing?

Charles Miller: You were absolutely right about that, and while it might seem a little bit off this world or science fiction-y, the technology's working today. We're actually testing it in 12 different countries and on five continents today. The technology is proven and our end vision is that in the future you will stay connected everywhere on the planet no matter what. You don't even have to know. Your phone will just keep you connected and you won't even know that it's connected to a satellite. You'll just stay connected everywhere. That's our vision.

John Gilroy: Well, that's really incredible. You can read all kinds of numbers on the number of phones that are out there. What, there's 7 billion people and 5 billion phones? Is that the right number?

Charles Miller: Well, they say there's 8 billion now, right? We're prolific as human beings, but that's a lot of mobile devices. By far the most ubiquitous, used, powerful technology in the pockets or in the lives of most human beings on the planet is the mobile phone. Some day, maybe everybody will have it and some visionaries have talked about that you are assigned your mobile number at birth and it

becomes like your social security number so that you get it from the day you're born.

John Gilroy: Wow. Well, who thought that technology evolved would be something like that? Okay, let me try to understand this concept again. You make a call from your smartphone, but instead of connecting to a cell tower, you connect to a satellite. Now it seems like battery and power and issues and distance, so without being too technical, how does it work?

Charles Miller: Well, your phone won't even know that the cell tower it's talking to is in space. They can hear hundreds of cell towers simultaneously and it has to make a choice, and it does that all the time. Your carrier, your mobile network operator, Verizon, AT&T, T-Mobile, they tell your phone which tower to prioritize first? We will just add a space layer to that. There's the ground layer of ground to cell towers. We'll add a space layer. Your phone will not be able to tell the difference, but your mobile network operators say which one you prioritize, and in the case where there's no ground based cell towers, your mobile network operator will just say, "Okay, in that case, talk to the space based cell tower," so it fills in all the black spots.

Charles Miller: It's not like we're substituting for the ground based towers, we're supplementing that. We're filling in all the black spots. If you go out in a remote area or even in there's an hour outside of Washington, DC area where I live, there's plenty of areas where you run into places where there's no connectivity, it'll just fill in all the gaps and you'll never be disconnected. When Earth, Mother Nature takes out the cell towers, like hurricanes and earthquakes and fires and tornadoes, it'll be instant backup from space.

John Gilroy: To get back to these mobile network operators, you first think that you'd compete with them, but you don't. What you do is you almost supplement, complement them. It's almost like you get the areas where they can't get and then you're actually kind of working together. Almost, here's a word from the past, a symbiotic relationship how you work together.

Charles Miller: We're going to be the mobile network operator's best friend, right? We are not going to compete with them. There may be other companies jumping into this that are going to try to take away, compete directly with the mobile network operators. We're going to do the opposite. We're going to be their best friend. We're going to extend their network to everywhere so you stay connected, and we think you as the end user, you don't want to have to figure out and make a choice. You just want your existing phone with your existing plan to stay connected everywhere. You don't care whose name is on the satellite, and the easiest thing for you is that it just stays connected everywhere, so that's how we're going to do it.

John Gilroy: We live in a world of apps here. There's apps everywhere. Every time I turn around someone says, "Put an app on my phone." Will the user have to install an app on the phone for this service?

Charles Miller: Well, for what Lynk is doing, your app is already on the phone. It's your messaging app here. If you're doing text messaging, you can use the regular favorite text messaging app and just send an SMS text message to our satellite. That's what we'll do at the start, and then over time, your voice and data plans, it'll just be voice and data. Whatever favorite app it is that uses voice and data or messaging will be just installed everywhere, so your phone actually thinks our satellites are cell towers and they work in all respect, like cell towers.

John Gilroy: Let's say I'm hiking in Utah and twist an ankle in the middle of nowhere. Do I have to wait for a satellite to come by or how does that work?

Charles Miller: Well, the end vision is you'll be instantly connected. You won't have to be any wait. There will be enough satellites in the sky to keep you continuously connected wherever you are, and so that won't be the case. In the first few years, because we'll need to launch a lot of satellites to get that, as we have the world's first commercial cell towers in space today, and we'll be launching more later this year and launching, accelerating ramp up next year. During the first few years, it'll be periodic coverage and the more we launch, the more frequent the overpass till it's continuous.

Charles Miller: We think that for some people, everybody wants it real time continuous everywhere, and we'd like to snap our fingers and make that the case, but it takes a few years to build and launch those satellites. But in the meantime, we don't think people will... Well, everybody always wants more. We think people will say, "Well, the alternative to this is nothing, and okay, so I have to wait 15 minutes for the satellite to pass over to be connected. That's infinitely better than nothing." That's where we'll start and we'll accelerate to getting to continuous everywhere.

John Gilroy: Now we've been using satellites to find a way around the block for years now. Yesterday, I used it to find an Advanced Auto, had to go an auto store in the middle of the day and it worked well. What is the technical difference between using your smartphone to connect to a satellite for GPS and for phone service? Is there a technical difference?

Charles Miller: Well, there is a technical difference. The GPS is much easier, it's one way. It's the GPS satellites are broadcasting from space from many different points and your phone processes those signals from three or four or five GPS satellites and figures out where it is? It does not need to communicate up. In our case, we've solved a harder technical problem that your phone has to communicate to

satellites two ways. It has to go both down, getting data down, and sending data up and that's the hard part that many people didn't think was possible.

Charles Miller: We figured this out back in 2015, that you could close the link from a standard mobile phone. Moore's Law, you can give credit to Moore's Law. The processing power in your phone is a super computer, and so you have a lot of coding gain or extra processing power that has been advancing this both at the satellite side and on the mobile phone side. Now with modern communications protocols, you can be connected two way.

John Gilroy: I live near the Appalachian Trail and I talked about hiking earlier. In August, I was hiking in the Santa Monica Mountains, and so I think of this as being in a desert and in the mountains, but a whole lot of other places besides that, huh?

Charles Miller: Oh, absolutely. We're a little bit blind to how much disconnectivity is in the world. Now because mostly the mobile network operators of the cities and the suburbs and the major roads, they mostly have covered the major highways. But if you go on some off roads or you go out in farms, you find a lot of disconnectivity without going out to the mountains or the deserts, right? An hour outside of Washington, DC in Western Loudoun County, there's a lot of people who are quite well off and have lots of McMansions out in Western Loudoun County about an hour outside of DC. In the last 15 or 20 minutes, many people driving to their very big homes from their good jobs inside the DC area are driving without connectivity until they get home. Then they get in their Wi-Fi hotspot and they're cut off, and they're actually in traffic jams on the way home at night, and have no connectivity for the last 15 minutes. There's plenty of places in America that don't have connectivity and we just don't think about it. We just think that's the way it has to be .

John Gilroy: Because I'm very sophisticated, I went to YouTube and typed in L-Y-N-K and saw a bunch of videos of your company, and I saw this one video. It was from February from the Falkland Islands and they had the first connection. It was really very exciting. It was all like a Super Bowl or something, and I guess it was a Superbowl from your perspective. How many satellites does it take or how many satellites do you have now? What's the projection?

Charles Miller: Well, we've built six satellites and built and launched six satellites. We built nine satellites, launched six. The first five are experimental test satellites. We rapidly developed them. The sixth satellite, we've constantly learning. The sixth satellite that solved all the key problems to bring the commercial service to the world is operational in orbit today. We have three more that are built and ready to launch and we're going to be scaling up and accelerating the build of these and launch of these satellites next year.

Now, eventually we'll keep ramping up until we build 5,000 of these satellites. There is so much demand and need for this around the world. Like you said, with over 5 billion people in mobile phones. The biggest problem we're going to have is there's so much demand that we need to build a lot more capacity to serve everybody on the planet. That's a great problem to have. It's a huge market, huge need for the world. It's literally we're solving a problem that is literally going to reach out and touch the lives of billions.

John Gilroy: In residential broadband connections, they talk about the last mile and how expensive that is. But I guess when it comes to this application, maybe it's the first mile, it's the app. I mean, it's the first mile since that's what gets them from their location to the terrestrial grid. If a lot of these first miles are located in underdeveloped areas, I guess the cost of terrestrial networks is really high. Can users afford this service?

Charles Miller: Well, absolutely. What we've solved here, not only is a big technical problem, but it's an economic problem, is building cell towers everywhere and stringing fiber everywhere is just impossibly cost prohibitive. You just can't cover the planet with that. In fact, 90% of the planet from a square mile perspective has no coverage, only 10%.

We've built out, and we are building out, about 10% of the earth's surface is where it makes sense to use traditional means, mobile ground based cell towers, fiber, cable, those types of things. And the rest of the 90% is, it's just so expensive in that it makes no sense to build there. That's what we've solved the problem for. It's much more economical to cover those other areas by satellite.

John Gilroy: Charles, 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. I referenced the Falkland Islands earlier, and it looks like there's been success in this technology to send text messages. I guess the next step would be a phone call or maybe even accessing the internet? What's needed to make that happen?

Charles Miller: Well, our existing technology will support voice over IP as well as data. The problem we have is, going back to that what you mentioned, there's over 5 billion people wanting this. Is if we allow people to do voice and broadband data, they use up capacity on the satellite, we knock a lot of other people off of using the satellite. From the beginning, we've decided the right thing to do is only allow messaging at the beginning so we can get everybody some connectivity. If we didn't do that, here's what everybody should understand.

Charles Miller: A voice call, five minute voice call, you can do about 5,000 SMS with the same capacity on the satellite for one voice call. You let somebody do a five minute

voice call, you're knocking 4,999 people off from having a connection. If you do that and one of those people dies because they weren't able to contact their friends or family or an emergency responder, well that's on you. We need to make sure everybody has some connectivity first, and then once we get enough satellites up, which we will, and in more capacity to enable people to do voice and data, we'll allow them to do that. The technology supports voice and data at the start, but we think the right way to start is to make sure everybody has some connectivity. Our commitment is nobody should die because they have a phone in their pocket and they're not connected.

John Gilroy: Right from your website, saving lives and changing lives, that's interesting. In a recent Constellations episode, number 130, we spoke with a gentleman named Bill Ray, who's an analyst at Gartner. He suggested that by providing backhaul capability, LEO satellites can immediately deploy 5G service to underserved areas such as Sub-Saharan Africa or rural Wyoming. Does this compete with the solution you're presenting?

Charles Miller: Not really. What that analyst doesn't mention is that technically, he's correct. You can use satellite backhaul, but satellite backhaul to cell towers, ground based cell towers, has been around for 15, 20 years. There's nothing new with having to be from lower Earth orbit, it's lower latency. But the expense is not changed to the cell tower. Building cell towers is expensive. Maintaining the cell tower is expensive. You have to get power out to the cell tower. That's expensive. None of the economics of the cell towers change. In fact, satellite backhaul is more expensive than traditional forms of backhaul, so it's even more expensive, and so none of that changes.

Charles Miller: We solve a fundamental economic problem by doing it from satellite. The fact is, we're only putting down bits. Our satellite will be traveling over Wyoming like you, and we might as well put down a cell beam in Wyoming at a marginal cost that is effectively zero. We can drop the cost and make it much more economical to the users in Wyoming and everywhere else in a rural remote community and make sure they're connected. We solve both the technical challenge and the economic challenge of universal connectivity.

John Gilroy: SpaceX, OneWeb, Amazon and others, everyone knows they're launching or planning large constellations with satellites to deliver broadband internet. But all of these services will require terminal. We just mentioned the terminal to send and receive lower Earth orbit. Could they use the same technology as you and eliminate the need for a terminal?

Charles Miller: Well, they could copy us. We're five years ahead of everybody and some of them are jumping in. But they're existing satellites, they have to totally redesign their satellites. The satellites you described are in much higher frequencies. It's called Ka and Ku-band. Those satellites don't work for what we're doing. The Ka and Ku-band is not good for connecting from space all the way directly to a

phone. We are operating in what's called beachfront property for mobile phones and UHF. That's much better link characteristic.

Charles Miller: It goes through foliage and trans and communicates and closes the link over long distances better. That's the right place to go. It's already in the phone and there's a bunch of companies want to jump into this. They're talking about new frequencies. Mostly those frequencies are not in the phone. So, you have to wait 3, 5, 7, 10 years for the phones to change, if they ever do change, and so that's very risky. It's very costly and not coming soon. What we're doing is something that's a spectrum that's already in the phone and our satellites work with basically every phone on the planet today.

John Gilroy: I deal with a lot of software developers. Would this be virtualizing a cell tower? Is that a concept that we could use to describe this?

Charles Miller: Well, that's an interesting way to do it, virtualizing. We're using software defined networks and software defined radios in our satellites. We are virtualizing the cell tower space. We constantly are doing on orbit upgrades of our satellite cell towers, and that is the future.

John Gilroy: That's what a software developer would say, exactly. Earth observation, EO, it's had an impact on all kinds of industries. We know about farming and mining, commercial fishing and everything else. Do you see cell to satellite connectivity having a similar impact on this diverse group of markets and applications?

Charles Miller: Well, I think Earth remote sensing and the revolution in small satellites is a big deal coming in the world. But I think what we're doing is even bigger. This telecommunications is a $1 trillion a year market, and we are using satellite cell towers to extend that $1 trillion a year market everywhere, so it's much bigger.

What we're doing is a much bigger deal, I think, than earth remote sensing. And what we've done is re-invent and reimagine a use case that nobody had thought of before, that you could have a satellite talk to a cell tower. Everybody knew for 30, 40, 50 years, we've been doing earth remote sensing from satellite for 50 plus years, and just doing it cheaper is not a big surprise. But the fact that you could have a satellite talk directly to a standard ordinary mobile phone is brand new open market that nobody had thought about before.

John Gilroy: You mentioned Moore's Law and technology moving so fast, and it is. How do you see the relationship between traditional cell calling and cell phones to satellite calling evolve over the next five years?

Charles Miller: Well, I think how it's going to evolve is you're going to stay connected everywhere, one. Five plus years from now, kids in the future are going to think that's the way it always was. They're going to think it's funny that you actually

were disconnected. Well, that's kind of crazy. I think it's going to change how people think about traveling to remote and rural areas that they'll be much safer. I think you're going to see changes in government policies and across a whole bunch of different things. For example, we right now, United States government subsidizes rural connectivity to billions of dollars a year. Well, there's no longer a need to subsidize that if everybody's connected and if we use technology and innovation to solve this big problem, you don't need to subsidize it.

Charles Miller: There's going to be some profound changes in National Parks. The Coast Guard, it can't wait for us for what we're doing to get here. The Federal Emergency Management Agency, hurricanes hit and you rush cell towers into places that hurricanes get hit and it takes days to get in, and now you got instant backup. Fires in California, they had a big issue. Fires in California, they shut off the power in California a couple years ago and to try to stop the fires. The fires started anyway, and then they couldn't tell people in certain communities that the fires were coming, to get out of their homes because the cell towers had no power. We solve that problem too. There's lots of ways that this will affect people's lives.

John Gilroy: Charles, I think you've really given our listeners a better idea of how virtualization can be applied to satellite communications in so many areas that we never thought of before. I'd like to thank our guest, Charles Miller, co-founder and CEO of Lynk. Thank you, Charles.

Charles Miller: Thank you.