

Podcast Transcription: Exploring The Benefits Of 5G Advanced For Operators

[Gareth] (0:00 - 0:22)

Hello and welcome to The Counterpoint Podcast. My name is Gareth Owen and I'm the host of this podcast on 5G Advanced. Joining me to discuss the topic is Danny Tseng, who is the Technical Director of Marketing at Qualcomm in San Diego. Welcome Danny.

[Danny] (0:22 - 0:23)

Hello, happy to be here.

[Gareth] (0:24 - 0:58)

Now 5G Advanced is defined by two 3GPP releases, release 18 and 19, and it's been in the news quite a bit recently. Just before Christmas there was a 3GPP plenary meeting in Edinburgh, which wrapped up the work on release 18 and approved the scope of work for release 19. So Danny, I wonder if I could start by asking you to explain the exact status of release 18 right now.

For example, when will the specs be frozen? When can we expect the first commercial devices with release 18 features and the same for release 19?

[Danny] (0:58 - 2:41)

Sure, yeah, happy to give an overview. So release 18 is the first what we call 5G Advanced release. It really started at the end of 2021.

That's when the projects kicked off. They were decided and the work continued through the last couple years. So like you mentioned, in December the 3GPP group of companies reached a milestone for functional freeze and they're working towards ASN.1. So there are a couple of upcoming milestones for release 18. The first ASN.1 proposal will be for April and the final version or the wrap-up of this release 18 will be in June. And for release 19, the same process started in December of last year, 2023. So we have a good set of projects that are now under the umbrella of release 19.

The work is starting as we speak and that work will continue to ramp up as we close off release 18. And the completion of release 19 will be expected for the second half of next year, so 2025. And there are also some discussions around a new set of projects getting included.

So that'll depend on the progress that the teams are making towards release 19 so far. So by September of this year, there may be some new projects coming in. And for things like drone communication, which wasn't as a part of the first set of release 19 projects, that will get discussed and re-evaluated to see if that gets included.

[Gareth] (2:42 - 3:02)

Okay. So a large part of release 18 and 19 is about sort of performance enhancements. So new features, new capabilities that build on sort of previous releases to improve the performance of existing devices and networks.

So from Qualcomm's perspective, what do you think are the most important performance enhancements here that will benefit operators?

[Danny] (3:03 - 4:30)

Yeah, I think if we look at a set of good features in release 18, 19, I think if you look at MIMO, that's one area where we see new enhancements coming in, I think ever since release 16. So every release since then, there are some sort of enhancements. And I think one area that's getting a lot of interest and it's very important for smartphone performance is Uplink MIMO.

So how do we achieve a more uniform experience, a higher throughput, the ability to support use cases like live video streaming, for example. I think those are kind of the focus right now for on the MIMO side. The other area where we're continuing to see enhancements is mobility, right?

So the device mobility. So as a device move from one cell to the next, how do we make sure that handover is as seamless as possible? So there's a lot of discussions on how do we do that?

How do we shorten the interruption time, if any, to do lower layer trigger mobility. So layer two mobility, for example, is one area that we'll see a lot of enhancements released in 18 and 19. And, you know, on the same topic, I think we're also looking at how we can utilize AI to enhance your mobility.

So I think that will be a very interesting use case.

[Gareth] (4:30 - 4:52)

Okay, so a very important issue for operators is reducing energy consumption. So 5G Advanced builds on energy saving features from release 19, which enables networks to be switched off in sort of low traffic scenarios based on feedback from devices. So what exactly will the new sort of energy saving features being introduced in release 18 and 19?

[Danny] (4:53 - 6:40)

Sure, yeah. So I think, you know, reducing energy or being, you know, being able to optimize energy consumption, both on the device and network side have been an important topic as we look at green networks and green devices going forward. So release 16, 17, I think most of the focus has been on devices.

So the, for example, the introduction of low power, wake up signal, actually wake up signal in release 16 was something that was introduced for devices and that continues to get enhanced through the next couple of releases. We do see a shift of this focus coming to the network side. So release 18, there was a study item on reduced energy consumption for the network, and that turned into a work item in release 18 and 19.

So the ability to kind of reduce, you know, energy consumption smartly, intelligently on the network has been very important. So that's that's all that. So that's an area where we'll see a lot of work going into whether that's on the time domain or the like turning off transmitters as much as possible, or the frequency domain techniques that optimizes characterization, we'll see those getting implemented in release 19.

But at the same time, I think on the device side, we're seeing this low power, wake up receiver, wake up signal. So further enhancing this wake up mechanism for devices so that it doesn't have to continuously monitor the control channel. So that, you know, a dedicated radio will be able to kind of wake up a device and that's going to be very helpful for for IoT devices like the iCAP as we go into 5G advanced.

[Gareth] (6:40 - 7:06)

Okay, but there are also a number of new use cases been defined in 5G advanced, so like non-terrestrial networks or satellites, ambient IoT, etc. So in the case of satellites, then 5G advanced combines cellular and satellite communication under one sort of standard, so effectively creating a sort of one global network. So what opportunities do you think this will offer operators and perhaps also the satellite industry as well?

[Danny] (7:06 - 8:51)

Yeah, I think I think this is a what we call one of the main pillars for 5G advanced, even though, you know, NTN is something that was defined in release 17. But that again, continues to enhance over time. So I think it gives operators and just users opportunities to get more coverage wherever, you know, it doesn't matter where they are.

So even though even if they're in far rural or remote areas, they'll be able to get some connectivity, right? So to be able to send out, you know, messages and even voice calls and data. And at the same time, I think looking at new use cases.

So if you can think of, you know, the SOS calls where we, you know, we sometimes see in the key use cases for these type of use these type of deployments. But even like, you know, we can see that 5G is defining satellite access for broadband. So so that's going to be providing broadband access to remote areas.

So that will connect even more people to closing the digital divide. But if I look at release, you know, 18 and 19, I think we're looking at a selected few enhancements. So for example, looking at how we can come up with, you know, better mobility support, coverage support, as well as improving uplink capacity.

I think those are kind of the key challenges, adding support for regenerative payload. And we're going to see a whole bunch of different new enhancements coming with 5G advance. So I think that's going to be very good for both, you know, mobile broadband support as well as for IoT.

[Gareth] (8:52 - 8:56)

Okay, and on ambient IoT, what will be the output at the end of release 19?

[Danny] (8:57 - 10:16)

Yeah, so ambient IoT is an interesting idea. It's what I call the full stack study item going on in release and starting release 19. So this scan is a new type of IoT or very low complexity, the IoT devices that may or may not have energy storage, it will try to harvest most of its energy consumption through its environment like RF, from the RF.

So it's unclear how far release 19 will take us. It is a quite complex project that touches every part of the 3GPP stack. And, you know, it could stay within a study item for release 19 and convert into release 20 for a work item or you may, we may see a decision point somewhere in the next, you know, 12 months or so that you may convert into a work item.

Yeah, so again, I think there's a lot of open questions, a lot of interest in this in this whole new area, and how that fits into the existing 5G ecosystem. But even more broadly, you know, there's a lot of the study even outside of, you know, cellular, how do we kind of enable these very low complexity, low power devices, so that we can connect more things. So, yeah, more to come on that.

[Gareth] (10:17 - 11:21)

Okay, so let's move on to one of my favorite topics using AI in the air interface. Now, sort of AI machine learning is a major theme running through 5G advanced. And of course, AI has already been used in quite extensively in 5G in devices, in networks, for example, for network planning, O&M, automation, etc, etc.

But this is the first time that it's being used in the air interface. And release 18 defines three AI ML based use cases. So one is channel estimation feedback.

The second one is beam management, mainly focused on the millimeter wave band, I think, and certainly precise positioning. So Qualcomm is involved in all of these three, and you've built test networks to demonstrate all these three use cases. So can you tell me a little bit more about this, for example, what were the main challenges that you had to overcome to get these three use cases to work?

Which use case looks the most promising right now? Is there a need for further studies or testing?

[Danny] (11:22 - 15:34)

Yeah, so I think we've come a long way on the wireless AI front. I think this may be the fourth year that we're talking about it, we're showing our progress. So we've come quite a bit.

So yeah, so like you said, there's the three use cases, we have built a test network for all of these, we've done testing internally, but also with partners. So the first one, of course, is the AI enabled channel feedback. So the idea is that, you know, if you look at how a network decides how it sends data to the device, it needs to determine the channel information channel state, like which what is the best channel to use, and there's a lot of overhead that's involved in kind of communicating that.

So the objective of this, this use case is to kind of reduce that overhead. So you have more airtime to, to send the actual data. So again, we've done a lot of work on this.

And I think what we have shown is that we can reduce this, the overhead about by about like 50%. And you can actually improve the network throughput and latency. With this reduction, I think we showed about like a 60% enhancement in median downloading throughput in one of our simulation in the past.

And I think one of the challenges, of course, if you look at the network and the devices, there are multiple vendors, and it's not always an easy thing to figure out how you these multiple vendors will work with each other. Of course, you don't want to kind of share your proprietary AI models, you want to make sure that you know, you hold onto your own secret sauce. But at the same time, you know, this has to work.

And how do you train that? So I think in the last year, and also you'll probably see in this year's demo is how we enable this process or this this technical sequential training, which allows the network and the device to share the data it uses to train on on their respective sites, but without sharing the model itself. And that's true for, you know, in the network with multiple device vendors, right?

So how do we make sure that every device can perform with, with, with wireless AI without sharing the device models. So certainly, so that that's one one, you know, very interesting area for us. The second one you mentioned is the beam management or more applicable for higher bands like millimeter wave.

So again, the way that this system works is that there are multiple ways to use for for device to send information to the device for the network system, the device, and they can choose different beams depending depending on the environment. You know, so again, looking at how we reduce the the overhead of that communication, and how we can kind of predict which beam is the best one to use. And again, we've shown good results there.

Positioning is the third use case. And really, it's focusing on improving the accuracy of the positioning. So how do we locate this device, you know, by triangulation, for example, or AOA plus roundtrip time.

So there are multiple techniques. So again, one of the challenges for that is, you know, if you look at environments like industrial or inside a factory, there's a lot of reflections, there's a lot of, you know, things that's kind of interfering with the way that you're detecting the location of the of the device. So to use AI to kind of identify those will be very helpful to to make sure that your accuracy is further enhanced.

And I think this I think the key point is there's a lot of potential for AI in communication, whether that's network planning, like you mentioned, or even network management, like load balancing, or even in the in the area of interest itself. I think those are, you know, some of the early things that we're looking at. And again, this continue, this continues to release 18.19. We're looking at even new use cases like mobility, I mentioned that that may be something that that's very interesting going forward as well.

[Gareth] (15:34 - 15:50)

Okay, so are we likely to see some some commercial deployments of these use cases in 5G or is this the objective here is just to demonstrate the feasibility of these AI based interface and so pave the way for an AI native interface in 6G?

[Danny] (15:50 - 17:09)

Yeah, so the way where things are today. So the study is complete, it's being completed or completed in release 18. And it's going to go through the, the process of getting defined into the work in release 19.

So I would say by end of 25, middle to end of 2025, that's when the standards will start to exist. So it's hard to say if this is going to come in the 5G advanced like late 2020, like 2728 timeframe, where it's going to come, you know, in the 6G timeframe. I think it does two things, it gives an opportunity to deploy this early, right.

So by the second half of this decade, there, you know, I, we can't tell the future, but there's, they will be people will be able to deploy this. But the second, I think the more important things is this kind of established the foundation for, for 6G, right. So 6G is something that we see is going to be AI native, so that you have AI in every layer of the of the of the design of the network.

And this is going to be a good foundation for that. So again, we're getting a lot of learning from the work that's going on. So I think, you know, it's again, just to answer your question, it's hard to say, I'm hoping that we'll see something by the end of this decade.

But if not, we'll certainly see that coming out soon after.

[Gareth] (17:10 - 17:46)

Okay, so that brings me nicely to my last question, and it's on on 6G. So release 19 will be the last release focused on 5G. But it will also contain some new technologies that will form the basis of 6G, like integrated sensing and communication, and field duplex, for example.

So two technologies with tremendous potential, but still with some significant challenges, technical challenges at the moment. So what is the work plan here? And again, as with the three interface use cases we just described, and any of these technologies likely to be commercially deployed in 5G?

[Danny] (17:47 - 20:01)

Yeah, so you mentioned integrated sensing. So I think this is exploratory, right? So I think if we look at the scope of 19, it's not really meant to define or study any 6G technologies.

But again, a lot of the work is beginning, whether it's in standards or not. So if we look at, you know, if we look at the content of release 19, right, one set of projects are things that's more forward-looking that we believe is going to be more impactful in the 6G timeframe, even though some of that may be brought into 5G advanced. So sensing and communication.

So integrated sensing and communication is one example. Full duplex, or what we call sub-band full duplex is another. And then looking at even higher bands for wide area coverage.

So we call this upper mid-band. And I know the definition of upper mid-band continues to kind of evolve over time. But if we look at 7 to 16 gigahertz range, how do we make that a, you know, a band range for wide area coverage.

So we have some research going on there as well. So I would say, these are kind of the things that it's kind of hard to imagine, you know, people to redeploy some of these infrastructure in the 5G advanced timeframe and have it been 5G advanced. So these are going to be more like a 6G technology.

So again, I think we'll enter the formal 6G study in release 20. So the way the roadmap is being laid out is release 19 is kind of the last release with 5G focus, right, 5G advanced focus and release 20 will be a lot of the 6G studies we'll get into it. And then, you know, the wrap up of 5G advanced in release 20.

And then release 21 is when the 6G works really starts. So yeah, so I think a lot of this, we'll learn a lot more as we kind of go through the next, you know, 12 to 18 months on how things are. But most of the ones that I mentioned are likely going to be a 6G thing.

And we're just getting ahead by kind of doing some exploratory studies on.

[Gareth] (20:03 - 20:34)

Okay. Okay, great. So that brings us to the end of the podcast.

Thank you very much indeed, Danny, for your valuable insights. And also for our listeners, thanks for tuning in. And as usual, you can listen to all our podcasts on our website at counterpointresearch.com and also on your favourite podcast platforms. So please subscribe and press on the notification button so that you are notified about each podcast as and when they are published. So that's all for now. Thanks for listening.