THOMSON REUTERS STREETEVENTS

EDITED TRANSCRIPT

QCOM - Qualcomm Inc at Needham Virtual Automotive Tech Conference

EVENT DATE/TIME: JUNE 03, 2020 / 4:00PM GMT

CORPORATE PARTICIPANTS

Patrick W. Little *QUALCOMM Incorporated - Senior VP & GM of Automotive - Qualcomm Technologies, Inc.*

CONFERENCE CALL PARTICIPANTS

Rajvindra S. Gill *Needham & Company, LLC, Research Division - Senior Analyst*

PRESENTATION

Rajvindra S. Gill *- Needham & Company, LLC, Research Division - Senior Analyst*

All right. Welcome, everybody. Sorry for the delay. We've had a little bit of audio issues. But we're very pleased to have Qualcomm presenting. With us is Patrick Little, Senior Vice President and General Manager of the automotive division at Qualcomm. patrick's had -- has over 30 years of executive management experience, engineering background in the semiconductor and technology industry. So we're very please to have him here.

In the interest of time, we're just going to do a straight presentation. If there are any other questions, we can -- I can try to relay them at a later point. But let me hand it over to Patrick.

Patrick W. Little *- QUALCOMM Incorporated - Senior VP & GM of Automotive - Qualcomm Technologies, Inc.*

Good morning, everyone. I apologize for the technical difficulties. It's part of the working-from-home experience. But I'm going to speak loudly because we have some audio challenges. But the messages today, I think, are -- should be interesting to everyone. So let me just speak in an elevated tone and hopefully be able to catch most of the audio that I'm pushing here. So I'll introduce myself quickly again. I'm Patrick Little. I'm the Senior Vice President and General Manager for automotive at Qualcomm. And so I lead the global automotive effort at Qualcomm. Today, I just want to talk to you a little bit about what Qualcomm's doing, but, probably more importantly, what's going on in the industry? What are the opportunities, maybe some of the challenges that are going on in our industry? And did COVID affect us? And how did we power our way through it? If you could go to the next slide, please.

So the -- I think you all know that the automotive industry is going through a fundamental transformation. And it's not just on one vector. It's on multiple vectors. And it'd be silly to even try to put it on one page or even 10 pages. But really there are some key technology drivers that are disrupting the automotive industry. And that's electrification, connectivity, including intelligent compute, and then also autonomy. And so the automakers typically are challenged with, how do we move in this century in March from one model to the next and modestly change things to minimize risk?

Now all these 4 sectors and technology drivers are coming from every direction and, frankly, just really upending their business for the better and also for the works. And so there's a tremendous opportunity for many of them, but also a tremendous threat to the business. Many of these companies have been on this very linear innovation have for many years, and then now they find themselves really challenged across their products and processes and organizations and business models. And quite frankly, many of the automakers have come to me and said, "When we look forward and we look at the assets, including the resources and the technologies that we have, they don't map very well to the challenges that are ahead." And so what this is doing is creating an opportunity for technology companies like Qualcomm and others to be able to step into that void and bring holistic solutions to get over some of these technology hurdles and, frankly, turn those threats around to become really great opportunities for many of the automakers.

Just quickly, in the interest of time, electrification is one of the bigger ones. And although it will be fundamentally there to help us eliminate reduce greenhouse gases and be gentle to our environment, really what it's doing is it's shifting the cost structure of the cars from the mechanical to the electrical systems and the softwares. At any point of moving everything over to systems, electrical systems and software inside the car. If I were to really pinpoint one thing that's really the catalyst for most of the change that's going on in the car right now, it's not autonomy, which is this progressive march in the backbone, it's really connecting the car to the world around it and bringing our digital lines into the car.

THOMSON REUTERS

And so if you look at -- the OEMs are looking at the -- the frame of reference for them is the handset. We probably look at 1,000 times a day. And their challenge is to try to bring an automotive experience that is very similar to what you're experiencing on your handset. And to bring that digital life into the car, transforming the user experience and the user interface through compute and software and AI and data is one of the big challenges for the auto makers and, frankly, doesn't really match their core competencies. And so one of the things that's happened recently is they've tried to take a lot of these things. This is true universally across all regions. They've tried to take these things in-house and make this transformation on their own. And frankly, even the biggest of them is really challenged with making this happen. They're all trying to move to connected services. They realize that there's a tremendous amount of profit and flexibility and being able to hold on to their customers, offer services throughout the life of their vehicle. And a big part of that is actually upgradable function. And so many of them are looking at pay-as-you-go models to superset a car and ship that same configuration globally from maybe a lower end model all the way to a premium model, and be to update these pay-as-you-gos for all their customers.

And so I'll talk quite a bit about, what does this transformation look like for the automakers, where they want to bring connectivity into the car, they want to bring the digital life into the car? These digital experiences that you're experiencing on your phone are what they want you to experience in the car. And I'll talk to you a little bit about the challenges they face and some of the things that Qualcomm is doing to help facilitate that entry into other makers really becoming mobility service providers.

But I thought this was very telling that a recent KPMG survey said that 85% of automakers actually think that the digital ecosystem will generate much higher profits than the car itself. And so as we know, cars are fairly low margin, but now they're trying to find a vehicle where they can really expand the user experience.

And then finally, one of the bigger changes right now is ADAS and autonomous driving. And I'll come through it in history and really let you know that it's -- we're not really just going to jump to autonomous driving overnight. Just like everything else that's happened in automotive and many other industries, what we're likely to see is more of a progressive adoption of driver assistance over the months, over the years and even, frankly, over the decades. And so, right now, you see a lot focused in the automakers in trying to meet what's called NCAP, New Car Acceptance Programs (sic) [New Car Assessment Programs], those levels of ADAS support. And so it's things like sign recognition and rank key and emergency breaking and adaptive cruise control are really going to be where the ADAS autonomy world will reside for the next 5-plus years. And only then when we start to see the cut in of higher levels of autonomy and mostly for commercial implementations. But I'll be getting to that a little bit more.

If we take a zoom back and see what's happening with the automotive industry, it's going through some fundamental technology dislocations. The automakers are really relying now with technology providers to now partner with them to be able to put these solutions together and be able to differentiate their user experience that they're delivering to their customers.

And so a lot of fun. I think most of them now, the automakers view this less as a threat now and more as an opportunity. Like 2 years, 3 years ago, all of them had threat in their eyes. And now many of them are looking at this saying, "Hey, we have a fantastic team. Now it's a good time." We're really able to reinvent ourselves and, frankly, reinvent the relationship they have with their customers by bringing scalable services.

Next slide, please. More work-from-home challenges. Okay. I'll just roll through this. And I'll speak up a little bit in case the audio isn't quite what we need here. Qualcomm has -- as I said, a big change for us over the last 5 years is we've gone from thinking of ourselves as a supplier, just thinking of ourselves as a co-innovator or even a trusted adviser to many of the automakers. And so there are a couple of key categories where we've really stepped in, we think, to help the automakers to make this turn to their near future.

The first one is connecting the car world around it. So Qualcomm is far and away the leader in telematics, connecting the car. And so all the way back from really the 3G, 4G and now moving in the 5G days, Qualcomm has been the market leader. We have not only the baseband 4G, 5G, but also the RF front end to attach to that. We also have all the other connectivity -- literally all the other connectivity technologies that are used around an -- whether it's Bluetooth or Wi-Fi or GNSS for location, the modem and the RF front end technology. And what this allows us to do is to become a lot more creative about helping the automakers, leaving the Tier 1s to solve some of these bigger challenges. And what we've found over the last couple of years is the scale and the breadth of assets that Qualcomm has, not only just limited telematic, but across all the categories is really helping us to set ourselves apart from some of the other players that might have a piece of this solution.

THOMSON REUTERS

So the Automakers, by definition, are running for the train. They're late with very complex solutions. Half the time, they can explain the user experience they want, but not only the underlying technology that's required to deliver that user experience. And so this is where Qualcomm steps in, as I said, is a trusted adviser. And we have the assets, the breadth of assets to be able to really bring about interesting solutions from the telematics all the way to services.

Another category, which is a little newer for us, that's really come into the Qualcomm fold over the last 3 to 5 years, and that's compute within the vehicle. We call it digital cockpit, which is to mean infotainment, but also the instrument cluster, which is also going digital. And so this has -- this may seem simple, to run the instrument cluster, announce it to run the center stack with the maps and navigation and your entertainment or infotainment applications. It's become a lot more than that. It's actually become the interim compute hub for the entire car. And so you'll see a lot of the applications and innovations, whether it's getting rid of the rearview mirror or whether it's bringing in new types of services and applications.

The infotainment, the digital cockpit is really the center of innovation for a lot of what's going on in automotive right now. And that innovation is not only hardware and silicon. It's actually quite a bit of software virtualization to be able to run a safety application like your instrument cluster right next to an entertainment application that's going on in your infotainment system.

And I'll explain in some greater detail, but Qualcomm has gone from really 5 or 6 years ago who are new to the space to becoming a leader and probably the leader in this space over the last couple of years. And so over the last 3 years, 19 of the top 25 automakers have adopted Qualcomm Snapdragon technology as their primary solution for their digital cockpit compute, which includes the instrument cluster. And so quite a ramp that we've been on and a serious amount of work and co-innovation that's gone on with the automakers.

The next category that we've gone at quite challenging over the last, I would say, 5 years, maybe even a little bit more is ADAS and autonomous driving. We've been investing in AI and machine learning for about 12 years at Qualcomm. And only now, over the last couple of years, have we put that to work in autonomous driving category. And so today, I'll talk to you quite a bit about my view of, how do we really realize the path to the full autonomy? What are the benefits to everyone, whether it's safety, whether it's convenience? And how legitimately can we get there as opposed to thinking some moment, all of a sudden, boom, all of the cars are going to be autonomous, which will certainly not be the case.

But Qualcomm finds, and as we look at our assets, whether it's compute or AI assets or even our software assets or even our AI acceleration assets, they're mapping very well into the ADAS and then to the full autonomous driving mission. And so we're working very closely with quite a few automakers on developing what we feel are more practical solutions on this more progressive march to full autonomy. And I'll talk about that quite a bit as we move to the presentation.

And then finally, Car-to-Cloud Service, really borne out of necessity. So we've had automakers come to us and say fantastic work that we've done in connecting the car and telematics and in bringing central compute, whether it's digital cockpit or autonomy into the car. What we really need is a better relationship with our customers. We need to help them to bring their digital lives into the car. And so how can you help us, Qualcomm? Since you're at the center of our telematics. You're at the center of our digital cockpit. You're bringing one for autonomous driving. How can you help us to bring it all together and not talk about technology to our customers, but connect with them and deliver them flexible capabilities? We deliver to them new services or new engagement markets. And so I'll speak to it quite a bit about how we partner with the automakers to bring Car-to-Cloud Services and make that a reality for the automakers, which I believe is really the next quantum leap in their growth and profitability and prosperity in our book.

Next slide, please. Okay. Just quickly, in the interest of time, I'll move a little quickly, but I wanted to give you an idea of what it looks like, this digital transformation that's going on inside of the car. This intelligent cockpit that I've been talking about, how do compute AI, 5G really transform the user experience? What does that experience even look like?

So the next slide, please. Okay. Full screen's not possible. All right. Technical difficulties, but I'll just march right through them. So the intelligent cockpit is graduating very quickly. So even this next generation, I think, will knock the socks off most of the people watching in the audience. So there are an incredible amount of applications and use models that are moving into the cockpit. The first thing I'll say is that it's very clear that the panoramic displays, a multiplicity of displays, what the driver looks like -- looks at in terms of the instrument cluster, the center stack to entertainment in the rear seats and entertainment for the passenger. So big wide screens being driven by very high-performance GPUs is a requisite to be able

THOMSON REUTERS

to deliver this next-generation cockpit. And as we make that march towards autonomy, even more so, we'll expect that entertainment piece of it to be more and more fascinating and more like the experience that you might get on your tablet or your handsets or even in your living room.

Another whole group of innovations in the cockpit really focuses on safety. So driver monitoring, not only for drowsiness, but also for personalization. Mapping the car to your personal needs is a big part of what's going to happen as well. Driver monitoring, the instrument cluster going into digitization, heads-up displays that will have augmented reality, voice -- natural voice prompt, natural language processing, gesturing. So that you don't have to look down to punch controls or even down to touch screens, that should be able to keep your eyes forward, your hands on the wheel, look at augmented reality representations of the road around you and being able to change those few controls that you need to through nonphysical means, such as your voice or such as gestures. So an incredible amount of change going on in the cockpit, which will drive, frankly, a very high level of safety over the coming years, but also a very high level of enjoyment and convenience and user interaction.

And so beneath all of that are really some core technologies that are incredibly key to be able to deliver that experience. And so if you look at what Qualcomm -- solutions to the challenges, we've had to bring a tremendous amount of compute capacity. When we first came with compute controllers in automotive, a lot of the automakers said, "Wow. Overkill. That's a lot of compute power. How can we ever use that amount of compute power?" And now, frankly, we're throwing about as much compute power as we can at them, and they're gobbling it up very quickly.

And in fact, they're saving money while they do it because they're integrating a lot of the functionality by putting audio off in separate ECUs and putting them into this central cockpit controller. A lot of these separate ECUs control units -- electronic control units across the car are now being absorbed and integrated into a single SoC in the center of the cockpit and much of the time, particularly it gets into premium models and mid-range models being driven by Qualcomm. And so a lot of the underlying technology in terms of compute and AI is incredible. And GPU, it's incredibly necessary to be able to bring these experiences alive. And don't forget, very importantly, it's connecting the car to the world around it. Many of these experiences require a touch to the outside world, the 5G reach to pull that high-definition content or high-definition audio or video. And so the connectivity Qualcomm brings, the compute capacity followed -- embedded with AI, all of these are very important to make this new user experience a reality, which, frankly, mimics the digital experience they now have today in order influx.

And if I can move to the next slide, please. Just a quick punctuation. AI is incredibly important. So AI is the constant, continuous improvement engine in the background that makes it understand your language better and better each time and recognize your voice better and better each time. It's the one that's going to give you that seamless and fluid user experience from those things that are safety-related or those things that are entertainment-related. And even as particularly as we go to ADAS, AI plays an incredibly central role in being able to provide the adjustable and continuously improvable algorithms that's going to allow your car to -- allow you to slowly and incrementally let go of some of the functions that you control in your car and let the machine handle. So AI, an incredibly important investment that we've made at Qualcomm across all of our domains, but I think automotive is actually one of the key beneficiaries over 12 years of investment that we've done in AI.

Next slide, please. And so very quickly, in the interest of time, Qualcomm solutions is actually pretty unique, and it's really giving you an insight as to why Qualcomm has come so quickly on the automotive wireless solutions category. And that is that our native architecture -- let's get too technical in too many details today, but it's important that our native architecture is what's called heterogeneous compute.

And so I'll give you an example. A homogeneous compute might be a CPU farm or a GPU farm. And so GPUs that are trying to solve problems that are better solved by a CPUs or CPUs that are -- problems that are better solved by a neural processing unit will slow down and bog the system down and actually create a tremendous amount of thermal and power dissipation. And so the twin advantages that Qualcomm has is heterogeneous compute allows us to look at each of the workloads coming from audio. We want that to go to the DSP. If you're going to be doing graphics processing, you're going to want to hit our GPU unit. If you're going to be doing AI for personalization or other means, you're going to want our neural processing unit to handle those workloads.

And since we're able to take the various workloads across the car, the automakers have trusted us to start to pull other ECUs off of their platform and put it under our SoC. The other benefit, and it's substantially important, and that is that our power is -- the orders of magnitude lower than many of the other solutions are out there. And these are 10x lower than many of the other solutions out there. And the reason for that is that we don't try to have the wrong engine driving the wrong workloads. So we're able to do that workload engine management. And frankly, that's a core competency of Qualcomm, having done that in the mobile space for now decades and trying to get that power down as low as possible to preserve

THOMSON REUTERS

battery life is now paying dividends in automotive market, where you wouldn't think that, that would be an obvious assumption. But very important that heterogeneous compute helps us to solve these local twists in workloads.

And so as I mentioned, we've been growing our performance of our chips generation-after-generation by manyfold, really trying to keep up with the amount of power performance and capability necessary to run many of these new applications.

Next slide, please. More technical difficulties. I apologize, everyone. We'll get there. Maybe I'll hit the high points in the interest of time. Okay. Very important. It's great to have an experience inside the car and all the compute power to be able to manage those applications, but it's also very important to connect the car to the world around it.

Next slide, please. We could go to the previous slide here, please. Why don't we just stay right here? We'll just stay right here. It's very important to connect the car to the world around it. And this is actually the primary and initial focus of Qualcomm. And that is being able to offer all of the various connectivity technologies within the car. And so it starts with bringing that bandwidth into the car. So 3G, 4G and now 5G bandwidth being brought in the car. Distributing that bandwidth inside of the car through Wi-Fi is also incredibly important. And so we bring Wi-Fi and Bluetooth technologies to allow you to interface with the car and be able to make good use of that bandwidth, the 5G pipe that's coming into the car. Maybe you want to stream movies. Maybe you want to download 3D maps. In the age of autonomy, maybe you need to upload rich data, not only to the cloud, but also to the cars around you. And so -- and also GNSS for precise positioning. So all of the connectivity technologies in and around the car is a primary focus of Qualcomm because we believe that most of these user experiences are really tied to being able to deliver great connectivity, uninterrupted connectivity experience that's similar from what you're seeing today here.

I'll move on to Cellular V2X.

Rajvindra S. Gill - *Needham & Company, LLC, Research Division - Senior Analyst*

So, Patrick, maybe we just have like maybe a couple of minutes on Cellular V2X, and then we'll -- we might want to conclude it then. And then we're going to go to the panel discussion afterwards that'll be...

Patrick W. Little - *QUALCOMM Incorporated - Senior VP & GM of Automotive - Qualcomm Technologies, Inc.*

.

Fair enough, Raji. Fair enough. I'll do exactly that. Let's see if I can...

Rajvindra S. Gill - *Needham & Company, LLC, Research Division - Senior Analyst*

That would be great. Thank you so much.

Patrick W. Little - *QUALCOMM Incorporated - Senior VP & GM of Automotive - Qualcomm Technologies, Inc.*

And everyone, I appreciate your patience overcoming these technical difficulties, but I do want to deliver an important message. Slide 9 then, please, if possible. Great.

Cellular V2X. Of all the things we work at -- work on in Qualcomm automotive, and, frankly, even across Qualcomm itself, I'm most proud and most excited about Cellular V2X technology. And the reason for is, this is a very, very advanced technology that requires the entire industry to work together, that is actually going to save a tremendous amount of lives. And so connecting the car to the world around it, whether it's vehicle-to-vehicle or vehicle to the infrastructure, so they will know what the traffic -- what the roads are, what the traffic conditions are. Or vehicle to pedestrian. So you'll know when a pedestrian is stepping off the curb. Or even vehicle to network, so you'll be able to more efficiently traffic manage. V2X

THOMSON REUTERS

technology, in particular, Cellular V2X technology, we think, is incredibly powerful and very important to save lives and to make things just more efficient across the transportation infrastructure.

We've worked with automakers. We've worked with mobile network operators. We've worked with module makers across -- and infrastructure providers across every geography across the entire globe to drive standardization, to launch solutions and now moving into commercialization first this year in China and following over the next few years in Europe and North America. Incredibly important. And when 5G comes along, we'll move beyond the basic safety measures of C-V2X release 14, release 15 to release 16 and 17, where we'll be able to do things like share video amongst the cars, will really be able to get a better view of what's going on around the car.

And so as we move to autonomy, the ability to have cellular V2X with incredibly low latency, incredibly high bandwidth is going to be very important to the fully autonomous experience. So I'm incredibly excited about Cellular V2X, the importance of it, the impact of it, and the community ecosystem really coming together globally to be able to drive this standard for really the better of the entire industry and the better of consumers.

And one last point on this march, before I hand it back over, is 5G is really going to change the experience across automotive, across every industry, but certainly automotive. Those rich use models that the OEM is looking forward to will be driven much of the time by low latency, very high bandwidth services, 5G services. And of course, a little latency with a higher throughput is going to allow 5G to have uninterrupted support to the infrastructure and also to all of the cars.

So Raj, in the interest of time, I'll end it there and just apologize again for the technical difficulties that we had. But quite a challenging for the industry. Qualcomm has been working in partnership with the automakers to really help them to make return in this transformation. Very exciting times ahead for all of us. I think automotive, although it's gone through these disruptions, is going to be a tremendously fast-growing industry over the coming years.

Rajvindra S. Gill - *Needham & Company, LLC, Research Division - Senior Analyst*

No. That's fantastic, Patrick. This is a great presentation. It's very insightful. We're going to start our panel discussion where Patrick will also participate in a couple of minutes. I encourage folks to join there. We're going to talk more about DATAx. We're going to talk about more to -- more about 5G impact on ADAS as well as overall ADAS trends. But thank you so much, and thanks, everyone. So we'll see each other in a few more minutes. Thank you.

Patrick W. Little - *QUALCOMM Incorporated - Senior VP & GM of Automotive - Qualcomm Technologies, Inc.*

Thank you. Bye-bye.