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PRESENTATION

Voice-Over

What do we mean when we say, “All you need is an idea and Intel inside?” - That in today's fast moving high-tech world, big ideas are powered by a one-of-a-kind partnership with Intel, because our customer-first approach is more than just a byline. From the moment we put the silicon in Silicon Valley, Intel has been accelerating the industry in big ways. Setting a course for a new era of bold innovation. No one else is this obsessed with engineering a brighter future. That's why we're driving the industry's biggest inflection points, putting intelligence where it's needed most, in ways that only Intel can, with the multi-architecture approach that empowers our customers to transform their businesses from the inside out.

We're democratizing AI in big ways, combining software and hardware to open up new possibilities. And we're moving that innovation around the world at lightning speeds with our advances in 5G. Collaborating with global operators and creating a new vision for networks of the future. We're taking intelligence and bringing it to the edge, accelerating business outcomes with over 30,000 Edge to Cloud solution deployments, and we're taking that same innovation to the streets, deploying new technology and advanced data layers to make autonomous driving not only possible, but safe and seamless.

Every day, we create world-changing technology that enriches the lives of every person on earth, making bold moves, because Intel has a unique portfolio breadth and depth, plus the global scale to serve as an unparalleled catalyst, for our partners’ biggest ambitions.

So, if you've got a big idea, let's go off and do something wonderful together.

Richard Piper

Wow! Am I ever ready to talk about innovation after watching that. Welcome, everybody, to the Intel Network Builders Enterprise Networks Insights Series. I'm Ric Piper, I'm an account executive at Intel, driving sales into our channel and scale partners, and I am your host today for this webinar. Thank you very much for joining us.

The title of today's webinar is Harnessing the Business Value with Private Networks. We will start today with a presentation from one of our key partners Mavenir, who are going to talk about the innovative things they're doing today with Intel and the industry. Then we're going to have a fireside chat and we're going to talk about some of the key trends and things that are going on, as well as we're going to answer your questions all along the way.

Before we get started, I want to take some time and point out a few of the key features in the BrightTALK tool that are designed to improve your experience with us today. There's a Question tab below your viewer. I encourage our live audience to please ask questions at any time during the presentation today. We will consolidate your questions and the presenters will answer them as we go along or throughout the presentation. Below your viewing screen, you will also find an Attachment tab with additional documentation and reference materials that pertain to today's discussion. Finally, at the end of the presentation today, please, I'm asking you to take time and provide us your valuable feedback in the Attachment tab as well. We truly value that feedback as we look to improve all of our webinars in the future.

The Intel Network Builders Enterprise Networks Insights Series is a live play every month. So, please, check out the channel to see what is upcoming and access the library of available resources and content. In addition to the resources you will see, we offer comprehensive NFV and 5G programs through Intel in our Network Builders University. You can find links to the programs in the Attachment tab as well.

Today, I am pleased to welcome Aniruddho Basu from Mavenir and Caroline Chan from Intel. Ani Basu is the Senior Vice President and General Manager of Emerging Business at Mavenir and part of Mavenir's Executive Leadership Team. He is based in Stockholm, Sweden. His charter is to extend, establish, and grow Mavenir's technology, portfolio, and business across service providers, enterprise, industry segments, with a focus on 5G, digital transformation, IoT and advanced communications, with new business models and go-to-market approaches, establishing a broad ecosystem. Ani has 24 years of experience in the ICT sector, and has worked for a number of multinational and Fortune 500 companies including Ericsson, Ascom, as well as Telstra, HCL, and Tata Group companies. He held roles spanning sales, business development, strategy, commercial management, product management, R&D and portfolio, innovation incubation, and operations. Ani holds an MBA in International Business and a Bachelor of Engineering in Electronics and Communications.

Also with us today is Caroline Chan, Vice President of the Data Platforms Group and General Manager of the Network Business Incubator Division at Intel. She leads pathfinding of advanced technology solutions and business practices established and accelerated by 5G, edge computing, and AI. She serves on the board of the Telecom Infrastructure Project, CableLabs' Convergence Advisory Group, and 5G Open Innovation Lab. Caroline also serves as an independent director in EnerSys Corporation.

Welcome, Ani and Caroline, and thank you for taking time to join us today.

Caroline Chan

Thank you.

Richard Piper

I'd like to start off and turn it over to you, Ani, and let you talk about the innovative and market-leading things Mavenir's doing.

Aniruddho Basu

Thanks a lot for the intro, Ric. A little bit interesting in many contexts. I'm in very august company today. Caroline's on, she's been in the industry for a number of years, also somebody that I really look forward to engaging with on this fireside chat post my session. Why it's also interesting is, first and foremost, I'm honored and privileged to be part of this community right now, having been invited as a speaker to address Intel partners, developers, customers, and the broader enterprise community at large. I think that time is also extremely interesting as our industry is getting into the onset of the adoption of 5G, not just as a technology stack, and yet another G, but fundamentally as a potential game changer, and an enabler for the digital transformation of enterprise and industry. So, thanks, once again.

What I'm going to do today over the next roughly 25, 30 minutes, after which Caroline and I will have more of an open discussion, is to frame private networks in the context of why, what, and how. I'll start with a little bit of a background. The background being that in the last three to four decades, over the various Gs that several industries have seen, from 2G to 4G, over the last roughly three decades, because it takes about 10 years for every new G to land, the industry has fundamentally been focused on enabling technologies that connect people. So, it took us roughly 25 years to connect about 5 billion people, and over the last few years, we have now reached a stage where there's more than 7 billion mobile subscriptions on the planet. So, there's actually more mobile subscriptions than there are a number of people. And that's been a great story so far, and that's been predicated on the fact that first there was an incentive to get voice services to touch more and more people on the planet. And then with the advent of the first smartphone around the 2006/2007

timeframe, to actually put smartphones that really changed the database construct of consumer transformation and mobility. So, 7.5-plus mobile subscriptions, about three decades of various Gs leading up to where we are today.

Now, why is this moment in time important? The number you see up there that I called “44 Zettabytes & The Data and Connectivity Movement”. So, 44 zettabytes is a fairly large number. It's 44 followed by 21 zeros. If you added three more zeros, you would get to a yottabyte, after which you actually run out of the decimal system. Now, 44 zettabytes was, according to a number of external sources, including IDC, was the size, the estimated size of the digital universe in the year 2020. All bits and bytes in rest, in motion, traveling through networks, 44 zettabytes, that's a shed ton of data. And evidently, and somebody apparently counted, that's a number that's larger than the number of known stars in the universe. So, why is that important?

As we enter into 2020 and beyond, on the onset of 5G, we are transitioning from an era, over the last few decades, where consumers and enterprises are essentially connected-- basic connectivity, access to voice, access to data. 2021 onwards, this 44 zettabyte paradigm, is the data lake which, together with mobility and connectivity, will fundamentally enable industries and enterprises to digitalize. So, the momentum that we saw, the scale and adoption of technologies, the value that has been unlocked so far on the consumer side, is now coming to industries and enterprises.

What does that really mean? That also fundamentally means that mass market needs essentially, shaped by relatively one single use case, which is voice and basic data connectivity for consumers, will now transition into some fairly specialized requirements because not every industry has the same need, enterprises have bespoke requirements, and moving away from essentially a scalable market and a connectivity construct fueled, for instance, by standardization and service offerings offered by mobile service providers, we are now getting into a scenario where instead of singularly one use case, we will potentially have thousands and thousands of use cases. Not just a few dozen or a few hundred devices. We are looking at a thousandfold increase in number of devices. But we are looking at very specialized requirements from industry sectors and a multitude of enterprises. We, therefore, need to move away from essentially what's been a relatively restrictive license regime, because spectrum is the new oil, spectrums are the highway that powers all of this connectivity and networking constructs, to more of a pragmatic regulatory shift, where more and more countries are looking at making more spectrum available, specifically suited for enterprise and industry adoption.

What we are also entering into in this decade, specifically with 5G, is traditionally the world of telecoms and IT have been at loggerheads. Telecoms has been very vertically integrated, very appliance-based approaches, while IT has had a much shorter innovation cycle, but a much more horizontal and decoupled innovation cycle. So, hardware innovation would happen on its own pace, while software and applications would develop on their own, while in telecoms, the reason why every G takes 10 years is because everything is vertically integrated, and everything is really, really boxed up.

Now, however, that principle is changing. This decade is about telecoms plus IT, and why that has happened is over the last 10 years, even IT-based principles like virtualization, cloud technologies, automation, AI/ML, are now increasingly de rigueur in the way that the next generation of technology platforms will be built.

Which leads me to the second point. If you're getting into more of an IT-centric networking and connectivity and mobility construct, we need to be moving away from traditional vertically-integrated appliances with purpose-built hardware, towards more horizontal platforms driven by software on the cloud, and leave the hardware constructs to companies like Intel, et cetera, that are driving much faster innovation in that space. We are also in an era, because of this enormity of the challenge before us, we are moving from connecting just 7 billion plus people to potentially tens of billions of devices in the next few years, we have to move away from an industry that has been dependent on a handful of technology providers, which has led to what I like to call proprietary oligopolies. We therefore need, simply because this is a much more efficient model, to bet big on open ecosystems and much more democratization of networks and accessibility.

So, with that said, let me come to why private networks. I already teed it up by saying that the consumer side has been about the lowest common denominator principle to address consumer needs, a one size fits all network approach. However, as industries and enterprises start to digitalize, there'll be bespoke requirements. That being said, private networks and bespoke requirements aren't fundamentally

new. They've been around for a while. Typically, they've been around in the shape of LMR and PMR systems, which are proprietary-based technologies, which were typically used by national security and public safety agencies for things like blue light services, for healthcare, for police services, and so on. Over the last roughly 15 to 20 years, and predominantly, I'd say in the last 15 odd years, since the advent and adoption of 4G, those agencies started to adopt LTE as the technology of choice, because there were scaling benefits, availability of devices, interoperability with operator networks. They started adopting what ended up being called private LTE in these national security, public safety requirements. So, private networks as an idea, as a construct, as a technology paradigm has existed.

What is fundamentally different now, however, and this is what's illustrated in the top left of the chart, is that with operational technologies, specifically engineering industries, industry verticals, advanced enterprises, there are cyber physical systems that now need connectivity. There are very unique sets of requirements, specifically around network constructs, that are not supported in traditional macrocell networks that are more consumer oriented. There are very unique security and identity and access requirements for mission critical networks and enterprises and verticals. There are rather specific performance needs in these kinds of environments that are also not supported by typical macrocell networks.

Now, in light of this, and in order to be able to address this burgeoning plethora of a thousandfold increase in different kinds of use cases, from enhanced mobile broadband to critical communications, to industrial IoT, there's a need for new business models, there's a need for a different kind of flexible network platform to address all of this diversity through much more flexibility, both in terms of network technologies and platforms, but also in terms of business models. We did a bit of a pull across multiple industries and enterprise sectors with one of our market research analyst firm partners, Omdia, and that poll, what you see on the bottom, is a word map that what comes to your mind as an enterprise, or an industry, or an operator, or even a consumer, when you start thinking about private networks? What drives private network adoption?

One of the key things that kept on coming up was security, and velocity, and innovation and ecosystems. These were, I would say, the top three or four keywords that we kept hitting. What we also asked was, do you believe that private networks will be owned and operated by traditionally as has been the case with mobile network operators, or do you see enterprises taking charge of their own destiny and insisting that they want to own their own spectrum assets, manage and drive their own network deployments, and so on? And I think it's fair to say at this point in time we see the jury's out on this. There's a fairly even-steven split between an expectation that operators will also have a very strong role to play, where they could offer slices of the network, or extensions of the network, built on capabilities that they've had over the last three, four, five decades in the connectivity industry. But there's also an increasing acceptance of the fact that for various reasons, whether it's for security considerations, or ring-fencing data access, to minimizing dependence on a macrocell network for various reasons, and there will be an increasing number of enterprises that are looking at ways to manage their own network connectivity and their own private networks as well.

So, that was kind of why private networks. In that context, if I look at market developments, the demand drivers for private networks are already in place. There's a 1,000x use case diversity. There's a need and an acknowledged, let's say, momentum across various industry verticals, and the entire enterprise sector, I would say, that to me ask for networks that address their specific and rather unique needs.

In terms of industry enablers, we see more and more countries actively allocating spectrum, and launching regulation that facilitates a faster adoption of 5G-based private networks and new kinds of technologies to enable private networks to become the true transformative change that we all expect. So, on the spectrum side, just as a case in point, one of the early outliers on 5G has been Germany, which has really led the industry for adoption challenge, and Germany has allocated 100 MHz of spectrum in the n78 band and made it specifically available at pretty much throwaway prices for enterprise and industries to really take that in, adopt 5G technologies, implement their own networks, and drive their digital transformation.

On a fairly similar note, in North America and in the US, CBRS is the spectrum vehicle of choice both across the PAL and the GAA spectrum. Part of it is owned by enterprises, and part of it has also been auctioned out to enable even operators to have a strong play in being able to offer bespoke services to enterprises, too.

On the technology evolution side, there are developments, specifically, like I mentioned, in the last 10 to 15 years, coming in from the IT side that has transformed the way that we build networks from the telecom industry, and telecom building practices in terms of resilience, availability, redundancy, ruggedization, and standardization that has also now been adopted by the IT side. So, key technologies like 5G, cloud, and automation, I think, pretty much underpin the fact that we can actually do what we need to set out to do.

Last, but not the least, and this is very germane to the discussion and conversation that we are having today, it is beholden upon us to drive and explore ways of expanding the ecosystem, to really bring in enterprises, to really bring in industries into the same conversation, to enable a much faster ecosystem acceleration than we have hitherto seen in the telecoms world. So, collaboration and cooperation across technology providers, service providers, demand drivers, regulators, policymakers, developers, is pretty much, I would say, going to become the de facto standard for us to build what I like to call as the ecosystem of ecosystems, to really make this happen.

Now, how will we, as Mavenir, what is our vision in terms of enabling this connectivity construct, this digital transformation construct? If I go back to 2006, the transformative change wasn't the first smartphone. The transformative change was the smartphone for the first time was able to access an abstracted network platform, and developers were able to create value over the top with their app store constructs, their applications, and not really have to bother about the underlying complexity of the networks. And that app store construct essentially led to where we are today. A huge amount of value that's been unlocked, driven by developers, by consumers, by enterprises that were able to access the power of the network beneath. If we as an entity, we as a community, are able to enable what I like to call the app store construct for enterprise and industry with similar principles, then we will succeed. So, from a Mavenir standpoint, our private network construct is not just about a few products and a solution set. It's also an idea. It's a fundamental blueprint, and what we like to believe is a lighthouse to guide. I know, that's a very big statement, but it's intended as a lighthouse to guide the entire ecosystem towards what you see here on the picture.

And what's illustrated on the picture is fairly simple. On the left-hand side, there's a ton of different kinds of devices. On the right-hand side, there's a ton of different kinds of clouds that host applications and services that are relevant for those devices and people and industries and enterprises that use those devices. Over the last three to four decades, we have focused on connecting the top device, which is first a voice phone, then a smartphone, to the smartphone clouds, and so on. What we now need to do is to enable a thousandfold increase in different kinds of devices to connect to their specific value delivery clouds. And in the middle, what is needed is a network that is, how shall I put it, programmable, fluid, agile, and that's fundamentally based on the principles of multi-access. It's fundamentally powered by the cloud. It needs to be edge capable in the sense of let’s no longer think about massive switch rooms with centralized computing capabilities, but more distributed use it where you need it, it's available where you want it, kind of construct. And since all these resources are finite, the ability of this network platform to be able to be carved out into slices that are intelligent, that are context aware, that are application aware, will be the way to be able to manage a finite resource pool, with much more intelligence, based on slices and intelligence, to allow for those devices to really tap into those applications and be able to leverage the right network resources as when needed.

And in order to make that happen, what we are trying to do with MAVedge, which is our private networks portfolio, and fundamentally our blueprint for the networks of 5G, is to move more and more intelligence northbound into a layer that's much more self-aware, which is intelligent and self-healing, to create what I like to call is a bit of a sentient, but a better version of, you know, an automated, all seeing, all healing Skynet. That was a bit of a “Terminator” reference, but let's say a benign Skynet, if you will. And the whole idea behind this approach is, therefore, to enable folks such as yourselves, partners, developers, customers, to be able to create value over the top, have an ecosystem that's able to access the underlying network capabilities, and develop their own applications that suit their own purpose at a much faster and a much more rapid pace than ever before.

So, translating that very nice vision picture into practical realities, this is a very simplistic architecture depiction of how that will happen. There's clouds on the right, there's devices on the left, and what we have done in the center is, we have an access, which is based on open architecture principles called OpenRAN, and that gives us the possibility to mix and match all kinds of different access points, whether it's indoor, it’s outdoor, and so on, and so forth. So, you have a multitude of access options. That connects, right next to the cloud is what

we call is our cloud core, and the possibilities are that we can do appliance-based deployments, but completely cloud-powered deployments as well. And in the middle, what you see is essentially edge. The edge is extending the cloud capabilities closer to the devices and endpoints, and also bringing the devices closer to the cloud as well. And this is where, across all of these domains, we are working extremely closely with Intel for a very specific reason that I will come to next.

So, as we build this, we started-- as a fundamental driving principle of Mavenir, we're about 15, 16 years old, and we straddle a very healthy middle ground between two clusters of technology, providers and infrastructure technology companies. The traditional companies, some of whom I worked with in the past, have an excellent approach. They are very tightly coordinated, everything works out of the box, and so on, but they have historically worked in a telecom industry that has been very vertically integrated, and which has eventually led to a stage where they have become proprietary interfaces, and it's a very closed ecosystem. That cluster of technology providers has also shrunk almost four to fivefold in the last 15 years driven by mergers, consolidations, and general price pressures. So, that has effectively meant that there's fewer R&D dollars being put in, to drive innovation in the telecom sector for a while now.

On the other hand, over the last 10 to 15 years, fueled by this adoption of IT-based building practices, and cool technologies like cloud automation and virtualization, there's been a plethora of new players that have come up that are driven by a different kind of innovation engine. And that's been software. So, there's a bunch of new companies that are working across the different parts of the telecom stack, whether it's on radio access, or data core, or management, analytics, charging systems, but fundamentally, those companies, by and large, are fairly restricted in terms of scope. They have focused on one or, at the most, two areas of the entire network stack.

Mavenir as a company is fairly uniquely positioned. Its genesis has been in the cloud and virtualization era, so we are about 15, 16 years old. Over the last 15, 16 years, we have kept the DNA of these new disruptors. We are very software-led. We really believe in open ecosystems and open interfaces. We really want to lower the barriers of entry for technology adoption. At the same time, over the last 15 years, we have taken what is good from the incumbents, which is to be able to build scale, to be able to really have a portfolio where you have the depth, as well as the breadth, in technology and networking capabilities that allows customers to really see us as a proper talking partner. But fundamentally, our DNA is open everything, and this is why open ecosystems matter.

If you look at the approach, and this is a bit like swearing in church, but I call it the Mac versus Android approach. Mac's a great product, Apple's always been great, but traditionally, over the last few years, and especially since their inception, they've been a very closed ecosystem. And that's been great for Apple, potentially even great for consumers, but that restricts them on innovation that can happen. Conversely, Android has been much more about open ecosystems, putting developer toolkits out there, and really driven a much wider scale adoption of much more mass-market technologies, and it has made mobility much more accessible over time. Not everybody can afford $1,000 smartphones. Our approach, if I may call it that, is much more towards the latter. Open architectures, open interfaces means betting big on partner communities, because no matter how hard we try, the top three, four companies on the infrastructure provider side will never have adequate R&D and innovation efforts that can be offset by the likes of dozens, or even hundreds, of companies that can create a much bigger ecosystem with much more innovation drive, engines, and contributions based on open interfaces.

That also immediately means that that's fundamentally great for customers, enterprises, and industries, because there's no lock-in, there's freedom of choice, you can mix and match. You become the owners of your own destiny. And what powers this approach is, for instance, our partnership with companies like Intel. So, we'd like to really innovate with software. Look at this as a PC-based approach. I mean, make a solid PC, there's people that will develop great applications for it. The network needs to become like a PC. Applications can be developed on a daily basis. The network stack needs to be accessible. We need to be able to drive through our software capabilities on top of x86 platforms with CI/CD, DevOps. All of the fancy acronyms and letters that you will have heard of will actually become a reality if we focus on real, true capabilities on the software side, and work really, really close with technology companies, such as Intel, and really standardize around certain architectures like x86. And that means, together with other partners and development principles, and let's say the IT-centric development and network philosophies, we need to drive scale and agility with the cloud. That will mean these hitherto inflexible network systems will become much more elastic. They will become much more agile. We will build networks that are more of a

Lego kind of construct. You can use Lego bricks to pretty much create everything. It's like a Minecraft of networks. So, that's why we really want to harness the power of software, baseline it on top of COTS hardware architectures, and drive scale and agility with cloud.

I won't spend too much time on this. The charts will be available post the session. This is an overview of translating what I just said into an actual offering stack. What you see here is, at the bottom, it's a multi-standard. Now, we even cover 2G and 3G, but principally the transformation engines are going to be 5G, and to a lesser extent 4G. A whole plethora of radio access products based on OpenRAN, macro and WAN products, as well as indoor and small cells. A lot of this is powered based on very similar principles on top of the Intel FlexRAN architecture. So, we really implement and bring in those kind of principles not just on the traditional side of virtualization on the core networks and the management layer, but also on the radio access side. Second part that you see is the cloud core and edge, I already spoke about that. The third part is a very robust automation layer that makes all of this accessible, and packages it all very nicely.

So, essentially, what you see is the bottom three layers are what I call is the connectivity and mobility piece of our MAVedge platform. That's the networking construct. The light blue piece that we call the service enablement side is our abstraction layer, the app store layer if you will. This is where you can have a catalog of services that enterprises can consume or offer. This is about services and partner management, but more importantly, this piece, this part is about open interfaces making available APIs that third-party developers and application providers can tap into. And finally, last but not the least, the possibility, should that be a requirement, and it's not usually always the case, if you were to want to monetize certain services around the private network construct, this space also has the monetization layer.

Last but not the least, what you see on the top is our ecosystem play. This is our partner community, our own developer friends, our application provider friends. What we do is we have our own business communication suite, and that comes historically with a lot of strength in the RCS, business messaging, and B2B and B2C enterprise applications and communication side. But I would say the vast majority of our engagement in this space is to actually build a partner community of application providers, of device vendors, and so on, that will really round up what I referred to in the previous chart as our app store for industries and enterprises approach.

From a build perspective, our whole approach lends itself to some fairly simple building blocks. What we really wanted to do was to avoid the complexity of complex telecom, macrocell network build-outs, which are unfathomable to anyone except those industry insiders. Unfortunately, I happen to be one of them. From an IT standpoint, we wanted to make-- and from an enterprise standpoint, we wanted to make the whole offering essentially boiled down to four parts. Just remember four pieces. There's a bunch of access points, covers all kinds of Gs, all kinds of frequency bands, different kind of form factors. There is one fundamental underlying data center infrastructure construct that's based on Intel COTS hardware x86. And this principle for both edge and data center underlying infrastructure applies both for radios, as well as for core, as well as for the management layer, analytics, and so on. So, access hardware, edge data center hardware, and related softwares.

The entire full suite of softwares for multi-G radio access networks, to CBRS and SaaS capabilities, to analytics and management, to service extensions, et cetera, come from Mavenir. That's where we really focus. And last but not the least, in order to make this something easily accessible and to drive faster adoption, “keep it simple, stupid”. Simple pricing, so it’s a dollar per hardware, or a dollar per consumption, or it's a dollar per service. So, we really lend ourselves to some really flexible and simple building blocks.

I'll touch upon this a little bit as well. Architecturally, the technology choices that we have made, and the whole DNA of how we build all of this, allows us to really address the entire plethora of deployment options. If it's a small enterprise, you just want to hook up a few access points and consume all of your network connectivity and the rest of the stuff through the cloud, we can do that. If you're a medium enterprise, where you need a little bit of edge capabilities, because there are certain applications that benefit from it, put the core network on the cloud, bung in a Mac box on enterprise with a gateway, hook up different kinds of access points, you're good to go. Maybe you're a large enterprise, where for any reason, could be security, data ring-fencing, isolation from public cellular, whatever it is that you'd like, you want your own dedicated on-prem network in a box. That too, we can do. And last but not the least, with our operator customers, if you want to provide shared infrastructure where you can carve out specific slices for different kinds of enterprises, different kinds of industries, different kinds of CSPs, we are able to do that as well.

So, the reason I bring this up is the choices you make, and the philosophy that you have, in terms of technology adoption, in terms of architecture, in terms of basic building practices, really gives us the flexibility that not too many companies have when it comes to networking today.

Use case enablement. So, like I said, we are working with a very expansive partner community, with a lot of customers. We have a bunch of contracts and projects in play. We participate in fora like 5G-ACIA, 5G Americas. We are members of a group called the Center for Connected Industries, for instance, in Aachen, where, together with other technology partners from the infrastructure side, from the device side, from the chipset side, as well as a developer community and companies that focus more on the application layer, we actually have representation from the demand side of things, advanced engineering companies, manufacturing entities, automotive players. Together as a community in these kinds of for a, we actively build industry kits. We look at real life requirements of use cases, and translate that into actual implementations and minimum viable products, with the whole aim that in order to make something successful, start from the demand side first, first principles.

This you may call it a bit of a marketing chart, but I firmly believe that because of these choices, because of this approach, we are able to deliver a much better cost of ownership. We are able-- and this is a real killer, we are able to address a three-times spread of deployment opportunities, from completely on-prem to a completely cloud-delivered solution. 100% transparent pricing, because, again, in IT there's very little hidden costs when you as a consumer are, for instance, getting an Office 365 license. That's what we want networks and related pricing to be. And given our software centricity, given our whole innovate on top of x86, that means we can really drive through more than a twofold faster service velocity compared to traditional incumbents and traditional building practices. So, multi-G access, multi-access core, analytics and automation, digital enablement, and real advanced services, these are kind of the cutting edge technologies and the portfolio elements that allow us to deliver on these promises.

The last chart here is, this has paid off, we really started our foray into the enterprise and industry space about roughly 16 months back. It's been a momentous journey. We are constrained, we are pretty much tripping over our own feet, we are running so hard. More than 90-plus qualified engagements across six continents. In a span of 14 months, we have picked up, and now it's already 15 contracts and projects that we are actively deploying, and they span mobile network operators and service providers to specific industries, to defense. We've actually established, back to my principle of growing the ecosystems, value-added reseller relationship, go-to-market partnerships in less than 14 months as well. So, great momentum that underscores the fact that we are making the right kind of choices, we have the right kind of partners, and we are positioned at the right time in terms of an industry inflection.

So, thank you very much. I really appreciate your patience, and I'll hand the floor back to Rick and Caroline.

Richard Piper

Oh, wow, Ani, man, what an incredible presentation and a wonderful look into the level of innovation that Mavenir's driving. Thank you very, very much.

I want to do is transition us to our fireside chat, and let's talk about some of the concepts that you helped unpack here today. So, Caroline, hi, welcome, thank you for joining us.

Caroline Chan

Yes, that was fantastic. I think Ani really outlined what 5G brings to the table, what the transformational capability or potential that 5G can bring is way beyond the smartphone era. So, very excited to hear that and looking forward to really a deep dive into this.

Richard Piper

I want to start off our discussions today. I've pulled a few questions together from our audience today, and I've consolidated them up, and I want to start with one of the set of questions that they had. It's really around the cost-effectiveness. What is the cost-effectiveness

for an enterprise to take this as part of their transformational journey, and what are some of the unique things being done to help make it cost-effective as part of their journey? Let's use that as a starting point for our discussion.

Aniruddho Basu

Would you like me to start?

Richard Piper

Yes, please, Ani.

Aniruddho Basu

That's an extremely good question. Cost-effective is all relative. I can start from one area, and I spoke about that briefly, is the pricing construct. So, when you try and get industries and enterprises to adopt technologies, pricing mechanisms, pricing parameters need to be much more simple. They need to be... they need to allow you, or lend themselves, to the possibility that you can consume that product as a product, or you can consume the service as an outcome, and you shouldn't have 27 different parameters with 57 optional features and a manual that takes, I don't know, three days to get through to understand the pricing constructs. So, we, as both Intel and as Mavenir, have worked hard to kind of make sure that the pricing construct to enable faster adoption exists.

Now, on the demand side of things, it's a different story. When operators sell connectivity to a consumer, the amount that's spent on technology, there's a very clear relation to I spend X million on infrastructure, I get Y million other revenues that I generate from people that use my service and phones on my network. When an enterprise brings in, let's say, a 5G network to drive a transformative change in operating efficiencies, that discussion is not about, OK, it's an operator, how much revenue are you generating? It's about the efficiencies that you drive. It's about the efficiencies that such technologies bring in a multitude of other areas, whether it's manufacturing efficiencies, it's supply chain efficiencies, it's operational efficiencies. It's the intangible value, for instance, that additional security brings in. What I see, at least personally and what we see collectively as an industry, is there's increasing maturity on the industry side and on the enterprise side to be able to put hard numbers against these previously intangible assets and values. And I see folks, whether it's in manufacturing or it's in the warehousing logistics, or automotive sector, clearly stating that, yes, this is not about selling, you know, a five-gigabyte connection at 40 bucks a month to a consumer, but if I bring 5G in and if I bring edge appliances in, I save 25% in terms of productivity gains, and that makes the investment worthwhile. Caroline, your thoughts?

Caroline Chan

No, I totally agree. I think we did a poll on CIO in 2019 and 2020, before the crisis, and we just did one again. The same-- it's North America based CIOs. What we found interesting is that at least 75% of the CIOs polled was actually planning on using up to 5% of their IT budget of 5G private networks. So, that number is actually really interesting. But then we asked them about how they see, why they're doing, and wanting to roll out the connectivity, it's really back to, Ani, what you described before. It is about productivity gain. It's about security gain, and end one aspect of it you alluded to was the the controlling of their own data, the data privacy issue, data sound issue, and owning my own data, using the data to help improve my business outcome. So, in some sense, some MBAs will talk about outcome-based pricing, and I'm thinking that maybe we are marching towards that, right, because telco always charge based off phone, based on number of bits and bytes they consumed per month. But when you come to enterprise and business, the outcome, productivity gain that you mentioned, that needs to take into the formula to determine the pricing. I think as an industry, as a new market segment, it's something that we all need to collectively look at.

Richard Piper

How about if we take another question from the audience? I've got a couple of other questions around the operations. So, you have an IT that is now having to build a new network, a private network, a cellular network, and the operation challenges that they face is leveraging

this asset into their transformation journey. Can we talk about that topic and some of the things being done in an innovative way to make operations and DevOps easy?

Aniruddho Basu

Yes, that's a great question. So, I previously come from one of the larger infrastructure companies, and I work... we had challenges there as well on how to reach enterprises and get them to adopt all of this stuff. And when I started with Mavenir, one of the decisions that we decided to take is that when we look at enterprises and industries, we're not going to directly engage with them. There's 600, 700 operators that are truly active in the world. That's hard enough for us to handle. When you're looking at tens of thousands of enterprises and dozens of industry verticals, that's just not practical.

So, what we decided first is our strength needs to be in the area of making technology accessible, and networks much more accessible. That being said, in every deployment, there'll be a requirement to adopt and adapt that specific technology in that enterprise or industry environment. So, no matter how much we try and make it cut and dry, there'll always be nuances of making that network fit. Let's say, within an automotive factory or a warehousing facility, the requirements in terms of interfaces connecting with their specific applications will be fairly unique.

So, what we think is the whole idea behind the consumer approach to macrocell networks has been minimize variability. I will deploy a network that spans the length and breadth of the US. It's a one network, one size fits all, consumers can access and get it. However, in the era of private networks, and this diversity of requirements and operating environments, there is a huge role to be played by system integration capable partners, and that needs to be a partner or an entity that is able to marry both IT awareness and telecoms awareness. Now, as telecoms becomes more IT-like, we are now suddenly able to tap into a much wider pool of generic IT and IT skills in private networking and 5G than we were able to do in the era of 2G and 3G and 4G. So, the whole idea, I think, between us collectively-- Intel, ourselves, and the industry-- is to make the whole telecom construct as IT-like as possible. That means enterprise IT departments, a much broader pool of system integration capable, you know, competence centers globally, and a much broader skill set of generic IT and IT skills. They can be brought into play to make this happen. Caroline?

Caroline Chan

Yes, I mean, If I... I mean, even... just take off my-- you and I both grew in the same role, we'll probably need to be more like the Wi-Fi industry. The Wi-Fi has successfully penetrated many enterprises. Most of us won't even think about it and just expect to be able to log on to a Wi-If. It still has its own limitations, the ability-- we still need to sign on and so on, but I'm almost thinking that for 5G private networks to be to be the way-- successful the way the Wi-Fi is, we need to adopt the mentality, easy to install, easy budget to bring up, easy logon, easy billing, and all of that, and then one single pane of glass. I don't think Wi-If's ever going to go away, and then there's ethernet, right? SD-WAN is proliferating. It needs to be a-- I almost think of it as a multi-access, not just 5G. All the things together, a single pane of glass, operation make easy. The IT CIOs should be able to see my-- what's my consumption, and then to be able to report up to the CFO every month.

So, the IT, OT, and telco, there's a three-way convergence that needs to happen, but it should be happening more in the way the Wi-Fi has been going. We need probably to get on that bandwagon, and just safely say that, as a telco, the traditional telecommunications tend to make things a little bit more complex than is necessary. We need to take that hat off and just think like the Wi-Fi and how do we do that? So, we have a lot to learn from that, but I agree with you on this. Too many verticals, we cannot be requiring everybody to have their RF degree in order to engineer this network. That's never going to work.

Aniruddho Basu

Not going to happen.

Richard Piper

Let's unpack... man the questions are phenomenal coming in. Thank you, guys, very, very much. The next group of questions come around applications. We people attending today that have applications. They're saying I want to play. I want to bring my application. I've got a couple of enterprises saying how do I bring my applications and attach them, and how do I make the concepts of this private network and security and the complexity of it simple, easy, and do very, very efficiently? How about if we take that as the next topic?

Aniruddho Basu

I think I'll defer to Caroline because Intel has had-- I mean historically has been one of the biggest enablers of application innovation, and then I'll maybe add to what she thinks.

Caroline Chan

Well, thank you for the compliment, but when we started this, before the 5G, we actually been working on something called MEC. We started mobile-access edge compute became multi-edge compute. It was very conscious that we made a decision that any kind of application, even the applications who would not originally written for 5G, need to be running on 5G. So, we have put out things like OpenNESS, which started as a SDK-- it's now an open source that we provided to the greater community-- to the idea is to hide the underlying plumbing, makes it such that-- I like to use this concept because my degree was RF. You don't need RF engineering to write applications that runs on 5G. Hide the plumbing, make the APIs, and especially the northbound APIs more like the IT world. That's one step, make API easy.

The second step is the outreach. People don't really write applications thinking, "I'm going to be writing on 5G". They write applications to solve an issue, whether it's a logistics farm. Lately, I've been doing a lot of precision agriculture types of application, so the only thing from the end user perspective. Our job is make it easy and outreach to them. So, some of the work we've done is 5G Open Innovation Lab that you mentioned is to reach out to that group, pull them in, providing them all the hardware platforms, the API, the training, and to a large extent some of the go-to-market before they need it, to provide the enrichment of applications. So, I mean, am I right, roughly? Did I—?

Aniruddho Basu

That's why I said, I mean, your expertise and your history in this area is so much more than ours. But I'll just say that exactly along those same principles, but on a much smaller scale, we are slightly smaller than Intel as a company. We work a lot in terms of really facilitating ecosystem growth, for instance, in Dallas, as well as in Stockholm where I live. We have created this innovation center where we work very closely with not just application partners and device partners, but with startup communities, and we bring them into our labs with the same principles that you spoke and endorsed. Make the networks accessible, bring them into our labs, give them access to KPIs, provide them some basic training, and then let them really have at it. If you brought in a lot of some of these new companies and startups and developers with us towards our final customers, we're deploying some of these projects together, and I think, I mean, like you said, this is the way that-- I mean, if you espouse the whole accessibility, create a community, and really make sure that our technologies and our approach supports it, we will all succeed as an industry.

Caroline Chan

Yep.

Richard Piper

The next question, I love this, we got a bunch of innovators today that are going, "What should I be focused on? What should I pay attention to? What should I be working on to solve the problems of tomorrow today?" Let's talk about that. What are the things that our community, our innovation, right, the brain trust of our world, right, should be focusing on to harness this private network to drive true transformational journey?

Aniruddho Basu

I think the first thing that this community needs to be thinking about is to not think about private networks. Just consider and really prioritize on focusing on what solutions are they bringing to solve what problems for the enterprise and industry. And in an ideal world, if we, Mavenir and Intel, are able to create a scenario where private networks or the network itself is the last thing they need to think about, then I think we would have really succeeded. I don't know if that made sense.

Caroline Chan

Oh, my gosh, I love the way you said-- loved the way you say-- I'm going to steal that line. You know, I could not have said it better, because we tend to think, especially the folks, some of us, with engineering degrees, we always think of it as a technology issue. What this-- it is actually a business issue. For example, if you wanted to solve remote learning, if you wanted to do telehealth, that is actually an outcome that you wanted to achieve. And forget about the technical side of it. Let's have the problem, what do you need to achieve precision agriculture? You know, provide credit to a farm, to improve the yield, decrease the water usage, wasting water usage. If that is a problem statement, develop an application on top of it, and then knowing that, the underlying network will give you the capacity to the throughput, the low latency, the location information, the ability to adopt AR/VR. Take that as for granted, start writing the application drive on top of it. Folks like Mavenir will solve that fundamental network issue for you. Don't worry about that. That's their job. Otherwise, Ani won't have a job if you try to solve that—

Aniruddho Basu

No pressure!

Caroline Chan

Right. Solve the business problem. Let us in this 5G world provide you with a foundation to enable you to do your job.

Richard Piper

What a great, great presentation today, team. Man, just a wealth of knowledge, innovation, leadership, and thank you both very, very much.

If we couldn't get to your questions today, man, please feel to reach out. You're going to be given some email addresses, use those, reach out to Intel. Man, we want to talk to you, whether you have an application, whether you have an idea, whether you have a problem to solve, man, you got teams here ready to come in and help you address your transformational journey as you harness innovation and private networks.

Thank you very, very much for joining us today. Please be sure to complete the survey in the Attachment tab. We really, really value your input as we work to improve what we're doing to help you and help us as a community.

Also, please be sure to join us for our next insightful series, August 18th, on Why Edge & AI with another key business partner, HCL, as we unpack the next level of innovation together.

Thank you again for joining us today. This concludes our webcast.