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Conference Debate Session VI:

5G/6G and Mobile Solutions for Commercial Use

Introduced and chaired by Paul Hughes, Research Director,

Future of Connectedness, IDC

Global Media Summit, San Jose 2023

Featured Speakers:

Analyst Chair: Paul Hughes, Research Director, Future of Connectedness, IDC
Anit Lohtia, CTO, 5G Strategy Lead, Dell Technologies
Jan Söderström, Vice President & Head of Advanced Technology & Industry Group, Ericsson
Marc Cohn, Principal Technology Strategist, Spirent Communications

Angus Robertson, MC
welcome back for our final debate session how to harness 5G Or 6G for commercial purposes commercial use. So Paul, research director at IDC will be chairing the panel, please come on up

Paul Hughes, Research Director, Future of Connectedness, IDC
so before we kick off, raise your hand if you think 5G Is overhyped today. There we go. All right. That's a good place to start. So I'll invite the panel up, I think we're going to have a nice sort of engaging discussion on the topic. So what I figured I would do is kind of start out by kind of presenting some of the, again, sort of presenting some of the IDC research as we look specifically at this at the 5G space and how and particularly on the enterprise side, what are some of the actual use cases that are coming but again, I want to first start out by sort of setting you know, starting with a reality check in terms of where we are, in terms of AI in terms of 5G. So, you know, we if we look, as I look out kind of at the broader footprint of you know, particularly from a telco perspective, and how we sort of see the overall market evolving, it's been pretty clear, I think, with the discussions we've seen yesterday, and today, as well as with cloud security, just the growth in the amount of connected devices, the amount of data that's, that's crossing across that we're seeing across the networks, the number of sensors, devices that are just becoming so pervasive in

the way that organizations are trying to drive greater efficiency and greater agility within their organizations. But we're also seeing that the importance of how the capabilities and the bandwidth are basically making it easier to bring more personalized services to the end user and to the enterprise. And of course, with all of this happening at a time when cloud IT and telco are all converging together. So it's sort of setting up a kind of a reality check. As we look at where 5G is impacting the overall market, as we sort of look specifically where we are. And just based on the audience, you all said you all believe it's somewhat overhyped. And I think what we're seeing in a lot of our data is from the enterprise perspective, the hype is starting to wane and it's dry, it's changing, impacting the business investment that we're seeing, you know, compared to last year. So the overall growth in 5G spending has actually slowed for 2023. And I think a lot of that is based on the fact that organizations are really looking for the kinds of use cases, depending on what vertical market they're in, that are actually going to bring a new level of benefit to their business. And similarly, if we look at what that impact is going to be on the business, you know, most organizations, particularly certain verticals, which you'll see in an upcoming slide, do expect to see a dramatic impact on how it can bring greater levels of efficiency, greater levels of operational agility within organizations as they take advantage of how just that the network bandwidth, the capabilities, the performance, the number of connected devices that can be added to the network and provide. But in terms of looking at from a product perspective, where we're actually seeing more of an opportunity, at least currently, and I think we'll get into it with the panel is actually on the mobile private network side of things, bringing into account the specific business use cases that become valuable for those organizations as they're trying to drive. As we've talked about yesterday, business continuity, resiliency, and agility into the organization, you can see that, you know, particularly in, for example, in manufacturing, bringing in greater levels of using mobile private networks, with 4g and 5G capabilities, to bring in greater levels of automation in other sectors like in mining, and agriculture, bringing in greater levels of efficiency, as well as health and safety, like all of this kind of comes becomes tied together, as we look to see how what's really going to be driving a lot of the transformational impacts that 5G can provide. And I think also and just sort of round out from the dip from a data perspective on life. On the slide side, when you look specifically at the vertical markets that expect to see this sort of dramatic change at this, this dramatic impact of what 5G can provide, not surprisingly, again, you're going to see almost 60% of manufacturing organizations expect to see this truly, truly impactful change in the way that they can conduct their business. And the way that they see the benefits of sort of, I'm not going to say just 5G, but it's going to be this multi access connectivity that allows organizations to stay much more efficient. So as we sort of think about driving a lot of the discussion today on the panel, diving into a lot of these core discussions and what does the industry need to do, I think to bring, to really help to drive this sort of the move from hype to actual reality. So with that, I think we'll start we'll, let's jump into the panel. Anit, I'll start with you, and then we'll kind of go down the line first, if you guys want to quickly introduce yourselves, and your role in the organization and the impact that you see 5G having on your business?

Anit Lohtia, CTO, 5G Strategy Lead, Dell Technologies
Sure. Hi, I'm Anit Lohtia with Dell Technologies. I head up the 5G strategy in the telco business unit at Dell, and I have a long history in this industry. I work with many operators AT&T, T-Mobile, as well as network equipment provider, Nortel, Ericsson over the years, and I've seen the evolution of technology from 2G to

3G to 4G to 5G. So we all go through the different cycles or hype cycles and then eventually the technology has created so much economic value across many industries. And I think in 5G it's not going to be any different although through the hype cycle, we'll see more and more real use cases coming out. So I look forward to our discussion today.

Jan Söderström, Vice President & Head of Advanced Technology & Industry Group, Ericsson
Jan Söderström, Ericsson head of advanced technology here in Santa Clara. I drive an ecosystem lab here among data monitoring, I drive an ecosystem lab here to expedite the uptake of new use cases for 5G Right, so we have a full 5G network where we test with different devices etc. Just for the ease, the road into getting new use cases on the 5G network, both private and public network. So we see a lot of traffic of people wanting to figure out these use cases. I agree with you that it is maybe in the early hype cycles. You are frustrated because there are more hype than there are reality. One of the thing is devices, right? So when I look into how the number of devices that are coming out, non-smartphone devices are coming out, they're still much fewer than smartphones, of course, but the uptake of new devices is the same as we saw in 4G. So, it takes some time. And still, the excitement is still there from our side.

Marc Cohn, Principal Technology Strategist, Spirent Communications
Good morning, I'm Mark Cohn from Spirent, world leader in communications, testing technology, and I work in corporate strategy. I'm responsible for our private networking initiative. That is leveraging our position as a leader in testing the 5G core, Spirent has seen tremendous growth in 5G over the last couple of years. We've been participating at least hundreds of network designs, especially focusing on the core deployment. What we see though that is encouraging, though, is planning for standalone because right now 5G is not 5G. 5G is the initial radios, and it's some infrastructure, but we're not seeing the capability that everybody's excited about, which is one of the reasons why we haven't met expectations. And I think we're gonna address this a little further in the panel.

Paul Hughes, Research Director, Future of Connectedness, IDC
Mark, I'll start with you on that. So, particularly in this as we are in this sort of weird inflection point where we're kind of mapping from the hype cycle into the reality, why do you think we're stuck there? And what do we think as an industry? What do we think the industry needs to do to one move to that next level, but also help these larger enterprises, as you saw manufacturing healthcare, that expect to see this really transformational impact? What is it going to take to help us get to that next point do you think?

Marc Cohn, Principal Technology Strategist, Spirent Communications
Well, I think Jan said it best I think it's going to take time. I mean, these are generational changes, you know, 5G is relatively new, I think there is also some investment exhaustion by operators across the globe who are putting in place the core infrastructure for 5G, but we now need to work on moving towards that 5G standalone capability that are really going to provide the low latency, high connectivity, all the vision and what some would refer to as the hype for 5G, but it is going to happen. If we look back a couple of years, this is one of the interesting things about 5G, even COVID-19 didn't stop the 5G global rollout, it was true in all geographies, it happened in a big way. And now we have hundreds of networks that are going

to be the launchpad for these applications. But it takes investment in time. It's not going to be rushed. And then of course, with a global business climate, that starts to look a little less certain than maybe in the last year or two. We're seeing in 2023 and maybe even to the beginning of 2024 is the time that it's not clear. And your data indicated that you know how, what appetite these operators and enterprises who are going to be ultimately funding this have for really driving yet another technology initiative.

Jan Söderström, Vice President & Head of Advanced Technology & Industry Group, Ericsson
I want to tag on - Mark said this standalone thing. I mean, what has been rolled out mostly in the public networks are known as standalone 5G, and what they are catered for is to deliver mobile broadband to your smartphones in a much better way it comes, you get better speeds. And for the operators, it gets cheaper to deliver those bits. That's what most of the deployments are today. We stand alone, you get all the additional features that enables for low latency and bounded latency and whatnot. Right. So that is sort of one thing in the in the public networks that the promise of standalone is coming now. Networks are being deployed, devices are slowly coming on board. For private networks. We have deployed many, many, private networks for Ericsson, in particular in areas like utilities, manufacturing, and ports and logistics. It's happening. These are typically companies that can afford to do some extra integration of modems but it's still maybe a bit too expensive for smaller enterprises to do that. There is also other blockers like for healthcare, I will say there I think it's more like data privacy. policy regulations that are stopping and stopping things. Those are two points that I want to make.

Anit Lohtia, CTO, 5G Strategy Lead, Dell Technologies
Just to expand on Jan's point about the complexity, I think the operating model needs to change in the private mobile networks. Right now it is too complex to deploy private mobile network for, especially from the IT folks who don't come from the GPP, or the operator background, that know how the technology and the know-how of the cellular network is confined to a very few select group of people who are with the operator community. But you have a widespread deployment of 1000s and 1000s of enterprises driving on the private mobility network, the operating model has to change how the technology is consumed, and it cannot be as complex as it is today. So it has to get to the operating model similar to what Wi Fi achieved, right? It's very easy to deploy a Wi Fi network, although 3G, PP or 5G Technology is different or more complex, but the onus is on the ecosystem to get to the point where you can deploy private mobile 5G networks as simply as you do good Wi Fi, at least that should be the (inaudible) will grow, it will take time, as Mark was saying to get there. But that's where we need to get. That's what we need to do to increase the pace of adoption of private mobile networking enterprise. I think another barrier to entry is a spectrum. Most of the spectrum is owned by operators across the world. Some countries have allocated spectrum for private mobile networks, but that's varying - every country has an almost different spectrum available, so there's no uniformity, that increase makes the ecosystem development slower, because there's not sufficient volume in annual spectrum or so getting to Jan's point that devices, availability of devices becomes slower. So again, that will take time. Yeah, so those are some of the key barriers, I would say, for the adoption of 5G Private mobile networks.

Paul Hughes, Research Director, Future of Connectedness, IDC

I think you bring up a great point, because we talk about the entire wireless ecosystem in the industry that we're in, it tends to be somewhat disaggregated. And so as a result, as we're looking at the business outcome from how high 5G is going to actually really benefit their business, you have this broad spectrum of organizations that play in that role. So particularly, if you're looking at a mobile private network you can work with an enterprise infrastructure provider like a Cisco to help you that can help support that. But just trying to get an understanding of where do you start? And how does the ecosystem itself kind of help. Is there something that the technology community can actually do to help kind of help solve that, does that AG that disaggregation issue we have in the in the overall ecosystem? Mark, what are your thoughts?

Marc Cohn, Principal Technology Strategist, Spirent Communications
Well, I think it starts and again, we're in day two, and I think this is a familiar theme, it starts with the business problem with the entity who's trying to solve this with a private network. And based on that application that's going to drive different technology options. And the one thing I want to make clear is that I don't, at least our organization and in engaging with not only the technology providers, but also the service providers, and system integrators and a whole range of different players in this morning, like you said, Paul, this disaggregated echo system, what we're seeing is that there's a range of different technologies as well, it's not private 5G it's Private Networking, with Wi Fi six, and maybe seven someday, that is going to play a role. LTE is already being used as Jan was pointing out in private networking that's already been deployed. And there's going to be other technologies, wireline Technology Satellite is going to be a place where for extractives, you're going to see opportunities to integrate that as well. There's going to be a range of technologies. It's not private 5G as much as it's this notion of a private network that is actually controlled by the enterprise or the government entity that's actually running it. And I see that and Spirent sees that if we're going to be operating in this new world with different you know, hybrid technology options, options. disaggregation of the eco system, which is completely pervasive. The players who are going to be at least leading right now are going to be integrators, who are very tied to those applications, those business problems that those entities want to solve, whether it's utility, transport and Logistics in a port that's doing asset tracking, industrial automation and a whole range of not just robotics, but other applications in the factory of factory that of the near future, and a whole range of other applications that are very vertically driven. And what, in order to, to be able to expedite this very complex environment, we're going to need to see a new approach to the business model, and also to the way in which each party in that business model who is engaging with multiple parties is able to manage one another and manage the kind of capabilities that they promise and ensure that these networks are behaving the way they're designed to, and that the capabilities that are being contracted for are actually being delivered. So that's going to be a whole new model for Service Level Management.

Jan Söderström, Vice President & Head of Advanced Technology & Industry Group, Ericsson
It's a big question, right? How we have the whole this is disaggregation on the big ecosystem, or the big set of players that you need to have for an enterprise to get all of this going. In many cases, it's like it's the industry 4.0 Question for somebody, right. And then it's not only 5G, it's data strategy, its edge, it's everything. And it's a lot of legacy systems, and Brownfield. So normally, it's like a consultancy project for years before they even start. So that is, of course, an issue. That is not really technology related, in many

ways. 5G is a part of it, we do see most traction, when there is a compelling sort of driving need. One example is mining where they exactly, where they want to have driverless vehicles down in the mines. And so it's a clear use case, so then you just do it right. And there are a few more of those ports. And logistics seems to be that as well. And there are other areas that are a bit looser. And then you go from those mega companies that want to have their own IT operations service that is sort of one with a private 5G network. That's sort of one camp of transformations we're doing. And then there's the whole spectrum down to the small and medium sized enterprises. And maybe I'll touch on that later. But then we can work with virus as developing all that.

Anit Lohtia, CTO, 5G Strategy Lead, Dell Technologies
I think just to add a little bit more to Jan's point, I think it comes down to understanding what problem you're trying to solve, like in mining case, it's very clear, you don't, you can't have people, there's no communication available. So you need a private mobile network there to solve the problem. But like in a wide range of cases, the people who have the business problem don't understand the technology. The people who understand technology have no clue what the business processes are running in that particular enterprise or that particular environment. And then you on top of that you have operational technology people, for example, in manufacturing, people running the plant, you have folks going in, then you have a networking piece, and then you have business owner on top of that. And all these four segments, they talk different terminology, they can talk to each other. And it's process how you bring these things together it's not a technology challenge it's more a process issue that needs to be addressed. And there's no simple answer, like there's no silver bullet, which will address this. But I think that's where more effort needs to be put to say how you get all these different groups together to solve the business problem and create productivity. The other thing I would say, if you deploy a private mobile lateral, you can address many different problems. But what I've seen is many times is a single problem does not have a strong business case. But if you have can solve multiple problems, then the return on investments start to increase significantly. And it makes a lot more sense to deploy for a private mobile network. But then it comes down to chicken and egg problem, who's going to eat the cost up front to make that investment? And that's where you need the business. Or business sponsors have the vision of saying, Okay, we're going bold is going to move in this direction. And then you go back to, is it hyperreality?

Paul Hughes, Research Director, Future of Connectedness, IDC
Right, exactly. No, and that gets into the whole discussion. I always think about use you sort of brought it up the whole concept of the taking those use cases and understanding how do we improve the process? Within the organizations as they start, as we're trying to demonstrate the value and in many in areas like say agriculture and mining, you know, 5G is not going to be standalone, it's going to be tied with Wi Fi, it's going to be tied with (inaudible), when you're going to have this (inaudible) and you're most likely some kind of data backhaul, because you're going to have so much that's going on, that's going to be critical for that. For that to basically maintain, again, back to business continuity and resiliency. This is what this is - why you see a lot of these kind of combined networks coming into play. But as we think about it from two sides. One, I see it from the enterprise side saying how do we build on these use cases? But then I also, see

it from the telco side - how do they know what the telcos need to do to monetize it? And we saw this issue with 3G years ago, you know, where we talked about what's the killer app that telcos are going to be able to monetize. And it's kind of, we see sort of a, I'm an OSS BSS guy at heart. So I see a lot of the same challenges kind of coming back in terms of what becomes the best way to build out those use cases, and actually make them monetizable for for the ecosystem as well.

Marc Cohn, Principal Technology Strategist, Spirent Communications
Well, to start there, there are a few use cases, even today, I mean, the one that's gaining some traction. And I am not saying the only one, I'm certainly just pointing out one that's gaining some traction that's even available in the US is fixed wireless access RX, wireless access. So in other words, using 5G to just bypass the wireline infrastructure, whether it's cable, whether it's fibre, whether it's anything, and that one's gaining traction, just because of the ease of deployment. And over time, we're going to see the performance issues or the operational issues get sorted out, at least in terms of putting an RF antenna in your home and figuring out the right place. I mean, nobody wants to be an RF expert, even in the enterprise. So think about your home, in the residential case, probably not going to happen. So there's going to have to be some organ operational maturity. But that's certainly one use case that there could be direct revenue that's being driven. Now,

Jan Söderström, Vice President & Head of Advanced Technology & Industry Group, Ericsson
if I may add, it's great use cases, a lot of sales in this area. The next sort of level is the smaller medium sized enterprises, which also want to bypass wired infrastructure to coffee shops, fire trucks, whatnot, right? So there we already have, this is a real business of providing SDWAN to SMEs, right. So we, Ericsson have an offering through the cradle point. So routers that goes into fire trucks, police, trucks, buses, or public safety, right. So that is on the low end of smaller organizations that don't have it, they probably can get sort of their private 5G or the operator network where all the complex management happens by the operator. You just have to trust the slicing and all that to keep your data secure. And the big, big corporations that want to have that has a huge IT organization, of course, they will deploy private networks for their needs. Eventually, also, they will, probably use a bit of the of the public infrastructure. I sometimes use the analogy of private or enterprise exchanges for telephony, they were around for 30 years, eventually, they were not needed. Because the seller networks could fix that software wise so but it's going to be a significant time of private networks.

Anit Lohtia, CTO, 5G Strategy Lead, Dell Technologies
I think one of the major change for operators is going to be how they do their business like as you if you go right from the first generation of technology to the second, third generation, they're primarily sold the connectivity, whether it's a server, you want to call it connections, SIM cards, or whichever form the business model has been more of a focus on selling connections, or devices. Now for the world that we are moving in. It requires creating solutions like to create solutions for different verticals with different use cases within the vertical that is a lot different than selling a simple connection, right? Whether they partner with the broader ecosystem, or like Whichever approach they want to take, or I think that would be a major shift in it, in addition to technology in the business model, how they operate and how they sell, the

solution has to change right and they have done some of that enterprise skills, sales and deploy some solution but that has been smaller part of the business compared to selling the bureau connectivity or connection So as we move forward, I think there will be more and more focus on, there has to be more and more focus to make these things happen from operator. So their mindset has to be changing to move towards this solution rather than just selling that connection and let the third party take care of whatever they do with the connection. Right. So that will be, in my opinion, a big change in how operators approach the enterprise market. And because there's going to be the bigger growth market. In previous generation, the actual subscriber, a subscription growth model was a primary model but first, it was a voice connection, then it was a data connection, and then different data plans, but the growth in that area is reaching more and more saturation in almost all markets. So enterprise is a big market. That's new growth area for operators.

Paul Hughes, Research Director, Future of Connectedness, IDC
One of the questions I have, which is when we think of 5G and we think of the flexibility of the network itself, and what it's supposed to provide, we'd love to get your opinion on the future and the rollout and benefits of network slicing, because obviously one of the, we see kind of the ability to provide dedicated network slices was secure with secure data and transport for you see the use cases for you for utilities, oil and gas, and for again, providing one of those. It's that classic model of providing resilient connectivity. But at the same time, again, I have my, my analyst hat on my end, my OSS BSS hat, and I think of the challenges of the service orchestration challenges that come into play. So as you look out at sort of the role of network slicing, we'd love to get your opinion on where and how successful the whole process is going to be?

Jan Söderström, Vice President & Head of Advanced Technology & Industry Group, Ericsson
I think that is one of those prime examples of where the promise of 5G lies, and where we maybe would have wanted to see it earlier. But it comes back again to this standalone thing, and device availability. But quality of service in general is key. And we start to see use cases for gaming, for VR, for SDWAN, where they are already at play. So it's definitely a key functionality that the industry must leverage to build value on top of just pure throughput. So we see a lot of activities. And in addition to the package sort of solution into an enterprise offering, I think we should also notice that there is new models coming up to expose network functionality such as network slicing through an API to any software company, or any gaming company or whatnot. So that is untapped. So far. We have acquired a company that does that. So we are learning that. So Vonage, they do voice and text messaging, and UCaaS and CTS and all that. So when you get your Uber message that the car has arrived or attacks that goes through one of those exposure systems, we foresee that network slicing, and location and precedent and whatnot can be exploited network functions or network capabilities of different kinds should be exposed that way. And that is several players are now acting on them.

Marc Cohn, Principal Technology Strategist, Spirent Communications

Just our thoughts on network slicing are that it's certainly the operators entry into the 5G based Private Networking arena. There's no question that there's some benefits to the operator. And there's likely even though there's some technical challenges, and I've worked on OSS BSS as well, I know, I get a sense of what you're talking about. But on the other hand, there are multiple other approaches to private networking. And the fundamental question that an enterprise has to answer is if you're looking at private networking, and you want one of the major advantages, which is and benefits, which is the control of that infrastructure, or at least that network, you know, do you want to see that to these other parties, like whether it's a carrier offering a network slice, or even a cloud provider wants to offer their variant of a package service for private networking, like what AWS is doing with private 5G, I mean, just as an example, not to be the exclusive one. So that's one of the questions. The other question is that when you look at the enterprise propensity for subscription base everything. Now the question is how do you offer this in the carrier, the more traditional carrier will model, especially when it comes to additional hardware and infrastructure? Is that going to work? So I think there's some big questions about network slicing. I don't think that it's clear exactly how this is all going to play out. I just think we got to watch this over time. I think there's a lot of competition going on right now for the right model.

Anit Lohtia, CTO, 5G Strategy Lead, Dell Technologies
The way I see network slicing is another tool, like it's a part of the 5G set of technology. If you think of 5G as not a single technology but a number of technologies coming together, whether it's on the air interface, better mobile broadband, or is low latency or yarn touched on the standalone versus non standalone web packet code technologies, and network slicing brings all this together. So I would say it's one of the tools in the toolkit that you can use if required, but I think we'd need to learn to walk before you start running. So we need to get going back to where you started. Is it high versus Get grounded? Get some easy, use cases addressed first, and then we move up the complexity chain.

Paul Hughes, Research Director, Future of Connectedness, IDC
Well, we'll open it up to the floor for questions.

Hans Steeman, Dutch IT Channel
Hans Steeman from the Netherlands, to what extent does Wi Fi six or seven fit in this model? Because you're always talking about the public network provider providing network for instance, industry to dot zero bound on use case exercise. But why should a company use that public network provider, then they can use in Wi Fi seven, fully in their own control with sufficient bandwidth for a very affordable price.

Jan Söderström, Vice President & Head of Advanced Technology & Industry Group, Ericsson
Wi Fi will always be there, 5G Is not replacing all the Wi Fi use cases, then it's a question about the functionality that you will get and how many devices you could have. We were for example, working with virtual reality glasses and augmented reality glasses over wireless and how many? How many you can have in the same room etc. So there are things where you will need 5G, but doesn't mean that the other technologies won't be there too. So I think that's part of the complexity that depends on what you want to do.

Anit Lohtia, CTO, 5G Strategy Lead, Dell Technologies
Yeah, and I would agree with that. Tt's not the Wi Fi versus 5G is always going to be and there's going to be use cases that will be very well served by Wi Fi. And there will be some use cases that are not. So for Wi Fi, I can give you an example. Like we have autonomous ballot in our factory which was running on a Wi Fi and they get stuck in certain areas. And then we replace that with the private 5G network where the coverage is overlapping coverage. And you can use seamless handover. In that case, autonomous ballot works with 5G. 5G does not work with Wi Fi. But there's 10 other use cases within the same factory which works just fine on Wi Fi. So it's not going to be one versus another. I think it's going to be a long time for that we can imagine.

Marc Cohn, Principal Technology Strategist, Spirent Communications
I just want to add one point, I think the point is Private Networking is going to be about the disaggregated ecosystem with many different players, integrators are going to have a major part in a major role because it's going to be application specific. And I think that the architecture or the, or the technology is going to be - it's where we're always going to be struggling. And I say struggling because there is extra complexity with this hybrid model where there's multiple technologies, there's not one technology that meets all the use cases, there's going to be judiciously selected to paste based on the requirements and business problem that are the business outcome that they're seeking.

Paul Hughes, Research Director, Future of Connectedness, IDC
I agree. I think a lot of our research and what I see as well is that both technologies are always going to complement each other. And particularly in situations where you look at these in these highly complex verticals like agriculture and mining, where you have the word the importance of it gets back to what I was talking about yesterday, too, in terms of resiliency and business continuity. These two, both networks play a complementary role to ensure that resiliency is in place because any one network can certainly do it. There is the ability to support it in terms of failover but at the same time you are you're going be using each of those networks for different aspects of the business to so as a relates to automation, or as it relates to data transport, or you know, to say, a deep inside of mine versus, you know, outside, outside on a larger external area. So that's where you're going to see that you'll always see that kind of complimentary play, I think.

Kishore Jethanandani, Private LTE & 5G Magazine
So I have a question for Mark. So there's been good adoption of private networks in manufacturing, and there seems to be continuing momentum in terms of progressing in use cases. On the other hand, you have construction, which has huge problems, has compelling use cases, but somehow the adoption doesn't take place. Do you have a perspective on that?

Marc Cohn, Principal Technology Strategist, Spirent Communications

Well, I think as Paul's chart indicates, there's a lot of different verticals, considering private networking. I don't think I can talk about the nuances between the differences in the manufacturing environment in the construction environment. I don't know if my fellow panelists, I mean, it's going to be based on the business outcomes in business drivers, and the economics and I just don't know the construction industry that well.

Paul Hughes, Research Director, Future of Connectedness, IDC
I would say, from my perspective, I'm not sure it's going to be a perfect answer. But you know, typically, in a manufacturing site of goods is always going to be fixed. So you're going to have dedicated resources with fit you're going to always have that fixed. In many cases, you're going to have fixed connectivity, you're going to have Wi Fi six in place, and you can build connectivity around it, construction being much more temporary. I think it makes a challenge as, as you know, if you are thinking of the kinds of benefits of how you, whether it's going to be related to say, autonomy, if you're not, you're not necessarily going to use autonomous vehicles in construction, per se, in maybe for certain aspects of it. But I think just the ongoing way that a lot of those sites are constantly changing. That would be my general perspective. And that's sort of I'm thinking very high level. But I think that when you think about areas like health care, or manufacturing, you're building around kind of a fixed, guaranteed site where you have dedicated resources, dedicated needed for connectivity, and that's only going to grow, whereas your construction is always going to be moving around. So that changes the model somewhat, but not the greatest answer. But that's sort of my opinion.Thanks.

Hector Pizarro, Diario TI
Hello, in Latin America, where I'm based and probably in other emerging regions of the world, as we always hear about problems with spectrum efficiency, because of fragmentation, availability, distortion in cities, for instance, and ultimately, also a regulatory matters. So based on your experiences in other more developed parts of the world what would you recommend the industry and governments in emerging regions to do about the spectrum efficiency?

Jan Söderström, Vice President & Head of Advanced Technology & Industry Group, Ericsson
I'll start but spectrum is a huge issue or huge thing to consider. So as an industry, we are trying to encourage governments and legislators around the world to harmonize as much as possible just to be able to draw on the scale of devices and whatnot equipment. So, that is the first advice, look into trying to harmonize with major markets to be able to draw on the ecosystem that is being built. Then the technology as such is starting to allow for much more sharing of spectrum or more agility of spectrum. So you can do more. So there is also just inherent waiting for the technology to come there will be more ability to handle complex cases. If you have a specific spectrum set up in a country, technology will eventually add tools to do more. I mean, just look at how we moved from 4G to 5G. With 4G a lot of the chunks or the Spectrum was locked to one user all the time. And I'm with the 5G, we can we steer this on a millisecond level. So we can use the spectrum much more frequently. Better, right? So we'll see those kinds of improvements coming. But if you're asking for how, how your industry and how your

legislators or regulators should act, I think it's trying to follow the leading nations because then you will get the scale of the of the technology following you.

Angus Robertson, MC
We have time for one more question.

Tony Chan, Communications Day
Hi, my question is for everyone. In terms of private networking, I know there's a lot of projects and proposals being put out there in the news of operators targeting private networks, as well as people like Ericsson and Nokia, also targeting private networks. Sometimes they get together and they have a partnership.But my question is, what is the operator's role in private network? I mean, somebody has to run the network. And, you know, the operational part of it, obviously comes from the operators, but, are they necessary? Can somebody like Ericsson, you know, deliver a project with somebody like AT&T, Orange? And, you know, if so, what's your perspective in the operators role in this? And how can they strengthen it? Or, you know, what are the weaknesses? Thank you.

Anit Lohtia, CTO, 5G Strategy Lead, Dell Technologies
I think that's a really good question. And as we were touching on few of the topics earlier, like one is, spectrum, operators have access to spectrum, right. So that's a default place to go. And though some of the countries around the world have started to allocate spectrum for my private mobile network, but many places, there's not enough spectrum available or not a good colour spectrum available. So that's certainly one area. Second, I would say, I touched upon this earlier, operators have to move up the value chain. So this 5G enterprise market is going to be a growth area. So we'll see more and more participation from operators, they have to evolve their business processes and studying great solution for different verticals for different use cases. Right. And they will partner with ecosystem partners to make this happen. So there's a big growth opportunity, and we'll see more participation from operators in this space. Jan?

Jan Söderström, Vice President & Head of Advanced Technology & Industry Group, Ericsson
I think it's getting super - good question. As we saw in your slide poll, right. Worldwide, it's like half. Operators are involved in half of the deployments in the US, it's less than that it's more. And particularly in areas where you have Enterprise spectrum like CBRs of Korea and Germany, then you can run it more on your own. And you don't have to rely on operators if you don't want to. But the operator still has a role. And in particular, if you want to use their spectrum, the other aspect I would mention is that there is also a difference in how complex network and IT department and enterprise want to run. When we are building our private 5G networks, we scale down the functionality of the OSS, we lock the parameters, we sort of make it simple, and so an IT department actually can run it. That, of course comes with a little limitations tool, right? You cannot play all the instruments that the 5G network can do. So if you want a very flexible, advanced and play on all the features of the 5G standard, then maybe you will ask the operator too because he's got an organization for that to manage that complexity for you. So I think those two aspects they operate can help well, and then of course, spectrum and stuff like that.

Marc Cohn, Principal Technology Strategist, Spirent Communications
And again, I certainly agree with both of my fellow speakers. But I just want to point out I don't see too many networks where there aren't going to be at least some operator because there's a wireline component here. So I mean, it's not that there's going to be multiple players that in some cases don't exist today. I mean, cloud providers coming in partnering with operators and looking and being on the front end, integrators are taking a huge role. This is a big buck market opportunity for the largest integrators and vertically specific integrators that maybe aren't so, so large. So I think it's not clear who's going to win, you know, or it's certainly clear that no one's going to take the whole pie. I mean, it may be true in certain geographies, but in the larger areas of the world, it's not going to happen. There's too many players that are fighting for this huge opportunity that's going to be emerging as a result of the release of 5G. And I think the other by the way, the one last point that I didn't mention earlier is edge is a part of this, too. It's not like this is communications only, I mean, there is this edge component, that cloud component that's going to enable these applications. And without it, maybe that opportunity doesn't exist, or maybe it has to be completely shuffled. But the edge computing is a vital part of the Private Networking ecosystem.