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The inside track on telecoms operators' technology strategies

Rakuten Mobile

Rakuten Mobile CTO Tareq Amin and Netcracker GM-APAC Robin Laliberte on how their strategic partnership will change the rules for the digital mobile market.

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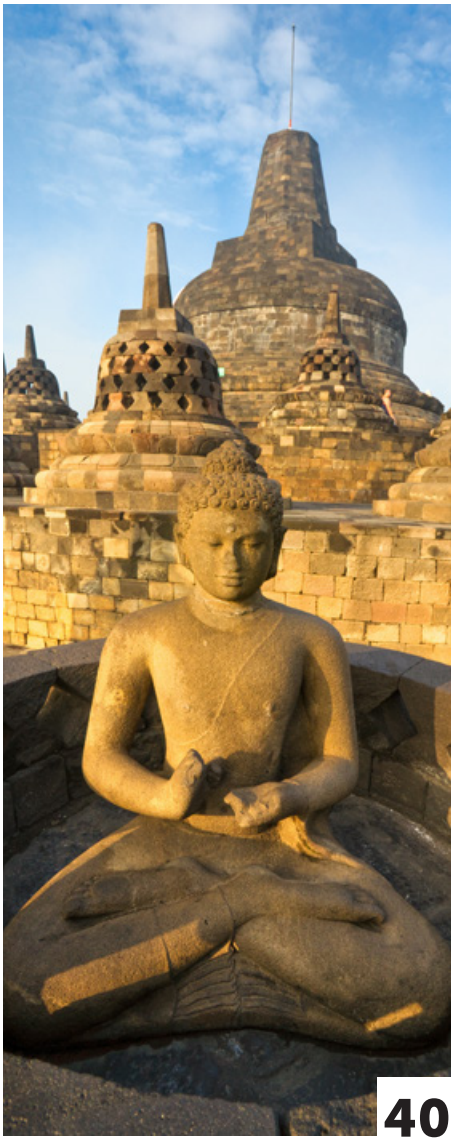

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Editor's choice

5G Insight report

Full Spectrum

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Welcome

Since the launch of the iPhone in 2007, operators have had a tumultuous time. Suddenly the device makers were in control and data traffic was booming beyond any operator's wildest nightmares as users started consuming and generating mind-blowing amounts of content, especially video, via mobile – and fixed – networks.

Despite massive investment in infrastructure, especially mobile, operators have struggled to keep up with demand. Now they are faced with "a good proxy", as BT's Chief Architect calls it (see page 6), for network performance in the shape of social gamers, who have zero tolerance for glitches in connectivity, and are a growing force to be reckoned with.

Still, 5G is more about linking machines together than people, and with 5G, the level of investment needed is greater by an order of magnitude. Spectrum auctions in many countries, including Germany and Italy with many more yet to come, have raised far more than anyone expected. These 'taxes' are in addition to the unprecedented cost of building out 5G infrastructure, and the mountains of debt that so many telcos are buried beneath.

The industry is still haunted by its abject, and inexplicable, failure to make money from charging premium rates for 4G. It's no wonder the dominant theme in the many events I've attended this year, from *MWC2019* in Barcelona, to *FTTH Conference* in Amsterdam, *FutureNet World* in London and *Digital Transformation World* in Nice, is how to monetise 5G, with *5G World*, also in London, almost upon us.

This issue of the magazine is dedicated to 5G and related technologies (automation, virtualisation, and cloud, artificial intelligence and analytics). We analyse your views on 5G through our survey results, and look at how 5G fits with other networks and infrastructure (see page 33). Starting on page 35, we look at what enterprise customers are saying they want from 5G and the difference it will make to their businesses, and how in places, regulators are hindering operators' progress.

The challenges are great, but the opportunities are terrific: never before have operators had the opportunities to offer and charge for different levels of experience and capacity, although for most network slicing is some way off.

In the interim, we look at two areas of technology particularly pertinent to 5G; where we are with virtualisation and where we need to be and consider how much AI will be a game-changer for networks.

We have the privilege of hearing from Piotr Jaworski, CTO, Orange Polska, who got a special mention for his achievements in our CTO of the Year Awards (see page 10) – and of course, we reveal this year's winners (see page 17).

We hope you enjoy the magazine, and are always delighted to hear from you.

Annie Turner, Editor

CTO Insight

BT Group's Chief Architect: networks are all about people

Neil J. McRae is Chief Architect, BT Group. He joined the company in February 2011, and has responsibility for the architecture and technology in all of BT's networks, infrastructure, IT and processes.

Long before he embarked on his career, though, and named after Neil Armstrong, McRae was drawn to technology through NASA and the Apollo programme, and recognised its potential to change people's lives. He grew up in a rough area of Edinburgh in Scotland that featured in the movie *Trainspotting*.

He says, "The movie applied some artistic licence, but showed a kind of hopelessness that a lot of folks I knew felt as they had no way to escape. I wanted to do something my life and technology [has] really made that possible for me."

He insists that improving people's lives is at the heart of BT, and that differentiates the company from everywhere else he has worked. According to McRae, the company has found that "getting people online, and, especially vulnerable people, can really make a big difference". He says, "We change the world for these people. It can reconnect them with the world. My father-in-law is quite isolated, but now he has his window on the world through the Internet and Facebook, and being able to talk to his friends and family who are all over the world.

"That's what excites me most about what we do with the network — if I can get someone, anyone, connected, no matter where they are in the world, it gives them a lifeline to make a positive difference to their own life and other people's lives."

McRae adds, "There's nothing worse than when technology doesn't deliver on its promise – that is for me is like kryptonite [the substance that was toxic to Superman]". He acknowledges that customers do complain about services, but says BT is steadily working through issues, "making it better and better".

Challenging in a different way

You could say McRae now works in a challenging environment: BT acquired EE in 2016, 5G is imminent, and there is an on-going drive to virtualise as well as integrate networks. Network traffic is already growing by 40% year on year, driven largely by video streaming and gaming, and looks likely to increase as FTTH rollout accelerates – Openreach, BT's broadband unit, passed its millionth home with fibre in April – and 4G coverage expands.

McRae says, "When I joined BT, one of the first things I knew we needed to do was get back into mobile, so we rolled out some 4G small cells, which gave us a lot of confidence that we could be successful, and then boom – we went out and bought EE. We didn't mess about with that: there were a few operators that we could have acquired, but we went for the biggest and the best one very specifically to underline our intent."

He continues, "We brought them into the BT family, and we've continued to win awards and grow [the number of mobile] customers and continue to be number one." Indeed, EE has won Rootmetrics annual Best UK Network Award for five years in a row (the last one August 2018) and won or shared the top spot in all six categories of RootMetrics' comprehensive testing, announced in April 2019.

That means EE/BT has now won the overall UK award in 11 consecutive rounds of testing, going back to when RootMetrics began UK-wide testing in the second half of 2013.

Group momentum

He says BT Sport and the EE acquisition gave the group more momentum, which the company has sustained as it faces the next challenge, "To bring those networks together, which we are [doing]. We're really in a great place where we're moving at pace to do that, and roll out 5G and FTTP – fibre to the premises. My colleagues in Openreach are really building that network quickly. There's still a long way to

go, but they're doing a phenomenal job of it and bringing the power of mobile and fixed together is the next big challenge.

"When you put all those things together, in my mind, working here and being a part of this, I mean, where else would you want to be, frankly? Nowhere else has got the 'train set' [the range of technology] that we've got," he states. "There's nothing bigger than what we're doing with 5G. We're building it right now to launch later this year — it's super exciting and we are going to change the world for people all over the UK, as we deliver better and better services."

BT is scheduled to launch 5G services in 16 of the UK's busiest cities in 2019.

Impacts of 5G

How will 5G change BT's operational and business models? McRae says, "On the operational side, that's really easy — it's automate or die; we have to automate everything. We're going to have hundreds of millions of connected devices and you can't do that manually. We have a big group of folks who are focused on automation."

He adds, "That's very much what we're working on: building out BT and transforming BT into this digital organisation. We're touching every part of our business. We have a programme to really crank up the handle on digital IT and analytics, and security around those things: we've got huge programmes to get ready to support enterprises, because 5G's a bigger enterprise play."

Beyond that, "It goes without saying" that for vertical and industrial applications, 5G requires "a completely different way of building a network, a different set of commercial models, a different way of thinking. At the core, it starts with a different way of working with those businesses. I genuinely believe that the hard part of 5G is not the technology. It's the different way of working, of engaging with businesses," McRae says.

BT is looking at how to provide blanket coverage with factories, for example, to allow a higher level of automation and flexibility, such as making factories more configurable as they will be able to dispense with miles of expensive cabling. Another area is connectivity solutions for

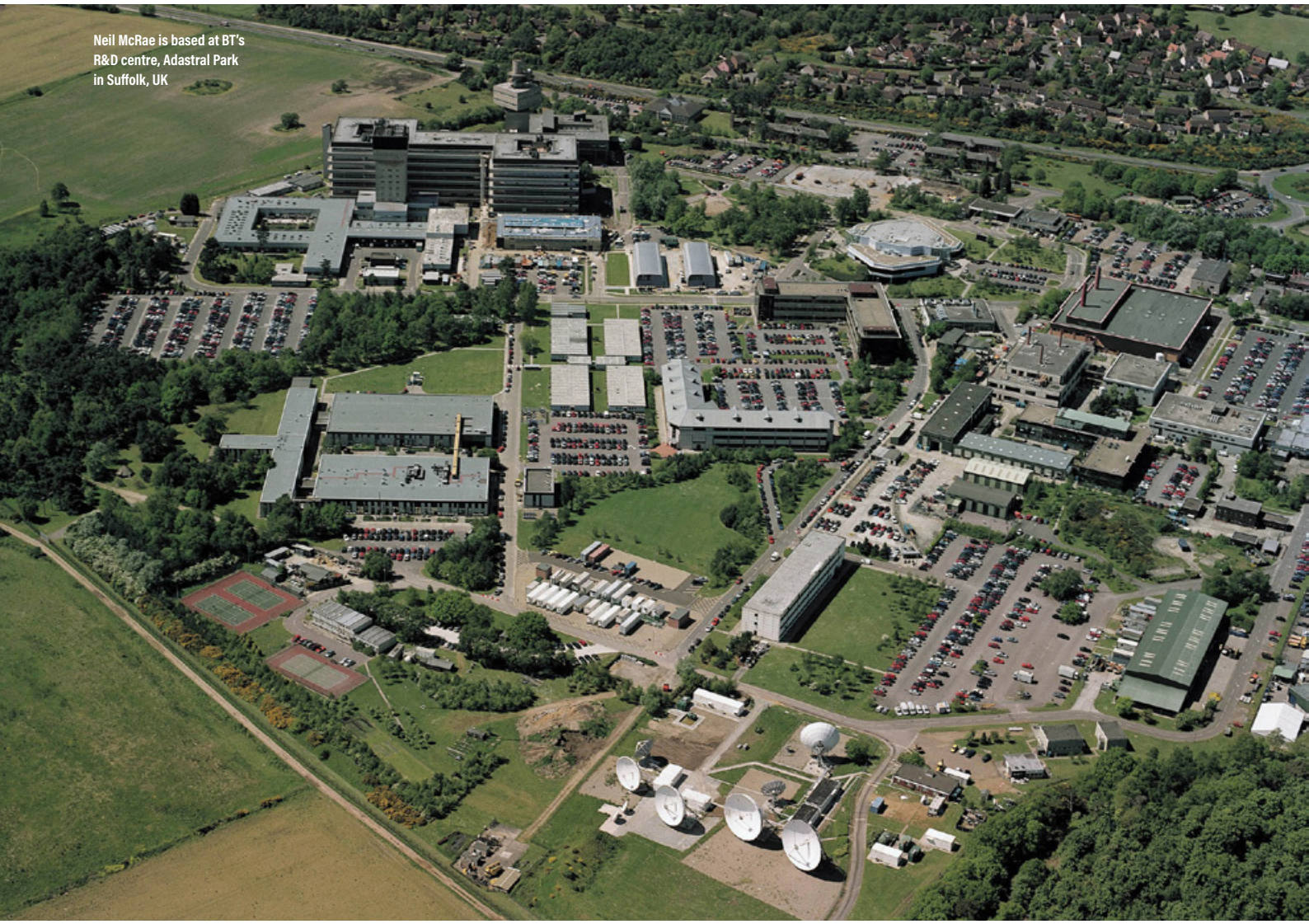
> "We have a programme to really crank up the handle on digital IT and analytics, and security around those things

supermarkets to improve the just-in-time supply of perishable goods to reduce food wastage, by monitoring and automated re-ordering.

Campus networks are another area, including hospitals, airports, shopping malls, universities and corporate premises. McRae says you shouldn't need to have to download the latest Disney at home for your five-year old before taking a flight because it's impossible to do it at the airport. He adds, "My vision is that the network is there with the best experience when you need it, where you need it".

But it's not just about connectivity. McRae explains, "Sticking sensors on a lorry and a locomotive might look like doing pretty much the same thing, but they work very differently with different parameters. You need to collect and analyse different information. I've been talking to GE, which makes trains, and there 500 plus sensors on their latest locomotive engine.

"I get quite excited about that because if I can extract all the data from those sensors, and help the customer prioritise it, it's less likely that hundreds or thousands of people get stuck at train stations on a Friday night, because a train broke down [due to predictive maintenance enable by analysis of data from those sensors]. That goes right back to that root purpose we have in BT of making the world better for people.



Neil McRae is based at BT's R&D centre, Adastral Park in Suffolk, UK

"The next wave of devices, sensors and analytics will come together — we have a lot of research programs with really great algorithmic work at BT's Applied Research that will pull those things together and give [enterprise] customers a much more valuable view than they would otherwise get."

Game on for consumers

The enterprise market might eventually dwarf the consumer market, propelled by 5G and IoT, but consumers are definitely central to BT's strategy too. Social [online] gaming in particular will be a huge sector. McRae, himself an enthusiastic gamer, observes that gaming is, "a very good proxy" for judging how well the network is performing.

Even video has "a whole bunch of protocols that will step down the quality of the picture if there's any network issues, whereas [for] gaming, the network has to work really well regarding latency – which is one aspect of network design – but also regarding packet loss and availability."

This is because, unlike many applications, online gaming is all about two-way traffic, not simply pulling content down from the web. McRae says, "That's why whenever we have had any network problems, we often found out from the gamers first."

He adds, "What my aim personally is…to give people the feeling that when they are winning, it's partly because they're using BT as their network: I want everyone's game to play better on our network than anyone else's. And that's what we're trying to build in terms of our reach, for everything from our [fixed] superfast and ultra-fast broadband network, and our 4G and 5G networks."

McRae explains, "I think that the human condition around trying to work differently is at the heart of 5G – to provide indoor coverage, blanket coverage, campus coverage, and coverage in train stations and at airports. Honestly, once we've got those [human aspects] things sorted out, the other issues are no brainers.

"The core technology of 5G is not the hardest thing about getting the most out of the opportunity. The hardest thing is our own attitude and our own willingness to work through some pretty tough stuff and how we work together to build solutions to problems that we might have thought are too hard to solve," McRae concludes. "Many ask why? At BT, we ask why not?"

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In the spotlight: **Piotr Jaworski,** CTO, **Orange Polska**

What is the biggest issue on your mind now?

There are two hot topics. 5G and Orange Fibre, which is the company's biggest investment so far. In 2017-2018 alone we invested almost €330 million and created Infostrada, which in that period provided super-fast internet access to over 1.9 million homes and companies. The length of the fibre we have deployed would go round the equator three times. 5G is the basis for developing the mobile network to offer new services to business and individuals.

Which person most influenced your career?

Jan Radziemski, former director of what was Telekomunikacja Polska, appreciated my skills back in 2001 and trusted me, a young manager, to build a complex operational structure for a key transformational programme.

Then Jean-François Fallacher, President of Orange Polska, promoted me to the responsible position of CTO in 2016. I've had to learn to manage a mobile network. This is ongoing.

Poland is a tough, competitive market, but Orange Polska has made great progress (with 4G and FTTH build out, for instance). How will you continue this success with 5G?

We want to continue this success quickly by implementing 5G in Poland because data traffic on mobile networks is growing almost exponentially. In 2018, customers have sent seven times more data than in 2015. At the same time, the Polish economy can rely less and less on low labour costs and is beginning to digitise dynamically. Orange wants to be a leading support and guide in this process, providing advanced IoT solutions, data analysis and smart city solutions.

What's the biggest obstacle to 5G's success and how will you overcome it?

To launch a new generation of mobile networks efficiently and effectively, it is important to acquire the necessary frequencies and facilitate the investment process so that it can proceed as quickly and efficiently as possible. We are ready for a dialogue with the government and market regulator to normalise these issues as Poland is Europe's most stringently regulated market.

What do you consider your greatest professional achievement?

Since 2006, I have been directly or indirectly responsible in Orange (formerly Telekomunikacja Polska) for the construction of an access network, and since 2016 also mobile and core networks.

I think this is the largest and best network in Poland; a spectacular success with over 3.2 million household within our FTTH's range, which we started building out in 2015.

What do you see as the biggest challenge facing the telecoms industry?

To preserve business profitability when capital expenditure is growing, due to continuous technological change, and the margin from traditional services is decreasing. We cannot just become a cheap cable to transfer expensive data: we must use our potential, expand into new markets, and in parallel strive to ensure that our services are always at the highest level.

What single recommendation would you make to your peer-group CTOs?

Above all, to look at the network from the perspective of the client, not as an engineer fascinated by technology. This should guide the choice of technology and development planning. It is also important to build close relationships with business side and cooperation between the network staff and teams creating offers. Mutual understanding of the needs of the modern market and technological capabilities is a guarantee of success.

What do you like to do when you're not working?

I am passionate about audio-visual technology and used to design TV-sets. I devour information from magazines, exhibitions, shows and the internet, and am passionate about technology in other dimensions too. I ski in winter and like to cycle, water ski, run and kayak in summer.

What is the most important lesson you have learned professionally?

Humility. Despite one's knowledge and experience one can never be omniscient, especially in technology. One needs to trust and rely on one's team colleagues who are experts and whose professionalism, commitment and expertise are a key to success.

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Rakuten's digital transformation rewrites the rules for the mobile market

Rakuten has changed the rules for what it means to be a mobile operator. The leading Japanese e-commerce company is going global with its brand, expanding its large ecosystem of services, and enabling it all with a new approach to mobility as a lifestyle. Netcracker is a strategic partner of choice for Rakuten that enables its unique approaches to services, customer experiences and revenue management.

This exclusive interview with Rakuten Mobile's CTO, Tareq Amin, and Netcracker's Senior Vice President APAC & Middle East, Robin Laliberte, details Rakuten's compelling go-to-market approach and the story behind the powerful Rakuten-Netcracker partnership.

1. Mobile Europe|European Communications: Tareq, please tell our audience who Rakuten is. What is the most important thing about the company as a major global brand and about Rakuten Mobile's innovative business model and market approach?

Tareq Amin: Rakuten was founded in 1997 as an online marketplace with six staff and 13 merchants. It has expanded to provide services in e-commerce, fintech, digital content and communications, generating more than JPY1 trillion (€7,994 billion) in revenue in 2018. Our company is headquartered in Japan and we have operations in 30 countries and regions worldwide, offering services to almost 1.3 billion members.

We have built up an ecosystem of more than 70 services including online shopping and travel, marketing, credit cards, online banking and digital payments. These services are connected by a common membership and loyalty program in which members can earn points that can be used on other services. Our brand has gained global recognition through our partnerships with internationally recognised sporting icons like FC Barcelona, the Golden State Warriors and the NBA [National Basketball Association].

From a mobile communications perspective, it is important to recognise that Rakuten is not a telecommunications company. We bring a lifestyle approach to mobility that is very different. We believe in simplicity, high quality and value, and especially in rewarding our members for participating in our ecosystem. We are dedicated not only to delivering a superb quality of experience, but also an emotional connection where our members know their personal values are aligned with our brand.

Because our members are always connected to their brand ID, we can offer them a unified experience with services that meet every aspect of their life needs. We act as a source of digital identity, so we can make it extremely easy to access any of our services via mobile. Consider the power of having one-touch access to any service in the ecosystem without a lengthy sign-up process. That's something no other mobile provider can offer today.

We are also technology pioneers. We will deliver the first cloud-native mobile network this year. It's open; it enables AI-driven and machine learning-based customer journeys; and it delivers both RCS and IoT-enhanced offerings. These factors allow us to be very disruptive in the mobility world, and we think that's a real positive for us and for our members.

2. How is Rakuten disrupting the status quo in the mobile communications market and what's your ultimate vision for the services you can provide?

Tareq: Our approach to our mobile offering is based on three key principles – it is content rich; customer-experience driven; and software-centric. This is very different from a traditional CSP which tends to be focused on selling connectivity first. We are offering an experience that isn't just about our mobile network or about voice, text and data. Our experience ties into the content leadership in our ecosystem, our membership-based business model and our concept of customer affiliation. No CSP has the kind of ecosystem we have developed or the idea that a customer is a member with a digital ID within that ecosystem that enables this very powerful lifestyle-based experience.

Also, being software-centric and cloud-native gives us distinct advantages. We are deploying a converged network core and distributed edge. We can offer dynamic network slicing and virtual scaling. And we can deliver a high degree of service automation. So from a pure services point of view, we are not just focused on the handset or handset-based services. We can roll out a range of IoT services that meet life needs – things like home security, pet trackers, or multiple lines in a household – and that's in addition to very robust and dynamic connectivity. So we are also able to deliver services and experiences that meet specific business needs; we're not just taking our B2C handset-based product and multiplying it for the B2B market.

> "No CSP has the kind of ecosystem we have developed or the idea that a customer is a member

When you add the benefits of our membership approach, like earning free delivery or a range of discounts or upgrades across the products and services in our ecosystem, that's something no CSP can match today. And that's also why our technology partners are so critical. We want to make sure our partners share our DNA when it comes to being disruptive, digital-first and customer-centric, and those are characteristics that Netcracker really brings to our partnership.


Robin Laliberte, Senior Vice President APAC & Middle East, Netcracker


Tareq Amin, CTO, Rakuten Mobile

3. Robin, on that note, tell us about Netcracker and why the company is singularly well positioned to help realise the Rakuten vision that Tareq has described?

Robin Laliberte: To begin with, Netcracker was founded more than 25 years ago and now serves more than 250 fixed, mobile, cable, satellite and digital service providers in nearly 100 countries around the world. We are known for delivering innovative BSS, OSS, virtualisation and cloud solutions that help our customers launch digital services and expand into new markets.

Our parent company, NEC Corporation of Japan, is a global conglomerate with more than $25 billion in revenues, more than 110,000 employees and a presence in practically every country in the world. Collectively, we have tremendous depth of resources and experience in delivering innovative technology and solutions as well as a strong focus on helping our customers to maximise their potential.

One of the things that makes Netcracker so well positioned as a Rakuten partner is our Cloud BSS solution. It is a flexible and scalable solution that delivers capabilities far beyond traditional CSPs' boundaries. This solution has been developed and honed over time because it is used to deliver everything from smart city and smart utility services, to Internet of Things (IoT) ecosystems; for launching entirely new lines of business in B2C and B2B cloud services; for monetising and shaping the customer experience for large and complex, multi-channel value added reseller networks; and for enabling sophisticated logistics businesses that require a high degree of custom requirements around every shipment.

But beyond those functional capabilities, it's critical we can deliver this solution on a fully managed basis, 24 hours a day and seven days a week, anywhere in the world. We like to say that the sun never sets on Netcracker managed services. The ability not only to innovate and to be flexible, but also to support a massive, growing and rapidly evolving global business is why Netcracker is a DNA match for Rakuten.

4. Tareq, as Robin mentioned the cloud, can you tell us how Rakuten's one-of-a-kind cloud platform is central to your disruptive approach to the mobility market?

There are many pieces to this puzzle, so I will focus on some of the highlights that really stand out in our approach. We have stated publicly that ours will be the first mobile network to be entirely cloud-native, but what does that mean? First, it means we have deployed an entirely virtualised radio access network (vRAN) for which we defined specific requirements unlike those of any other operator. We've coupled that with a distributed, common carrier-grade telco cloud; a 5G-ready, IPv6-based transport network for our backhaul and a completely software-defined programmable infrastructure. It's easier for us to deploy and expand as it's more responsive and performs faster, and it's all 5G ready from the start.

The point of this, however, is to deliver any service anywhere. So we have combined mobile edge computing with SDN-enabled centralised and

regional data centres, and created a zero-touch, end-to-end automation and assurance layer for service delivery, based on unified OSS and BSS.

Everything is software controlled and built to our particular specifications, which is why we not only have an extremely high degree of control, but also have massive cost advantages. This cost advantage is extremely disruptive to the traditional mobility model, as is our ability to deliver any sort of cloud-based services over this infrastructure rapidly and in a fully automated manner, which is central to our customer experience vision as well.

5. Robin, what is Netcracker doing to make that digital and mobile-first customer experience come to life?

Robin: Because Rakuten has this mobile-first vision from the start, we have an opportunity to radically improve the overall customer experience. So, for example, Netcracker's ability to define and automate highly personalised customer journeys and to deliver mobile-first, digital experiences across any customer-facing channels will play a big role in how Rakuten's members interact with their services.

Our solutions will be central to realising Rakuten's goal of making emotional connections with members from the mobility point of view. Our role is to make things simple and personal for members; to shield them from the underlying complexity of this sophisticated cloud network; to help them shop, buy and solve problems; and also to help them understand how they're being rewarded.

6. So Tareq, are you also addressing the practical matters that can make the traditional mobile customer experience so frustrating for people?

Tareq: Yes, we absolutely are. We want to fix the things we have all wrestled with as mobile customers. For example, we will revolutionise the in-store concept. We want to change how customers are served there and shift what can be a two-hour process down to about five minutes. What we mean by mobile- and digital-first experience is that our entire customer onboarding process should be digital. Right away that will reduce the number of people waiting around the shop.

People who go to the shop should not have to wait to onboard or address a need. So, we'll provide our digital experience through tablets in the shop that allow customers to onboard in self-start or full self-service mode. We don't want customers staring at the back of a PC screen waiting for something to happen: we want to empower them to take care of their own needs and to have access to friendly and skilled staff members along the way.

Another practical matter we can address is to make the boring regulatory bit of the onboarding process more interesting. Normally a staff member has to read out dull terms and conditions as part of this long process and it's very negative. We're moving this requirement into a quick, dynamic video that gives a summary and meets the regulatory requirement in a much faster, more personalised and more entertaining way.

7. And what about the bill, Robin? What's different about billing in Rakuten's world and how is Netcracker involved?

Robin: It's important to keep in mind that the membership points and rewards concept makes Rakuten very different from traditional mobile operators in what we might normally call billing or revenue management. We are way beyond the bill here. As members of the Rakuten ecosystem, customers can accumulate points for everything they do. And those points can be used for purchases, discounts and for status in the ecosystem which provides greater eligibility for premium services or benefits. It's a simple and positive concept for customers, but it requires a very sophisticated solution.

Netcracker can charge for anything relating to mobile service consumption – like any type of messaging service, any IoT device or service, or advertising and sponsor-supported services. By providing a service-agnostic charging engine, Netcracker translates the consumption and integration of all these kinds of services into membership points and manages the transfer of that value within the Rakuten ecosystem.

Those points can trigger status and eligibility entitlements for all sorts of benefits, which could be bonuses on mobility services or devices, but can also mean an upgraded credit card, free shipping or travel insurance – things that are not specifically related to mobility services, but which help make Rakuten's mobile lifestyle approach come to life. More directly, membership points from all over the ecosystem can be used to pay the mobile bill. So this is where Netcracker gets to show the power of our solutions and experience and deliver great value to Rakuten's members in tangible ways.

Tareq: And if I may add, as we have started to implement Netcracker's solution, it has turned out to be just as we expected – great technology, great innovation and absolutely outstanding solution delivery.

8. This is an exciting vision, but will it be limited to your members in Japan? Will Rakuten expand its global footprint and turn mobility from a regionally-based service to a global, digital service like most of the rest of the Internet?

Tareq: This is a global vision. Rakuten has members in dozens of countries and our focus now is on making our brand globally known, so we are working hard to grow our brand and raise awareness worldwide. While our mobile network initiative is starting in Japan, we expect to disrupt mobility on a global basis in the future, especially as our ecosystem and member base continues to grow around the world.

9. Robin, how can Netcracker make that global vision happen?

Robin: Netcracker is truly a global company. We don't just have a global sales presence, but we deliver solutions to industry leaders all over the world. That's what makes us a strong choice as a partner for Rakuten, because anywhere Rakuten wants to expand its mobile footprint, we're there. We've been there for years and we've helped deliver mobile networks and digital services there, and we do it every day. So we really look forward to helping Rakuten succeed not only in Japan, but everywhere in the world this amazing and disruptive initiative takes us together.

10. To summarise, what can you tell us about Rakuten's team and the profiles needed to conduct such transformation?

Tareq: Our origins are in Japan so our foundational culture and approach is firmly rooted here but, as we globalise, we are learning and adjusting our approach to be more universal. And the credit for this should go to our founder and CEO Mickey Mikitani for his vision of globalisation. This vision encompasses a number of key elements. First, a commitment to being English-centric across the business to attract the best global talent and build great teams. At the same time, we always ensure we serve the needs of our local and regional customers, and remain true to our core values of being digital-first, customer-focused and disruptive.

For more info visit: www.netcracker.com

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Join this webinar with iBwave and Dean Bubley from Disruptive Analysis, to learn more about the current state of indoor 5G, where it will be going and what's needed to get there.

Dean Bubley, Founder, Disruptive Analysis
Zachary Elias, Product Manager, iBwave Solutions

Don't get left behind with your SS7 network refresh

NetNumber

25 June, 3pm BST

In this webinar, NetNumber will discuss some of the common challenges that CSPs are facing when going through a network modernization and the underlying elements that should be considered during a transformation.

Matthew Rosenberg, Chief Revenue Officer, NetNumber

Exploring current and future use cases for 5G

3 July, 2pm BST

The webinar will be hosted by Mobile Europe & European Communication's editor, Annie Turner, with guest speakers Klaus Moschne, Executive Programme Manager, NGMN, and Nick Sampson, Director of Wireless Access and Core Network Standardisation, Orange.

Nick Sampson, Director of Wireless Access at Orange
Klaus Moschner, Executive Programme Manager at NGMN

Will regulation stifle 5G's potential in Europe?

9 July, 2pm BST

The webinar will be hosted by Mobile Europe & European Communication's editor, Annie Turner, and veteran analyst John Strand of Strand Consult.

John Strand, CEO of Strand Consult

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CTO of the Year 2019

The annual awards celebrating outstanding use of technology by mobile network operators

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Mobile Europe & European Communications hosted its annual CTO of the Year Awards in May, which saw execs from across the continent head to London for a roundtable discussion, dinner and prizegiving ceremony.

THIS YEAR THE SHORTLIST WAS:

Neil McRae, Chief Architect, BT
Boris Drilo, CTO, Hrvatski Telekom
Kristian Eliassen, CTO, ICE
Miguel Santos, CTO, Grupo MASMOVIL
Piotr Jaworski, CTO, Orange Polska
Elmar Grasser, CTO, Sunrise Communications
Branimir Marić, CTIO, T-Mobile Czech Republic
Liga Krumina, CTO, Tele2 Latvia
Micha Berger, CTO, Telenet
Ruza Sabonovic, Vice Pesident, Head of Network, Telenor

Our congratulations to them all – see opposite page to find out who the winners are.

We would also like to thank the judging panel for their efforts

Kester Mann, Principal Analyst, CCS Insight
Annie Turner, Editor, *Mobile Europe & European Communications*
Payam Taaghol, CEO, MYCOM OSI
Bengt Nordström, CEO, Northstream






Elmar Grasser, CTO with Swiss operator, Sunrise Communications (pictured bottom right), was chosen as for a CTO of the Year Award because of his pioneering deployment of 5G. The Award was presented by Payam Taaghol, CEO of MYCOM OSI, who sponsors the *Mobile Europe & European Communications'* annual CTO of the Year Awards.

Boris Drilo (bottom left), CTIO, Hrvatski Telekom, wasn't able to attend the ceremony, but was chosen by the judges for the breadth of his achievements at Croatia's largest network operator.



Photo: Drazer Tomic

4 reasons why the Assurance Cloud is critical to monetizing the 5G experience

By Ian Meakin
Global Head of Marketing, MYCOM OSI

The race to deploy 5G has begun, and the critical consumer segment is being promised orders of magnitude faster connectivity today. But how can CSPs be sure that they are delivering against this promise? And how can similar promises be delivered for network slice-enabled digital services in new, untapped segments going forward?

The assurance cloud – service assurance deployed as a Software-as-a-Service (SaaS) offering from the cloud – delivers increasingly critical 'carrier-grade' differentiation with closed-loop, automated, real-time assurance alongside business agility. It eliminates the bottlenecks of legacy assurance on the journey from CSP to DSP.

Removing barriers to business agility

It takes weeks or even months of time and effort to on-board new services with legacy assurance systems. This is a major barrier to achieving business agility. So, CSPs need to not only reimagine the services they deliver, they also need to rearchitect how they assure these services if they are to have a chance of monetizing 5G.

Compared to traditional assurance systems, cloud-native systems reduce deployment time and effort by 75%, through automation and infrastructure independence. SaaS service assurance completely removes the need to manage infrastructure and platforms, and can be deployed, ready to ingest data, in under one hour. Aside from these clear deployment benefits, SaaS service assurance offers four operational advantages.

1. Operate at digital speed

From zero-touch assurance of new services

to closed-loop automation of hybrid network management and NFV/SDN telco cloud assurance, the key to delivering differentiated services lies in AI-driven automation and predictive operations powered by the cloud, unconstrained by legacy infrastructure constraints. It not only saves on otherwise spiralling IT costs, it also unlocks agility and innovation. With automated service assurance, DSPs can bring new services to market and monetize them quicker, operating at digital speed.

2. Embrace open ecosystems

Open source initiatives are fundamental to the transformation from CSP to DSP, enabling collaborative, cost-efficient innovation. SaaS service assurance enables CSPs to rapidly adopt and leverage new open technologies, such as OSM and ONAP, with no complicated upgrades or deployments.

3. Continuously innovate

To enable DSPs to compete and win against web-scale competitors, service assurance must keep pace with agile innovation, moving from waterfall to continuous deployment. Continuous innovation for service assurance is critical to assuring new features, content and solutions, and zero-touch on-boarding, and is native to the SaaS model.

4. Unlock edge use cases

Public cloud is essential for AI at scale and massive big data analytics, while private edge cloud delivers on Ultra-Low Latency use cases such as driverless cars. Service assurance must be cloud native and micro-services based so it can run in the public cloud and be deployed on-demand, automatically, at the edge for latency-critical use-cases.

The Assurance Cloud™ keeps the CSP in control

SaaS service assurance, if packaged correctly, delivers these advantages alongside predictable, lower TCO compared to traditional on-premise deployments. Efficiencies of scale are passed on to the customer, within a commercial framework that allows for seamless scaling, ensuring that CSPs only pay for what they need.

MYCOM OSI, the Assurance Cloud Company™ and leading independent provider of Assurance, Automation and Analytics solutions to the world's largest Communications Service Providers (CSPs), is playing a key role in enabling the transformation of Tier-1 CSPs globally. These include Three UK (the world's first carrier-grade telco cloud), Globe Telecom, Vodafone, Verizon, Telefonica, STC and Deutsche Telecom.

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tmforum EXCELLENCE AWARDS 2018 WINNER Operational Transformation and Agility Award

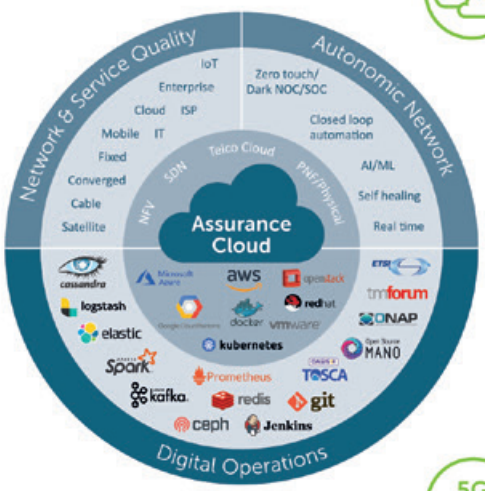
Assurance, Automation and Analytics for the Digital Era

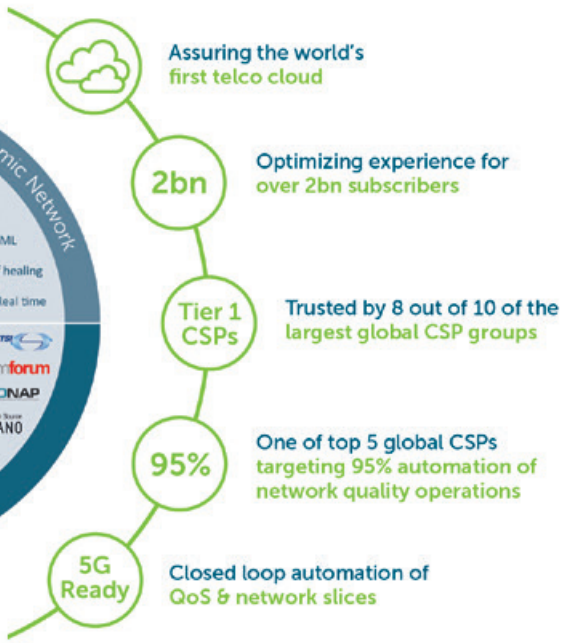
Realizing agility, scalability and efficiency through automated digital operations is critical to the success of Communications Service Provider (CSP) transformation to Digital Service Provider (DSP). MYCOM OSI's Assurance Cloud™ – the telecom industry's first cloud-native service assurance solution available as a public cloud service – simplifies and automates CSPs' network and service operations.

MYCOM OSI's Assurance Cloud™ helps CSPs:

- Visualize, automate and optimize **digital experiences** as well as **service** and **network quality** across **hybrid telco** and **IT networks**
- Enable **digital**, **5G** and **IoT services**
- Deliver **agility**, **scale** and **efficiency** with **automated digital operations**

Powered by MYCOM OSI's award-winning Experience Assurance and Analytics™ (EAA) suite of applications, it governs global digital experience as well as service and network quality with an intelligence platform that monitors, detects and heals by leveraging local orchestrators, driving digital transformation initiatives towards autonomic network management.





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SMART IOT CONNECT

10 September 2019, UK

Intelligent Connectivity and Collaboration for Smarter Cities

Our towns and cities are changing rapidly with technology and will transform how we live, work and travel in the decades ahead. They present huge opportunities for cities, citizens and businesses – not least, telecom operators who have a significant role to play.

While work is gaining momentum the world over, challenges remain as various parties look to carve out space within smart cities, seek out ROI and jostle for lead position.

This conference will explore the various roles within and routes to making our towns and cities more digitally enabled. It will include success stories and frank discussions with telecom operators, vendors and public sector bodies, discussing how they have made their city based projects work and how they solved issues such as security, effective collaboration, developing a coherent strategy and making digital cities work financially, as well as the obstacles that still need to be overcome.

For more information and to register, visit
www.smartiotconnect.com

Location: etc. venues St Paul's, London, UK

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John O' Grady – +44 (0)7741 911300 or johno@smartcitiesworld.net

Smart cities need telecoms and civic authorities to communicate

This is theme of the one-day ***Smart IoT Connect conference*** on 10 September 2019, hosted by ***Mobile Europe & European Communications*** and our sister brand, ***Smart Cities World.***

Here the hugely popular keynote speaker from last year's conference, Stefano Gastaut, CEO, Vodafone IoT, talks to Annie Turner about telecoms and smart cities, how well they understand each other – or not – and the key role of telecom infrastructure in smart cities.

Vodafone works with 80% of the world's car manufacturers on connected vehicles and towards automated cars: in Europe about 20 million cars are connected to its network. It is also involved in other elements of mobility, like Mobike's cycle-sharing and car-sharing services, like Zipcar.

AT: Is it a difficult to negotiate with cities? My feeling is that there is not a good understanding concerning what telcos can bring to smart cities by city authorities and by telcos about what smart cities need?
SG: I think you're spot on. I feel that a lot of authorities within cities don't understand what communication service providers (CSPs) can offer them, and I'm not sure how well CSPs understand what cities need.

AT: How is this affecting the progress of smart cities?
SG: The second consideration is that there's really not money in this and frankly, when you start talking to the politicians…not all of them understand it.

There's a generational thing… It's not a coincidence that the most advanced countries are where


Stefano Gastaut, CEO, Vodafone IoT

you have a very young generation of leaders, such as in Estonia and Lithuania…and emerging markets…where you have young not only populations, but younger leadership and politicians.

AT: Where have you seen successful deployments in Europe?
SG: Spain has had a lot European Union money and we're doing [projects with] a few medium- to small-sized cities, of 40,000 to 50,000 people, spending public money to make the cities better. And we're doing some really cool projects, like waste management, which is a big application, but a very straightforward one.

We connect the garbage cabinet with the trucks that pick [garbage] up to optimise the route and so you know when it's full.

The second application is lighting. You don't need all the lights all at the same time; you adjust them based on where people and cars are.

The third one is the area of safety and security [which] has to do with cameras to check on [crowds]. Possible applications are enabling the police to recognise people.

There are things happening, but not at big scale.

AT: Spain has a high FTTH penetration, having made immense progress in the last few years. Is that all part of the same progressive thinking?
SG: It is. Some countries in Europe have taken [communications infrastructure] more seriously because they understood. Ten years ago [broadband] was a nice way of getting a few votes. By now I think everybody has understood, even more the old-style politicians, that the digital infrastructure – no matter if it's FTTH or IoT or 5G – is critical for digitising the country and making it future-proof, while not forgetting enabling citizens to surf the web well.

Look at the three Baltic republics, which are super-small, but they are ten times more advanced for public administration services: it's all digitised. They are really going fast, along with some of the Nordic countries.

Another example is Poland; compare it to places like Italy, or the UK. It is going faster.

It is a bit scattered and countries are going at different speeds, but things are going to pick up, I'm pretty sure, everywhere.

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Essential information for senior decision-makers in the mobile communications industry

5G Insight report

Sponsored by: NetNumber

2019 5G reader survey:

Mobile operators target consumers and enterprises with 5G, but return on investment and backhaul costs are big concerns.

Our 2019 survey of Mobile Europe & European Communications readers confirms that 5G deployment is underway with operators targeting consumers and enterprises with new services. However, service providers have big concerns about getting a return on their investment (ROI) in the new technology and about how to handle backhaul economically. Operators also are worried they could be displaced if enterprises decide to deploy their own 5G networks.

We conducted this readership survey in April and May 2019. Of 85 respondents, 47% were network operators, 32% were suppliers and 21% were other types of companies, such as consulting companies, systems integrators, analysts and regulators. A full 88% of respondents were from Europe, 8% from the Americas, 2% from the Asia-Pacific region and 2% from the Middle East and Africa.

Nearly half of mobile operators surveyed said they will deploy 5G this year, and just over a quarter in 2020.

Most 5G deployment in Europe is happening in Switzerland through Swisscom and Sunrise Communications, though operators in other countries are beginning to roll out 5G. For example, Vodafone has limited deployments in Spain, and T-Mobile Austria announced 5G availability in March. As we went to press, EE announced it would begin offering service in a

handful of cities in the UK on May 30.

Ookla, a provider of Internet testing and analysis applications, recently unveiled a new interactive map of 5G deployments worldwide, which the company says will be updated weekly. Current stats show 303 5G networks deployed in 293 locations globally.

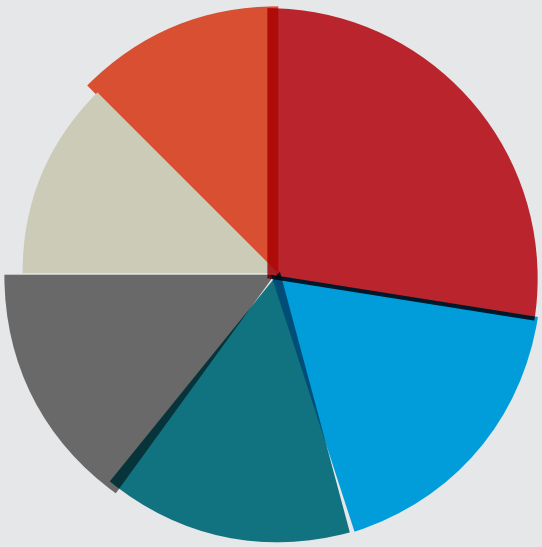
Notably, 15% of the operators we surveyed said they have no timetable for deployment. With hype about 5G and the race to deploy it at an all-time high, the reluctance of some operators to commit to 5G is telling.

So far, 5G largely has been pushed by equipment vendors for obvious reasons. And while many communications service providers (CSPs) share their enthusiasm, others are more sceptical. Chief among their concerns is fear that they will not be able to get a ROI in 5G before "the next G" emerges, promising even faster speeds and more capacity.

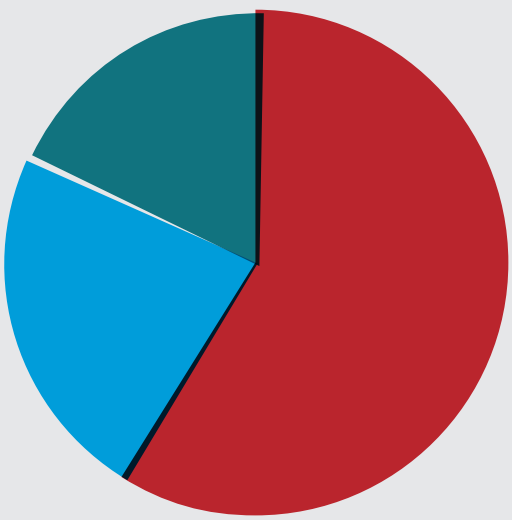
A recent report, *5G Deployment State of Play in Europe, USA and Asia*, which was commissioned by the European Parliament's Committee on Industry, Research and Energy (ITRE) and published in April, suggests this is a valid concern.

"It is becoming clear that 5G will cost much more to deploy than previous mobile technologies (perhaps three times as much) as it is more complex and requires a denser coverage

When will operators roll out 5G?



- **27.5%** 2nd half 2019
- **17.5%** 1st half 2019
- **15%** 2nd half 2020
- **15%** We have not timetable for deploying 5G
- **12.5%** 1st half 2020
- **12.5%** 2021



Are operators targeting consumers or enterprises first?

- **57.5%** Both
- **22.5%** Consumer
- **17.5%** Enterprise

of base stations to provide the expected capacity," the report states. "The European Commission has estimated that it will cost €500 billion to meet its 2025 connectivity targets, which includes 5G coverage in all urban areas."

That's a hefty price to pay without any guarantee of ROI. We'll discuss the challenges in more detail later, but first let's look at how operators are going to market with 5G services.

We asked respondents whether they are targeting consumers or enterprises first, which use cases are most interesting and which services are being delivered first. A majority of respondents (operators and suppliers) said that consumers and enterprises are both targets. This result differs slightly from our Q1 survey, which found that 40% of respondents intended to target enterprises first. Interestingly, the services that respondents say are coming to market first – enhanced mobile broadband and fixed wireless access – are predominantly for consumers.

Smart city applications rank highly among the first services operators are rolling out, and they top the list of the most interesting and promising use cases for 5G, followed by connected vehicles and industrial automation.

Smart cities are appealing because they offer telcos and suppliers an opportunity to test technology and services, and explore myriad vertical use cases, from smart home and energy to digital health and connected vehicles. The European 5G Observatory cites the following as a "non-exhaustive list of 5G trial cities" in Europe: Amsterdam, Aveiro, Barcelona, Bari, Berlin, Bristol, Espoo, Ghent, L'Aquila, London, Madrid, Malaga, Matera, Milan, Oulu, Patras, Prato, Stockholm, Tallinn and Turin.

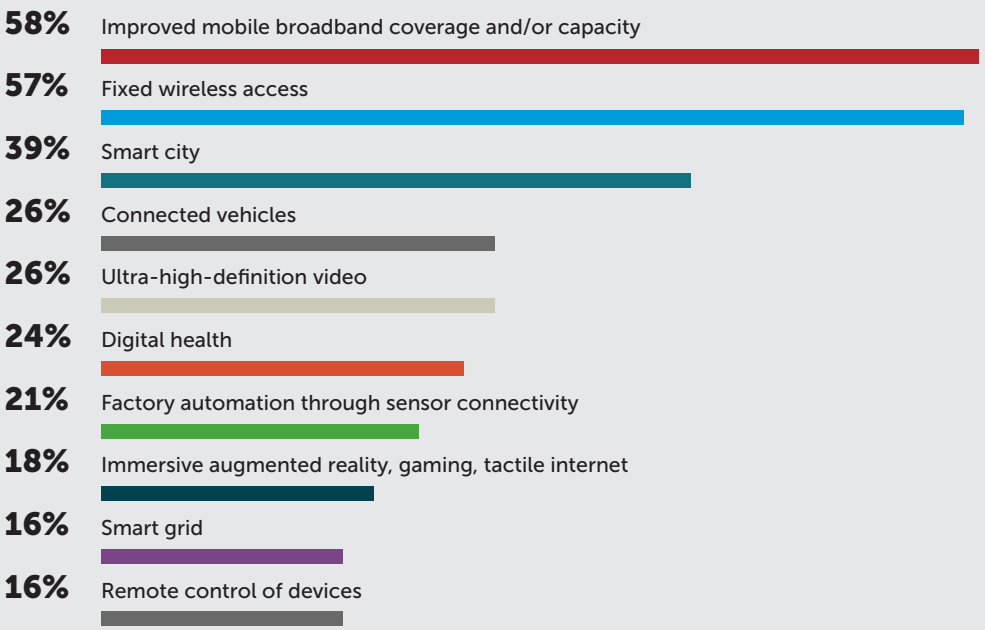
> **"Serving the enterprise market is challenging for mobile operators, partly because it's not clear what they need to deliver**

In addition to smart cities, the 5G Observatory tracks "digital corridors", such as the Pan-European Union 5G corridor, where vehicles can traverse borders. These regions allow for testing of cross-border road safety; data access, quality and reliability; and connectivity.

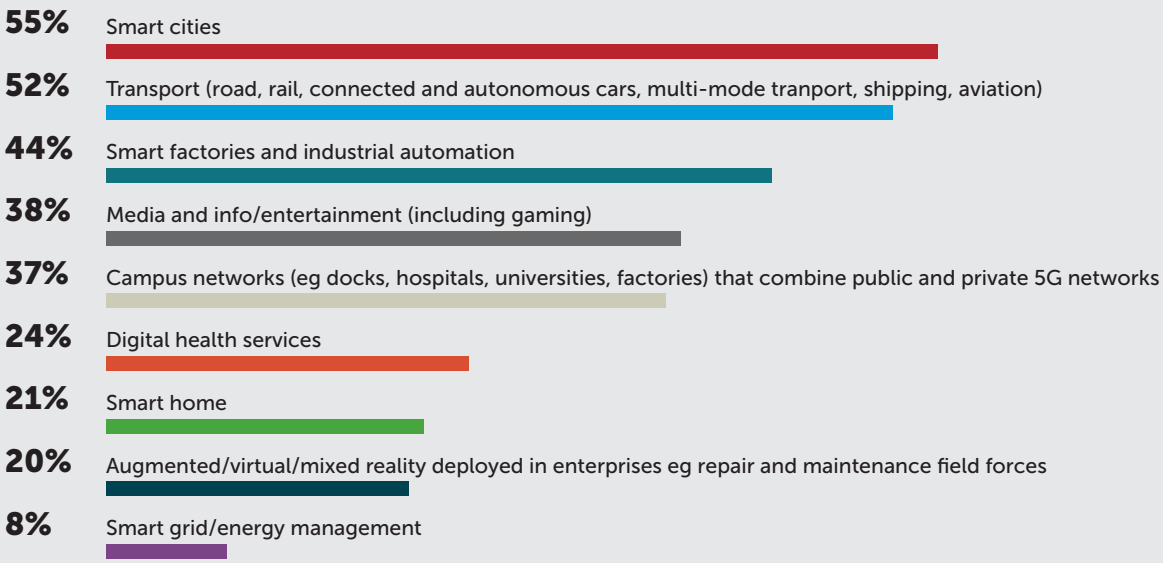
More than a third of respondents ranked enterprise services such as industrial IoT (IIoT), media and entertainment, and campus networks in their top three choices for promising use cases. As we noted in our Q1 survey analysis, many observers agree that operators must tap the enterprise market to succeed with 5G as the market for B2B internet of things (IoT) services is expected to be twice as large as the consumer market by 2020.

Serving the enterprise market is challenging for mobile operators, partly because it's not clear what they need to deliver (see page

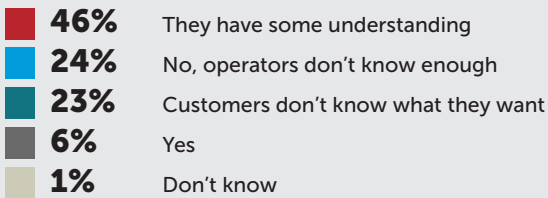
Which 5G services are operators deploying first (respondents were asked to rank all the options in importance, from 1-10, with 10 being the most important)?

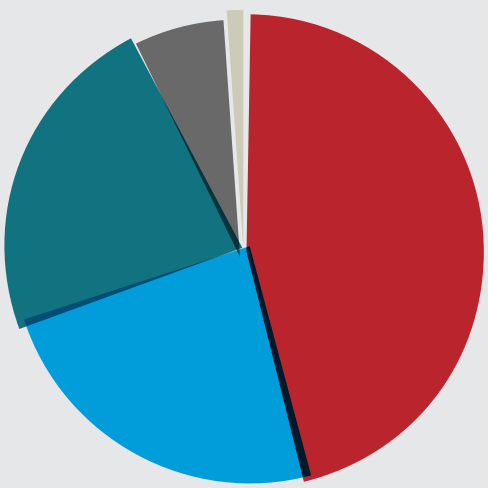


Which use cases is your company most interested in (respondents were asked to pick their top 3)?



Do operators understand what their enterprise customers want and expect?



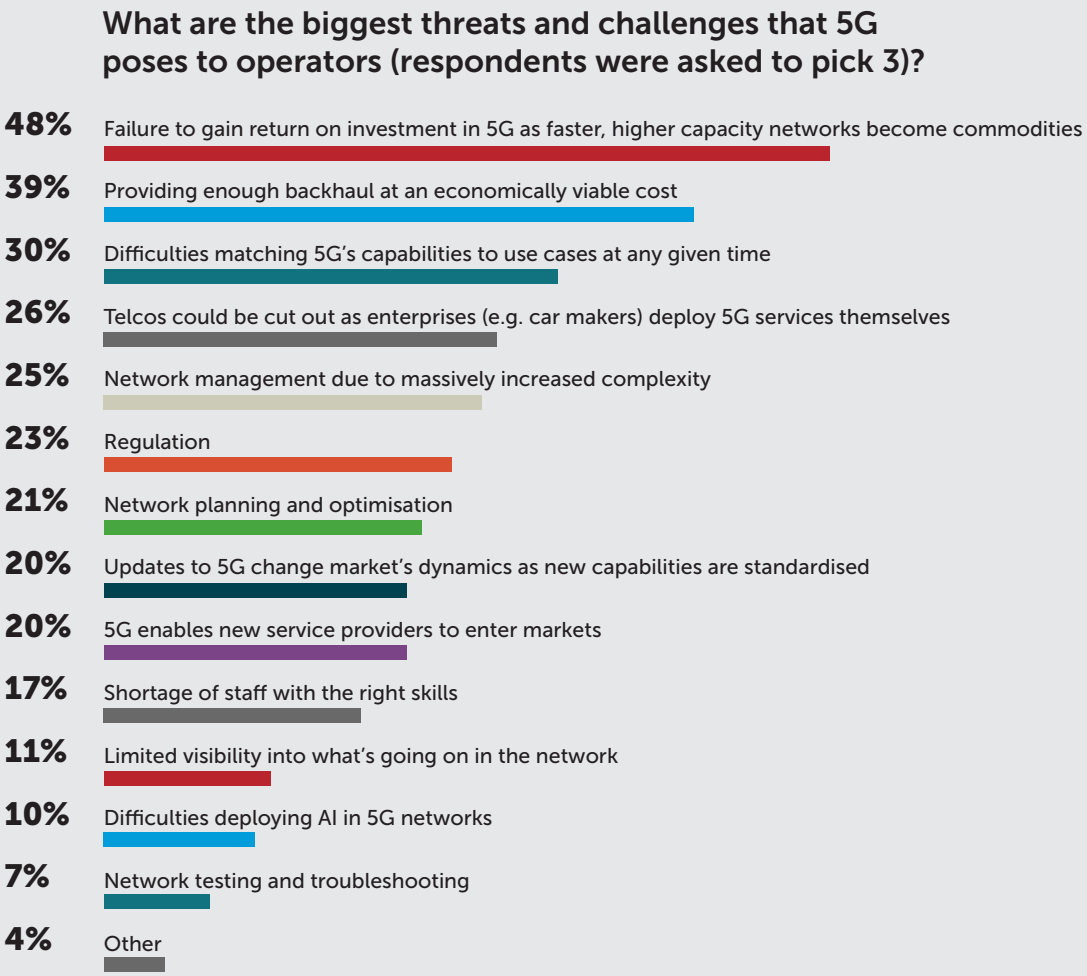


35). When asked if operators understand what their enterprise customers want and expect from 5G, only 6% said "yes". Nearly a quarter said operators don't know enough, and another 23% said customers don't know what they want.

Another problem is that in addition to upgrading radio access and core networks for 5G, operators must overhaul their IT support systems to be able to manage B2B services end to end. This is especially tricky when partners are involved.

Only a quarter of respondents put the complexity of 5G network management in their top three biggest challenges (see page 28), but this will be a major issue to resolve if operators are to deliver quality guarantees over network slices.

If operators don't figure out, and quickly, how to market 5G services to enterprises, there is a risk that enterprises will develop their own, private 5G networks, in much the same way they built their own voice and data networks decades ago. Indeed, survey respondents are aware of the risk, with 26% citing displacement among their biggest concerns.



As noted, the biggest challenges for operators are financial, with nearly half citing worries about the ROI as the most significant threat, followed by ability to provide backhaul at low enough cost.

The European Parliament's report on 5G is critical of the industry's push to roll out 5G ahead of demonstrable demand for it.

"As 5G is driven by the telecoms supply industry, and its long tail of component manufacturers, a major campaign is under way to convince governments that the economy and jobs will be strongly stimulated by 5G deployment," the report states. "However, we are yet to see significant 'demand-pull' that could assure sales."

These campaign efforts are also aimed at the mobile network operators, but they have limited capacity to invest in the new technology and infrastructure as their returns from investment in 3G and 4G are still being recouped. The notion of a "race" is part of the campaign but it is becoming clear that the technology will take much longer than earlier generations to perfect."

The report notes, for example, that China believes 5G will take ten years to roll out nationally because of its complexity.

Backhaul is another looming headache. 5G promises ultralow latency (1 to 10 milliseconds), peak data rates of 1 to 20Gbps, and connection density of up to 1 million devices per square kilometre. Backhaul networks today are not equipped to meet anything close to these requirements and a debate is taking shape over the best way to accommodate them.

Improving fibre connectivity is an obvious solution, and this topped the list of critical success factors for 5G deployment (see page 33). But fibre deployment requires huge capital investment, and fibre may not be fast enough, according to some operators and network

equipment suppliers. For that reason, they are considering wireless backhaul options.

One additional challenge which we did not ask about in this survey, but which could slow deployment of 5G, concerns about potential health risks posed by the new technology. HSBC Securities analyst Sunil Rajgopal noted in a recent report that health concerns are elevated because of the density of 5G deployments.

"The race to 5G could be slowed by alleged health concerns related to radio frequency," Rajgopal writes. "These concerns have been around as long as mobile phones, but there have been a number of recent regulatory/public initiatives demanding delays or outright bans on the rollout of 5G."

The European Parliament's report cites this as an issue as well: "One aspect [of 5G] that is not well understood today is the unpredictable propagation patterns that could result in unacceptable levels of human exposure to electromagnetic radiation."

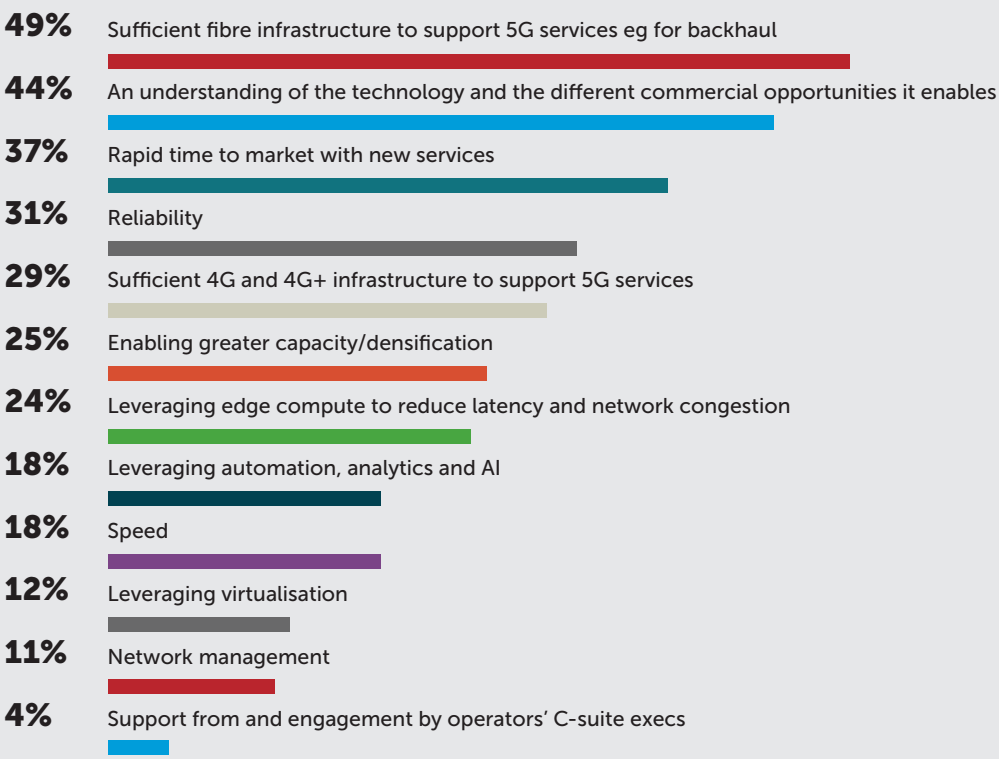
In April, the Swiss government announced that it will introduce a monitoring system to assuage concerns about the potential health impact of 5G emissions. The Cabinet agreed to have the country's environmental agency measure levels of non-ionising radiation, assess the risks and regularly inform the public about its findings.

Finally, we asked respondents which factors will be most important to 5G success. It's not surprising that sufficient fibre tops the list, followed by establishing a business case and being able to deploy new services rapidly.

The European Parliament's 5G report offers four specific recommendations to help operators ensure successful deployment and monetization of 5G in the EU:

- Increasing long-term R&D efforts on 5G is essential to understand multiple propagation unknowns (for example, measuring and controlling radio frequency EMF exposure with MIMO at mmWave frequencies).
- More detailed study of business models is needed to better define the goals, scope and revenue sources for 5G.
- Policy for 5G networks should be based on encouraging infrastructure sharing and separation of infrastructure and services.
- Developing a lightweight regulatory framework for deployment of small area wireless access points (SAWAPs), key to the densified 5G networks envisaged, is essential for their easy rollout at the very large scale of base stations necessary."

What are the critical success factors for 5G services for network operators (respondents were asked to pick 3)?



Getting to beyond: A 5G future is looming, but security is still a challenge

Pieter Veenstra, Senior Manager for Product Development (Security and Routing), NetNumber

The journey to 'planet 5G' will be long, complex and highly demanding but it holds the promise of great opportunity for providers either seeking to be the first to plant their flag and claim that they have won the race, or seeking new future-proof revenue streams in IoT or ecosystem collaborations.

However, like most journeys these adventure seeking operators have luggage that has to go with them into the future. Commonly known as 'legacy', this technology luggage such as SS7, Diameter and SIP still has a role to play.

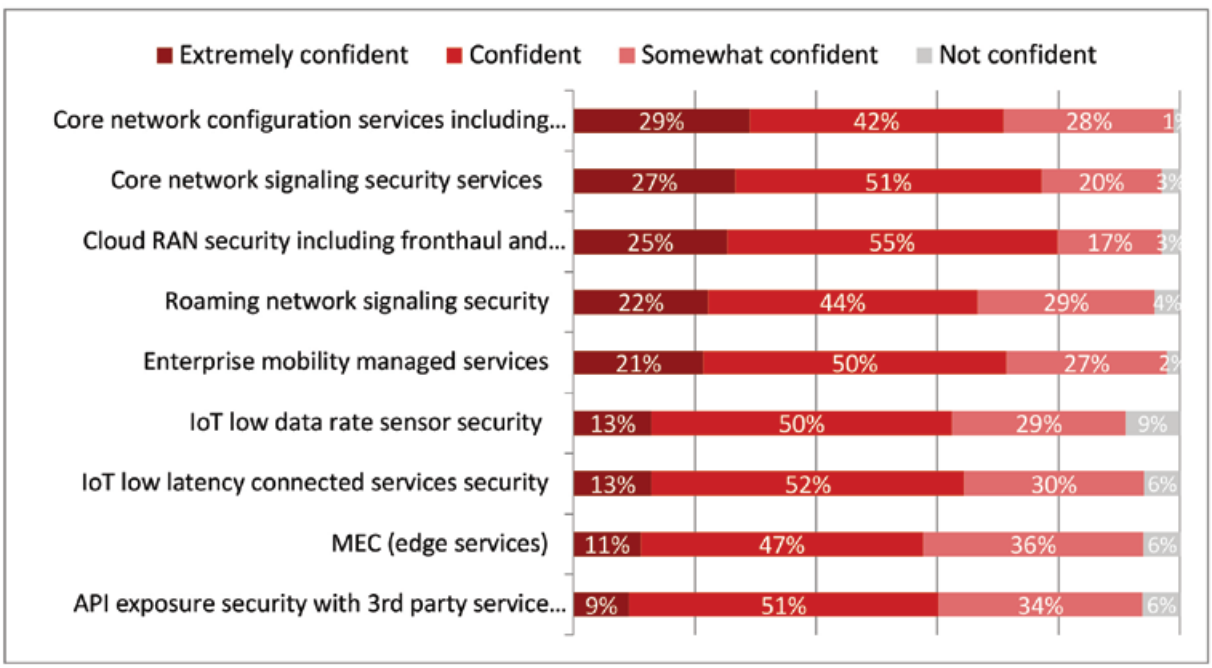
Unquestionably 5G is a critical enabler for the next steps in the digital transformation of our society, private and business processes. The necessary network transformation and modernisation to 5G is revealing a proliferation of concerns regarding security, fraud and privacy – which if left unchecked will lead to significant problems, legal and financial penalties for progressive communication service providers.

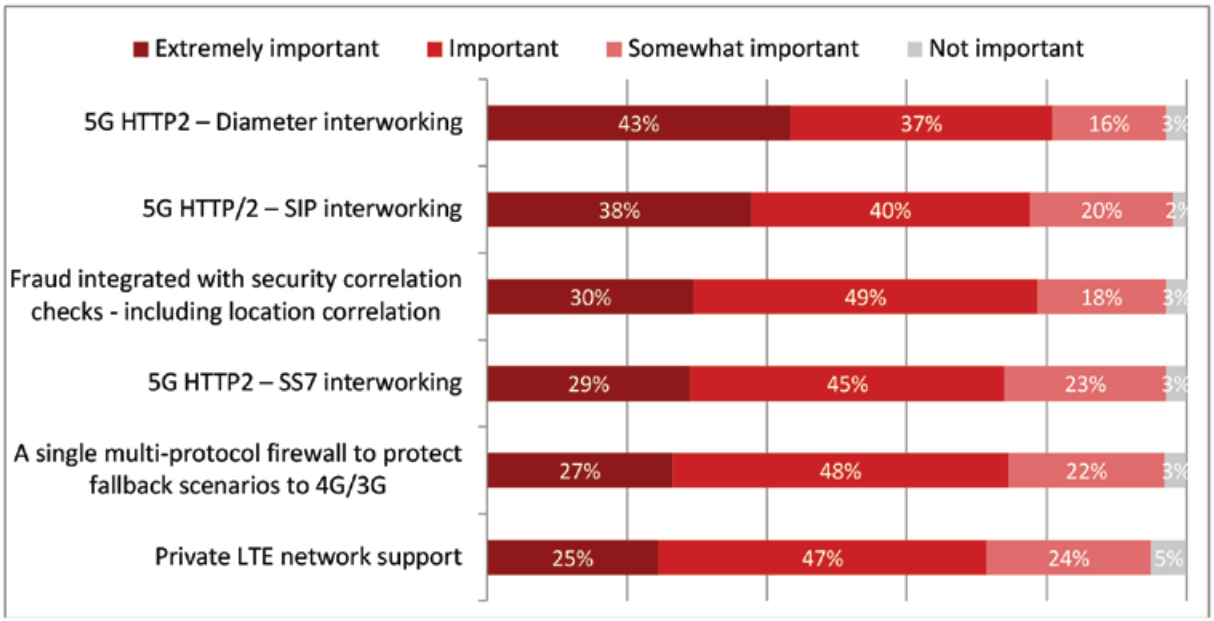
Counter-action

As a counter-action the industry is turning to network vendors, governmental and standardisation bodies to come together, regulate and collaborate to keep our communications, data and privacy secure.

In a recent webinar from LightReading, I had the opportunity to discuss some essential research and a report on Securing 5G Networks with Jim Hodges of HeavyReading. This article adds depth, insight and conclusions to the survey responses and findings.

In 2016 I started my editor role in the GSMA Fraud and Security





Group (FASG) for the definition of Signaling Firewall requirements for SS7 and Diameter, to enhance the protection of international roaming traffic between mobile networks worldwide. Today I'm leading an investigation in the GSMA to identify and track the open issues for 5G Security and will be speaking at 5G World in London.

Securing the 5G control plane

Confidence in the industry's ability to secure the 5G control plane is the first discussion point from the report. There were open questions about the ability and relative confidence levels associated with securing the range of standard 5G security use-case cases utilised in the study.

While about half the respondents said they were "confident", when we break down the numbers further though, this translates to about 40% being either only "somewhat confident" or "not confident" which is not a strong endorsement.

The increasing complexity of the control plane makes issues for operators around the impending paradigm shift and evolving trust model, due to multiple actors, network slicing, distributed service execution, the use of internet protocols and so on.

NetNumber hear similar concerns as these in conversations with our customers, that come with different challenges. For example the potential for attacks, the increase of computing power and security risks that Mobile Edge Computing (MEC) brings; and security issues around API exposure with a new trust model.

Firewall support for 5G

The survey also addressed another important topic – how does the complexity of securing the 5G control plane impact the evolution path of 3G and 4G control plane signaling firewalls?

When 5G interconnection begins to roll out, the 30 year-old SS7 network will still be there –even bigger and carrying more roaming traffic than today. This steep uptake of mobile roaming will likely be due to developments such as the European Union's 'roam like at home', and roaming support for M2M and IoT services. This will include static devices because many operators deploy M2M services with roaming arrangements in foreign networks.

In summary

Given the critical role of 5G in digital transformation and the more stringent legislation for data protection with, for example, GDPR, security in 5G is an absolute critical success factor for this new technology. However, the LightReading report on Securing 5G Networks shows low confidence levels among the respondents that will likely evolve as operators gain experience with the implementation of 5G core networks.

5G security will significantly improve, but the interworking with the present 2G, 3G and 4G networks with SS7, Diameter and SIP will demand special attention. Download a copy of the report at https://go.netnumber.com/Securing5G_WP

Fibre comes to the fore for 5G

5G's success is tied to the speed, reliability and capacity of the other networks it will complement and augment, including 4G, but most especially fibre.

Almost half of the respondents who work for operators said sufficient fibre is the top critical factor for 5G's success (see page 24). Franco Bassanini, President of Italy's Open Fibre, said fibre and 5G would form "dual-faced networks of [fibre to the home] FTTH-5G" at the FTTH Conference, held in Amsterdam in March.

This is because fibre will be needed to provide sufficiently fast front and backhaul for 5G at all the radio access network sites, including small cell sites that will be needed to provide, for instance, indoor coverage.

Allison Kirkby, CEO of Denmark's TDC, insisted the two are "supplementary, not complementary – 5G will add to fibre, not replace it," she said, but acknowledged that 5G could also "be 'air fibre' for the last mile" in some places.

The leaders

Given this inter-dependence of 5G and fibre, and how long the operators' have been planning for 5G, the low fibre penetration within some of Europe's biggest economies is surprising – see the graph showing the ranking published by the FTTH Council in March on the next page.

Belgium is not even on the list. Germany, Europe's biggest economy by far, is thirtieth out of the 34, while the UK only just met the criteria for inclusion, largely due to the efforts of alternative, fibre-only network builders like CityFibre and Hyperoptic, not Openreach, BT's access business.

Spain's tremendous progress stands out, given how badly it suffered after the global financial crisis that started in 2007. This is mostly due to two factors. Orange Group's Deputy CEO & Chairman of Orange Spain, Gervais Pellissier, noted that Spain's regulator behaved "more like the US and let the incumbent [Telefónica] run with [fibre deployment] and no restrictions, and that encouraged the others."

He compared this to France, where Orange is the incumbent, saying, "We invested in fibre until the regulator told us to stop for a year to let competitors catch up".

Secondly, fibre is core to Telefónica's growth strategy of delivering unique content such as video, e-sport and gaming over super-fast broadband. "We don't sell FTTH, we sell Wi-Fi, experience and services," said Enrique Blanco, CTIO of Telefónica Group.

> "5G will add to fibre, not replace it...but it could be 'air-fibre' for the last mile in some places

He claimed the company overall is number one for fibre deployment in Europe and Latin America and that 44% of Telefónica's customers have broadband speeds of more than 50Mbps.

Scale is the key

He said that in Spain, the average consumption of fibre bandwidth is 170-180Gb – about ten times more than average mobile consumption – and that the company is seeing use of fibre bandwidth "grow and grow" in all its markets as customer very quickly get used to having that speed and capacity. For instance, in Brazil customers are quick to complain if their line speed drops below 60-70Mbps.

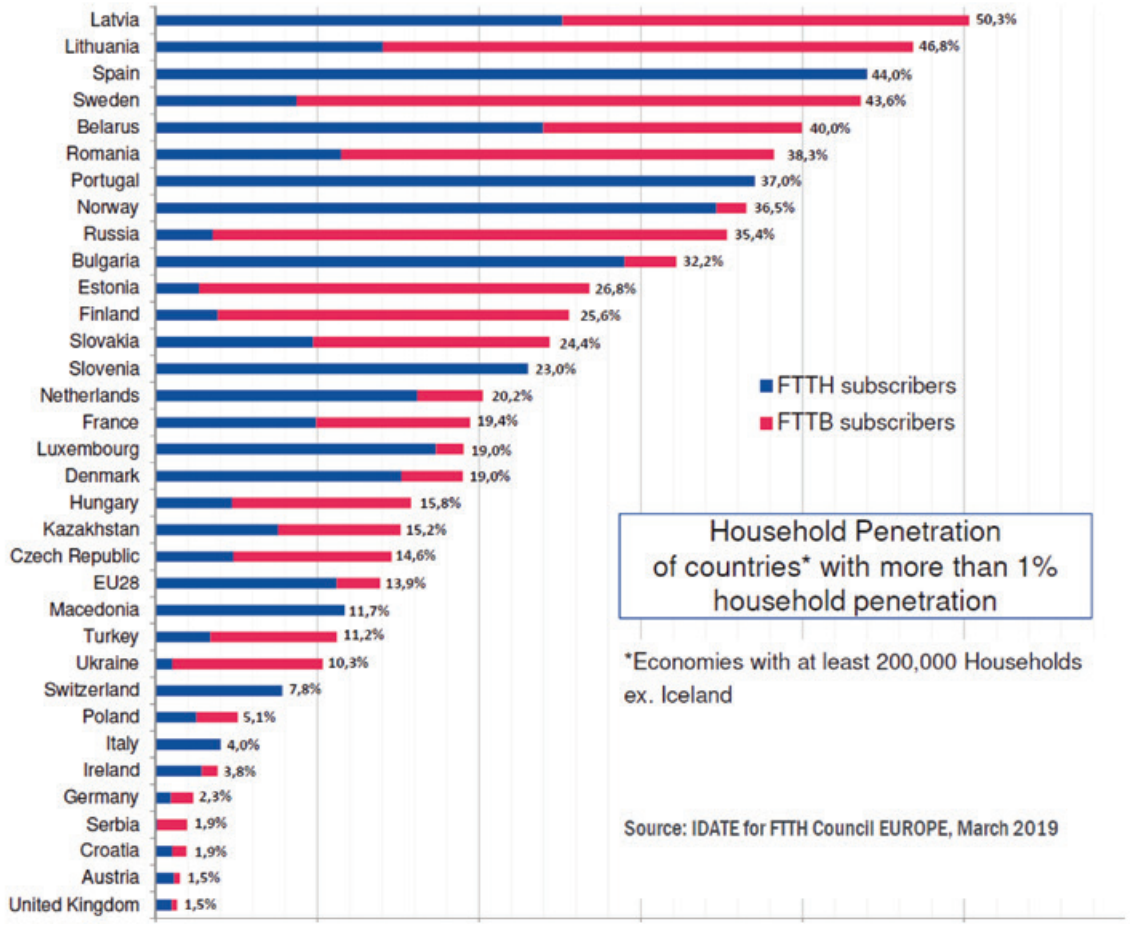
Blanco commented wryly, "We have changed their mindset" and said scale and experience are important: "We are building a FTTH machine that we control from end to end. We can cut the cost of passing homes and the number of complaints with this machine".

Other factors

There are other factors to consider about the Council's ranking, such as it takes no account of extensive cable networks in some countries, which until surprisingly recently some operators argued was a good-enough substitute for fibre. Nor does the ranking include fibre to the kerb or the cabinet: indeed, the FTTH Council has strong views about hybrid solutions being marketed as 'fibre', describing them as "fake fibre".

4G coverage and capacity is also beyond the scope of the ranking, although it will be key to 5G's progress. When EE announced it would be the first to deploy 5G in the UK, from the end of May, Kester Mann, Principal Analyst with CCS Insight, said, "EE's [statement] highlighted that the shift from 4G to 5G is an evolutionary one". He added, "The UK will have completed a remarkable turnaround…In 2012, it became only the fifty-third nation to launch 4G. Now, with all four networks planning to go

FTTH/B – European ranking



live in 2019, it can justifiably claim to be one of the world's 5G pace-setters."

Spiralling costs?

It is not surprising many operators have put off deploying fibre as its is hugely expensive. Many operators have staggering levels of debt, and most are judged on quarterly results, although making money from huge infrastructure investments is a long-term play.

To add to their woes, operators are being forced to spend eye-watering amounts to win 5G spectrum in some national auctions. Italy's raised more than €6 billion and Germany's has already hit that milestone and is ongoing, and many more are yet to come. On top of all this, they are facing the high costs of building out 5G infrastructure.

On the last point, the European Commission, FTTH Council and others argue that the costs are not well understood and could be substantially less than feared through the intelligent alignment of fibre and 5G infrastructure.

The FTTH Council Europe's recent quantitative study, *5G and FTTH: The Value of Convergence*, makes cheerier reading than the ITRE report referred to on page 25. It found that "between 65% and 96% of fibre costs for 5G X-haul can be eliminated by rolling out an optimised and 'future-proof', converged fibre network".

It claims, "In some cases, the cost for fibre to 5G can be virtually eliminated, which can potentially decrease the total cost of 5G by in the order of 50%. The extra investment needed to immediately make an FTTH network ready for 5G (even for high density of cells) is only 1% to 7%."

Not everyone will agree with the models and assumptions behind these claims, but they are food for thought.

Network sharing

Finally, infrastructure sharing is another pragmatic approach to cutting costs and one that is gaining momentum. Telefonica Group's CEO, Jose Maria Alvarez-Pallete, pointed out in May that 80% of capex and 20% of opex in network build-outs goes on infrastructure sites and transmission rentals.

In January, Telefónica and Vodafone in the UK said they'd expand their network sharing arrangements to include 5G sites: In February Vodafone and TIM said they would look into combining their 22,000 passive towers in Italy into a single entity to support 5G active network sharing, and will consider active sharing for 4G. The agreement looks likely to be extended to Iliad.

In April, Orange and Vodafone announced they would extend their network sharing in Spain to 5G.

There are other examples and it looks certain that there will be many more to support 5G.

We need to talk: the 5G use-case debate rumbles on

To make a good return on investment, operators need to pick the right use cases. The question is how to identify those use cases and then work out the most successful approach. Our survey suggests a level of disconnect between customers and operators, and in some markets, regulation is adding to the difficulties.

In our survey (see page 27), less than half our respondents thought operators had a 'good' or 'some' understanding of what their customers want from 5G, and almost a quarter said they don't think customers know what they want.

The best way to find out is to ask them, but of course, we don't always know what is possible. As is often said, before the invention of cars, had people been asked what they wanted regarding transport, they'd have said faster horses that eat less and can work longer.

Still, at TM Forum's Digital Transformation World in May, in Nice, representatives from four different sectors had some firm views on what they wanted from 5G.

Let the games begin

According to Mark Newman, Chief Analyst, TM Forum, gaming is the fastest growing sector of the entertainment industry, worth $150 billion (€1.34 billion) a year. Some operators have been quick to see this as a big opportunity (see the interview with BT's Neil McRae on page 6) and at MWC 2019, Deutsche Telekom's board member, Claudia Nemat, said at its press conference, that gaming, "Is where the money is".

Vesa Jutila, Co-founder & CCO of gaming company Hatch, said that the future of gaming lies with streaming, just as it has with music and movies, but of course, the big difference with gaming is that it is interactive. Hence buffering that works for music and movies is a non-starter for games, where low latency, speed and reliability are the base line.

Jutila said, "5G will be a massive enabler to bring live gaming to mass market audiences. The Hatch strategy is to work with mobile operators and OEMs to make Hatch the key service for their 5G launches."

So far Hatch has signed up to work with NTT DoCoMo in Japan and South Korea. Jutila explained, "We are only 50 people, so partnering is very much in our DNA. Hatch is a trading

service, but we don't own any servers. We don't operate any data centres – we use cloud service providers to post the streaming service for us.

"We work very closely with network operators to optimise the network connectivity by peering arrangements so that they connection between on the service and end users can be optimised. We also believe that mobile operators could take a much more active role in optimizing the network traffic."

He concluded that while mobile edge computing would massively improve gamers' experience, "but it really requires new mindset [in operators], and much more, faster decision making to be able to capture this 5G dream and opportunity".

Boosting broadcasting

Jamie Hindhaugh, COO, BT Sport, works for a broadcaster within a telco. The company offers 12 media channels plus over-the-top channels and highlights of exclusive Champions League and other football tournaments.

He said, "To cover a football game, we have about 120 people alongside the cameras. We will have at least two trucks with ten generators spewing out…we have huge teams that moves between football grounds all the time".

The cameras are tethered to transmission cables to ensure broadcast quality, making it extremely difficult to talk to people at the ground or travel in the team bus to provide live coverage. Also, some grounds are not viable as they don't have fibre infrastructure and/or 4G coverage is poor

Hindhaugh said network slicing with guaranteed low latency service would transform outside broadcasting, as camera are no longer tethered and more grounds are suitable for broadcasting from. He said, "You've a creative on site…but much of the creative work can be carried out back at the studio complex with video galleries," where one team can work on multiple games.

He said that as well as opening up a world of creative possibilities, 5G will improve work-life balances for people who no longer need to be away from their families for two days at a time. Also, it makes it possible for people with disabilities to do these jobs in a studio – whereas many football grounds are not easy to move around – and it reduces pollution.

Hindhaugh was just talking about sport, but 5G has the potential to change the face of broadcasting as it will be possible to cover so many more places and events, at far lower cost, from outdoor concerts, to all kinds of stadia, and lower ranking teams across many activities, instead of just the top ones in a handful of the most familiar sports.

Connected transport

Paul Spence is Chief Technologist at McLaren Applied Technologies (MAT), which is a separate business to the race team. It applies lessons learned to other industries and also "provides all the vital electronics and data systems – the platform – to go racing," Spence said.

One area it works in is providing Wi-Fi for connected trains, to passengers but also for the running of the train, from which it collects data to analyse its performance with the aim of improving the running of the train.

In the automotive business, MAT provides a safe stop mechanism.

Spence said, "5G technology has to prove itself. It needs to be highly reliable. We've taken some of our systems into motor sport and it stresses them; it's all problems. It's not the speed – trains go fast – or the vibration or the temperature, it's all those things in one go and you've only got two days to get it right, then you're onto the next site. It's getting that V2X to be reliable."

He explained how connected vehicles take reliability to a new level. For example, the company ran ordinary 4G on a race track and discovered one in 10,000 handovers failed, which was too high a rate. It proved hard to get what turned out to be a systemic, authentication bug fixed, not least because no-one else had ever noticed it before.

He said that while "things failing once in 10,000 times doesn't seem that bad…on average, human drivers drive 100 million miles before they have a serious accident in the Western world.

"We think [5G] will improve safety, and it will if we can get it right but you can't rerun a specification to get it right in the real world. In motor sport we have to develop a simulation and a lab, then 100 guys in a team work to enable the car to go as fast as it can by understanding the difference between the simulation and the real world."

Smart enough for cities?

In our reader survey (see page 27), smart city applications rank highly (third) among the first services operators are rolling out, and top the list of the most promising use cases for 5G, followed by connected vehicles (which arguably are part of smart cities) and industrial automation.

Martin Brynskov, Chairman, Open & Agile Smart Cities (OASC), certainly thinks so. In his speech he explained that OASC represents140 cities in 29 countries. He said, "So if you learn just one thing from what I'm going to say, it's that this is about cities and communities: it is not a sector – it's all sectors."

He said operators misunderstand what cities want: "Yes, it's a huge market opportunity… Think about how you will operate in this space, that's going to be your biggest challenge. Cities really want 5G to work [and] they really want to work with you, and they want to buy your services."

He said smart cities, "would not allow single entities or a few entities to own this common ground… no community will let you suck the economy, or the power out of them. We're moving towards a situation where [operating rules] will come from the demand-side to all of you. And you need to work with us."

While we hear a lot of talk in telecoms about ecosystems and partnerships, in smart cities they are scarce.

Regulatory damage

Clearly there is much to learn from working closely with customers, across many sectors and many operators already have pilot schemes running with partners. This takes time and investment though, and at the same time, some are under huge pressure from their governments, shareholders, enterprise customers and regulators to get on with it. Germany is the most obvious example.

Yet auctions in Germany (and Italy, with many more still to come), have forced operators to pay staggering amounts for the 5G spectrum they need, increasing the urgency of return on investment, and meet stringent licence terms.

At the other end of the spectrum, Orange Group's approach is that getting it right is more important than rushing. Its first networks will not be commercial, but designed and developed with customers, such as Renault and the national rail company, SNCF, to meet their specific needs – apparently with the full backing of their government and the regulator.

Making the right use case choices is tricky. Regulation's effect on the markets is some countries is making it a lot harder.

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What happened to NFV and SDN?

The complementary technologies of network functions virtualisation (NFV) and software-defined networks (SDN) have made slower progress than was hoped. Now we're looking to implement zero-touch operations, automation and artificial intelligence (AI) in the 5G era.

Slow progress is due to many factors, but one aspect in particular that is deeply troubling is the continuing tension and distrust between operators and the established equipment providers.

Klaus Martiny, Senior Programme Manager with Deutsche Telekom, has been involved in standardising NFV from the outset. He is currently leading ETSI's industry standardisation group for Zero-touch Network and Service Management (ZSM). Speaking at FutureNet World in London, he said there is "a gap in the belief that [NFV] is the best technology since [it began in] 2012 or 2013 until now; it is something of a ping-pong between suppliers and operators. The operators say the vendors are not doing what [we're] interested in and the vendors say the operators are not ordering what we are offering. It's an on-going tradition."

Slow but steady progress

Despite this, some operators are making progress. Walter Miron, Director of Technology Strategy at Canada's TELUS, was speaking on the same panel. He gave a matter-of-fact account of his company's experience with SDN and NFV technologies: "We started with SDN, probably 2012, as a research project, and that has progressed to an in-market solution in Canada: we were probably the first to market in Canada, which has its pros can cons."

He explained that, "The service composition is virtual routers, virtual firewalls and devices across our network storage structure, over our own networks and partner networks, and they are all live, and probably past version two and well on the way, with all the lessons that come from that."

From an NFV perspective, Miron said that, in addition to those mentioned, TELUS has deployed infrastructure with many other virtualised functions in "two flavours": a fully programmable deployment and individual functions that can be virtualised as necessary like "a lifecycle manager".

He added, "Core SDN is making its way into our network, but it's not fully fleshed-out: you have to learn to be good at software networking before you put it into the court, and make sure you've got robust processes and learnings across the organisation."

Luca Pesandro, from the Standards Co-ordinator Technology Division of Telecom Italia, said his company has begun to deploy virtual functions in the network: "It's a process that is going quite well and increasing day by day. We are now looking at the early stages of orchestration." He said the company has issued a request to vendors to recommend what technology would be the best to deploy first, "bearing in mind that NFV should allow us to have multi-vendor deployments."

He also acknowledged that his company was "possibly" a little behind regarding SDN and added that it is harder to manage and it is important "to ensure that the solution is not bringing more problems instead of solving some."

Harder than we thought

Martiny noted that although he feels ETSI has done a good job on NFV standards (which is not a universal view – see panel on page 39), "implementation has been much, much harder than we thought when we started, because it has a direct impact on each of the operators and the whole organisation, and on the knowledge of the [employees] and this kind of stuff.

"If you are implementing NFV as it is defined in ETSI, then it has a direct impact on other business models…Now we are talking about software, not boxes, which was the original idea of NFV…and we have to play nice with the new kids on the block called open source [see panel]. It makes it all so complex to find the best approach and get the benefits of NFV."

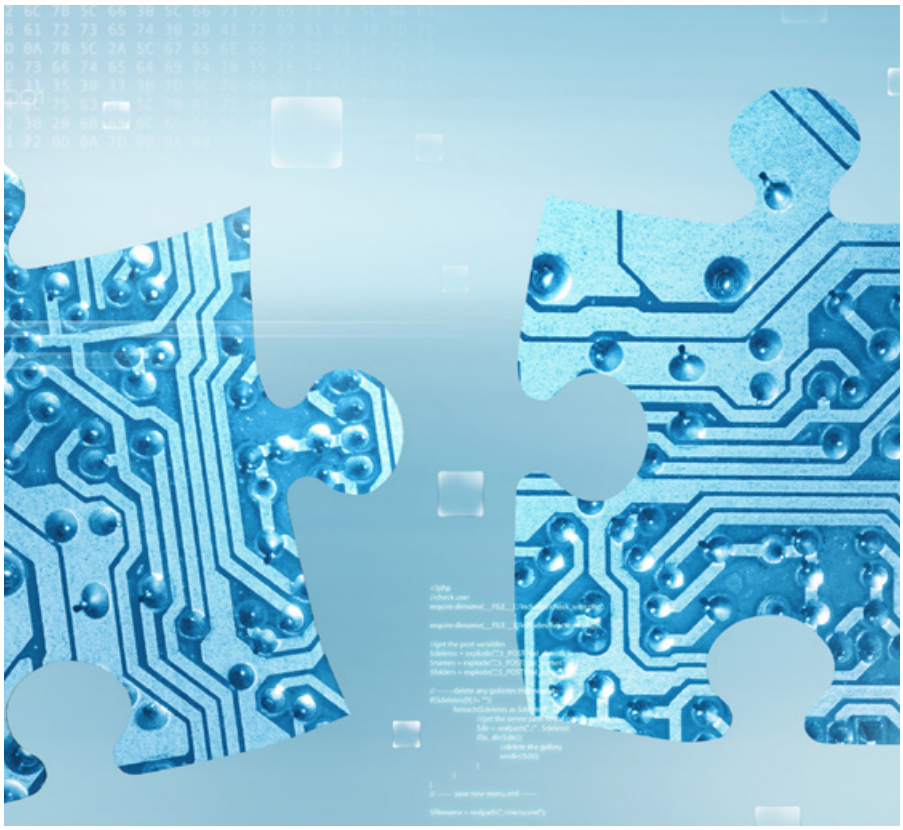
Pesanda raised another issue: "When you have to work with other operators, you have to guarantee access on a fair, non-discriminatory basis to your devices and metro facilities that [are] virtual. That's something you have to solve. It's a very tricky point in your selection of what virtual functions you can deploy and in what part of the network you are able to virtualise now without unforeseen impacts on the legal side."

More tech to fix it?

It is generally agreed that the only way to achieve the goal of end-to-end automation and zero-touch operations which will be essential in the era of 5G, is through AI. Martiny, commented, "For sure automation and AI go hand in hand, but no technology can deliver what

Standards bodies, consortia and European Union projects that have a bearing on ETSI's Experiential Networked Intelligence initiative

ITU-T	Focus group on machine learning for future networks, including 5G
IETF ANIMA	Research group on autonomic networking integrated model and approach
CCSA TC610 (was SDNIA)	Artificial Intelligence Applied in Network industry group
H2020 & 5G-PPP	SliceNet, SelfNet, 5G-MoNArch
TM Forum	5G intelligent service operations
OASIS	Advanced systems interworking – open intelligent protocols
The Linux Foundation	ONAP, Acumos



we are looking for. The truth is that it is a combination of all those things. They are pieces of the entire future to achieve automation from end to end. That is something nobody is able to solve. ETSI is a good opportunity to push things forward."

Mind the reality gap

In particular, one issue that is exercising all operators is the gap between the reality of their customers' experience at any given moment and what their own network-monitoring tells them is going on. As Miron remarked, "How many times have you seen an operations environment where there's 1,000 outstanding alarms? In our new world, we can't live that way. We have to make sure we go out to the intelligence behind the alarm."

In recognition of these issues, in January 2018 ETSI launched an industry standardisation group called Experiential Networked Intelligence (ENI). So far 20 operators have joined, along with vendors and other interested parties.

Martiny explained, "We have so many different technologies, but they need to be operated jointly…and the idea of ENI is to deliver an umbrella to manage different technologies." This will be achieved by developing an architecture and use cases, and one of ENI's initial use cases is self-healing networks.

He added, "We have a policy of talking to each other", by which he meant the other ETSI industry standardisation groups that have a huge bearing on customers' experience. They include: Mobile Edge Computing (MEC), NFV, Open Source Management and orchestration (OSM), and ZSM. The idea is also to work closely with other bodies whose work is related (see table).

Martiny noted, "Often the operational aspects come very, very late when we are defining new technologies. Nobody talks about service and network management." This is a trap ETSI seems to be determined to avoid this time round.

Ever the realist, Pesado thinks AI systems will evolve gradually in networks and operations, "starting from a very low degree – we have none today for operations or automation – and we will build layer on layer, towards zero touch. Building this, we need to be careful. At all levels we are trying to achieve service and overall network management."

Miron said he would be, "Excited to see, from an operator's perspective, what comes out of the common service model and IETF [see table] in terms of carrier service definition, because no customer pays us for a virtualised function… To leverage [virtualisation] we need to get to defining end-to-end services so we can use the technology the way it is meant to be used. How do we get service definitions that can work across various standards bodies, as well as with vendor partners?"

ETSI's ENI has a big task ahead.

OPEN SOURCE ISSUES

Most of the larger operator groups in Europe, with the notable exception of Telefonica, which even so has indirect contact through various other activities, have joined the Linux Foundation. This is because they see the neutral Open Network Automation Platform (ONAP) as the preferred platform for automating services. ONAP brings together the ECOMP framework developed by AT&T and the Linux Foundation's Open Orchestrator Project.

This move towards ONAP is a big departure for telcos and to some extent was borne out of the narrow definition of NFV that ETSI stuck to for too long, in some critics' view.

Regarding the increasing use of open source in the industry generally, Ibrahim Gedeon, CTO at TELUS, spoke with his customary directness when he described open source as, "the new model of taxes on telcos. Like, whether it's [an open source supplier] or an old maintenance contract from [an established telco vendor], it is the same [thing]. And frankly, to be honest… the problem we have is now we're paying both."

His colleague Miron outlined another issue too: "In [the movie] Ghostbusters, the mantra was, 'Don't mix the streams' and now we are mixing the streams. Finding the right talent for the skills to be able to do that and implement operational practices that bring the same kind of reliability you would expect from a telco is a huge challenge for us. We have open source software, Linux distributions – all of these are not what your typical network engineer happens to know about, but they now need [them].

"For a lot of people who have coding and scripting experience, the truth is [telcos] are not the sexiest place to end up for your career. It's a huge challenge to identify and retain good talent."

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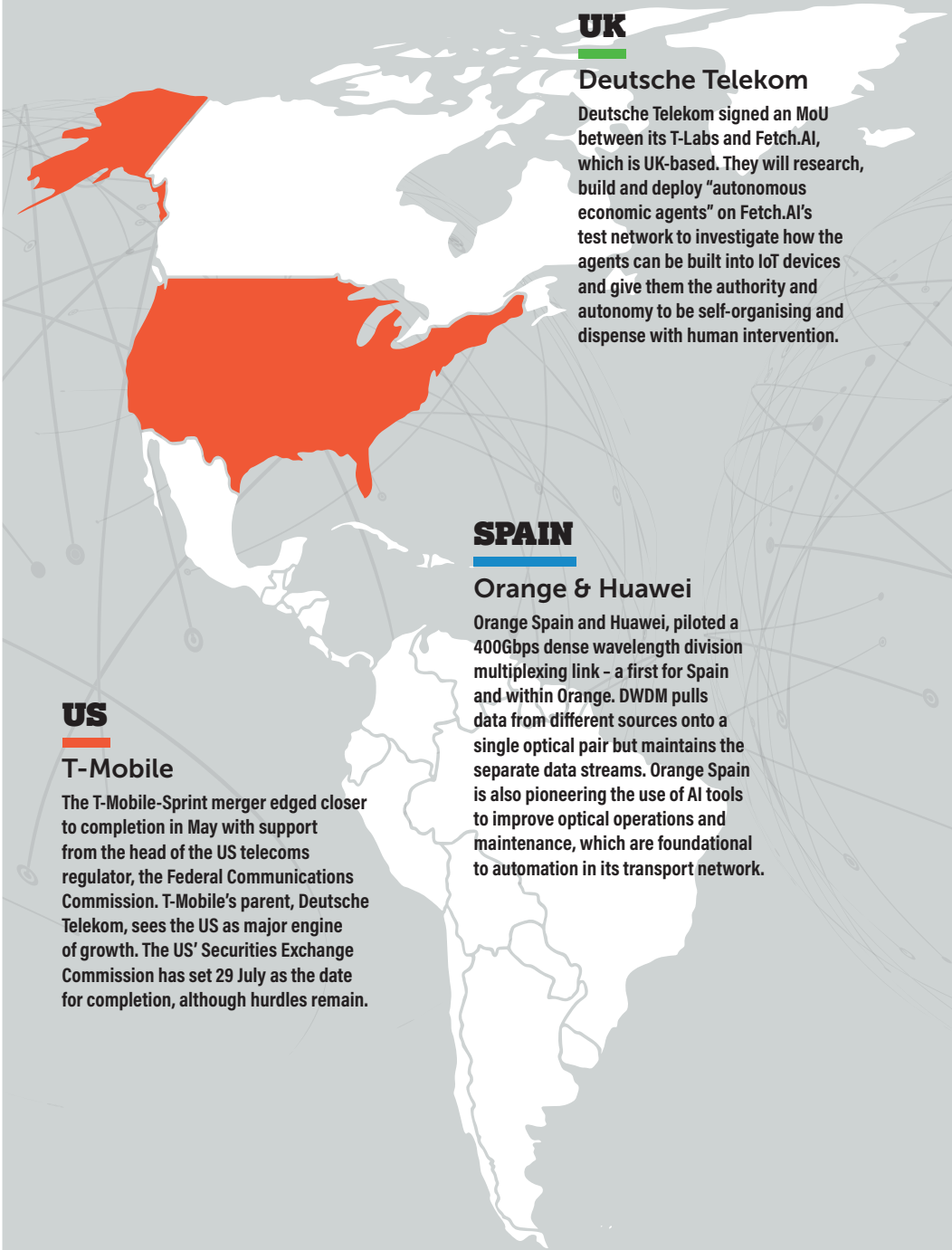
ITALY

TIM has said it will extend the 5G infrastructure-sharing agreement it signed with Vodafone earlier this year to Iliad, which entered the Italian market in 2018. This was after Iliad asked the Italian telecoms regulator, Arcom, to assess the impact of the Vodafone-TIM tie-up on competition in the market.

SOUTH-EAST ASIA

Telenor and Axiata plan to create an Asian super-carrier by combining assets in Q3 this year. The new group would stretch from Thailand to Indonesia and have 300 million customers. It would be one of Asia's largest mobile infrastructure companies with about 60,000 towers and €11.61 billion annual revenue. The companies expect to save about $5 billion through consolidation and greater scale, but provided no details.



UK

Deutsche Telekom

Deutsche Telekom signed an MoU between its T-Labs and Fetch.AI, which is UK-based. They will research, build and deploy "autonomous economic agents" on Fetch.AI's test network to investigate how the agents can be built into IoT devices and give them the authority and autonomy to be self-organising and dispense with human intervention.

SPAIN

Orange & Huawei

Orange Spain and Huawei, piloted a 400Gbps dense wavelength division multiplexing link – a first for Spain and within Orange. DWDM pulls data from different sources onto a single optical pair but maintains the separate data streams. Orange Spain is also pioneering the use of AI tools to improve optical operations and maintenance, which are foundational to automation in its transport network.

US

T-Mobile

The T-Mobile-Sprint merger edged closer to completion in May with support from the head of the US telecoms regulator, the Federal Communications Commission. T-Mobile's parent, Deutsche Telekom, sees the US as major engine of growth. The US' Securities Exchange Commission has set 29 July as the date for completion, although hurdles remain.

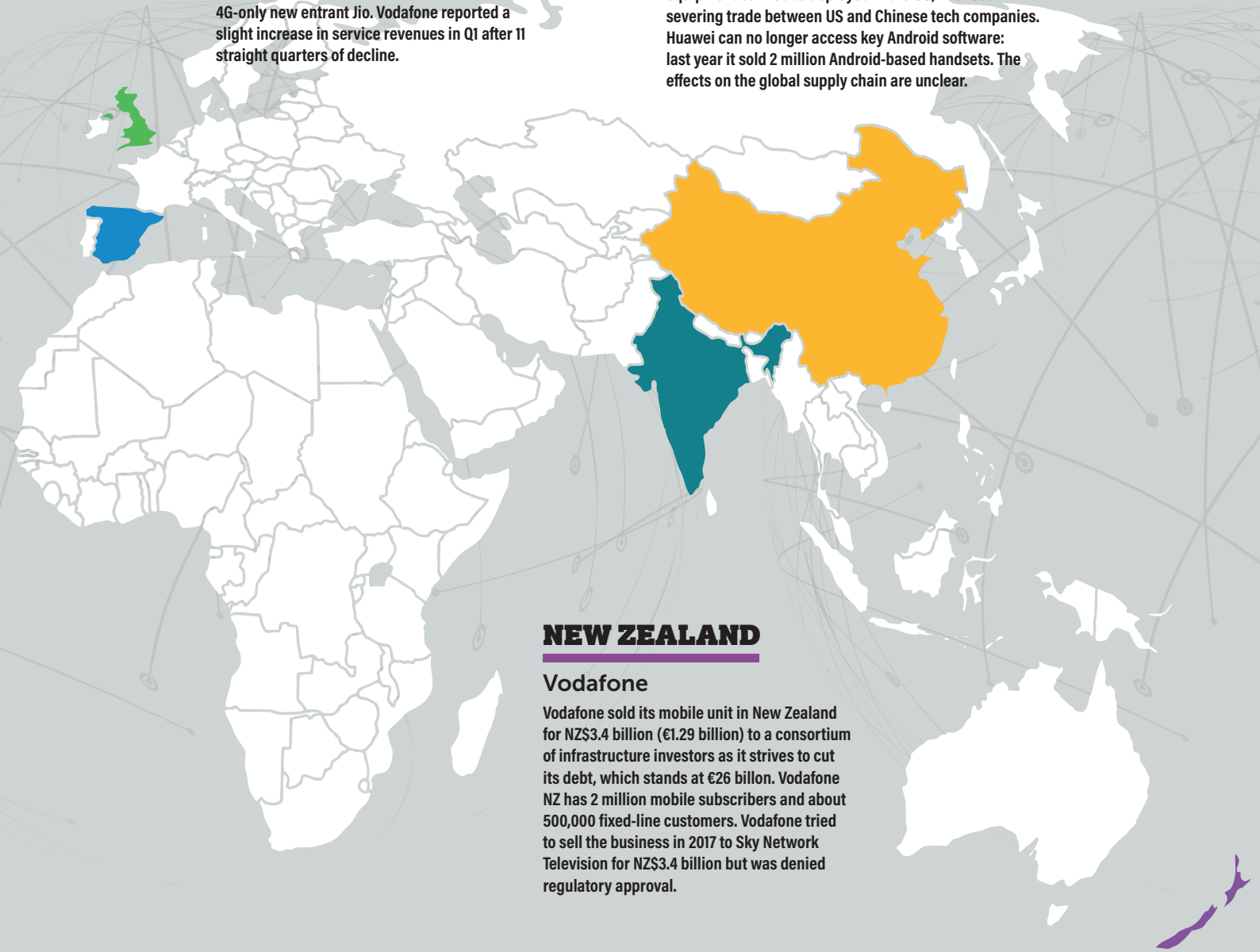
INDIA

Vodafone Idea

Vodafone Idea, formed by a merger of Vodafone Group and Idea Cellular in India last August, showed signs of regaining traction in the market that was so severely disrupted by the 4G-only new entrant Jio. Vodafone reported a slight increase in service revenues in Q1 after 11 straight quarters of decline.

CHINA

As the trade war between the US and China heats up, US companies have been banned from selling components to the Chinese giant Huawei without permission from Washington. Due to a separate order, Huawei telecoms equipment cannot be deployed in the US, in effect severing trade between US and Chinese tech companies. Huawei can no longer access key Android software: last year it sold 2 million Android-based handsets. The effects on the global supply chain are unclear.



NEW ZEALAND

Vodafone

Vodafone sold its mobile unit in New Zealand for NZ$3.4 billion (€1.29 billion) to a consortium of infrastructure investors as it strives to cut its debt, which stands at €26 billon. Vodafone NZ has 2 million mobile subscribers and about 500,000 fixed-line customers. Vodafone tried to sell the business in 2017 to Sky Network Television for NZ$3.4 billion but was denied regulatory approval.

Cybersecurity threats will increase cost for telecom sector

John Strand of Strand Consult outlines 13 questions he would like to ask China's government.

Huawei has been in the news in recent months with operators investing in 5G networks and security concerns that the equipment could be compromised by the Chinese government. As part of PR fight-back, Huawei took 250 analysts and journalists to China for a tour of its headquarters and corporate presentations. Strand Consult declined the invitation for the all-expenses paid tour, lacking confidence that it would meet Western standards of transparency and candour.

Governments require online platforms to monitor and remove certain kinds of content, and will insist telcos police their networks for cybersecurity threats, many of which fall into the category of national defence. The global financial sector has incurred huge costs to manage regulatory compliance, now the telecoms sector will be hit by similar costs to secure networks, products, and services. Operators should be recognised for their efforts.

We need more focus on and understanding of the Chinese view of cybersecurity. These are the questions Strand Consult would have asked had it travelled to China.

1. What is the government's policy for deciding which entities can build and run communications networks in China?

2. Which entities design, build, and operate the infrastructure often referred to as the 'Great Firewall of China' that blocks access to websites inside and outside China?

3. Which entities design, build and operate China's Social Credit System, the government scheme that measures each citizen's economic and social reputation?

4. Which entities design, build and operate the 'world's biggest camera surveillance network' – the hundreds of millions of closed CCTV cameras that monitor the Chinese population?

5. At MWC2019, Huawei's Deputy Chairman, Gou Ping, discussed spying by the US government. Why is there no Chinese Edward Snowden to expose government-sponsored surveillance? How does China treat citizens who criticise the government?

6. How does the Chinese government work with Chinese ICT companies such as Huawei, ZTE and Lenovo?

7. Why must foreign companies surrender intellectual property to the government when working in China?

8. What is the market share of Western network equipment in China?

9. What is the Chinese government's process to approve vendors and suppliers for wind turbines, aircraft, telecoms infrastructure and smartphones?

10. How successful is China in realising its China 2025 strategy and how does the government measure success?

11. What kind of new intelligence has China gained from its 2017 National Intelligence Law? This compels Chinese citizens and companies to provide unmitigated intelligence within and outside the country to the Chinese government?

12. Many countries fear the use of Chinese 5G equipment. Does the Chinese government have the same fears regarding equipment from the West?

13. Many Chinese firms claim that they are immune to influence from the government, but how if the government gets to have seat on their board of directors, how is it that the government is not influencing corporate decisions?

The current attention on cybersecurity is long overdue. Cybersecurity is increasingly important and demands greater attention. It costs money to build resilience into products and services, and it is important to have frank discussion about the costs and trade-offs for cybersecurity with other political goals.

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