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The inside track on telecoms
operators' technology strategies

CTO of the Year 2019:

Sunrise Communications' Elmar Grasser
trailblazes 5G in Switzerland

CTO of the Year 2019

Celebrating Boris Drilo, CTIO of Hrvatski Telekom for his innovation and speed of deployment

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Final Say

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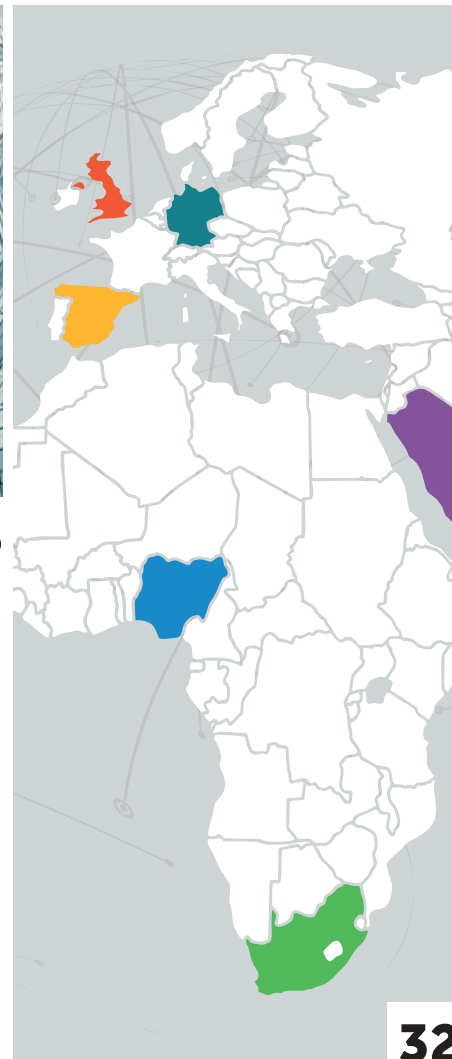
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It's been a tense, but immensely interesting, summer in telecoms. The ongoing US-China trade war is causing great concern about the likely fragmentation of the global communications industry and the implications if Huawei kit is discounted from many operators' 5G infrastructure.

This complex issue has compounded the many uncertainties around 5G, which already included ongoing standardisation, operators needing to make major changes to their core network architecture and the search for new business models (see page 34).

These were big debating points at our CTO of the Year Roundtable held in London in early summer, where the sustainability of the European industry emerged as the central, multi-faceted theme. You can read our write-up of that discussion among a diverse selection of CTOs and industry experts from across the continent on page 16, as well as find out about this year's winners, who were recognised for their vision, innovation and ambition.

The contrasting interviews with them make fascinating reading (see pages 8 and 12) and we offer our congratulations to both of them and all the other entrants.

On that key question of sustainability, there is no doubt that many telcos, of different types and sizes, are having a tough time right across Europe. They are already battling huge debt and yet need to make unprecedented levels of investment to deploy 5G.

The heavy investment required to sustain their businesses, which marks telecoms out from many other sectors, is nicely summed up by Hargreaves Lansdown equity analyst, George Salmon, who recently noted that, on average, BT and Vodafone have "spent about 15% of revenues on capital expenditure" over the last five years, whereas "the average for the FTSE 350, excluding [real-estate investment trusts] and investment trusts, is around 7-8%."

Still, operators are famously innovative and there are lots of opportunities. In this edition we're looking at why they might well have the edge over the hyperscale public cloud companies when it comes to IoT (see page 24) and how they are addressing the software-defined wide area network (SD-WAN) market (see page 27). We also look at the critical, but vexed, issue of network automation and how operators are progressing with it (see page 29).

Enjoy the issue and email me at anniet@mobileeurope.co.uk with any feedback or about the issues that are most important to you in your workplace.

Annie Turner, Editor



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CTO of the Year 2019

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Our CTO of Year Awards had two very different winners this year, a reflection of different markets and priorities as the telecoms industry moves into uncharted territory with 5G, automation, artificial intelligence and so much more.

08

CTO of the Year 2019

Elmar Grasser won one of CTO of the Year 2019 Awards for transforming both Sunrise Communications' network and its ambitions

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CTO of the Year 2019

Boris Drilo, CTIO of Hrvatski Telekom, won the second CTO of the Year Award for the breadth of his vision and innovation

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CTO Roundtable

CTOs from across Europe and industry experts tackled some tough topics at the CTO of the Year Roundtable which took place in London this summer

CTO of Sunrise Communications: Raising a workforce's self-belief trumps technology

Elmar Grasser won one of Mobile Europe|European Communications' two CTOs of the Year 2019 Awards for leading his company's pioneering roll-out of 5G across Switzerland – one of first commercial launches in Europe. His success, though, is probably more about his transformative effect on the culture of the company than technology, as he explained to Annie Turner.

You don't have to spend long with Elmar Grasser to understand just how committed he is to excelling at his job and how much he wants his company to excel. At the same time, he has a relaxed demeanour, and when he arrived at the CTO Awards roundtable and ceremony in London in May he looked remarkably fresh-faced for someone who had just stepped off a long-haul flight. He explained, "I sleep best on planes. When I hear the engine, I fall asleep. It seems to be a reflex" – which is just as well given how much travel his work involves.

Travel aside, that ability to switch off has no doubt stood him in good stead. Six years ago, when he joined Sunrise Communications as its CTO, the company was perceived by consumers and its own network staff as a poor quality, cut-price and remote competitor to the mighty former incumbent, Swisscom.

At the beginning

Grasser said, "It was a challenge in the sense that there was quite a big gap in terms of perceived and real quality between the networks in Switzerland. I would say Sunrise had the worst reputation... and to be honest, in terms of quality, it was something I perceived, too,



using the network. I was surprised to find that in Switzerland."

Sunrise has turned this around to such an extent that Grasser laughed, "I'm very much convinced that this Swiss level of quality we talk about is only where it is now because a non-incumbent raised the quality to such a level we were starting to attack the incumbent, which was a surprise, I guess, and a big one."

It wasn't just that Sunrise's coverage had

'holes' in it, as this turned out to be more about the network not being optimised than a lack of investment. The reasons for this were highly revealing and included poorly managed outsourcing, split responsibilities, and many recent changes in management and to strategies.

"When you have lots of changes in the management and there is no clear guidance from them, as was the case in the network environment, then people just look after themselves,



Stein am Rhein is just one of the 262 cities, towns and villages with 5G connectivity provided by Sunrise at the end of August

protect themselves and are not cooperating”

Grasser found, “Not much self-confidence that we would be ever able to get to the level of where Swisscom was and we had to change that. And [to do that] you have to be very ambitious, which is not easy. In such a situation... you have lots of people who don’t believe you and you have to convince them. You need to build small successes to give people confidence, so that they can see it is possible.”

Grasser had to address Sunrise’s relationships with its outsourcing partners, which were heavily criticised by staff: “Basically, there

was not one vendor that was doing well, so my analysis was that might be both an internal and external issue.”

External issues

The partner agreements “were wrong from the spirit of responsibility and commercially not right. That is when you have the advantage of your experience from working in another country.” Grasser joined Sunrise from E-Plus in Germany. He explained, “You know what makes financial sense, like how much operating a network [and an IT system]

should cost, taking into account the price levels are different. With that benchmark view, you can go into proper negotiation and see what is achievable.”

He decided that partners had too much responsibility for things that should be in-house, such as network planning and engineering and he brought them back into the company. “That was a huge change in the contract: we were taking people back and saying this is a core responsibility of an operator, and I’m still convinced that this is the right thing.”

Some operational tasks are still out-

JUDGES' VERDICTS



Bengt Nordström CEO, Northstream, part of Accenture

The CTO of Sunrise in Switzerland, Elmar Grasser, is a well-deserved winner of the *Mobile Europe | European Communications Award for CTO of the Year 2019*. During his six years at Sunrise, Elmar has taken the network service from poor quality to 'Swiss-quality levels' which is evidenced by the rising Net Promoter Score and other benchmarks scores that the company achieves every year. One reason that he has been so successful on this 'quality journey' at Sunrise is his ability to create an atmosphere of confidence within the organisation that it can set and achieve ambitious targets for network quality and compete with anyone.



Kester Mann Principal Analyst, CCS Insight

Elmar Grasser was a popular choice with the judges, having played a pivotal role in Sunrise's pioneering push into 5G. We were particularly impressed with its innovative 5G for people strategy that seeks to bring disruption to the home broadband market. Under Elmar's influence, Sunrise has claimed various technology firsts and scooped a flurry of network awards, despite tough competition from a very dominant incumbent rival. Crucially, its network's progress has contributed to good customer growth in both consumer and enterprise segments as well as strong improvements in Net Promoter Scores.

sourced, but, "We draw a very clear line about where the responsibility is for the partner and where the responsibility is on our side". He added, "I put the commercials into what I thought would be the right balance. If one partner has a nice advantage but the other suffers, that's not going to be a long lasting... If you have both a win-win situation, that's when you can start [competing], because then you're a strong team and together you are successful."

When Grasser started at Sunrise, the Network Promoter Score (NPS) was very low, but it has increased more than 50% to a current high customer satisfaction level and is improving every year. He noted, "When you have a bad reputation, that reputation stays for a while. You have to build up confidence with the customer as well; you have to be patient." He added that benchmarking has been immensely beneficial to Sunrise as when you communicate the positive findings of a third party, "it really jumps into the perception of the customer and then you see the NPS really moving on."

Other benchmarks that Sunrise has excelled in include the Internet Provider Customer Barometer 2019, published by *PC Magazine* and *PCgo Magazine*, and measured across Austria, Germany and Switzerland, the Mobilfunk Shop Test and the Connect Mobile Network Test.

Wider success and responsibilities

For Sunrise's CTO, network quality is about more than competition with rival operators, though. He believes that, "Infrastructure com-

incumbent with the second biggest rival a big distance behind and the third a long way behind that. The danger is that this is accepted as a sort of natural order and the operators fail to grasp how poor their networks really are, and how damaging the lack of competition is for the wider economy.

Grasser did not name any specific examples, but a look at the FTTH Council's ranking of full-fibre penetration in European countries is surprising: some of the biggest economies are the biggest laggards, while others that have emerged from very difficult times are way up the table, such as the Baltic states and Spain.

He acknowledged that, "In Europe it is very hard [for telcos] to have rising revenues [as] we must invest a lot and that is one of the root causes of why we don't have good infrastructure... At the moment, it is not easy to convince people to invest in the European telecoms companies, because the revenues are under pressure."

Closer to home

Regarding Switzerland, Grasser said, "We want to invest and we want to invest in 5G, but it is hard to execute this because we have so much trouble with roll-out" due to permissions being withheld.

The country has stringent rules in place regarding electro-magnetic emission levels and the Swiss operators have been plagued by health scares concerning 5G, which, although they are without foundation, are making it impossible to deploy 5G in many cities.

Much of Sunrise's 5G deployment is in rural areas and towns rather than city centres. Grasser said, "There is much public resistance and not much cooperation at the political level. We were hoping for some relaxation [of the rules], but it's been almost the opposite. We're meeting headwinds." The decision regarding the relaxing or otherwise of the rules is yet to be made, but in the interim it creates a difficult situation.

Grasser sees 5G deployment being slowed as a result of fake news and scaremongering, and that is bad for the economy. He thinks it behoves the various relevant authorities "to create an environment, where the operators are prepared to invest, [so that] they can bring the benefits of 5G quickly to the industry and the consumers."

He added, "In some countries, like Germany, I understand that the government says if

“ You have to build up confidence with the customer as well; you have to be patient

petition is extremely important if you want to raise the quality in a country."

He observed that in some other European markets it is common to have a strong



you want to roll out 5G then public buildings are available as [mast] sites. That would be a dream for us. We don't have that situation."

Remaining goals

What's next for Sunrise? Naturally nothing ordinary: Grasser said, "We are aiming for the defect-free network, like we have for electricity and the water supply... Coverage and network reliability are the two factors we need."

Another issue he wants to address is his company's digital interface with customers. He wants them to be able to interact with Sunrise via apps to "manage their subscription, see how big their bill is and where you can buy packages." He said, "They want to have that seamlessly, without human interaction. That is a technological aspect where we as operators need to be extremely good... that's one of the extreme cases I'm focusing on."

"The customer is always the focus. It needs to be easy for them to get from us what they want via digital interfaces," but always with the option of going into a shop or contacting a call centre.

What about the tech?

How does Grasser feel about the challenges posed by virtualisation, automation and artificial intelligence? "Sometimes there is a danger that if you start focusing on these things that, as a technician and an engineer, you are drawn into a world where you trying to solve a problem for yourself, not for the customer. The most important thing I need to think about [is] how can I provide services,

especially in that context, in the B2B world, for B2B customers?"

"It's extremely important to differentiate between the goal and the means. I'm a person from the mountains [the Dolomites] and the goal is to get to the top of a certain mountain: the rucksack and the shoes are very important, but often engineers focus on the shoes and the rope, then forget the mountain top."

"It's extremely important to engage in these topics, but... you start with the goal [for your

“The new technologies are the biggest revolution, but they are tricky. You need to have really good people”

customers] then figure out how to meet it, rather than start playing around with the technology and see what you can do. The goal must never leave your mind.

"The new technologies are the biggest revolution, but they are tricky. You need to have really good people to [develop their use]," he added, but one of the big issues facing telcos is that graduates would rather go to hyperscale

web companies or start-ups.

Grasser agreed it is a challenge that telco is seen almost as an old economy industry – ironically, given that it is the bedrock of the digital world – but there is another issue, too. The people who are trained in and dedicated to software development typically come from outside Europe's bigger economies.

Enrichment and paucity

On the one hand, he is delighted to employ people with the right skills from any background or nationality, given that he thinks diversity brings a higher quality team and business. On the other, though, he expresses disquiet about why generally richer European countries do not teach or promote these skills as key and desirable. In particular, he is concerned that in the longer term this situation is not sustainable – relying on resources from outside a country that are fundamental to its success.

He said, "Software development is the most important topic going forward. And every company has to see that, or at least telecommunication companies need to see it as a core competency, not something that somebody else does for me. We are happy to have people from Romania, from Delhi, from Belarus, from the former Yugoslavia, where we have partners with the right resources... but I believe many people in these countries understand the only way they can [progress] is probably by being experts on this technology."

"Our education systems don't take this enough into account... We still teach Latin in European systems, but we don't learn how to use the most important tool in the world of the future... Our children are all consumers, not programmers." He continued, "You need [these skills] not only in your professional life, but in your private life. You need to understand some mechanisms in terms of data protection, security and so on."

He concluded, "We are more fearful about technology. In our society, if you talk about AI, robotics and so on, it's associated more with the fear of losing jobs than as an opportunity. That's a general observation I have when I travel in many different countries... We see the negative points. I don't want to put them aside, but there is no way around software being part of our future and one of the most important parts of being economically successful." 🇩🇪

CTIO Hrvatski Telekom: Deploying innovative technology to give everyone a better future

Croatia's geography makes it a challenging place to deliver good quality network coverage, even so, Hrvatski Telekom's network has been judged to be among the best in the world by a third-party benchmarkers. Under the leadership of its CTIO, Boris Drilo, who is one of our CTOs of the Year, the operator continues to innovate, and its pioneering work is often deployed in other parts of the Deutsche Telekom Group to which it belongs. **Annie Turner** investigated.

While Croatia is a small country in area, of about 56,594km square, its geographic variation is huge and home to a population of about 4.28 million. In the west, the country is on the Adriatic Sea coast and includes over 1,000 islands and islets, 48 of which are inhabited. In the south, the Dinaric Alps rise to a peak of 1,831 metres at the border with Bosnia and Herzegovina. The city of Dubrovnik in the extreme south of the country is practically an exclave, linked to rest of the country by territorial waters.

The central and southern regions near the Adriatic coastline and islands consist of low mountains and forested highlands. The north is hilly, while in the east the flat plains of Slavonia are traversed by rivers including the mighty Danube, and the Drava, Kupa and Sava.

All of which make for a famously beautiful country, but a challenge for Boris Drilo, who is a Member of the Management Board and CTIO at Hrvatski Telekom (HT). Despite the difficult terrain, he and his team have succeeded in bringing internet access of up to 30Mbps to all parts of Croatia, using what he describes as "innovative hybrid technology".

With a big emphasis on security, in Croatia's cities about 900,000 households have direct ac-

cess to speeds of more than 30Mbps, whereas 250,000 of them have speeds ranging from 100 to 500Mbps. In the next two and a half years, HT plans to invest heavily to expand its fibre and mobile infrastructure so that 1.2 million of the 1.5 million households in the country will enjoy speeds of over 30Mbps. Over 600,000 households will gain access speeds of up to 500Mbps in that period.

“The main goal of HT's activities is to connect everyone with the opportunities the latest technology offers

The fibre-based access network (FTTx) is available to 420,00 households (out of Croatia's 1.5 million) and outdoor 4G population coverage is 99% of the population and the indoor reaches 85%. HT has also been able to increase LTE's top speed from 350Mbps to 850Mbps

in about half of the network. Not surprisingly, voice over LTE (VoLTE) and voice over Wi-Fi (VoWiFi) are both in commercial use, and HT was the first in the Deutsche Telekom Group to run a pilot for video over LTE (ViLTE).

Coverage in rural areas

HT has already secured rates of up to 30Mbps for more than more than 60,000 homes in rural and less populated areas of Croatia using a combination of the fixed and best mobile network what Drilo describes as "a unique combination" to provide stable and fast internet access. This provides two to five times faster speeds so customers can, for example, consume the television content provided by HT's IPTV service which was not available due to the bandwidth limitations of the existing ADSL lines.

The operator is continuing the huge modernisation programme of its fixed and mobile radio and transport networks across Croatia. There is an ever-growing demand for data services, especially in the popular tourist areas of Croatia. So far, 75% of the network had been modernised, in areas including Istria, Zagreb County, the city of Zagreb and the entire Adriatic coastline. These areas are now experiencing an increase in speed of up to 30% with more than 50% higher mobile internet traffic.

Boris Drilo



POVEZUJEMO HRVATSKU NAJBOLJOM MREŽOM

The plan is to complete the upgrade to the rest of the country's infrastructure by the end of the year, ensuring it will be prepared for the next step – implementation of 5G technology.

The telco is also running a pilot to test 5G network technology in 3.5GHz frequency range across an area covered by about 20 base stations. It wants to gain better insight into the state of technology and its performance in real-life conditions. So far it has achieved speeds above 1Gbps on a commercial 5G device, in the streets of the city of Krk.

Strategy, society and the economy

For Drilo, technology is not the point so much as the difference it can make: the company estimates its investment this year will directly influence the creation of 9,582 new jobs and 0.62% growth in gross domestic product.

He explains, "Our investments already affect

the growth of the digitalisation index of the economy and society for Croatia. Our investment in the wider availability of high speeds provides the preconditions for introducing the latest smart solutions to homes and businesses and will ultimately result in strengthening the competitiveness of the Croatian economy."

Award-winning achievements

Mobile Europe | *European Communications* is not the only one to recognise Drilo's achievements. Ookla gave HT awards for the Fastest Mobile Network and Best Coverage in Croatia. It compared user speed tests at Speedtest iOS and Android mobile applications among all mobile operators in Croatia during the first and the second quarter of 2019. HT achieved better results in the speeds for mobile download and upload as well as in mobile coverage compared to other mobile operators in Croa-

tia, with up to 50% better performance.

Not only that, according to Ookla, HT's network is among the ten best in the world and in Europe, only the Netherlands did better, while network performance in Zagreb was found to be better than in South Korea, which is generally recognised as having the best network in the world and it was the first to deploy 5G commercially.

Earlier in the year, HT also won the Best In Test from P3, which does mobile network benchmarking. P3 found it to be the fourth best in Europe, showing an increase of 73% in traffic and 68% better throughput than its local rivals.

Internal operations

HT is always mindful of customers' experience, and convergence is a big part of that. It introduced its converged customer

JUDGES' VERDICTS



Payam Taaghoul CEO, MYCOM OSI

The judges were impressed by the speed, range and depth of progress regarding Hrvatski Telekom's infrastructure build-out to support new revenues, for example in regard to smart cities, IoT and mobile banking. It is an inspiring example of using technology creatively to overcome difficult terrain.

It also plays a pioneering role within the wider Deutsche Telekom Group. As CTIO, we felt Boris Drilo demonstrated real vision, pragmatic innovation and outstanding execution of the company's technology, operational and business strategy.



Annie Turner Editor, *Mobile Europe* | *European Communications*

In his time as CTIO at Hrvatski Telekom (HT) Boris Drilo has improved the country's infrastructure in terms of speed, reliability and capacity at an amazing pace. He used technology creatively to bring coverage to areas that are hard to reach, but the judges really liked the fact that he sees technology as a means to a much better end for the Croatian economy at large and people individually. We were also impressed by the pioneering work done at HT – such as on the harmonised application programme interfaces – for use in the wider Deutsche Telekom group.



offer, branded Magenta ONE, in 2016. This continues to grow and serves some 227,000 households and 30,000 business customers, offering fixed line, mobile communications and generous cloud storage options.

HT is also deploying a new approach to IT, based on microservices and open APIs based on TM Forum specifications. HT was asked to present it as a case study at TM Forum's *Digital Transformation World* event at Nice in May.

HT has also pioneered the introduction of the virtualised network functions. Currently, the HT NFVi [network functions virtualisation infrastructure] platform is being used to deliver virtualised evolved packet core (vEPC), virtualised Session Border Controller (vSBC) with virtualised broadband remote access server (vBRAS) in the pipeline.

In this and many other areas, HT's outstanding technical abilities and innovative approach have led to it developing and pioneering the use of new technologies which have later been deployed in other DT Group companies. For example, the self-care mobile app being used across DT footprint in Europe is based on the harmonised application programming interfaces (HAL) developed by HT, using 17 of TM Forum's collaboratively developed open APIs.

Moj Telekom app has digitised HT's interactions with customers, providing them with a detailed overview of all fixed and mobile telco services and their consumption of them, any place, any time. It enables them to pay bills and activate e-billing and management of tariffs and options. It also lets customers check

internet availability (see page 15) through an interactive map. At the end of the first half of 2019, the app had 233,000 users.

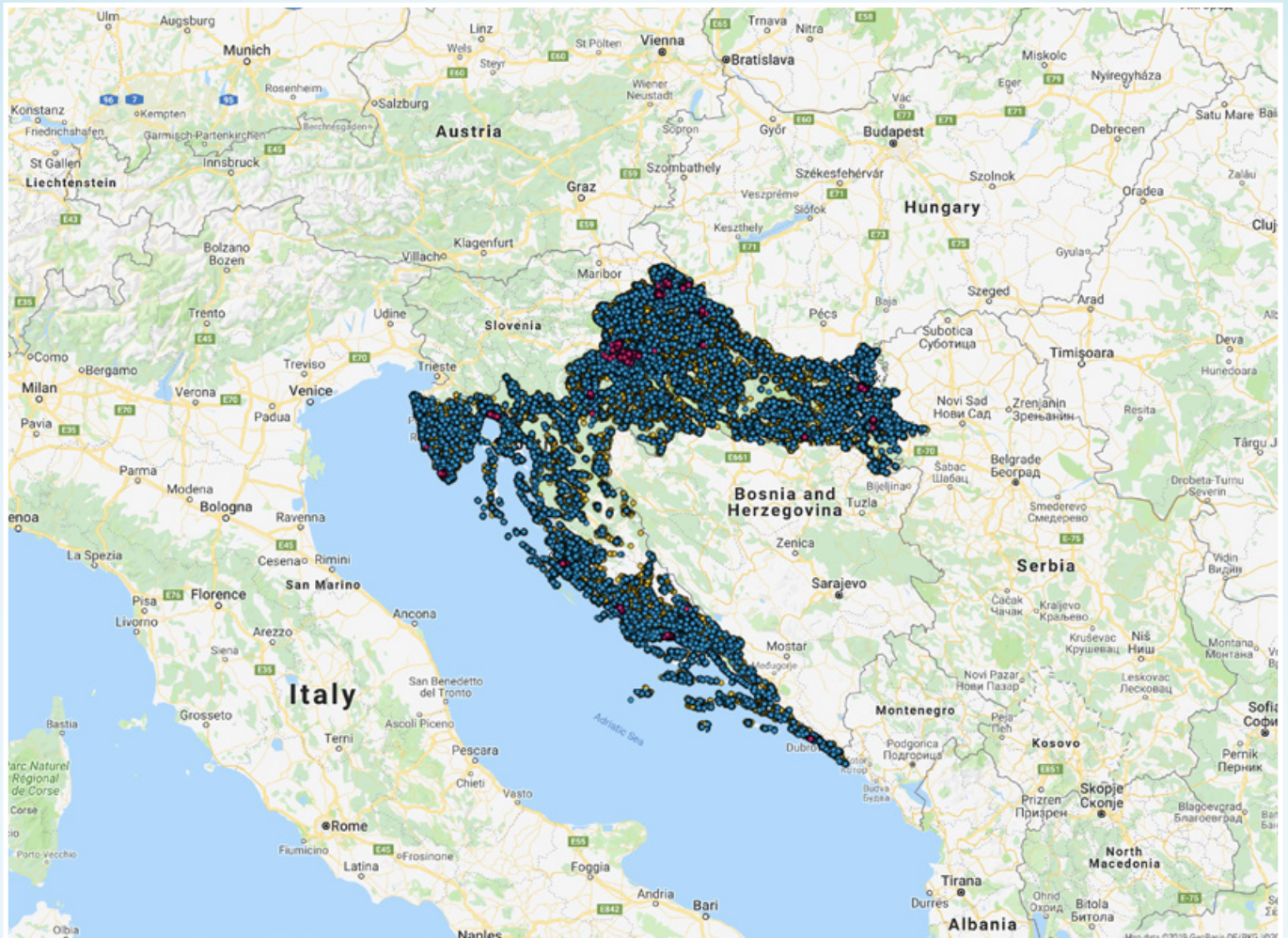
And it continues to innovate for customers: this year HT and Zagrebačka banka launched Telekom Banking, an app-based mobile banking

“ HT has deployed an NB-IoT network nationally and intends to facilitate the setting up of smart cities

app, from which they can run a current current (checking) account, as well as mortgages and savings. It is the first such service on the Croatian market and includes the IziPay service to send money safely by clicking on a contact from their directory. Using the app does not take up any of the customers' data allocation.

Smart parking in Dubrovnik

Smart cities and IoT are other key parts of the company's strategy. It has deployed an NB-IoT network nationally and intends to facilitate the setting up smart cities, and to support their digital transformation, using



Using AI to boost business assurance

HT played a key role in award-winning proof of concept project to explore the use of artificial intelligence (AI) in business assurance.

Fraud costs the communications industry up to \$29 billion per year, according to the Communications Fraud Control Association, and the problem is likely to worsen as more services are delivered through ecosystems of partners.

The Open AI Business Assurance Marketplace (Phase III) was a proof of concept Catalyst project run within the telcos' trade body, TM Forum. HT worked alongside fellow operators BT, Deutsche Telekom and Orange, supported by Amdocs, Bulb Technologies, FICO and IBM to develop a prototype solution in under half a year.

The aim was to show how artificial intelligence (AI) and application programming interfaces (APIs) can be combined to reinvent fraud protection and revenue assurance for the digital world.

The Catalyst worked on three areas:

- Helping operators enable digital operations and integrate systems for more holistic business assurance
- Applying AI – specifically machine learning (ML) – for business assurance to enable business decisions based on data via AI techniques like random decision forests, gradient boosting and more
- Creating an API-driven business assurance marketplace to help service providers quickly choose the right partners.

The team's solution was demonstrated at TM Forum's *Digital Transformation World* at Nice in May and won an award for the Catalyst project (out of a total of 32 teams) likely to have the Greatest Business Impact. It was also a finalist for the Best Use of Open APIs and IT Transformation Catalyst projects.

technologies to improve the quality of life for citizens, optimise local resources and foster entrepreneurship.

For example, as part of an initiative called Dubrovnik Smart City, HT led the implementation of a smart parking implementation project for the entire city of Dubrovnik, which uses 1,900 sensors and the NB-IoT network to help drivers find free parking spots and reduce traffic jams: in cities, drivers can spend up to 40% of their time behind the wheel looking for a parking space and creating unnecessary pollution.

Drilo concludes, "The main goal of HT's activities is to connect everyone with the opportunities the latest technology offers so that they can now live better and more easily, creating the basis for a better future. That is why we are constantly investing in the development of a secure and stable network, and use innovative solutions to bring the best possible internet access to each corner of Croatia".



CTO of the Year ROUNDTABLE

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Telecoms is at perhaps the most exciting and challenging point in its long history, due to new technologies – 5G, IoT, automation, AI and analytics to name just a few – and the investment they need without a clear path to making a return on it. Sarah Wray reports on what some of Europe’s leading CTOs and other industry experts had to say at a roundtable held earlier in the summer.

PARTICIPANTS AT THE ROUNDTABLE

Kristian Eliassen, Technical Director, ICE (Iceland)
Elmar Grasser, CTO, Sunrise Communications (Switzerland)
Krzysztof Kozłowski, Managing Director, Orange Labs
International Poland
Liga Krumina, CTO, Tele2 Latvia
Kester Mann, Principal Analyst, CCS Insight
Bengt Nordström, CEO, Northstream

Stephen Oakham, Director of Mobile Service Assurance and
E2E Governance, Liberty Global
Payam Taaghool, CEO, MYCOM OSI
Annie Turner, Editor, *Mobile Europe* | *European
Communications*
Sarah Wray, Contributing Editor, *Mobile Europe* | *European
Communications*



Payam Taaghoh, CEO, MYCOM OSI (foreground) and Stephen Oakham from Liberty Global



Annie Turner, Editor, *Mobile Europe* | *European Communications* and Bengt Nordström, CEO, Northstream

How telcos can deliver on the promise of so many game-changing technologies in the fast-changing digital world was the theme of this animated discussion. The question of how telcos can rejuvenate their businesses was the undercurrent throughout. But first, a more volatile issue was on the agenda.

The ongoing Huawei controversy was met with broad agreement among the attendees that the issue is a political one rather than technological, but also one that hugely affects telcos, their supply chain and customers. Delegates were less concerned about the short-term effects, but said they were monitoring the situation closely to assess the long-term impact – not only for telecoms but for broader global trade too, stressing they wanted a “fact-based” discussion.

The operators added that for them, the focus is on holistic security as threats come from everywhere. Elmar Grasser, CTO, Sunrise Communications (see page 8), agreed, saying:

“We take security threats extremely seriously. We’re investing significantly. We detect things every day and they’re coming from everywhere, all over the world,” but he noted nothing had been detected relating to any vendors.

The assembled CTOs agreed they hoped the situation would be resolved soon. Bengt Nordström, CEO, Northstream, said, “If it continues to escalate, we are all losers.”

Potentially at stake is “the fantastic progress” Huawei has made and enabled for the telco industry, particularly around 5G, added Kester Mann, Principal Analyst, CCS Insight, as well as the prospect of less competition among vendors in the market.

Money talks

Revenue was a huge concern among the attendees, with telcos striving to strike the balance between the investment required for 5G and the profit they need to turn today. This is not surprising given the information Annie Turner, Editor of *Mobile Europe* | *European Communications*, cited from Bloomberg. It found that between 2012 and 2018, the value of Europe’s telecoms companies almost halved

from \$234 billion to \$133 billion. By comparison, according to the same source, during the same period the value of the US sector has risen by 71% to \$532 billion and Asian telecoms companies have grown in value by 13% to \$561 billion.

Nordström noted that the US has outpaced Europe in network investment for the last ten years, and can subsequently command higher prices from customers. “You must see the connection between revenue and investment,” he said.

In October 2018 a Bloomberg report found that European telcos’ perceived gloomy prospects are dragging down their share price, making the sector the worst-performing in the *Stoxx Europe 600 Index* over the preceding two years. Ovum reckons the European industry’s revenue fell from \$444 billion to \$369 billion between 2012 and 2017, with overall consumer prices dropping 40% over the preceding two decades.

“You can’t keep asking the private sector to pay all the money, with no help from the government and all the restrictions. It’s just not sustainable,” Payam Taaghoh, CEO, MYCOM OSI stated.



Sarah Wray, Contributing Editor, *Mobile Europe* | *European Communications*



L to R Krzysztof Kozlowski of Orange Labs International Poland, Kester Mann, Principal Analyst, CCS Insight, Liga Krumina, CTO, Tele2 Latvia

Kristian Eliassen, CTO, ICE, remarked, “But if you look at the amount of money that people are willing to pay for new and the best phones, you would assume that the consumer is also willing to invest in quality of the network side.”

Taaghoh agreed saying: “The amount of money that is generated by this ecosystem is not proportionally distributed to the people that make it really happen. Without networks, there would be nothing.” Although many telcos are still profitable, “the model is unsustainable”, he added. “We double the amount of [bundled] data for a smaller price every year.”

“That’s why operators need to look at whether connectivity is the long-term route or whether they need to start making bolder investments,” Mann commented.

International comparisons

Attendees called more for government support given the societal impact 5G is poised to have, with some raising concerns of complacency in Europe. Grasser said, “We need an ecosystem to drive 5G,” including high-tech companies. “In Korea, nobody would question whether you need 5G or not,” he said. “5G infrastructure is just a requirement; you shouldn’t wait until these companies ask for it. You need to build it and they will use it very soon.”

Krzysztof Kozlowski, Managing Director, Orange Labs International Poland, said, “As CTOs we are all very pragmatic. You look at your budget and you try to balance things... most operators don’t really see the need to build 5G today,” but they have to balance this with customer expectations.

Nordström believes that although 5G network slicing and IoT opportunities may bring some incremental revenues, they probably will take some time to develop, as new business and partnership models are required. Liga Krumina, CTO, Tele2 Latvia, asked, “If 5G is about automation and self-driving cars, but there is no infrastructure coverage, how can those self-driving cars even exist?” – leaving the question of who will fund that infrastructure hanging in the air.

Nordström thinks operators could achieve more positive results through consolidation, which would stabilise the market and create a more investment-friendly environment. Some consolidation is underway. For example, Sunrise is in the process of acquiring UPC from Liberty Global in Switzerland, “And I am sure this will have a huge and good impact to the



L to R Kristian Eliassen, Technical Director, ICE, Krzysztof Kozlowski and Kester Mann

whole economy [of the country],” Grasser said.

Also, at the beginning of August, Vodafone completed the acquisition of Liberty Global’s cable assets in Germany, Hungary, Romania and the Czech Republic. Liberty Global almost immediately announced it would invest massively in full-fibre deployment in the UK, outside the big metropolitan areas.

Stimulating competition

Indeed full-fibre deployment is an issue that is rapidly rising up the agenda for both telcos and politicians in many countries. Grasser said it is “as important as electricity and water,” and

As more base stations will be needed for 5G to massively increase capacity, Nordström noted a growing trend for independent infrastructure companies becoming interested in owning telecom tower infrastructure, as they can reduce costs for the large mobile operators and provide a regular return for themselves.

This type of arrangement can also make operators a more attractive option for municipalities too, Nordström said, although concerns were raised about fair and regulated pricing for operators. A national infrastructure operator is under discussion in Poland, for instance.

Clearly the operators are not blind to the trend either: since the roundtable, Vodafone announced that it is going to create a stand-alone tower company from its cell tower assets, which will be the biggest tower business in Europe, and probably sell it off in future to release value for shareholders.

Entrepreneurs

This challenging economic and financial backdrop sees CTOs pondering issues beyond technology, including business models and future strategy. As Grasser put it: “I feel like an entrepreneur. I’m not here just to do technical things but to have an entrepreneurial approach.”

A big shift in thinking as well as network architecture is the growing demand for computing power and other resources to be at the edge of the network, close to where data is generated and consumed, including massive IoT deployments. Other edge candidates include video streaming and gaming; the latter is tipped to be one of the 5G’s first lucrative use cases.

Kozlowski said: “Without edge computing,

“ We need an ecosystem to drive 5G...In Korea, nobody would question whether you need 5G or not

underlined its fundamental importance to 5G – the two complement each other – and many use cases.

Taaghoh said government could hasten the progress of full-fibre build-out across Europe by mandating it as a standard part of new homes, in the same way that new houses must have a certain number of electricity sockets, and connections to water and other utilities.



Elmar Grasser, CTO,
Sunrise Communications

you cannot cope with the increasing costs.” He explained that Orange Polska ran a trial three years ago, putting all the compute power for the fixed and wireless network into a local data centre. The cloud RAN was not ready then, but now the technology is available he said.

Putting too much on 5G?

5G has been much hyped and is often described as being telcos’ saviour. Striking a realistic note, Taaghoul observed, “4G fixed what 3G was supposed to do, and not only did we pay a lot for the spectrum, the technology was still about connectivity. With 5G we have a real chance to deliver on our promises of performance and quality, and invent whole new ways of how people and businesses behave”.

“I’m worried we’re going the same way with 5G,” Mann commented, particularly if it’s sold [only] as a story of faster connectivity as is sometimes the case in mainstream media, although he acknowledged that we need to improve basic connectivity to address the big potential markets that 5G can monetise. B2B (particularly industrial and manufacturing) and B2B2C (especially gaming and broadcast) markets are seen as those with the most opportunity to tap new revenue.

Fixed wireless access can be quickly deployed to provide fast broadband to not-spots and rural areas via 5G, as the Swiss example underlines, Grasser noted.

Beyond faster broadband, addressing the huge B2B market will be a challenge for

operators, which will have to change the scope of services they provide and become complete end-to-end service providers, developing and delivering quality applications.

Delegates agreed that a big obstacle is that operators do not have the software developers they need. Many struggle to attract coders and recruit workers from other countries. “Software is everything, and we have a shortage worldwide of coders and programmers. Agile assembly of off-the-shelf and open source software, subscribed to and run in the cloud, is a tremendous opportunity,” Taaghoul said.

Some companies are looking to hire aspiring coders before they go to university and train them in-house so that they are useful from day one of their employment after graduation.

What happened to IoT?

The attendees noted that IoT has not taken off as quickly as expected, but is still a major opportunity. The group thought one reason IoT hasn’t been prioritised yet is because of the relatively low margins in relation to effort, “but I think it will come,” Grasser predicted, noting that coverage of both the network and devices will be key. Then operators will be able to do more, particularly in areas like the smart home, including security. That critical mass of devices will also create an opportunity for operators to help customers manage the data from the devices, he added.

Winning in the IoT (see page 24), and so many other areas telcos have their eye on for

new sources of revenue, relies on operators being ecosystem players. How realistic is this, given there is almost no track record so far?

Turner said, “Everyone likes the idea, but no-one wants to do it. They’re companies; they’re there to make money. We all talk about how we need to work together to deliver change in government or make sure we are delivering on connectivity but no one wants to give up revenue [or control] to another company.” That said, she thinks operators are more open to partnerships with other companies they wouldn’t have normally worked with in the past.

“ Without edge computing, you cannot cope with the increasing costs

Taaghoul summed up, “We have to change the way we work,” and cited how Google created an ecosystem of developers and partners around Android to reduce the barrier to entry for developers. He said, “If we have ways of offering our networks, maybe slices, that make it easy to experiment, and deliver quality services, then we can create a very valuable ecosystem.”



Payam Taaghoul congratulates
Elmar Grasser

Telco cloud – the 4 immutable laws

Mounir Ladki, President and CTO, MYCOM OSI

A strategic digital transformation and migration of infrastructure to the cloud can cut the IT costs of a Communications Service Provider (CSP) by up to 31 per cent, according to the judgement of Three UK's director of IT transformation speaking at their media and analyst event in April 2019.

Three UK began the process of moving 90 per cent of infrastructure to the cloud, automating all processes and getting rid of traditional customisation methods in 2016. Just three years later and they are already reporting that they expect to have reduced IT costs by 19 per cent. The savings are expected to reach up to 31 per cent in 2023.

The business case for telco cloud, based on the above real-world return on investment, is undeniable, but what does migration to the cloud really mean for a CSP?

CSPs must transform themselves into Digital Service Providers (DSPs) if they want to maximise the opportunities presented by 5G and win competition coming from web-scale companies as well as other CSPs for agility, on-demand service delivery, cost efficient digital operations, speed of innovation and differentiated Quality of Experience.

Telco cloud is the destination for CSPs embarking on this journey, as demonstrated by Three UK. Decades-old on-premise software development, deployment and operations principles are a barrier to digital transformation. Only by virtualising core network functions and embracing a cloud-based, SaaS approach can service providers unlock the new digital opportunities.

Established Tier 1 CSPs which are already supporting 2G, 3G and 4G networks with legacy infrastructures can still realise the benefits of a cloud-native approach by adopting the following four immutable laws:

- 1. Automate, automate, automate!** – 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 and monetising 5G lies in AI-driven automation and predictive operations. 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 monetise them quicker, operating at digital speed
- 2. Be open** – Embracing open ecosystems means rapid and industry-wide



Mounir Ladki, President
and CTO, MYCOM OSI

innovation with reduced costs through collaborative open source, open APIs and open standards. Initiatives such as the TM Forum's Open Digital Architecture (ODA) program and the widespread adoption of open source are fundamental to end-to-end hybrid telco cloud networks. With companies leading the adoption of open source in the telco cloud, and operators like Three UK citing open APIs as a key factor in their telco cloud strategy, the case for openness is clear

- 3. Continuously innovate** – To compete and win against web-scale competitors, DSPs need to change their approach to innovation, climbing out from under the waterfall and embracing continuous development. Continuous innovation is critical to delivering new features, content and solutions, and zero-touch onboarding. This is relevant as DSPs need to be able to support the launch of digital services in real time
- 4. Go hybrid** – The final immutable law of the telco cloud is the cloud itself, or more specifically, hybrid cloud deployment. We are seeing public cloud used for AI at scale, massive big data analytics and private EDGE cloud with micro data centres and EDGE COMPUTE to deliver the ultra-low latency use cases, such as driverless cars. To run in the public cloud, telecom assurance must be cloud native and microservices-based. Microservices can then be deployed on-demand and automatically at the EDGE, to service some real-time use cases. A successful digital transformation into a cloud-native DSP may be a challenge, but AI-driven automation, openness, continuous innovation and the hybrid cloud hold the key.

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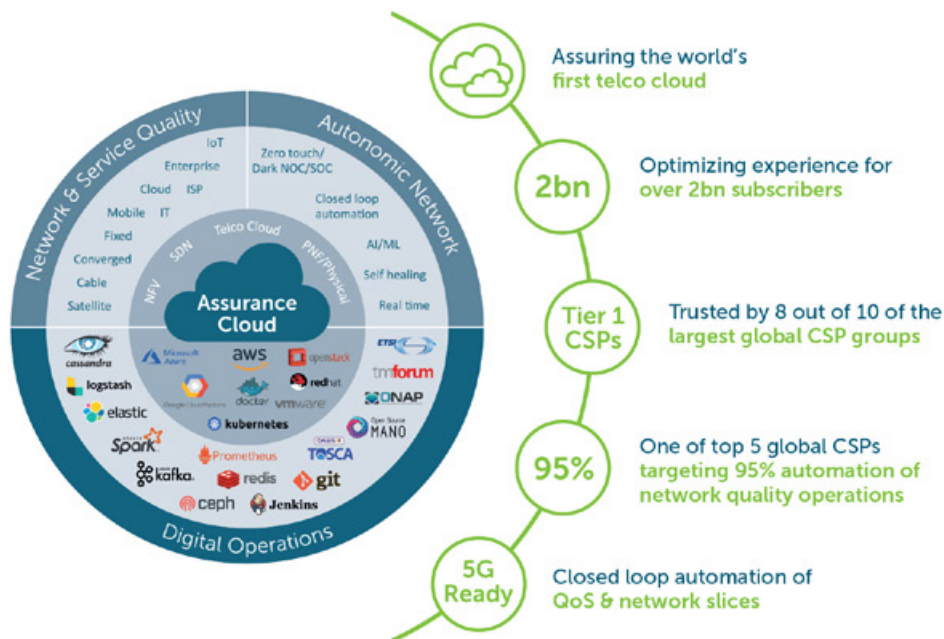
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Network architecture & opportunities

Insight report

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Have telcos got the edge when it comes to IoT?

Could edge computing shift the balance of power from the big public cloud providers like Amazon Web Services to network operators and help them address a \$4 trillion market? Sue Tabbitt investigates.

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SD-WAN: what's next for enterprise networks and operators' role in them?

As internet- and software-based options become more sophisticated and robust, the case for high-spec private WANs and specialist multi-protocol label switching services (MPLS) is diminishing. What's next, asks Sue Tabbitt?

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Where are we with network automation?

Fuelled by impending 5G, pressure on operators to automate their networks is mounting. So where are European operators in their journeys and what obstacles do they still need to overcome? By Kate O'Flaherty

Have telcos got the edge when it comes to IoT?

Could edge computing shift the balance of power from the big public cloud providers like Amazon Web Services to network operators and help them address a \$4 trillion market? How well do operators understand this and what are they doing about it? Sue Tabbitt investigates.

As the communications industry moves into virtualised infrastructure and value-added services, network operators and service providers must keep reviewing whether they are doing enough to maintain and grow their share of the action. With momentum gathering around the Internet of Things (IoT), especially as 5G takes shape, conversations are turning increasingly to enhanced data requirements – not just speed of transmission, but enterprise-level service guarantees about performance consistency, latency, uptime and security.

In this context operators are developing or reassessing their position on edge computing. In telecoms, placing data processing at the edge of the network aims to reduce network congestion and ensure application performance by running software/processing tasks closer to the end user. Low latency is always cited for mission-critical applications, with automated cars as the favourite life-and-death example, but while gaming is not mission critical, gamers are very intolerant of glitches in network performance, and collectively they represent a global, multi-billion-euro market that is growing rapidly.

Cost is an important aspect, too: is it economic or necessary to fire CCTV footage of a wall behind a building to a central cloud service for continuous analysis, when it could be processed closer to the point of need, especially as most of the data is likely to be discarded?

Charging for added value

It also makes sense that communications service providers (CSPs) should have a hand in addressing IoT traffic routing and data management. Certainly, as core network services have become commoditised, and/or have succumbed to software-based treatment, operators are being forced to reinvent themselves and IT-based services have become a logical extension of digital innovation. Just as operators have long wanted income from the chargeable content and value-added services delivered across their infrastructure, so too are they keen to play a part in ensuring robust assurances around services' performance, security and more – and to charge for that assurance.

“The transition for telcos is now more

towards helping on the data side, to uphold the performance of critical applications,” said Kevin Hasley, who heads up performance benchmarking in telecoms at analyst firm RootMetrics by IHS Markit. Whether customers of IoT services are farmers using data visualisation in managing plant crops, utility companies monitoring asset maintenance and service demand, or highways and other transport organisations striving to keep people and goods moving, they need to be able to count on a reliable data service.

At Swisscom, IoT-based edge opportunities are an extension of the operator's broader emphasis on enterprise IT services. Today, half of the turnover from its enterprise business comes from such propositions, including systems integration and capabilities to develop data-based services at the edge, according to Julian Dömer, the operator's Head of IoT. “We have been shifting to IT services and the cloud for a decade, and the edge has been on our roadmap for a while,” he said.

“**The transition for telcos is now more towards helping on the data side**”

“IoT requires a lot of IT integration capabilities,” he noted, emphasising the scope for a value-added service play. “Those providers offering ‘only’ connectivity will not profit from the higher margin parts of IoT business.”

Beyond traditional connectivity

“Telcos need to look beyond the traditional connectivity services market boundaries, seizing the opportunity to play key enabling roles in the broader IoT ecosystem,” agreed Gabriele Roberti, European Edge Computing Practice Lead at IDC. “Since they operate infrastructure close to the end devices, they are well positioned to provide several enabling services, such as edge computing resources; connectivity of edge devices to cloud; data management services; data security; connec-

tivity management; device management; and hosting facilities.

“These various services can be profit centres in their own right, as well as differentiators for the operator,” he stated, adding that customers are likely to pay for premium services, where operators can meet or exceed expectations for network reliability and service quality for critical application services that rely on low latency and high service uptime.

Edge computing services do not begin with IoT – nor with 5G – however, so this is not a new approach or market. This means operators need to be clear about what their precise role might be and how they might best align with partners to position themselves most strongly for specific opportunities – without trying to reinvent the wheel or invest in areas that will take them too far from their core business.

MobiledgeX – a common telco view

There are signs that operators have realised this. Pointing to specific developments across Europe, Roberti called out Deutsche Telekom's MobiledgeX, which DT established last year to present a common telco view of edge computing to the software developer community, to make it easier for them to develop latency-critical applications.

Dean Bublely, Director of Disruptive Analysis, a consulting and ‘futurism’ firm, agreed it is unrealistic to imagine that 800 mobile operators will each develop and run their own edge capabilities. He sees enterprise customers buying into hybrid data scenarios for their IoT and other comms-reliant data needs. Here, the big public cloud players or ‘hyperscalers’ (the likes of Google, Amazon and Microsoft) are likely to provide an aggregated service that splits out applications activity across the optimum combination of major data centres and more local facilities or telecoms operators, through their own partnerships, he believes.

In which case, operators need to ensure they are well positioned to take their share of the action – and profits – via the right industry tie-ups. Bublely thinks scenarios such as DT's MobiledgeX, Ericsson's Edge Gravity and Kinetic Edge Alliance – which he refers to as ‘federated edge’ provision or ‘edge ecosystems’ – are the way forward. Here, operators band together with cloud providers, content delivery networks, device manufacturers and application developers to provide a complete offering to enterprise clients.



Dean Buble, Director of Disruptive Analysis



Gabriele Roberti, European Edge Computing Practice Lead at IDC



Julian Dömer, Head of IoT at Swisscom

The power of ecosystems

This kind of set-up is attractive to IoT developers who will ultimately come up with the products that entice customers. It's also appealing to enterprise clients, who don't really care about who does what as long as they get the service they need at the right price point.

"The idea [of the federated model] is that it's a coordination of lots of edge resources, all presented to developers as a unified platform," Buble explained. Tower companies, property firms, independent edge providers might all be part of that federation, but the point is that participants each focus on what they're good at with no need to overextend themselves.

Buble warned, too, that the 'edge' means different things to different representatives in the industry. Edge data processing could actually happen in a grey box attached to a set of traffic lights or on a tiny chip implanted in a smart sensor. In which case the prospective role for the telecoms operator will be non-existent, unless they are part of a broader ecosystem specialising in traffic-based IoT or smart cities solutions, where operators may be welcomed for their investments in secure data transmissions and trusted enterprise relationships.

Device manufacturers and technology providers to the telecoms industry have also identified the need to play a proactive and innovative role within these expanding ecosystems. Take Nokia, which, in conjunction with Telia Finland and Intel, is using 5G to enable 'industrial IoT at Nokia's factory in Oulu. It is also working with DT on a 5G pilot at the Port of Hamburg; and with mobile operator Smart Communications and the Philippine Red Cross (PRC) to bring innovative technology such as LTE-connected drones and a portable network into areas struck by disasters.

Sandro Tavares, head of mobile networks marketing at Nokia, believes operators need to position themselves to take advantage of more of these ambitious projects. "Operators should evolve their business models and drive an evolution towards becoming a full provider of digital services to consumers and enterprises," he said.

“Operators should... drive an evolution towards becoming a full provider of digital services to consumers and enterprises

More to the edge than IoT

Indeed, given that the role of the 'edge' is much broader than for IoT alone, there could be numerous additional business opportunities once network operators have the right partnerships in place.

Said IDC's Roberti, "We see 'edge' as an opportunity for telcos that is not confined to IoT use cases such as connected vehicles and industrial automation scenarios. In general, every low- and very-low-latency digital use case will benefit from edge capabilities – from augmented and virtual reality applications and mobile gaming to remote surgery and content

delivery networks."

From an internal operational perspective, meanwhile, edge computing could offer new options to CSPs looking to drive greater service differentiation. As well as ensuring that gigabytes of network traffic are not being moved unnecessarily to a distant cloud facility, the ability to draw on edge computing facilities provides a means for operators to apply discrete security rules or other controls for different environments.

"Edge will play a significant role in telecom infrastructure transformation, toward distributed clouds, also called 'telco cloudification,'" Roberti said. But his advice is clear, and it comes back to operators determining their own particular source of value-add – whether as edge integrator, aggregator, edge platform as a service provider, something else or a combination of these roles in different situations.

Big numbers, big markets

Certainly, the projections for enterprise spending on such services look enticing. Looking specifically at IoT, worldwide spending is forecast to reach \$725 billion in 2019, an increase of 17% over 2018, according to IDC's *Worldwide Internet of Things Spending Guide*. Yet connectivity services represent just 10% of that spending. "So it is important that telcos look at other parts of the value technology stack," Roberti concluded.

Chetan Sharma, who sees edge computing as a \$4 trillion opportunity, believes that ultimately most data processing and AI deductions will happen at the edge in all major markets. He concluded that although cloud computing isn't going away, "The big [cloud] players realise that at a minimum they need to partner up with operators to get access to their real-estate property." ■

SD-WAN: what's next for enterprise networks and operators' role in them?

Enterprise wide-area networks (WANs) and associated managed services that guarantee performance for critical applications have been a big earner for network operators for decades. Now, as internet- and software-based options become more sophisticated and robust, the case for high-spec private WANs and specialist multi-protocol label switching services (MPLS) is diminishing. What's next, asks Sue Tabbitt?

With a number of things happening at once, it is hard to see just how the market is developing, and how it will play out for traditional enterprise WAN infrastructure and service providers, and their long-term revenue streams. In particular, are they adapting quickly enough to the evolving software-defined WAN (SD-WAN) opportunity?

Finbarr Goode Begley, Senior Research Analyst at Cavell Group, believes that while traditional network operators might see the gradual shift away from legacy WAN/MPLS propositions as a threat to profitable core business, there are plenty of opportunities for service providers to carve out lucrative new business streams in their place.

"Many companies do not want the hassle of arranging underlying transport, or are concerned about the quality and security of the public internet," he noted. "Large carriers like Telefónica, BT, CenturyLink and Colt have rolled out their own managed SD-WAN services where they offer enterprises a one-stop shop with more complete control over both the transport and SD-WAN overlay network."

He warned that, if operators don't rise to the challenge with the right combinations of solutions and skills, there are plenty of challengers ready to make this opportunity their own. "While it's very likely that managed service providers that coordinate both access and the wide area will continue to play a very large role in enterprise SD-WAN, new pure-play managed service providers like Aryaka

and Cato are positioned to compete strongly against traditional carriers," he said.

MPLS still growing at 30%

BT is keen to present itself as having all bases covered, saying it can take enterprise customers on a journey from old-style private WANs to more virtualised, internet-based services at a pace that suits them. Its Global Services organisation, which has been through the mill in recent years, claims that providing a future-proof proposition for enterprise customers is a priority. "SD-WAN is a fundamental part of every conversation we have with customers," said Adrian Comley, who is responsible for 'dynamic network services' product development at BT Global Services. "We're not saying 'Stay with MPLS'; we support them wherever they are on their journey."

He conceded, however, that BT's 'heritage' portfolio accounts for the largest proportion of revenues and that the company is seeing 30% growth in MPLS bandwidth. "So customers are still buying it," he noted. There is no denying the Internet is important in a WAN context, he added, "as 99.99% have a hybrid set-up today. Initially the move to the cloud was the key disruptor, as the Internet became the destination. Then you've had scenarios where for application performance, enterprise headquarters or major factories, customers will deploy Internet-based services as a backup and means of load balancing."

To keep ahead of customers' needs, BT Global's portfolio spans business-grade, uncontended high-quality Internet WAN services down to cheap broadband. "That way,

organisations can make the choice based on the relative needs for application performance and price," Comley said. "The underlying technology doesn't matter to the customer, the real priority is whether their ERP [enterprise resource planning] system works."

Technology partnerships

BT's technology partnerships for SD-WAN – including Cisco, Riverbed, Infovista and Nokia/Nuage – reflect operators' need to offer solutions at different price points and levels of sophistication, at the same time ensuring that BT gets a slice of all the pies. In terms of a managed service, there are different options here, too. "Customers tend to want a co-managed option, for example where they do their own service requests and BT does more advanced configurations or trouble-shooting," Comley explained. "We can support customers anywhere on that curve."

Meanwhile, tie-ups with the big cloud infrastructure players around the world, from Amazon Web Services and Microsoft Azure to Alibaba, plus direct connections with local ISPs, mean BT can replicate its services internationally.

In common with other SD-WAN players, BT is heavily promoting its lab facilities, where enterprise customers can come and model their needs and see how they would work in an SD-WAN context. "We can even emulate specific site topologies so customers can get right into the detail," Comley said.

Market challenger

Andrew Halliwell, Product Director at Virgin Media Business, which is coming at SD-WAN

as more of a challenger provider, agrees that the transition of WAN infrastructures and services to the Internet will be a gradual migration, but he is excited about the potential and expects to see 50% of Virgin's enterprise and public sector WAN clients transition to SD-WAN within three to five years.

"We see it as the logical next development after the cloud maturing," he said. "I think the old and new worlds will co-exist for five to ten years, though we see significant growth coming – for example, where there is a need to get to a cloud model quickly (to deploy Microsoft Office 365, for instance) or if an organisation has a significant branch network and needs an efficient solution for its smaller sites."

Virgin Media Business's heritage is in providing enterprise collaboration solutions (video, for example) and providing the 'heavy-duty plumbing' – super-high bandwidth backhaul via its cable networks plus 4G and 5G infrastructure – to support intensive, content-based applications over distance. Its approach to SD-WAN is to provide best-in-breed solutions, bundled with adoption, testing, deployment and any upgrades, as a complete, delivered service. "Our mission is to get customers up and running at speed," Halliwell said, pointing to pilots it has been working on which have seen five sites deployed in 30 days; ten to 20 sites within three months; and 500 sites in six to nine months.

Providing the proof-of-concept service is critical to winning over customers and showing them what's possible, Halliwell noted, echoing BT's findings. One of Virgin's recent pilots has been for a professional services engineering and design company, which wanted to see how reliable an SD-WAN set-up would be for sharing huge computer-aided design (CAD) files.

Culturally, discussions about SD-WAN are a different type of conversation to traditional WAN sales, Halliwell said. So Virgin has been investing in new skills accordingly. "As a challenger provider we're keen to accelerate disruption, in contrast to the more protectionist view of the incumbent network operators," he explained. "We're building specific capabilities in application and security assessments. We do a lot of public sector secure networks, or operational performance improvements, so skills like this are critical."

It is identifying wraparound services as operators' best chance of developing new profitable revenue streams as old-world WAN product- and service-based business peters out.

A strong capability

"SD-WAN is a very strong capability, but it's still only a technology," noted Franck Morales, VP for connectivity services at Orange Business Services. "Customers want something global and integrated that can drive business results and the best possible user experience." He sees Orange's opportunity, then, as being the one-stop provider.

Its services cover: maintaining legacy WANs; providing connectivity to the cloud as enterprises continue to migrate their business systems there (including secure internet connections anywhere in the world with consistent SLAs); providing all the agility of new technology, including virtualisation, automation and orchestration; and bringing everything in line with organisations' particular policies.

"In an SD-WAN scenario, the ratio of hardware to software value is 20:80 or even 10:90 and the need for professional services is significant," Morales said of the cultural shift away from traditional WAN solutions. "In the new world, if there is an operational issue, this could be down to a huge number of possibilities, so we've added new tools to our frontline management to monitor everything and our people are evolving so that they can troubleshoot anything."

Value-added services around advanced security are also a focus and, in common with BT, Orange places a large emphasis on customer labs where enterprise customers can come and see first-hand what's possible in an evolved network scenario. That includes pushing the boundaries yet further and exploring SD-LAN scenarios, too.

"The local area network is now heading the same way, and we've started collaborating with our partners and customers to realise this," Morales said. Building on its relationship with Cisco regarding SD-WAN, Orange is now developing SD-LAN solutions via its Open Labs programme, tailored to address individual customers' business challenges and use cases with network automation, analytics and security.

Paying for performance

Although services like security will pave the way for premium charges, Morales noted that it's guaranteeing application performance, the user experience and business outcomes that matter most to customers, keeping conversations away from cost-cutting. "Savings are not the number

one criterion. IT and networking people inside companies are moving closer to supporting their lines of business, and they're ready to pay to maintain performance," he said.

"If technology can also bring more value to customers, for example by helping them to address new business areas or markets, and attract more income, they're willing to pay more for that," he continued. "It's something we're starting to see with the next phase of digital transformation.

"Customers want more agile contracts with us as a result," he stated. "So, rather than a ten-year fixed arrangement, they want to be able to set up quickly in new countries or react quickly to evolving business opportunities with our help. We're co-creating those future scenarios with our clients now."

Strategic approach

Lindsay Newell, Head of Marketing for Nokia's Nuage Networks, believes this more strategic approach to software-defined enterprise networking is a win-win for all sides.

"Viewing SD-WAN through the lens of MPLS replacement and cost reduction is a very short-sighted and narrow way to approach what has the potential to be the biggest revolution in enterprise wide area networking in 20 years [since MPLS and Ethernet started to replace T1/E1 circuits]," he said.

"The transformational potential of SD-WAN can only be realised when an enterprise views it as a platform for business innovation and part of their digital transformation journey, including adoption of public/private cloud, embracing workforce and workload mobility, and the radically different security paradigm that come with it."

Once they're on the right path, operators have a chance to sell SD-WAN as an upgrade to MPLS, with the bonus of the simplicity of dealing with a single supplier (for example, the underlay and overlay from one supplier). They can also assume responsibility for provisioning new sites or making adds, moves and changes; provide seamless cloud- or network-based security for software as a service applications and public cloud workloads; and eliminate the stack of appliances taking up space and power in every enterprise branch today.

"That's a lot of upsell potential for the service provider and delivers a clear [return on investment] for the enterprise customer," Newell noted. ■



Network automation – where are we now?

Fuelled by impending 5G, pressure on operators to automate their networks is mounting. So where are European operators in their journeys and what obstacles do they still need to overcome? By Kate O'Flaherty.



Dennis Lorenzin, SVP, Network Cognitive Services,
Global Services at Nokia



Susan James, Senior Director of
Telecommunications Strategy, Red Hat



George Glass, VP of Architecture and APIs at TM Forum



Yves Bellego, Director, Network Strategy at Orange

Network automation has been steadily increasing over recent years as operators realise the potential cost savings and customer service improvements. But over the last year, automation has become more urgent as the reality of 5G draws tantalisingly close. As BT's Chief Architect, Neil McRae, recently said about 5G operations: "It's automate or die; we have to automate everything."

In response to external pressures, many operators are ramping up their activity, at least publicly. Three recently announced it is moving to a totally virtualised core; Vodafone, BT and Orange are increasingly active in the area; while Telefónica is focusing heavily on automating its networks and adding artificial intelligence (AI) ahead of the launch of 5G.

But new analysis from Rethink Technology Research shows a different picture: Operators are slowing investment and reducing their ambitions in network automation. According to Rethink's report, many operators' plans for completion of self-organising networks have now slipped back to the mid-2020s. Globally, only 18% expect to have more than 40% of functions automated by the end of this year.

Organisational upheaval

Among the issues, Rethink said operators fear organisational upheaval, while immaturity of the technology and an overall lack of urgency are preventing the necessary change. So where are operators in their automation journeys – and what challenges are still holding them back?

There are big differences in operators' progress, said Broadband Forum's CEO, Robin Mersh. He conceded that perhaps there has been "a little bit of a pause: not so much about automation but more around using software defined networking [SDN] and network functions virtualisation [NFV]."

Network automation focus areas

As part of their network automation journeys, Daniel Ramirez, Mobile Solutions Manager, TEOCO, said operators are focusing on two key areas: ensuring network resilience and provisioning services.

Operators are concentrating on automating their core infrastructure software and distributed customer premises equipment offerings,

said Nathan Rader, Director of NFV Strategy at Canonical. "Automating core infrastructure software will be essential in helping telcos generate revenue from these non-differentiating services at a time of 5G-enabled applications, as well as for scaling network resources up and down based on customers' changing demands."

Monitoring, stability and scalability directly impact the end customer experience, making these elements "critical" to operators, noted Susan James, Senior Director of Telecommunications Strategy, Red Hat. She said a lot of progress has been made in the provisioning of services, which has led to "significant improvement in responsiveness to customers, as well as cost savings".

At the same time, there is a big focus among many operators in finding the most feasible technology solution for automation, for example, the best NFV orchestrator or DevOps tools, said Aurelio Nocerino, Managing Director, EALA Lead for Next Generation Enterprise Services Practice at Accenture.

According to George Glass, VP of Architecture and APIs at TM Forum, operators want to automate the management of the network: "We want to move to real-time zero-touch automation of the network, but we are not seeing that happening."

“It’s automate or die; we have to automate everything”

TM Forum has kicked off a new piece of work called Autonomous Networks to help manage networks of the future. "We are seeing a number of operators automating existing processes and not making the transformation steps needed," added Glass. "They need to look at where the network elements themselves can be moved to be automated and controlled."

Operators' journeys

But what do the operators themselves say? BT's Chief Architect Neil McRae explained the firm's journey: "When we hosted the London Olympics, it started us on a different path. The 100-metre sprint was a 10-second event and we

realised our current way of looking at the network – which was based on 15-minute events – probably wasn't good enough.

It started us thinking about how more of what we do on the network is mission critical and cannot fail. It can take minutes for humans to solve anything, so humans are out: automation's the only choice."

The next challenge was infrastructure, such as base stations, the core network, and optical devices – which were all designed for 15-minute cycles. McRae said the breakthrough moment came when the operator realised it needed more information from the network to be able to react more quickly. This saw it introduce telemetry streaming. "It's a similar technology to what Google and Netflix are using to deliver video to YouTube and Netflix," he explained.

The firm used this for analysis and tools, some script based, others AI- and machine learning-based, to make decisions about certain situations. Said McRae, "Imagine our network is suddenly streaming all this data. We can say, 'When the network is working well, the data flow looks like this'. When something goes wrong, the data flow changes.

"We can map events to that data changing and see a failure in a device, for example in Edinburgh. We can then ask the network to change what it's doing to cope with that problem. We can do this very quickly and almost in real time."

Working with Google

BT worked closely with Google on developing this streaming technology that allows a real-time view of the network. At the same time, BT is in the early stages of building a cloud network to allow it to scale up and down in line with demand depending on customer needs.

Another European operator that says it's focusing on automation is Orange. Yves Bellego, Director, Network Strategy at Orange, said all the operator's networks have automation tools doing everyday optimisation. "This has become totally business as usual."

Bellego cited two main drivers for automation: "One is to make savings, and the other is to identify problems before customers notice and fix them."

Six months ago, Orange started adding machine learning algorithms to anticipate evolutions in traffic and so it can adjust in advance to cope. "We analyse the last two weeks and anticipate evolution of traffic and adjust the

coverage of different radio sites," Bellego said.

Orange will continue to develop its traffic management. "In the past we weren't that accurate as traffic was growing rapidly.

It was growing so fast that we needed to upgrade capacity, but now growth is slowly declining, so we need to manage the traffic to save costs." Orange is also adding AI into different algorithms.

“It can take minutes for humans to solve anything, so humans are out: automation's the only choice.”

Challenges in automation

Progress is being made, but there are still obstacles in operators' automation journeys. A key challenge initially is where to start with automation, said Redhat's James. This includes how to do it in a consistent way, and how to capitalise on what others have already done and learnt.

Another issue that's existed since the inception of network automation is the required change in ways of working. McRae said it is tempting to roll things out and add automation afterwards, but "We can't work in that way."

Most operators understand they need to change the way they are working, said Nocerino. "They need to apply the principle that if they break something, they are in charge of fixing it. It requires a different mindset and approach."

McRae said mindset was an issue before, but engineers are starting to realise that the way things were done won't work in the future. "We had a third-line support team that were typically experts in configuration, but they are now experts in programming."

However, he conceded that there aren't enough skilled experts. BT is trying to resolve this by bringing in graduates to train in an 'automation academy'. "You need to understand code and logic, but also the network protocols. This can be challenging. In the net-

work we focus on state – what is the current position of the network? In IT you look at things transactionally."

Getting into training

Training is important, said Victor Omojevverha, independent IT consultant, Gridlockaz Consulting, and some firms are rolling out modern automation tools, such as Ansible and Puppet, alongside older solutions, such as Infoblox.

"This brings the current teams into and alongside the automation process. The main thing is to show automation as a skills enabler and not a threat. Automation gives seasoned engineers a new lease, especially when they realise that none of their current knowledge is wasted. Far from it – they will be in high demand if they are able to combine their networking experience with newly acquired automation skills."

Increasing use of open source can be a challenge, Orange's Bellego said. "In the past we would buy from people we know well, such as Ericsson and Huawei. Now we need to change that mindset and buy different pieces from multiple sources."

Complexities of data curation

Meanwhile, Dennis Lorenzin SVP, Network Cognitive Services, Global Services at Nokia said data curation can be complex. "It's a well-known fact that you need curated data with a degree of standardisation for automation."

Indeed, network automation can offer multiple benefits, but the area overall is very complex. "It's getting beyond the ability of the human brain to be able to understand it or respond fast enough," said Glass. "Initially, people used analytics, but now we are understanding patterns using machine learning. This allows you to let the computer learn for itself and it improves the AI engine so it's self-configuring."

It is true that experts note a slowdown in operators' network automation journeys, particularly outside more developed areas such as North America and Asia. However, it could be just a matter of getting over the final complexities as operators grapple with adding machine learning and AI to their networks, as well as managing the data that feeds it. 5G is progressing and, in the competitive battle to improve the customer experience, network automation will certainly be an accelerating factor. ■

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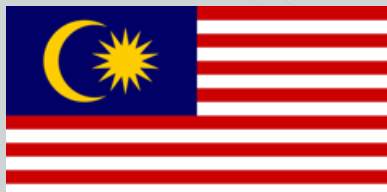
European Union

Vodafone was finally given the approval to acquire Liberty Global's cable assets in the Czech Republic, Germany, Hungary and Romania, making it one of the largest telco groups in Europe. Although Vodafone had to agree to various remedies imposed by the European Commission to guard against anti-trust issues, disgruntled parties in Germany, including Deutsche Telekom, are still mulling legal action on the grounds they didn't go far enough.



Malaysia

Stumbling blocks in the proposed joint venture between Axiata and Norwegian telecoms giant Telenor Group have derailed the proposed merger of most of the two operators' Asian telecoms assets. The new entity would have had 300 million customers in territories stretching from Thailand to Indonesia, with about 60,000 towers and €11.61 billion annual revenue. However, the two acknowledge the rationale still holds good — annual operational savings of about \$5 billion through consolidation and scale — and that the deal could be revisited.



US

T-Mobile

T-Mobile US's \$53 billion acquisition of Sprint was finally given the go-ahead by the American Department of Justice, but a number of obstacles remain. Attorneys General in 17 states plus the District of Columbia are to bring a lawsuit to prevent the deal going through. They say the merger of the country's third and fourth largest carriers would greatly reduce competition in the wireless industry, and think the remedies put in place to encourage a fourth operator are insufficient. There have been reports of T-Mobile pausing orders for 5G sites as the uncertainty continues.

Venezuela

Ericsson

Digitel has chosen Ericsson to deploy 200 4G base transceiver stations to improve coverage and capacity. The value of the contract is about €22.75 million and includes replacing Huawei infrastructure. The work will start in the capital, Caracas, with Zulia a priority as its networks are heavily congested. Digitel launched Venezuela's first commercial LTE services in July 2013, and its 1800MHz 4G network covers 135 towns and cities.

Brazil

Viavi

Brazil's National Telecommunications Agency (Agencia Nacional de Telecomunicacoes, Anatel) chose US-based Viavi Solutions to evaluate and test spectrum suitable for 5G: the multi-band spectrum auction planned for 2020 will probably be the biggest ever for Anatel, involving frequencies in the 700MHz, 2.3GHz, 2.5GHz and 26GHz bands. The government is not looking to raise revenue from the bids, but wants investment commitments to deadlines for network implementation, and coverage and capacity goals.

Pakistan

Zong

Pakistan's third largest mobile operator in terms of subscribers, Zong claims to be the first network to successfully test 5G in Pakistan. The operator is owned by China Mobile Communications Corporation, which itself belongs to the Chinese state. It staged the trial at its headquarters in Islamabad with download speeds of more than 1Gbps. In July, the Pakistan Telecommunication Authority (PTA) published guidelines for issuing temporary 5G authorisations to service providers, vendors and research organisations. There is no charge for a temporary licence and they last three or six months, but can be extended, subject to the PTA's approval.

China

Huawei

The Chinese giant is making huge strides towards potential self-sufficiency after the Trump Administration barred US firms from trading with it, then lifted the ban temporarily. The Chinese giant is particularly reliant on US companies for software and chips. In August Huawei launched Harmony OS, which it described as the first distributed, open source operating system alternative for Android devices, should access to Android be blocked again. It is also planning a new \$1.4 billion R&D centre in Shanghai. Local media say Huawei's employees talk about being in "battle mode".

Australia

NBN Co.

The company overseeing the construction and management of Australia's National Broadband Network (NBN) published its Corporate Plan 2020 to 2023. It said it is on track to complete the NBN network build by 30 June 2020 with a total of 11.5 million premises passed. Currently, about 86% of Australia's homes and businesses can order an NBN-based service. The network 'completion' excludes some 100,000 premises, identified as 'complex installations' as they are difficult to access and/or involve sites that have cultural importance.



How mobile operators need to transform to make it in 5G

Bengt Nordström, CEO of consulting firm Northstream, looks at 5G roll-outs around the world so far, early use cases and those to come. He outlines three primary areas where he thinks mobile operators must make big changes if they are to gain maximum benefit from 5G.

We are more than halfway through 2019 and many mobile network operators around the world are rolling out 5G networks. For now, 5G will essentially be about an enhanced form of mobile broadband (eMBB) and enable substantially increased end-user throughputs for applications like streaming, downloading and gaming. Fixed wireless access (FWA) is another early 5G use case that will bring high-speed fixed broadband to suburban and rural areas.

Beyond those two, there are the more future-oriented use cases, like the massive Internet of Things (mIoT) or applications that require extremely low latency (URLLC), such as remote surgeries, augmented reality (AR) and gaming. Tech companies that develop and market such offerings will heavily rely on the mobile operators they deem best suited to deliver their services to the end customer. While some operators have already begun to revamp themselves going into 5G, many are yet to embark on the transformation journey.

In our view, there are three primary areas in which operator transformation is in order:

Network architecture

Although some operators are already underway, going forward it will become crucial for most mobile operators to have software-defined, cloud-native, virtualised networks in place that will enable the delivery of applications closer to the end user, with shorter lead times and at lower costs. Automated network orchestration, aided by artificial intelligence (AI), will be necessary to simultaneously run the ever more complicated grids that will be needed to support the various 5G use cases. However, operators can find it challenging to implement these changes, due to deployment complexities and a perceived lack of technological maturity in the solutions.

Business models


With the advent of enterprise-orientated use cases such as mIoT and URLLC in 5G, the business-to-business (B2B) branch of operators' activities will grow in importance. Therefore, developing strong business relationships with service developers will become essential. To provide more value to enterprise clients, services that should be in the B2B portfolio include: client-server hosting in operators' own network edge facilities; providing orchestration for applications; and, potentially, offering dedicated network slices with guaranteed quality parameters.

Organisation and ways of working

It is not enough simply to put the most advanced network infrastructure in place – another crucial element is to modernise the sometimes decades-old IT stacks operators still use. Customer relationships are becoming digital and the backend systems have to be able to support that digitisation throughout the entire lifecycle.

It is even more important to rethink the internal ways of working within the organisation. Here, 'agile' has gained momentum across a variety of industries, including telecom. Briefly put, the term describes a framework to increase customer value, shorten time-to-market and improve budget efficiency. Mainly, though, agile is about a mindset that strives toward continuous learning and improvement rather than a set of tools to cut costs.

The future role of mobile network operators may be mostly that of connectivity providers, but you can still be great at that – or you can fail. Ultimately, to leverage the full potential of all 5G use cases, it will become imperative for mobile network operators to implement these three changes, and the difference between those that make it and those that don't will be their ability to do that.

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