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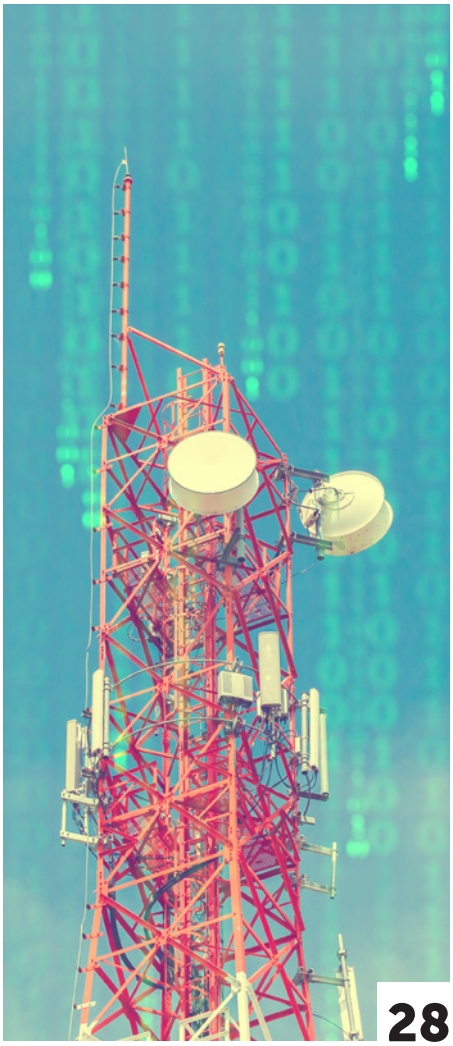
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Welcome

All to play for

The annual CTO of the Year roundtable and awards is always the highlight of my year, bringing together executives from across Europe, from the Group giants to their nimbler counterparts. Despite the differences in their businesses, from scale to purchasing power, research budgets to the size of their teams, their optimism and concerns about the industry share common ground.

There is an extensive write-up of the event in this special issue where the CTOs talked transformation, regulation, reinvention and digitisation. What it reveals is CTOs facing the squeeze from marketers and finance teams, with the former demanding dazzling performances to fuel price competitive deals and the latter reining in vital spending for technology projects. It's an impossible model and the challenge for CTOs is showing why this spending is essential to continue to support today's networks and also prepare for those of tomorrow.

One way of overcoming these dual challenges is using the softwarisation of networks – a subject of one of our features in this quarter's issue – to give developers "a playground to innovate" as one CTO put it and create new capabilities. Telenet CTO Michal Berger wryly noted that its innovation centre full of programmers produces 80 percent "garbage" but the remaining 20 percent is of high quality. This, and other areas, gives CTOs a degree of confidence about the years ahead. But they definitely could do with more cash.

The roundtable is the starter to the CTO of the Year's main event – the winners of the Group and Regional CTO of the Year awards. As you will see in the coming pages, both Vodafone Group CTO Johan Wibergh and Turkcell CTO Gediz Sezgin are incredibly focused on innovation and invention, with a realisation that telcos need to undergo digital transformation on many levels to adequately prepare for 5G.

In addition to our exploration of the latest developments in virtualisation, which span three operators' very different approaches to the technology, we also take a look at artificial intelligence. I've made a point to excise any references to 2001's HAL (aside from that one) as this is a technology that is increasingly being taken more seriously, whether through network planning or customer service. Evidently an area to watch.

Enjoy the issue. As ever, email me graeme.neill@mobileeurope.co.uk to give me your thoughts on the issue and the latest talking points affecting you in your work.

Enjoy the issue,
Graeme Neill

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The inside track on telecoms operators' technology strategies

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Digital Transformation Roundtable Invitation

THURSDAY 1 NOVEMBER
The Mercer
34 Threadneedle St
London EC2R 8AY
9am – 2pm

Spaces are allocated to relevant senior professionals from operators only, subject to approval. It is not available to vendors or solutions providers.

The discussion is followed by a three course networking lunch.

On Thursday 1st November, Mobile Europe & European Communications is hosting an invite-only roundtable for a select group of industry experts, titled: "Making sense of digital transformation: the journey to changing the face of telecoms."

Digital transformation is a crucial plank of any operator's shift to 5G. Spanning people, processes and technology, it is arguably the biggest shift operators have ever had to undergo.

This roundtable, Mobile Europe and European Communications' latest exploring this issue, will delve into how operators are designing their transformation journey and whether they are baking in simplification or viewing that as the destination. The shifting sands of the operator/vendor relationship will also be discussed, as well as the risks that could derail their strategy entirely.

A write up of the discussion will be published in a special report in the Q4 edition of Mobile Europe & European Communications magazine.

If you are interested in taking part, please email **emilys@sjpbusinessmedia.com**

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The inside track on telecoms operators' technology strategies

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Invitation to network operators

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We are delighted to be working with RedHat and Intel to deliver a series of thought-leadership roundtables in European cities throughout October 2018, to discuss opportunities and challenges of some of the fastest-growing areas for telco operators – Media Function Virtualization (MFV) and Network Function Virtualization (NFV):

Switched on:

how media function virtualisation is revolutionising TV and home entertainment

The software defined telco:

how to build the next generation network

Full details, dates and locations available at www.mobileeurope.co.uk/me-events

If you work for an operator and would like to take part, please apply via email to marcinp@sjpbusinessmedia.com with your preferred roundtable and location.

Each roundtable will take form of a discussion in a small group chaired by a senior member of our editorial team and hosted a premium city centre venue, followed by a sit-down, 3-course meal. It offers a valuable opportunity to discuss the future direction of the telco industry and how to best take advantage of upcoming developments.

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08 **GROUP CTO OF THE YEAR - JOHAN WIBERGH, VODAFONE GROUP**

Graeme Neill talks to Johan Wibergh about transforming telecoms internally and externally, and the promise and pitfalls of 5G

12 **REGIONAL CTO OF THE YEAR – GEDIZ SEZGIN, TURKCELL**

The Turkcell CTO talks to James Blackman about how to broaden an operator's tech strategy and be bullish about creating your own services

16 **CTO ROUNDTABLE**

CTOs from across Europe discuss achieving 5G's potential, navigating hype and fighting battles internally

VODAFONE GROUP CTO: why the most exciting time to work in telecoms is now

Johan Wibergh was the unanimous choice for the Group CTO of the Year award, leading Vodafone on an ongoing journey of transformation and innovation and ensuring it is best placed to make sure 5G thrives rather than fails. He talks to Graeme Neill

First of all I do work too much," Johan Wibergh laughs towards the end of our interview. Maybe so given his tech responsibility for some 500+ million customers, but then he lists his hobbies, spanning photography, food and fitness, coupled with several book recommendations (especially Matthew Walker's Why We Sleep, if you are in need of your next read). Even while the books are usually consumed in the audio format rather than paperback, it does beg the question of where he can fit in his Group CTO duties. It seems clear that he relishes the challenge, set hours of the day be damned.

Wibergh made the jump to Vodafone from Ericsson three years ago, where he had spent almost two decades. Why make that change after so long? Nice company car? Excellent salary? "I don't have a car," he laughs, perhaps partly answering the question. He adds: "I did 19 years at Ericsson and the last six and a half was as head of the networks business. It was more than 50 percent of the company's revenue. When you have done something for six and a half years, you start to think 'what's next?'. There wasn't probably a next step for me at Ericsson. I lived abroad twice and I wasn't done with that. [I thought] it would be nice to live abroad again."

Living abroad previously meant Brazil and the United States. This time around it's brought him to Marylebone, central London, where he walks to Vodafone's nearby offices in Paddington each day. He says: "I've been extremely pleased to move here. I really enjoy London. First of all I think it's a very beautiful city, the architecture is so nice. English people are extremely friendly and it's very easy...to like it."

It's not quite poacher turns gamekeeper but the shift from vendor to operator requires a change in mindset. Wibergh says both companies have more things in common than are different but says Vodafone's culture, led until this October by Vittorio Colao, is what stands out as a differentiator. He says: "There is a lot of speed of acting, understanding something then acting on it quickly. Another thing is a very good culture in Vodafone about really knowing your things. People are extremely knowledgeable and Vittorio has really trained up the organisation. If you go to Vittorio with something you know he will ask you five million questions. You better make sure you have the answers. Management is really on top of things and knows the details." For cynics perhaps viewing this as veiled criticism of his former employer, Wibergh is quick to stress that he was outlining the positives of his current one.

How this will change when Nick Read swaps his Chief Financial Officer role for Group CEO remains to be seen. Read's appointment is just one aspect of a Vodafone undergoing wider change. The operator has been working to transform itself and prepare for the years ahead. Staff and skills are central to this but the fight is more difficult than ever. For some time now, Vodafone hasn't just been competing with Deutsche Telekom, Orange and the like for fresh talent; it is fighting against the allure of Silicon Valley and the bright lights of digital giants or plucky upstarts. It and other telcos are also battling against the attraction of someone striking out on their own; working on their idea in a garage with the aim to become the next Facebook or Google.

> "There is a lot of speed of acting, understanding something then acting on it quickly

Vodafone is a 27 year old brand so how can it keep up? Wibergh admits it is a hard fight to employ the next generation but says it has recruited more than 600 people in IT and digital across Europe in the past three years. During the past six, 8,000 people have been hired to work in IT development, operations testing and the like.

Wibergh lays out Vodafone's advantages: "First of all I think we have a strong brand, which helps. The brand is well-known, quite modern, loaded with things like speed etc. We have a fairly exciting technology environment, we have a network that handles 500 million customers, mobile, fixed - we can wholesale to reach more than 100 million households with fixed broadband, we operate as our own in almost 40 million households...It's one of the biggest networks in the world in terms of traffic."

He adds: "We've an advanced technical environment so you can actually do quite a lot of things. We have very strong skills on the network side but a lot of the new things are happening in the digital space where you compete with whether they are going to go to Google or Facebook." He drily adds: "These guys have pretty strong brands also."

Change within

The external recruitment side of digital transformation is one thing; forcing internal change is another. The skillset of a 22 year old IT graduate will be very different to that of a Vodafone lifer at her desk for some 20 plus years. To overcome this, there's Vodafone University, a company-wide scheme to bring new proficiencies to staff.

Wibergh ultimately leads the technology strand of the courses, which have trained up more than 10,000 people during the past three years. He says: "We have to make sure that we balance between people coming in with new skills and working with people that maybe don't have those skillsets. There's a general philosophy that it's better to have our own employees to work on new exciting stuff."

He smiles: "You can use external people for the less exciting stuff." But he admits that is easier said than done; without at least training up staff in the "less interesting stuff" you are not going to have a well-rounded workforce. He says: "You need to prioritise your people and make sure they have the right competencies."

Digital transformation within an operator is the inevitable reaction to an industry in flux, shifting from LTE to 5G and anticipating and hoping to capitalise on the wave of the Internet of Things. Between his chairing of NGMN and Vodafone's multitude of trials and research across its markets, Wibergh has been among the most vocal about 5G's potential, and where it could fall apart.

Delivering his 5G elevator pitch, he splits it into short term and long term models. "In the coming two years, what will drive 5G deployment will be smartphones and a cheaper way of delivering data. It will be more driven by countries like China, who has a greater need to get more mobile capacity. 5G then becomes a more cost effective way of pushing it out."

He adds: "But if you take a step back and talk about what happened with 4G and 5G. 4G was really about enabling smartphones. 4G came just after the iPhone and Android phones and really made smartphones great. 5G, if you look at the coming 10 years you will say that this is when IoT really happened and

Ready player one: Vodafone's sponsorship of e-gaming is dovetailing into its 5G trials

really became big. That doesn't technically mean that everything needs to use 5G." He pauses. "That's a long elevator ride!"

Efficiency gains are something Wibergh has argued as an advantage of 5G for some time, but it's hardly the sexiest use case. The Vodafone Group CTO begs to differ: "As an industry we are not known for being capitally efficient. If you look at it we are not really earning enough to pay back the cost of capital...People go wrong and look at what you make based on EBITDA but EBITDA is before all of the investments, whether it's spectrum or equipment. If you look at profitability for operators, we are not doing that great."

It's fair to say that Wibergh is pessimistic about 5G's short term revenue potential, hence the focus on efficiency. The first wave of 5G phones will likely be the generation's most expensive, which is hardly encouraging for a mass market revenue success. He says: "There will be some [sales boost] but it's not proven. That's what the industry is debating. Some are bullish and say there will be a lot of revenue opportunities; some are bearish and say 'no, it will be hard'. We have certain ideas but it's not obvious that we are going to be able to generate a lot of revenue growth." He adds: "Short term, it's not a great business case financially but it's not an option not to be out there. Vodafone is a technology leader so it's not an option to be late in the market versus your competition."

Of course, 5G's consumer appeal is not just centred on smartphones, Given his background in IT, his memories of playing Pong during the 1970s, and Vodafone's recent sponsorship of e-gaming, I ask whether he has tried low-latency gaming through a 5G network, one of the most commonly cited short term use cases. "Not yet. Not yet," he deadpans. "No-one has offered it to me."

> "If you look at profitability for operators, we are not doing that great

Pocker-faced frivolity aside, he shares the opinion of BT/EE's Fotis Karonis, who told me last issue that 5G should be a platform for others to innovate on top of. Wibergh says: "For the various people and the applications, it is for them to innovate on that. We need to put in place something that makes it easy for other companies to innovate and produce some great things. It's not up to us as operators to have a great deal of expertise in every vertical like this. We need very much to put in place an easy infrastructure that other companies can innovate and create...new services."

When I suggest operators need to build in a 5G equivalent of SMS, very much an example of user generated telco innovation, he agrees and adds: "Having the SMS capability gave us a lot of applications that utilised that and drove traffic. When it comes to low latency, we are looking at MEC, mobile edge computing. It's enabling these things in the right way [that will] create new services."

This is where the longer-term gains come in with the Internet of Things. Wibergh presents it as a toolbox, with enterprises able to tap into the cellular LTE-M and NB-IoT technologies now and 5G for more data hungry or super dense requirements in the future. He works alongside the consumer and enterprise IoT teams, ensuring the operator's network is fit for purpose. The variety of opportunities within the Internet of Things also means the future is slightly hard to predict, argues Wibergh. "I'm not sure what will come first and in what order these things will come."

Breadth of testing

Use cases aside, Wibergh is non-committal on Vodafone's 5G launch. It could be 2020, could be sooner, could be later. But its research activity has demonstrated its desire not to be left behind. It has set up three testbeds, diplomatically using each of the three major vendors. Spain is home to its research with Huawei, Italy with Nokia and Germany with Ericsson. It used Mobile World Congress in Barcelona to demonstrate a 5G data call in partnership with the Chinese vendor. It plans to use its Milanese testbed to roll out 100 5G sites by the end of 2018. The work with universities taking part in the three testbeds also gives it a potential source of new graduates.

He is bone dry about how he has to balance this desire not to be left behind and the appetite to explore 5G's potential, with the challenge to sell this internally to those who will pay for it. He says: "On one side you say 'we are launching something, we are not going to have much revenue short term and it's only going to cost you, yes, we need to buy some spectrum so a few billion euros on that and we need to buy new equipment but we have to do it'. So we end up in a little bit of a debate on that," he says, impressively straight-faced.

"If you look at the investment over a time period, you will get cost savings on the data and that's why you need to think about it. On

the other hand, we have been very clear to the market that what we are doing with these things fits within our regular capex budget."

Like most western European operators, he looks to China as the dream, "where spectrum costs basically nothing", as he puts it. However, this is tempered with his view that 5G is effectively an "add-on" to LTE, meaning Vodafone can use existing sites and undergo a more gradual build out. He adds: "It is correct that 5G will use high frequency spectrum, which will go shorter distances than others. But since we used beamforming, that makes the signal go longer so the grid that we have that is built for 1800MHz sites fits nicely for 5G."

He says 5G's implementation should be easier than 3G, at least on the technology side if not necessarily the business side. He says: "As a decent add-on to a 4G network it gets a little bit easier than to put in 3G. 3G was very difficult because the technology was much more immature. The products were bad, worse quality and there was a lot of software quality problems when it came to 3G. The reason was there was so much functionality on the 3G products and the quality of the software was not good enough.

"The industry learned so when we did 4G, at least what I remember from what Ericsson did, we reduced the functionality to the killer functionality of quality. The need to improve quality was really high and it was really high on the products. They performed really well so it was a great customer experience. We hope the same thing will happen with 5G. It's important to have a high quality performance rather than a bunch of different features."

Reinvention

Preparing for 5G has also meant Vodafone reinventing its network. Legacy is being stripped out – "we have plenty of legacy," he says with some understatement. It's never a straight swap of old for new because "we have to balance between what the economic lifecycle is and what's the stability of the new products versus the legacy products". Nevertheless, 3G will be switched off first in the Netherlands in 2020, followed by other markets. 2G will follow around 2025, with a small chunk kept for M2M and roaming.

Then there's OCEAN, Vodafone's attempt to stitch virtualisation and cloud technologies into its network. It was launched two years ago, beginning with the shift of its voice and network core across the Group to virtualised architecture. This was followed late last year by implementing a cloud native container-based software environment, as well as further exploration of automation.

Compared to its 5G work, Vodafone has largely kept progress of OCEAN under wraps. In a way, it has been subsumed by something much larger as Vodafone began exploring how cloudification could transform and introduce more consistency and automation into its network, IT and enterprise services.

Wibergh describes automation as central to the operator's digital transformation, which explains why it joined ONAP last year to collaborate further within this space. The Linux Foundation-led project is aiming to build an open-source neutral platform for network, infrastructure and service automation. Its membership of more than 50 telcos accounts for more than 60 percent of the world's mobile subscribers.

Momentum is growing after the completion of ONAP's first project last year. In Vodafone's view, ONAP represents an opportunity to move beyond a proprietary virtualisation model, which in effect OCEAN was. How confident is Wibergh that it will succeed? He says: "From my viewpoint what's most important is that we get one framework...my top priority is to have one set of standards around this. Priority number two is one set of standards. Priority three; one set of standards. I would compromise anything to get that in place. I'm extremely supportive of any initiatives that can achieve one set of standards.

"There's a lot of momentum around ONAP. I hope that will succeed and I don't mind us stopping doing things if it means I can get one set of standards established in the world. All this work is hard to get people to agree to." As any telco working on any standards project will testify.

Wibergh says ONAP's original architecture was aimed at one big operator in one country; something that wouldn't work for Vodafone, "a small operator in many countries" as Wibergh puts it. But he is undeterred by the challenges facing the industry.

Between automation, transformation and the next generation of telecoms, plus his extra-curricular activities, one might think there aren't enough hours in the day for Wibergh to tackle these tasks. But he is undeterred about the challenges facing the industry. He says: "There's a lot of really exciting stuff happening in technology. We are lucky to live in this time period with so many things going on."

JUDGES' VERDICTS

CAROLINE GABRIEL
Co-founder and Research Director, Rethink Technology Research

Johan Wibergh has led a coordinated and visionary strategy to include new technologies in an increasingly heterogeneous network. He also recognises that technology upgrades are not enough on their own, and the Digital Vodafone program aims to leverage the improved networks to support greatly enhanced customer experience.

The judges were also impressed by Wibergh's high level of public profile, including his chairmanship of the NGMN Alliance. These activities ensure that Vodafone is represented in many important initiatives, and which contribute to the global progress towards next generation platforms.

KESTER MANN
Principal Analyst, CCS Insight

Johan was the stand-out candidate for the Group award having overseen impressive improvements to both Vodafone's existing networks and the development of a range of new technologies. His efforts were illustrated by improving network reliability metrics and good gains in Net Promoter Score.

We were particularly impressed by the consistent progress made across Vodafone's broad European footprint, which includes many markets exhibiting vastly different characteristics. The company's efforts in NB-IoT stood out as Johan oversaw both the development and launch of this new technology.

Turkcell CTO: "We want to change the destiny of the telecoms industry"

Turkcell has a singular vision for digital transformation, which has seen it outrun OTTs in its home market. Gediz Sezgin, the Turkish operator's CTO and the industry's newly-crowned Regional CTO of the Year, tells James Blackman about its mission to change telecoms

"Our target is not just the Turkish diaspora, or the wider Middle East. We are targeting the whole world," comments Gediz Sezgin, Senior VP of Network Technology at Turkcell.

A modest start but it is a mark of the Turkish operator's confidence in its own digital transformation that Sezgin is just about the only tech chief at this magazine's CTO of the Year event in London (see page 16) to present authentic solutions to the industry's grandest challenges.

How can operators compete with the over-the-top providers with fewer physical assets and freer business models? It is a question that goes round and round the table in London, until it falls to Sezgin. "We do the same as them," he shoots backs. "But we do it with our own capabilities."

It was the same at Mobile World Congress in Barcelona in February, and any number of trade shows in between, where Sezgin's boss, Turkcell chief Kaan Terzioglu, has cut a singularly assured figure with a David-and-Goliath tale about Turkcell taking on the 'internet giants', and winning.

In an industry filled with uncertainty about its role in the digital world, Turkcell talks like a

leader with a blueprint for digital reinvention. "Our ambition for global growth is driven by our digital services and our operational models," comments Sezgin after the London session.

Sezgin, awarded Regional CTO of the Year at the Mobile Europe and European Communications event, is responsible for designing the technological foundation for Turkcell's new services push. It has been a heavy workload, he notes, weighed down by the rapid rollout of a nationwide 4.5G radio network, which has included two-carrier aggregation, 4x4 MIMO and 256 QAM technologies from the start.

Alongside this, Sezgin has devised twin NB-IoT and LTE-M capabilities, an upgraded 10G optical transport network, and faster fibre-to-the-home (FTTH). He has also layered in a flexible screen of virtualised and self-organising functions over the top. All his work has been geared towards a single goal: to remake Turkcell as a 'digital services provider'.

The arrival of 5G will consolidate its position, he says, by multiplying out both the user's experience and the network's capabilities. "Speed will generate data, and people and things will interact more. There will be vast opportunities for operators. All the tools needed to process data, and all the experiences created as a result, will happen at very high speeds," he says.

Network service

Sezgin started at Turkcell a year after its foundation in 1995, as one of the company's first network engineers. At the time, he had just completed military service, after an education in engineering at Istanbul Technical University, and a first job at the Turkish branch of equipment vendor Alcatel.

Following a variety of senior roles in information and communication technologies, he was appointed Senior Vice President of Network Technologies in 2015, just as Turkcell was setting a new course. He has witnessed its development over two decades, and taken a closer role in its strategy. "It makes me proud," he says, looking back.

The single project that satisfied him the most is the company's work on 4.5G, in late 2015 and early 2016, which kicked off the company's technology revolution. "It is an exceptional source of pride," he says. Turkcell was the first operator anywhere to launch a three-carrier 3G UMTS service, with download speeds of 63MBps; it wanted the same advantage in the 4G era.

"So we built a future-proofed network infrastructure," says Sezgin. It acquired the largest holding from the 2015 spectrum auction in Turkey. It now has 234MHz of spectrum across multiple bands, both paired and unpaired spectrum for frequency division duplex (FDD) and time division duplex (TDD). It is the largest FDD spectrum owner in Europe.

"We had only a very short period to launch it following the tender. We used the time well," he says. It invested in the latest capacity optimisation, higher order modulation and carrier aggregation techniques as standard. Its teams covered 790,000 square kilometres of Turkish countryside in the rollout, including hard terrains and rough climates. In line with the country's 'universal service' law, it has sought to connect outlying regions, rolling out 4.5G services to 1,799 villages, where it already provides 2G coverage but skipped 3G altogether.

> "Technology moves fast and mobile technologies occupy a special space

"Having captured the leadership, we have only strengthened our position since," says Sezgin. Turkcell has achieved 90 percent population coverage, is one of just seven networks to achieve 1GBps speeds, according to the Global Mobile Suppliers Association, and was the second operator after Telstra to hit 1.2GBps.

In general, its baseline of broadband connectivity is bouncier in every way. Following tests of low-power wide-area (LPWA) technologies in early 2017, it flicked the switch on twin NB-IoT and LTE-M networks for Internet of Things services, notably for smart cities. It has LPWA pilots with water, electricity and gas companies, and partnerships for vehicle tracking and healthcare, as well as that strange and explicably popular IoT favourite, bee-keeping.

Sezgin's team has enabled "end-to-end" redundancy in its optical transport network, he says, with sub-second convergence and seamless multi-protocol label switching. The undisputed king of fibre in its home market, Turkcell is offering multi-play over 10GBps FTTH services, with 3.1 million Turkish homes passed by the end of 2017.

Striking oil

It is a comprehensive scope of work, for sure. But the focus in the last 12 months, which Mobile Europe and European Communications recognised, has had rather less to do with radio and fibre data transport, and more to do with data storage. Operators must master every aspect of data handling, says Sezgin, if they are to re-emerge as digital providers.

"We have taken very important steps in our digital transformation over the last three years. The basis of it is data, which is like the oil of today. But producing data alone is not enough. What is important is to process it, keep it in our country, and ensure its security," he says.

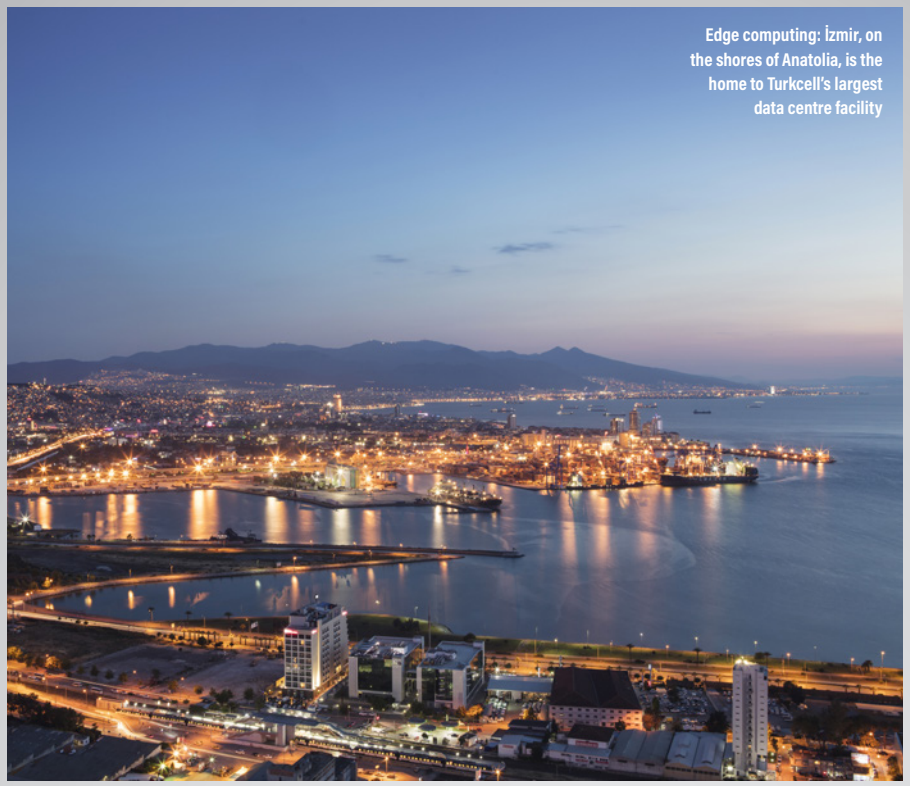
In line with the teachings of the new GDPR regulations in Europe, Turkcell has sought to keep its data close at hand. "Turkey's data should stay in Turkey," comments Sezgin. The company has spent TRY615 million (€97 million) on "next-generation data centres" since 2016; it opened its largest facility in İzmir, on the western shores of Anatolia, at the start of the summer.

"Turkcell has become the largest data centre and cloud services operator in the country, while cementing Turkey's goal to evolve into a global hub for data centres in the region," comments Sezgin. Its total spending will climb to TRY2 billion (€316.2 million) by the time it has completed data centres in Ankara and Corlu by the end of 2019.

Just as the demand being placed on its systems has become multi-faceted, its corresponding network infrastructure is suddenly labyrinthine. As per contemporary network operations, Turkcell is running a trio of networks across five different spectrum bands between 800MHz and 2.6GHz, with coverage supported by a combination of macro and small cells.

It has maintained KPIs for voice and data services, even as new network layers have been added during 2017. Nevertheless, its complexity requires simplification and Turkcell deployed a centralised SON platform to create order from the chaos, automating the most critical network functions. "We are moving towards our goal of becoming a digital operator. Automation is an instrument of our 5G vision, as well. The whole industry has to automate to manage network complexity," says Sezgin.

In behind, Turkcell has promised to virtualise 50 percent of its core network in its developing



Edge computing: İzmir, on the shores of Anatolia, is the home to Turkcell's largest data centre facility

cloud set-up within three years. It has the infrastructure in place to deliver, he reckons, with an infrastructure capacity of 200GBps already virtualised on its data service network, and a cloud capacity of up to two million subscribers on its voice service network.

In terms of network functions, it has a stated target to virtualise 75 percent by 2020. Again, it's on track, with six percent in the bag already, and a pathway to 18 percent by the year-end. It has established a centralised virtualisation infrastructure (NFVi), in the shape of its 'unified telco cloud,' and set about its Gi-LAN, EPC and IMS core, claiming "remarkable" gains in the process.

"We plan to virtualise all network components to have a more flexible architecture. Transformation from a customised, hardware oriented, vendor dependent structure to standardised, software oriented and vendor independent is one of the key means to make network components more flexible," states Sezgin.

Switching off Netflix and drowning out Spotify

Turkcell has a line, which it repeats on the conference circuit and in trade discussions, about filling customers' time with digital services. It talks about there being 1,440 minutes in a day, and taking a large number of them, each at a time. All of its infrastructure building and optimisation is geared towards this purpose.

Indeed, Turkcell's singular vision about digital transformation is arguably more clearly grasped than by any European operator brand. Digital services and solutions will play a "bigger part in customers' lives" than just phone calls and data sessions, and it wants part of the action.

> "The whole industry has to automate to manage network complexity

"The data revolution has created trillions dollars of value. But not for the telecoms companies carrying the data," Sezgin says. "In the last 10 years, OTT companies have used telecoms infrastructure to reach billions of users. Telcos have missed an opportunity. They have to change their minds to compete with the OTT providers." Emboldened by its advancing technology, Turkcell is one such operator. "We can't just act as a raw data handler," he says. "We have to transform to a processed data services provider - to compete, and be on the winning side."

The old operator community, which can appear encumbered by costly radio licences and expensive network infrastructure, have certain advantages in their relationship with data because of their history. They are more reliable and better trusted than internet companies, he suggests. "This will provide significant opportunities in the upcoming period."

But operators have to ready themselves first. "That's what we have done in the last three years. We transformed into the world's first real digital operator." He describes a company that has moved decisively from bundling airtime to selling over-the-top services. "For Turkcell, real convergence is not about fixed and mobile but about infrastructure and OTT services."

Turkcell has grown faster than any telecoms operator in Europe over the last two years, on the back of an expanding roster of digital services, which each rework familiar OTT templates for an expanding crowd. BiP is an instant messaging service like WhatsApp, fizy offers Spotify-like audio streaming, TV+ offers Netflix-style video streaming, and Yaani provides Turkish language search. It has introduced a personal cloud service called Lifebox, and a magazine syndication app called Dergilik.

Half of Turkcell's 37.6 million subscribers already use its digital services and some of them are outrunning their better-known reference models in the Turkish market. "We have left behind Spotify and Netflix," says Sezgin. There are cities in Anatolia, he says, where usage of BiP has caught up with WhatsApp.

Yaani was downloaded a million times in its first nine days, and five million times in eight months since last October. Lifebox is Turkey's most popular personal cloud service. More than five million magazines and newspapers are downloaded each month in Dergilik. Turkcell's Hello Hope app, which enables communication between Turks and Syrian refugees in the country, has been downloaded half a million times and was lauded by the GSMA for its humanitarian credentials.

Turkcell has developed application tracking functions in its network to enable enhanced charging models that "favour" its own digital services, "to increase the take up rate and usage, which in the end improves loyalty and decreases churn", as Sezgin puts it. In other words, it is slicing its 4.5G network up in order to enhance the experience with and drive

loyalty to its own digital services.

Sezgin explains: "Each individual service has different service level requirements in terms of throughput, delay, availability and so on. By designing a slicing structure - which is central to 5G, but which Turkcell has already implemented in basic form with 4.5G - each service is evaluated separately."

Technological destiny

This service-based slicing has allowed Turkcell to manage and streamline the performance of its own digital products, and boost its overall numbers. "2017 was a year in which we reached important milestones in our digital transformation," he says. These include a new digital brand, Lifecell Ventures, to disseminate Turkish content via operators around the globe.

"Turkcell wants to grow by making its services available globally. But not like these typical imperialistic digital companies. We want to build up a franchising model, where we gather our international affiliates under the roof of the Lifecell brand. We want to change the destiny of the telecoms industry," he explains.

Lifecell Ventures is offering revenue sharing, white labeling, and operator branded solutions. It has started talks with Russian internet company Mail.ru, which commands more screen time in Russia than any other site, to boost its digital solutions and international reach. "We're planning to exchange know-how and business experience to expand our global digital footprints."

Turkcell has seen a rapid return on its gamble for reinvention. Its annual revenues jumped 17.5 percent in the first quarter, to TRY4.8 billion (€757.3 million), with 536,000 net additions, including 155,000 on contracts. Three in five of its 35 million plus customers take three services, at three times the ARPU, including at least one from its digital portfolio.

The work of Sezgin's team in the background, in terms of radio upgrades, has enabled the company's rebirth, and set it on a pioneering course with 5G. Its current investments in NFV infrastructure have created reusable resources, he explains, which can be used for architectural changes such as control and user-plane separation of EPC nodes and edge computing.

"It has given us the edge to be one of the first operators in the world to implement latest features of 3GPP," comments Sezgin. Turkcell has put "a lot of attention on 5G readiness" with its 4.5G activity during the past two years. It has already trialed 5G test equipment in the 71.5-73.5 GHz range, hitting top speeds of 70GBps. "It is one of the highest data transmission speeds ever achieved with 5G," notes Sezgin.

The company has tested and developed Massive MIMO techniques in its live network, also geared towards high speeds in dense areas and will be the first in the region to test techniques for FDD Massive MIMO systems. "In terms of product readiness most of our network is ready for 5G Release 15," he says.

Now Release 15 is 'frozen', rubber-stamped for standardisation, Turkcell is to start testing 'non standalone' 5G with vendors, starting field trials immediately, and upgrading its core network to a fully SDN-enabled and NFV-based architecture in preparation for 'standalone' 5G.

In the end, digitalisation is the most important issue, says Sezgin, and for any Chief Technology Officer. "As the world's first digital operator, 5G means a lot for us - it's not just a new technology, but a major step for network digitalisation. We need to make sure to create an end to end virtual network, which is software based, rather than hardware oriented," he says.

There is work to do, however. "It can't be done, end to end for the whole network, within the first years. It is very important to have a clear roadmap to transform into a fully software-centric, virtual entity," he says.

This idea of the convergence of digital infrastructure and services must be put in process, by every function of the business. "We're not just focused on the technical side of the 5G; we're not only working as a technical team. We are united, with marketing, sales and digital services. We are creating a business oriented roadmap for 5G," he says.

We speak before the financial turmoil that gripped Turkey in the late summer. Regardless of the uncertain situation within the country, the mood within Turkcell is confident, reflecting the status of the "world's first digital operators". Sezgin says: "Turkcell stands out; it operates with the spirit of a leader; it also positions me as a leader in my role, which I am very proud of."

He rounds off: "Technology moves fast - what was a dream yesterday is a reality today. And mobile technologies, especially, occupy a special space. All the big stories revolve around data and intelligence. To be in the midst of this, to be working with these technologies, is very exciting to me."

JUDGES' VERDICTS

BENGT NORDSTROM
CEO, Northstream

Spearheaded by its CTO, Turkcell has become well known for its commitment to technology and innovations. It has a strong track record of pioneering new services such as HSPA+ and VoLTE.

2017 has been a year of many important accomplishments of Sezgin and his team. Among the most significant ones to mention are: delivery of 1GBps mobile broadband service, 90 percent population coverage of 4.5G services in Turkey and becoming first operator in the world to offer to support both NB-IoT and LTE-M across its entire network.

Gediz Sezgin is recognised as a strong influencer of the telecom industry both in Turkey and internationally. In addition to driving 5G development in his native Turkey he is also an executive member of GSMA Technology Group and NGMN board.

PAYAM TAAGHOL
CEO, MYCOM OSI

Under the leadership of Sezgin, Turkcell is setting new standards in Turkey, the region and indeed the world, achieving many world firsts.

The network innovation has been outstanding - the 4.5G network rollout reaching 90 percent coverage of the population in Turkey at a speed up to 1.2GBps commercial traffic, the launch of VoLTE, VoWifi and SMSoIP and the adoption of the Enhanced Voice Service technology and of the Self-Organising Network are just some of the success stories worth celebrating.

Sezgin's adoption of cutting edge technologies and innovative solutions has had a significant commercial impact on Turkcell, whilst the excellent performance and quality of the network and the expansion of the digital services offering have provided an impressive increase in customer satisfaction.

CTO of the Year Roundtable: the hype and the glory

Under the header Facing the Future, the mobile industry's leading CTOs assembled in London earlier this summer to define the challenges and opportunities they face with digital transformation and the rollout of 5G. James Blackman reports

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GRAEME NEILL, Executive Editor, Mobile Europe and European Communications
BENGT NORDSTROM, CEO, Northstream
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GEERT STANDAERT, CTO, Proximus
PAYAM TAAGHOL, CEO, MYCOM OSI
RADOSLAV ZLATKOV, CTO, Vivacom

Except for certain old habits, which are always the hardest to break, everything is in play and nothing is in the way. That is the conclusion of a wide-ranging discussion among leading technologists on the eve of Mobile Europe's 2018 CTO of the Year Awards in London about this industry's own digital transformation.

The session starts looking back, with a question about the most considerable challenge for operators in the last 12 months. Geert Standaert, CTO at Belgium's Proximus, and last year's Regional CTO of the Year, kicks things off with a view of the intensifying regulatory environment.

The weight of regulation, most recently made heavier by the introduction of the GDPR protection of consumer information, will continue to be a burden, he says. "We have a role to educate, so politicians and regulators understand how things work - so they understand the consequences of their decisions." The economic value of mobile broadband in Europe will be also stimulated or stymied by regulation. "However hard we work in Brussels, the wrong policies will put spokes in the wheels," he says.

His second point sets the tone for the rest of the session. The market's ambition is outrunning its means or, rather, its hype is out of control. "There is a difference between the marketing and the reality," he says, joking about remembering the days when straight-talking engineers set the agenda.

"Nowadays, you have to put a giant filter over the marketing. We all know the promise of NFV and SDN - around time-to-market, agility, and cost - but you sign up to these business cases with your blood, and your CFO wants to know if they don't deliver [the forecasted returns] immediately."

The effect is like a runaway train. Marginal gains are sold as rapid transformations by desperate vendors, he suggests. A dose of old fashioned realism is required. "That engineer-to-engineer debate is needed again," he says.

But it is not just the vendors; operators are shovelling in the coal as well. "Marketers are putting more gigabytes into the packages," he adds. The rest of the panel picks up the thread. "The marketing team is putting pressure on the networks," says Micha Berger, Chief Technology Officer at fellow Belgian operator Telenet. "We've been giving away more and more. It's like it's the only way we know how to sell - to play around with the bundles."

He reverts to a familiar industry plot-line. "The challenge is not to become a utility company. If you're investing more because usage is going up, and your ARPU is flat, even on a good day, then it's an impossible model."

Radoslav Zlatkov, CTO at Bulgaria's Vivacom, agrees. "The difference between the expectation and reality is getting wider and wider." But the pressure from within is not just from edgy marketing teams, but from impatient shareholders. "They measure us in months, quarters, years," he says.

In most cases, they have neither the time for digital transformation, nor the stomach for industrial revolution. "No one is willing to accept the transformation costs - which will probably come out as an effect after several years," says Zlatkov.

"My supervisory board wants to know why I'm burning their money. I explain it's crucial. In the end, they give me room to breathe because I am achieving short-term targets on a quarterly basis."

Working in a pressurised market like Bulgaria, "with probably the lowest ARPU in Europe", creates certain discipline. "We are very efficient; we are constantly optimising our bottom line." The trick with back-office transformation is to keep it out of sight of shareholders, it seems. "We have to hide strategic things in behind," confesses Zlatkov.

Urgency and the weight of history

This unhinged dynamic means practically every task in network operations soon becomes urgent. Thirty percent of the work in Zlatkov's department was classified as 'strategic' two years ago, he says; that figure is closer to 70 percent now. How can operators do so much more with so much less, just to maintain the status quo?

Standaert sums up the dilemma for engineering teams. "We are being asked to go further in our digital transformation - to deploy 5G, rollout fibre, and support 70 percent higher demand for data - with the same capital budget, and targets to bring costs down," he explains. "Even if we take a filtered view of the next 10 years - and I don't mean the [inflated] Ericsson and Cisco view - then the challenge is enormous. We have to find new ways."

> "The difference between the expectation and reality is getting wider and wider

Which poses the question again about 'facing the future', and what operators should do to catch a sail on the rising digital swell, which is about to pull everything from its mooring. Berger at Telenet reckons operators should put urgent focus on software innovation, and follow the course of younger internet companies.

"We should change our industry by creating capabilities we haven't had before. We have to start by building strong networks. That is the foundation. We have to be smart in the infrastructure we put in the air, in the ground, in data centres. But we have to put more into software and innovation to build new products," he says.

"We should be doing this within network operations, and not just waiting for vendors and marketers to come up with ideas. We are used to deploying boxes in fields. We need to let software engineers loose in this environment, to give them a playground in which to innovate. We should have innovation centres, and challenge each other."

Telenet opened an innovation centre in Brussels late last year, he notes, and staffed it with graduate programmers. "We have brought students in, and there are great things coming out of it. Yes, 80 percent ends up in the garbage, but 20 percent is really good," he says.

Almost as an aside, he suggests over-familiarity in the telecoms market has bred complacency. The industry needs to diversify; new blood brings new ideas. "Perhaps the fact we see so much of each other is not always a good thing. As an industry, we need to bring new people in."

The sentiment chimes with the rest of the panel, which collectively describes the telecoms market as rather long in the tooth. "There is a serious point in there, that we are 20 years older than the industries we compete with," remarks Andy MacLeod, former Chief Technology Officer at Vodafone. "When Vodafone started, the jobs were doing this," he says, pointing upwards. Not anymore, he says. "You can see the thought process: 'Is this where I'm going to be for 20 years?'"

The echo around the table confirms this as a hard truth. Bengt Nordström, CEO at Northstream, and a judge for CTO of the Year, talks about redundancy programmes within operators, and the challenge for veterans of the industry to change horses. "There's not that many places to find a new job, so you better stick with what you know," he says. "It makes us protective of change. In a growing job market, it would be different, because you'd happily explore new things."

The answer is to "embrace diversity into the equation", comments Fotis Karonis, MD for Mobile and Voice Convergence at BT/EE. "Different skills and cultures will challenge a company, and move it forward. The inclination is to hire people that reflect your own world view. But change can't be achieved by sticking with the same mindset."

That world view, informed by legacy and experience, is an issue for telecoms. What would be required for the industry to embrace failure as a means to learning, as Berger suggests with his 20/80 ratio for grassroots innovation? The industry is struggling to reconcile its past with its future, and to find a course between, away from the siren song of utility provision.

"Our biggest challenge is understanding what to do with digital," remarks MacLeod, at once drawing a distinction with the age-old battle to market airtime. "Because that's us trying to move into this layer around us. That's what we have to wrap our heads around. The problem of unlimited data is a tactical one, but it's something we know. As an industry, I'm not sure we know how to do the digital piece nearly as well."

Handcuffed by hardware

Payam Taaghol, CEO at MYCOM OSI, provider of service assurance and analytics to network operators, and another judge for the awards, points to the different business models, contrasting paying local subscribers hooked on mobile services, with a global audience served by advertising and less critically dependent on their providers. How can their profits flow so easily, when this industry's are so becalmed, he wants to know. "We haven't figured out how to make money, and they have. What is the barrier?" The clue is in the name, he suggests, in the 'operation' of networks.

It is an explanation that works for Berger, who expands his earlier point about innovation. "We are bound to our infrastructure; those companies are only bound to their ideas. We should use our infrastructure to be the most efficient we can be, but we shouldn't be handcuffed to it. We should be able to innovate, not just in our home market, but in every market. Netflix is based in California, but it serves the whole world," he says. Physical infrastructure is this market's albatross, suggests Nordström. "The idea of building a Facebook for the UK is not going to fly. That's the limitation for operators. The question is how to compete when your competitors have a global market. Telefónica and Vodafone have 30 percent of their markets, but they can't scale as global businesses."

In the end, scale is more easily achieved over the top of the internet, observes MacLeod. "Those companies are all on-net, and most of us are off-net. More of the world is off-net for Vodafone than is on-net." He compares the internet experience offered by social media to the 'walled garden' environments first presented by mobile operators in the early days of 3G. "It is a model that works because you don't have to negotiate."

Across the table, Zlatkov agrees. "They are not regulated; we are. It is hard to fight with someone that is completely free. They also have different expectations. Their failure rates are much higher than ours. We cannot fail. If we failed once, it could bring down the entire business." However, he notes that that risk is not stopping the operator from a developing "cooperation" on small-scale engineering projects between Vivacom and its OTT partners in Bulgaria.

Taaghol says the gap between how much customers are willing to pay for OTT players and operator services is stark. "ADT charges me £35 per month for my alarm system, Spotify charges me £19 per month for music, and you all charge £25 for connectivity, anywhere in Europe. It is just too cheap. How can operators survive, always doing more for less?"

"You make your own Spotify," responds Gedin Sezgin, Chief Technology Officer at Turkcell. "You have the network, the customers, and other advantages as well. You know, WhatsApp can make app-to-app calls, but, with a network, we can make app-to-network calls. It brings important differentiation."

Turkcell has modelled itself as the "first digital operator" with the launch of a roster of services straight out of the OTT playbook (see interview, page 12), which it is making available globally. "We changed our minds; we become a digital operator - the first in the world," explains Sezgin. "We started to develop our own digital applications."

It sounds simple. Is Turkey a special case? Could an operator in the UK, say, do that? "There aren't many like us," he admits. "There is a way to go, yet, but you have to start somewhere. Last year, our revenue growth was 23 percent - twice the rate of the second best growth of any operator in Europe."

"That's unfair. Just thanks to digital applications?" asks Berger. "Yes, most of it comes from there," Sezgin replies. "But we launched a 4.5G network two years ago, with 4x4 MIMO and carrier aggregation from launch, so our 4.5G users are recoding double the data usage of other customers."

Still, Turkcell's business model is fundamentally different to a lot of European operators; in many cases, telecoms operators are hobbled by their networks. Taaghol explains the dilemma: "The largest taxi company in the world, Uber, owns no taxis; the largest retail business in the world, Alibaba, owns no stock; the largest hotel chain in the world, Airbnb, owns no property," he remarks. "This industry owns telecoms networks, and says it is bound by them."

Zlatkov fires back, drawing on some of the Szegin's earlier comment about the market accentuating its differences. "Each has their advantages. As network operators, we can compete on a different level. We have our subscribers, our networks, our billing relationships. We are known; we visit our customers' premises. On top of all that, we are heavily regulated. The trust is with us."

Standaert at Proximus agrees. "We have networks and local presence." He cites also the market's engineering prowess, as an inherent technical advantage, embodied by the CTO-grade knowhow around the table. "We take our expertise for granted. We can all programme our smart homes. That's not straightforward for everyone. There must be opportunity in that."

He has an instructive tale about frustrated global scale. Proximus has created a mobility platform that combines data from mobile networks and navigation systems to offer cities a solution to congestion. The challenge is operators require a local presence to trade in a familiar manner with cities. "Scaling a platform is not easy; it comes with a lot of hurdles," he explains.

> "Different skills and cultures will challenge a company, and move it forward

At the same time, such scale is attainable, he suggests, pointing to the example of Proximus subsidiary BICS, wholesaling carriers' services in international markets. "It started in Brussels, and is now in California and Asia, and is number three in the world. Things that can be done; it's just hard work."

Collaboration affords greater opportunities, especially for tier-two brands locked in single markets. Proximus jostles with Orange Group, Telenet, and Liberty in Belgium. "I am a small operator, a small guy; thank god Luxembourg is there," Standaert jokes. "Smaller operators should come together, and cross their engineering, and find ways to scale."

Revisiting collaboration

MacLeod shakes his head and reflects on the idea of inter-operator collaboration as a cure-all for cheaper infrastructure and fiercer innovation. "This industry, or this layer of it, has created a lot of what's good about telecoms by cooperating. But that has hardly happened in the last 10 years," he comments.

"We are quite focused on the closer nature of competition with each other - and between our layer and other layers of the industry. You could argue we don't take a big enough strategic perspective. But that's what happens when you have a fairly robust industry; it tends to get introspective."

Nordström rejoins; the work to standardise GSM services a generation ago was collaborative and definitive for the market. "We achieved a scale we never had before. This industry doesn't collaborate like that anymore. Everyone talks about it, but no one does it," he says. "The GSMA is designed for collaboration," offers MacLeod. "That's more an event organisation than a collaboration," Nordström shoots back.

There is a 'chicken-and-egg' dynamic with future networks and services, reckons Sezgin. In terms of industry collaboration, the first task is to thrash out 5G use cases, he suggests. "Sharing is important; it helps in ways. But 5G is not like previous technologies. We need the use cases to justify the investment. We should work together to create the use cases, and then we can invest."

Vivacom in Bulgaria sees things rather differently. "If we just wait for 5G to help us, we will remain as pipes. We need to have examples - to have a selling point," says Zlatkov. It sounds like the same argument, to identify use cases first, but he goes further. Network operators should develop industrial propositions in collaboration with third parties, which can be further iterated in live settings with trusted customers, before their wider commercialisation. Operators must call the tune with 5G, and dictate the pace of innovation, he says; if they fail to orchestrate around their own radio play, it will be rendered as a baseline for others. Zlatkov says: "If we just wait for 5G, someone will come to us and say, hey guys, let's use your 5G network. We will miss the momentum."

5G presents the telecoms industry a chance to reinvent itself for a transformative digital age, Karonis agrees. "It opens a new chapter. We can be over-the-top of the over-the-tops, and squeeze them. There is lots of optimism. We just have to revitalise the business model," he says. More than this, it presents a unique opportunity for network engineers to write the future themselves, suggests Zlatkov. "The new sales forces will come out from our part of the industry, because we understand the technology. It's just one logical step for us."

> "If we just wait for 5G, we will miss the momentum

But are we not in danger of mixing hype and reality, again? Karonis suggests the reality is 5G technologies will provide the capacity to serve the consumer market's spiralling demand for digital services. "5G provides a quick response to that," he says. Standaert echoes this. "The first use case for 5G will be about dealing with demand. The sexy stuff around latency and IoT, which you can't do today already with NB-IoT and LoRa, will come later," he says.

But the hype, mostly around enterprise services, is just as real, Karonis says. Society will be digitised and transformed with high-capacity, low-latency 5G impacting everything from industrial practices to city operations, to transport systems. "We start with the consumer side, but the big opportunity with 5G is in the enterprise space. That's where the revolution is," he says.

Across the table, MacLeod chimes in. "For people-to-people communications, 5G is an evolution of what we already have. For machine-to-machine communications, it is more revolutionary," he says, acknowledging also that the IoT space is already developing around a number of LTE spin-offs and low-power equivalents.

He makes the point that 5G techniques like network slicing will allow operators to serve enterprise use cases in new ways. "We have a one-size-fits-all approach with the consumer sector. It's not the way to go with enterprises, which are more fragmented. We have to be more granular," he says.

The advancing role of data analytics and

artificial intelligence, gaining momentum with the introduction of 5G networks, will enable almost defect-free networks, he observes, which will make the case for mobile connectivity in a myriad of critical enterprise functions. "Having machine learning so you can know about incidents is a super important science," he adds. "By doing that you become increasingly relevant in time critical functions, so there is a lot of space beyond consumer to improve every industry."

Preparing for take off

But contemporary digital communications rely on complex heterogeneous networks, which are impossible to build and manage alone, observes Karonis. The time for talking is done. "It is increasingly evident you can't do it all by yourself. You need to leverage your strengths," he says.

Karonis was director of IT at Athens International Airport in a previous life; mobile networks should be airports, he says - market-stations for transport and trade, pioneering new digital exploration and enterprise. "This industry is 30 years behind," he says. "Airports are major hubs and market places. That is something we're just starting in this industry. By having a strong brand, you can have your own content, and also attract the likes of Netflix and build the market around [it] to be more relevant in areas you are not used to being in."

Models for sharing everything from transmission technology to energy consumption are increasingly relevant. Karonis references EE's deal with UK rival Three to share LTE infrastructure, signed way back in 2013. "Finding common ground between us is so important," he says. Bryn Jones, Three's former Chief Technology Officer [see page 34], comments: "In UK, we're in a slightly fortunate position with the elements of site sharing we have. In Europe and other countries, there will need to be more sharing."

But for network building, the telecoms industry has to get closer to governments and landlords, as well. "5G requires more fibre and more cell sites. If governments want digital economies, then it is no good for multiple operators to do the same thing, at prohibitive cost. It is not going to work," he explains.

Indeed, incoming 5G technologies make infrastructure sharing imperative if operators are to build networks efficiently, and find room to innovate over the top. The problem is letting go of old working habits, which have underpinned several generations of radio technology. "We want to live in the old world and move to the new one at the same time," comments Berger.

Conservatism is no good, when there is so much is to play for. No one at the table deviates from the line about network sharing. "It is not logical to build two 5G networks in the same country. Because this competition over the best coverage is over. That game has gone," says Berger.

"If we were smart, we would spend less; we wouldn't make the vendors richer. We would share our networks, reduce our investments, and free up money for innovation. There's lots we can do; we have lots of talented people. But at the moment, everything we have goes on infrastructure."

There's the answer; what's stopping you? "Nothing is stopping us. We are stopping ourselves," says Berger. "As an industry, we are not used to sharing. That approach has served us well until now. But the game has changed. If we shared more, we would gain more."

MYCOM OSI: Ringing the changes in OSS for autonomous networks

This year has been proving a busy one for MYCOM OSI, as the global CSP community wakes up to the instrumental role cloud-based service quality assurance can play in realising autonomic networks.

The more ambitious CSPs' plans, the more critical it is that they can support the QoE with a light and eventually no operational touch – tracking everything in one place, and leaning on the latest technology to enable predictive analytics, automation and self-learning.

In this exclusive interview with Mobile Europe and European Communications, Payam Taaghol, MYCOM OSI's CEO, sets out his vision and describes the transformations his company has already made possible.

MYCOM OSI CEO Payam Taaghol

Mobile Europe and European Communications: MYCOM OSI has made the headlines on numerous occasions so far this year, suggesting that the company is really riding a wave at the moment. What's going on?

Payam Taaghol: I think it's exactly that – we have created something the market is really craving now. We have a solution which is genuinely disrupting the market - at a time when operators absolutely need to rethink and behave differently in the way they manage and provide assurance around their network and services.

As CSPs embrace digital transformation and connectivity becomes faster and more ubiquitous, the emphasis is shifting to innovative on-demand, real-time consumer and enterprise digital service opportunities. This demands new ways of launching, monitoring, managing and ensuring the quality and performance of services as well as the networks they run on – aided wherever possible by smart technology. We play directly to that need with an intelligent, integrated solution for letting operators visualise, automate and optimise digital experiences, as well as service and network quality. We cater for this, end-to-end, across hybrid physical and virtual telco and IT networks, providing integrated, real-time assurance with closed-loop automation and analytics driven by artificial intelligence/machine learning.

Our solution and approach are different to anything that has gone before. We manage everything via a single, integrated platform in the cloud, and provide our solution via a software-as-a-service (SaaS) subscription model, in keeping with the way organisations are increasingly accessing software. It all adds up to a solution that's highly scalable, can harness the latest technologies, including smart analytics and self-management techniques, and which increases the quality of service (and SLA options) for customers - while simultaneously reducing complexity and cost for service providers.

This approach has now attracted a number of prestigious industry awards, hasn't it?

Yes, and we're particularly proud because most of this momentum is being driven by our customers – CSPs that recognise the importance of what we're doing and what we offer them. They have been the ones nominating and supporting us, which is the best possible confirmation that what we're doing really matters.

What awards have you won so far this year?

We're proud to say there have been several. We won a significant TM Forum award for operational transformation and agility, for championing a solution built on a modern architecture that's designed specifically to be delivered via a cloud environment. It is genuinely transformational for our customers, because it enables the automation of very complex operational processes, taking CSPs closer to being able to realise dark,

zero-touch and even no-NOC networks. We've also been recognised as a 'Top 10 company to watch' by Stratecast|Frost & Sullivan, and been covered by Ovum's On the Radar.

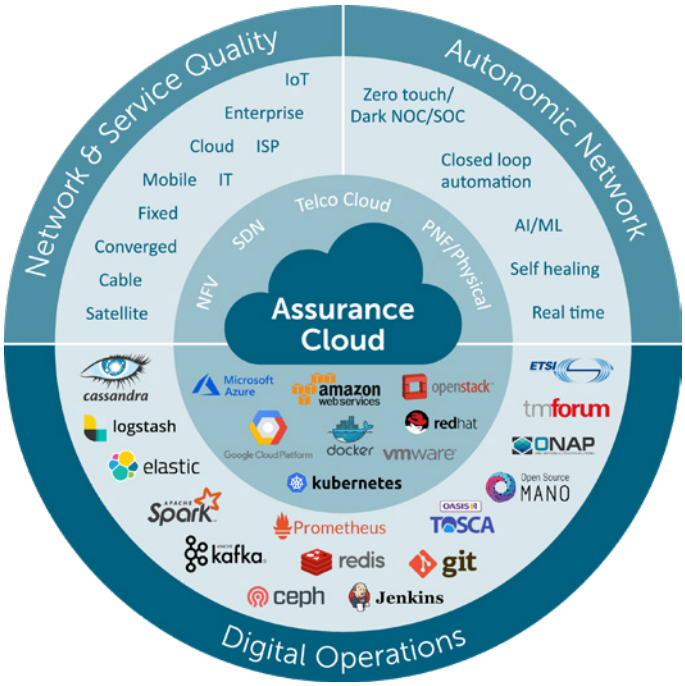
What are you offering that is so different and disruptive?

Just as Salesforce disrupted sales management and CRM by moving everything into the cloud and making it accessible through a different purchasing model (SaaS), we offer an 'assurance cloud' for CSPs harnessing the same delivery model. In doing this we have overturned 30+ years of traditional cumbersome approaches to OSS and reinvented the service assurance market based on cloud benefits, technologies and commercial models. Nobody else has done this with the real, large-scale commercial project success that we have.

The fact that our solution is cloud native (i.e. has been designed to be run in the cloud) means it is infrastructure agnostic. This means it can be run in any telco-optimised cloud environment, in addition to traditional data centres and bare metal if necessary, offering the ability to reduce deployment and operations efforts and cost associated with assurance systems by 75 percent versus traditional OSS approaches. It also means massively reduced headaches in infrastructure acquisition and management by CSPs, which can be a major reason for project delays. Our subscription business model, meanwhile, accelerates deployment and helps map assurance costs better to business cases - especially with fail-fast CSP initiatives. It also provides much more flexibility for CSPs' Capex and Opex needs and challenges.

Importantly, we approach services assurance and quality holistically, which is critical in supporting CSPs' ambitions for new digital services and customer experiences. Specifically, we have collapsed the traditional silos of service assurance – i.e. performance management, fault management and service management – into a single integrated, real-time system enhanced by automation and analytics. Because of all this, our proposition is something much bigger and more transformational to CSPs. As they begin to roll out increasingly creative services, from IPTV to innovative new digital experiences for enterprises, including those based on 5G and IoT, our complete, integrated 'telco cloud' solution can look after every aspect of quality assurance – not just the performance of the underlying network, but also how that service is experienced by every customer.

The need for automation has never been greater in our industry. We offer a unique catalogue of highly specialised application- and outcome-based automation solutions, also via subscription, that harness our core quality assurance functionality to monitor, detect, analyse, make recommendations and fully self-heal and self-optimise CSPs networks end-to-end. The potential use cases we can support span a range of enterprise and consumer, fixed and mobile, physical and virtual, network domains and native and OTT digital services. What we have is truly differentiated and covers all technologies, vendors and network



domains. It is the brain that would leverage the orchestrators based on changing network conditions to dynamically control the user experience in real time.

When it comes to harnessing AI and machine learning to optimise service quality, we've been careful to ensure that all network and service automation is fully programmable and can be open- or closed-loop. This means CSPs retain control and can embed their own expertise. Automated processes are fully auditable too, which is very important.

Tell us about some of the CSPs already using your cloud-based solutions.

One of our big success stories is with Three UK, which is deploying the world's first telco cloud. It's a hugely exciting project. The company carries something like one third of the UK's data traffic and has targets for doubling business, increasing network speed eightfold, reducing IT spend, becoming the UK's number one brand and being first to market with digital services provisioned and assured via the telco cloud. To get to this point, they needed a full network transformation, which is where we came in.

> "The need for automation has never been greater in our industry

The deployment for Three UK marks the first time an operator has implemented a fully integrated, cloud-native core network. Our assurance cloud will manage Three UK's entire IT and telco network - from RAN to core, both on the physical and virtualised parts of the network, all in one place, viewable with a single line of sight. This has never been done before.

We've also deployed our cloud-based assurance platform in one of the top five largest CSPs in the world – a company with more than 300 million subscribers. Beyond the sheer scale of operations and the two hundred billion data records per hour we are crunching, an interesting point is that the CSP has set out to automate 95 percent of its network and service quality management with our platform and catalogue of solutions.

What does the future hold? As 5G beds in and OTT services using IoT become prevalent, where does OSS need to head next to support all of this and give users the experience they expect?

We talk about the complete transformation of the service assurance function from a tactical solution to a 'digital brain' that helps make the network of the future autonomic – i.e. automated and driven by AI. This is about taking experience, performance and quality indicators across all networks, services, customers and devices, IoT or subscriber, and continuously monitoring them in real time. It's about detecting or predicting degradations or anomalies; figuring out root causes or optimisation recommendations; and then orchestrating changes in the network and services as needed. And all of this is powered by closed-loop automation, and driven by self-learning. Once you can get to this point, then service and quality assurance can provide additional strategic value - taking the wealth of assurance data and intelligence and using this to automatically govern networks.

> "Operators need to rethink and behave differently in the way they manage and provide assurance

All of these capabilities will soar up the agenda with 5G and IoT, where new use cases require even higher focus on QoE, QoS and guaranteeing SLAs - for example driverless vehicles, remote robotic control and other latency-critical or mission-critical applications. One of 5G's killer benefits is to allow QoS to be differentiated through network slicing, so rather than having one network-wide QoS and the pressure for CSPs to expensively over-provision for peak scenarios, they will have the option to differentiate service levels by customer, application, use case, location, time and so on. Each network slice, which is likely to be provisioned dynamically and on demand, will need to be quality assured in its own right, while at the same time all of the hundreds or thousands of slices will need to be quality assured as a whole. Significantly, our solution is deployed on the 5G test network at the University of Surrey's 5G Innovation Centre and engaged in several TM Forum Catalyst proof-of-concepts, to progress our developments on 5G assurance and network slicing for IoT applications.

AI/machine learning is a particularly fascinating area, specifically how this will be further embedded within assurance to reduce configuration and correlation rule-creation, and provide predictive and problem-solving capabilities that are too complex, too large in scale or too dynamic in speed for humans to comprehend and act on. Some of our customer proof-of-concepts in this area are yielding some very interesting results.

As operators increasingly acknowledge the need for digital transformation in the way they organise and manage their networks, in what continued and expanded ways will MYCOM OSI be able to help and support them?

In addition to providing a comprehensive, integrated approach to assurance, not to mention an end-to-end digital service quality management capability which supports network slicing, real-time service adjustments and tailored SLAs, we also offer a step-by-step transformation process to help CSPs migrate towards a more virtualised, digitally-innovative future. Recognising that it could take service providers up to 10 years to make the transition, we help them do this in a manageable and self-funding way through a series of tangible stages.

As the CSP gradually consolidates and simplifies its OSS and overall service assurance activities and associated IT systems, the payback from reduced costs and complexity help to drive the next stage of the transformation. And at each stage, we ensure that the technology being implemented is futureproof – so able to take CSPs forward to the next stage when they are ready. It's something we've been doing with a major service provider in the Middle East, where it has proved very successful in moving the company's ambitions forward.

As operators transform themselves into digital service providers, we're seeing a fundamental evolution in how they are architecting their whole business. From Telefónica to China Mobile, every major CSP now is looking to reorganise its existing assets (physical network, OSS/BSS, CRM and more) and newer capabilities (cloud, SDN/NFV, big data/analytics, IoT platform, autonomic service assurance, and so on) and offer them in the form of a layered as-a-service vertical digital platform, with differentiated services for various industry sectors. We are ideally positioned to help them with all of this.

Finally, do you have any thoughts about the way technology providers' relationships with CSPs will change in future?

Something that has emerged very strongly from this year's industry events has been the desire for a new relationship between CSPs and their suppliers. Instead of the traditional vendor-CSP relationship, which are driven by RFP procurement processes that go on for months or even years, CSPs are increasingly looking for a more partnership-based scenario, where both parties co-invest and collaborate in an agile way to drive meaningful innovation. Surprisingly this is very welcomed by a large community of progressive CSPs.

This might take the form of proof-of-concepts, or try-and-buy models to which both parties contribute with regular, inclusive reviews. And in fact this is something we've been doing for some time through our agile approach to solution development, where we seek customer input and conduct development reviews and demos every couple of weeks. This approach to software enhancement, coupled with our continuous integration and delivery platform, allows us to push innovations from our labs to the customer's production environment in a fast, low-cost and continuous manner. It's definitely the way forward in a dynamic, digital future.

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Three tales of network virtualisation

Telefónica, Orange and Velcom are at different stages on the journey to NFV. They talk to **Michelle Donegan** about progress and pitfalls

After several years of hype, expectations for network functions virtualisation (NFV) have predictably crashed down to reality. Service providers and vendors are realising that it will take longer than anticipated to transform physical network elements into virtual network functions (VNFs) running in the cloud. There's more realism about when they will see the promised benefits of cost savings, network flexibility and service agility.

"It was naïve to think that you could do something as big as moving to a cloud-based network in two or three years," says Caroline Chappell, Research Director at Analysys Mason. "It's a decade-long journey and the thing that differentiates the leading companies is that they're getting the fundamentals right."

Those fundamentals, she explains, are the necessary changes to operator culture, governance, organisation and processes. "There's a huge amount that needs to be done and it's not just a question of sticking a function into a virtualised server. That's the least of it."

Operators are not all progressing at the same pace and with the same vision, she says. For every noteworthy operator like Telefónica and AT&T, there are those who expected success quickly and easily then swiftly became disheartened when this didn't happen, she notes.

She describes three phases of network virtualisation. The first is simply putting VNFs on commodity-off-the-shelf servers and running them standalone, which is where roughly 80 percent of NFV deployments are today. Telefonica calls this "vertical virtualisation," and did this initially to race to market while also working on their holistic Unica platform strategy. However, Chappell says this is an ad-hoc approach. "All they've done is changed the box from a proprietary one to commodity hardware. And these virtual appliances will all be silos."

The second phase introduces orchestration and the ability to support multiple VNFs on the same platform, in other words unsiloing Phase One. "This is where the leading edge of the market is now," says Chappell.

The third phase is fully cloud native -"running an equivalent cloud for the network just as Google or Amazon would run," says Chappell. "We think this is going to underpin 5G networks. No operator is there yet, although AT&T announced that its telco cloud for 5G will be cloud-native and containerised – a very advanced cloud indeed."

As the following mini case studies show, European operators' experiences differ sharply.

> "The leading companies are getting the fundamentals right

Telefónica leads Euro pack

Telefónica stands out in Europe for network virtualisation with its bold, comprehensive Unica platform strategy. The operator describes it as one of the first industrial telco clouds. Its original goal was to have a distributed infrastructure platform to start deploying available network components, according to Aurelia Martínez, Network Virtualisation Manager of Telefónica Global Systems and Network. The platform needed to be able to host VNFs from different vendors, plus unified infrastructure management to support them regardless of where they are deployed.

The Spanish operator recently expanded the objectives to bring the infrastructure closer to users, via micro data centre and on-premise edge deployments, as well as achieve zero-touch orchestration.

At its recent Network Innovation Day, it said that the platform was deployed in four markets in 2017 and is being deployed to seven more in 2018. It comprises 21 data centres in 11 local domains and one global domain.

The aim is to have 20 percent of mobile user plane traffic and 50 percent of control plane traffic handled by VNFs, says Martínez. "We are focusing on virtualising the IMS and EPC, which are the most mature network components that exist in a virtualised environment."

The immaturity of technology has been one of the biggest challenges. "VNF vendors say that they are going towards virtualisation, but they are actually vertically virtualised deployments," she says in an echo of Chappell's Phase One. "You have to work hard with the vendor... to change their way of deploying VNFs."

More specifically, Martínez said one of the main problems Telefónica has encountered is with the OpenStack open source virtualisation platform, which has "great shortcomings in terms of supervision, operation and tools to install your software". These have to be improved for production deployments, she says, but "they are at a very early stage". This begs the unanswered question of why use it at all but for now it seems OpenStack is telcos' best option. Another challenge is that implementing VNFs from different vendors increases complexity, but a virtualised environment for a single VNF is "under control."

While Martínez acknowledged network virtualisation is not easy, Telefónica's commitment is unwavering. "Although our daily routine shows us how hard it is to overcome

Abstract thinking: virtualisation amounts to a fresh approach to telecoms

all the problems we face, we would not change our strategy because our objective is clear: we go towards a telco cloud that allows us to deploy and manage a virtualised end-to-end network," she says.

Her advice to other operators contemplating virtualisation strategies is to go big. "Have a global vision of end-to-end virtualisation without making islands. This implies a bigger effort but in the long run it is more effective."

Orange goes industrial

When Orange started network virtualisation, it had two sets of goals. In enterprise, the aim was to develop new services provisioned on-demand. In the residential market, the goal was agility and, secondarily, cost savings. These objectives remain the same today although the operator is now more cautious about the economics.

"The savings will take a long, long time, much longer than we expected," says Yves Bellego, Director of Technical and Network Strategy at Orange, adding that he does not expect them to materialise before five years.

The first new NFV-based enterprise service that the operator has launched is Easy Go Network, a Network-as-a-Service offering. It's available in at least 75 countries and allows companies to provision services, such as security, for branch offices and scale resources up or down via self-service web portals.

Orange is now entering what it calls the "industrial" phase, or "full virtualisation" as it defines its Infrastructure-as-a-Service project being rolled out in Spain. Previously, everything was provided by the same supplier with no real orchestration. This was how Orange's vIMS deployment went several years ago, according to Bellego.

Orange has now decided on architecture that comprises Red Hat's NFV infrastructure, Juniper's SDN controller, and hardware from Dell and Hewlett Packard Enterprise. The first virtualised elements on the new platform will be the mobile packet core, with vEPC functions supplied by Cisco and Ericsson.

Its biggest difficulties with network virtualisation have been dealing with hype, reviewing all internal processes to support virtualisation, and the immaturity of Open Network Automation Platform (ONAP) for orchestration.

"For quite some time, there was a huge gap between announcements from our suppliers and what was really available; so many announcements were more polluting than helping," says Bellego. "When we started the real discussions, their readiness was not as we expected. This is why we are only now deploying the industrial solution."

The next steps are to expand the deployment of the NFV system in Spain to other markets and to launch ONAP. Orange has bet a lot on ONAP to be its target orchestrator. It has not deployed the first release, but it is working to deploy the second or third. Bellego says "[it's] the OSS of the virtualised world".

Velcom gets ready for 5G

Velcom, A1 Group's Belarusian subsidiary, started its virtualisation journey to reduce operational costs and prepare for 5G. The work started in 2016, and in just nine months all the elements of the core network were virtualised, says Christian Laque, Senior Director of Technology. "This is an amazing task, and we managed the migration without any negative impact to customers," he says.

Laque says the key was to everyone on board with and trained on the new technology. "We didn't have one team working on the old system and another working on the new; everyone was on the journey to the new one," he says. That said, he admits he should have started educating staff earlier. "Each person had to learn the new system because our goal was to have nobody left in legacy."

He also says it was important to have close cooperation with suppliers. Velcom deployed hardware from HPE, the virtualisation layer is based on OpenStack, and ZTE supplied all the VNFs. Laque says that a single VNF supplier is what allowed the operator to deploy so rapidly. The A1 Group has adopted this same approach, Laque explains, and each market will have one supplier for the virtualised functions.

"With one supplier, you have easier integration and less headache with interoperability with others," he says. "And the cost factor is much lower from an operational perspective. You have one look and feel for the engineers," he says. "At the same time, we decided that all interfaces must be based on open standards, so we have the flexibility to exchange VNFs with another supplier." This switch is not on his roadmap for now, with 5G microservices and containers the next stops on Velcom's journey.

Three operators, three stories. As ever with virtualisation, the destination is easy. It's the journey that proves difficult.

Intelligent future: AI in telecoms

No telecoms announcement worth its salt goes without mentioning artificial intelligence at present. But how are operators actually using it? **Kate O'Flaherty** reports

Artificial intelligence comes in many guises. In telecoms, mobile operators are increasingly using the technology and its subset machine learning to improve efficiency internally, as well as externally in customer-facing operations.

With the ability to make smarter decisions, the technology is being applied to network deployments as part of the move to virtualisation. Operators are also harnessing AI in sales, marketing and customer service, where it helps reduce churn by targeting consumers with the right offering at the right time. Players in this area include AI enabled services such as Telefónica's Aura and Vodafone's TOBi, which are already starting to make an impact.

Momentum is growing yet operators are facing challenges as they begin to apply it. With new technology come the inevitable technical and cultural issues including a need for new skills and attitudes. But operators are also particularly well placed to take advantage of the large amounts of data that underpins AI and machine learning. "Telecoms data is incredibly rich; more so than other industries, because mobile operators have a lot of information about customers," says Nick Patience, Research Vice President, Software, 451 Research.

"The retention of existing customers is so important," adds Emma McGuigan, Group Technology Officer, Communications, Media and Technology, Accenture, adding this can be achieved by using AI to create a seamless experience.

Of all the operators, Telefónica's AI strategy is among the most advanced. It is using it within internal business management as well as across customer relations. Francisco Montalvo, Director of Fourth Platform at Telefónica, which handles its AI plans, says it will change the way the operator interacts with its customers.

Like all operators, Telefónica is undergoing a digital transformation. The firm, which describes itself as a platform company, wants to ensure a uniform approach across all its markets. As part of this, Telefónica is using AI for smart marketing to ensure each customer is offered the optimum product. This is in addition to harnessing it for optimisation across several areas. "We are investing billions in network, IT and service related systems," says Montalvo. "We need to make sure every euro we put in gets the best possible return."

According to Montalvo, AI also benefits network planning. The firm operates thousands of sites, which need to be physically visited each month. "If we can optimise the routes and identify the best sites to implement, it has a big impact on our business."

Improving customer solutions

Orange is another operator applying AI across multiple areas of the business. For example, Nicolas Demassieux, Senior VP Orange Labs Research, says the operator is using it to improve consumer solutions – such as its Djingo virtual assistant. The company is also harnessing AI to boost its own operations.

According to Demassieux, AI can be trained to understand how the network operates, improving security and saving energy. He explains: "We can use data to learn how the system behaves and monitor it, so it works better. We are using this already in research and sometimes in production."

Orange is also examining "a more powerful vision of cognitive metrics", says Demassieux. "For example, when building the 5G network, we use AI to predict the load per kilometre. If we look at how consumers are using video, it is possible to configure the load in real time on the network and prevent outages."

Customer facing operations are starting to benefit too. Doron Youngerwood, Product Marketing Manager, Big Data and Artificial Intelligence, Amdocs, cites the example of Vodafone UK, which uses AI to improve its customer service. Previously, it was struggling with a low net promoter score. The operator addressed this through its TOBi chatbot. "Using AI, they can guide the interaction, ensuring the customer is dealt with in the right way," Youngerwood says.

And behind the scenes, vendors are targeting operators with a number of products based on cognitive technology. Fernando Núñez Mendoza is CEO of fonYou, which builds bots to help operators sell products through omnichannel methods. South American operator Claro uses fonYou's AI to offer a personalised service to its 24 million subscribers.

When someone runs out of credit, machine learning algorithms conduct real-time analysis of the subscriber's purchase and payment history and offer a bespoke top-up if they are low risk. Mendoza says AI requires a cultural change among operators but he also concedes that firms need to cut through the "hype around AI and analytics".

Yet the technology has the potential to also be applied more broadly across the telecoms industry. For example, it is proving useful in wholesale carrier fraud prevention. Katia Gonzalez, Head of Fraud Operations at BICS, says AI is able to perform tasks too complex for humans to do in a traditional way.

It is with this in mind that BICS is currently performing trials focusing on gathering more data sources. The firm is already learning about the challenges, says Gonzalez: "When we talk about AI or machine learning, people tend to think it's all automated and that you just set it up, and it works. But you need lots of human intervention in the beginning. You need data scientists and in-depth analysis and knowledge from the business."

Of course, harnessing AI is particularly complex for BICS as a wholesale player. "There is a main difference between retail and wholesale: retailers know their customers and it's easy to spot something not 'normal' in behaviour. It is more difficult in wholesale when it comes to fraud," Gonzalez says.

> "In five years there will be no decision that will not be supported by AI

AI challenges

Operators are aware there's still a lot of learning to be done. Demassieux says: "Today, we have people manually optimising the network. If we replace this with automated methods using AI, we need to qualify the performance of the 'improvement'. He explains: "You need to understand that even if AI is statistically performing better, the mistakes it makes will be different, as it does not 'think' like us. So, you need to work out what the errors might be and put processes in place to account for this."

Maximising data can be a challenge, technically and culturally within the business, says Montalvo. "How do we make use of data in decisions? People have been making decisions based on instinct for years and now a machine is telling them that their chosen option is not the best one."

Silos between teams can also be an issue, according to David Wyatt, VP EMEA at data analytics firm Databricks. "To implement AI, multiple teams need to be involved. Data engineers cover the IT infrastructure, while data scientists create and iterate around the information. If those teams can't collaborate easily around a unified analytics strategy, they will not produce good results for the business."

More broadly there is an increasing need for skilled individuals working with AI technology, says Elena Fersman, Research Director, Machine Intelligence and Automation, Ericsson. Operators are tending to outsource for skills they don't have, while some are using in-house data scientists. Telefónica employs data scientists in each country and uses external companies for data engineering, says Montalvo. Meanwhile, according to Demassieux, Orange uses in-house expertise, and also works with partners including traditional vendors and start-ups to solve specific problems.

Today, AI is mainly used to automate processes, says Fersman. She says that in five years, the technology will be "even more efficient". Currently, the sophistication of solutions varies. However, driven by machine learning, products are improving all the time, 451's Patience says: "The beauty of machine learning is, it is driven by data: it's not fixed code," he says. "As the data and comments get richer and more varied, it learns, so in theory it should get better and better."

According to Patience, today's machine learning is very text based, but in the future, it will be able to analyse images. "For example, if you had a damaged phone, you could take a picture and image recognition would be able to see if it needs repairing, or if any other parts are broken."

Further still, AI will help to offer completely new operator business models, experts predict. Patience says the technology can be part of the ecosystem enabling smart cities, offering multiple opportunities for operators. "They could sell packages to governments. For example, if people are going to an event, location data from their phones might show what the traffic will be like." Mobile customer data could also be used to inform town planning, such as where to build an extra train line or add parking spaces.

As use cases continue to expand, the role of AI will increase across operators' businesses. "In five years, there will be no decision taken by Telefónica that will not be supported by AI," says Montalvo. It will be pervasive and cut through all areas of operators' businesses, says Accenture's McGuigan. "We will think more about how machine learning can be part of how the estate runs. There will be a shift from ticking a box on AI to it being ingrained in all processes."

News spotlight

Nokia outlines €3 per 5G handset patent rates

Nokia is aiming to net €3 per 5G New Radio smartphone after revealing its standard patent licensing rates

Jones leaves Three UK CTO role, with tech duties to be split

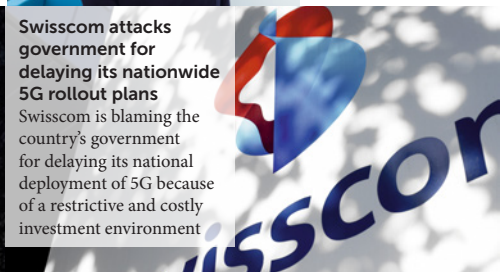
Three UK CTO Bryn Jones has left the operator, with his tech duties split to reflect the ongoing softwarisation of telecoms

BT, Facebook open door to start-ups in latest innovation contest

BT and Facebook are aiming to unlock fresh connectivity solutions for rural areas and self-healing networks after launching its latest start-up competition

Swisscom attacks government for delaying its nationwide 5G rollout plans

Swisscom is blaming the country's government for delaying its national deployment of 5G because of a restrictive and costly investment environment

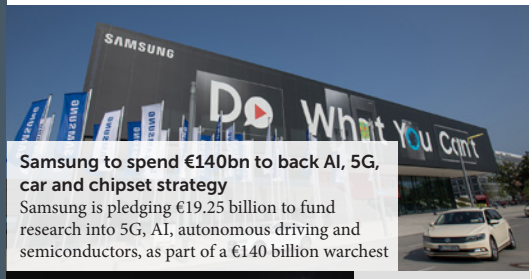


Com Hem brings 1.2GBps speeds to Sweden

Swedish triple play provider Com Hem has rolled out 1.2GBps fibre to 600,000 households across the country

O2 flicks switch on Wi-Fi rival in LiFi trial

O2 has used beams of light to transmit data through light bulbs in a trial of LiFi, a technology that could prove a rival to Wi-Fi



Samsung to spend €140bn to back AI, 5G, car and chipset strategy

Samsung is pledging €19.25 billion to fund research into 5G, AI, autonomous driving and semiconductors, as part of a €140 billion warchest

Proximus unleashes TITAN to strengthen network capacity

Proximus is aiming to increase the capacity of its network tenfold after launching a three year transport network modernisation project

Ericsson boosts automation with CENX buy

Ericsson has strengthened its automation services with the acquisition of CENX, which it said would grow its virtualisation solutions

Deutsche Telekom puts NB-IoT on the runway at Dusseldorf airport

Deutsche Telekom is deploying NB-IoT to monitor infrastructure quality in one of Germany's busiest airports

EIB swells Nokia's coffers by €500m to fund its 5G research

The European Investment Bank has lent Nokia €500 million to help the Finnish vendor invest further in the research and development of 5G technology.

Nokia has been one of many telcos beavering away at a flurry of 5G trials and demonstrations ahead of the technology's commercial launch.

In a statement, Nokia toed the line of fellow telcos in repeating how 5G would power the likes of augmented and virtual reality, driverless cars, healthcare, industrial automation and other services requiring low latency and ubiquitous coverage.

Nokia CFO Kristian Pullola said: "We are pleased to land this financing commitment from the EIB, who shares our view of the revolutionary nature of 5G - and the realisation that this revolution is already underway.

"This financing bolsters our 5G research efforts and continues the broader momentum we have already seen this year in terms of customer wins and development firsts, supporting our relentless drive to be a true leader in 5G - end-to-end."

The future is exciting. Ready?

Vodafone lends digital transformation know-how to MTS

Vodafone is to help MTS with its digital transformation strategy after the Russian operator extended its strategic partnership with the UK telco.

Both operators have been working together for 10 years, cooperating in procurement, technology and marketing. Under the new agreement, which extends the partnership until 2020, Vodafone will also provide examples of how to digitally transformation internal technology, business and organisational processes.

Alexander Gorbunov, Vice President, Strategy and Development, MTS, said: "Our strategic partnership with Vodafone has... helped us to save a considerable amount of time and resources when building networks and launching new products, ultimately strengthening MTS' position in our markets.

"At the current technological stage, this new step in our cooperation opens for MTS a way to accelerate our digital transformation as well as to improve our business efficiency both quantitatively and qualitatively through access to Vodafone's expertise and know-how."

Since 2008, Vodafone has provided MTS with access to its product portfolio and marketing research, as well as given advice on how to best extend its network across Russia. It also helps MTS with purchasing software and IT equipment.

Telenor Norway dubbed world's fastest network in latest speed tests

Telenor Norway has been deemed the world's fastest mobile network, with consumers able to download with speeds of 72.05MBps.

Research from testing agency Ookla found the top three operators for downloads were European. Telenor was followed by T-Mobile Netherlands, with speeds of 70.05MBps and Nova in Iceland, which hit an average of 67.83MBps.

telenor

Ookla said Telenor Norway's success hinged upon a multi-carrier LTE deployment strategy by using the 800MHz, 1800MHz and 2.6GHz layer that gives it the balance of coverage and capacity. The operator has also rolled out Gigabit LTE, 256QAM and 4x4 MIMO to selected sites to drive network efficiencies.

Next year, Telenor Norway, which has an LTE population coverage of 99.4 percent, is aiming to refarm its 3G holdings in the 900MHz and 2.1GHz bands to strengthen its LTE position. A chunk of 2G will be open until 2025 and power M2M and legacy voice services.

Ookla's Milan Milanović said another strength of the operator was its aggression in pushing consumers to modern handsets equipped with the latest antennas, RF front-end and antennas.

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PUERTO RICO

AT&T

AT&T has deployed LTE-connected drones carrying temperature sensitive medical supplies in the latest trial of IoT technology.

The operator teamed up with UK packaging company Softbox Systems on the trial, which tracked the location and temperature of the supplies in real-time using app and web dashboards.

Sensors were also able to track whether the box had been tampered with by using light exposure to determine whether it had been opened.

LESOTHO

Vodacom

Vodacom has launched what it claims to be the first commercial 5G fixed-wireless service in Africa.

It is using spectrum in the 3.5GHz to offer connectivity to two enterprise customers.

While it hopes to extend its offer to surrounding South Africa, Vodacom said it cannot launch it commercially until it gets access to 3.5GHz in that market.

MEXICO

Megacable

Work is underway on the Topolobambo – La Paz project, Megacable's deployment of a submarine cable to boost connectivity and latency in Mexico's second largest tourist destination.

The operator is working with Huawei on the project, which will connect the two sites via a 250 kilometre undersea cable across the Gulf of California.

La Paz is one of Mexico's biggest tourist draws and Megacable is keen to improve the high failure rates caused by aerial optical hardware.

BRAZIL

Copel Telecom

Copel Telecom has launched 1GBps broadband in the city of Curitiba in the south of the country.

The operator has deployed 33,000 kilometres of fibre across the wider state of Parana.

INDIA

Idea Cellular

Idea Cellular will start running voice and data services on a common cloud platform after deploying new core network technology from Nokia.

The Finnish vendor said the technology was the latest step in the Indian operator's wider digital transformation to meet booming demand for mobile solutions.

It added its cloud native portfolio would help Idea Cellular enhance automation, scale out faster and accelerate the time to market of new products.

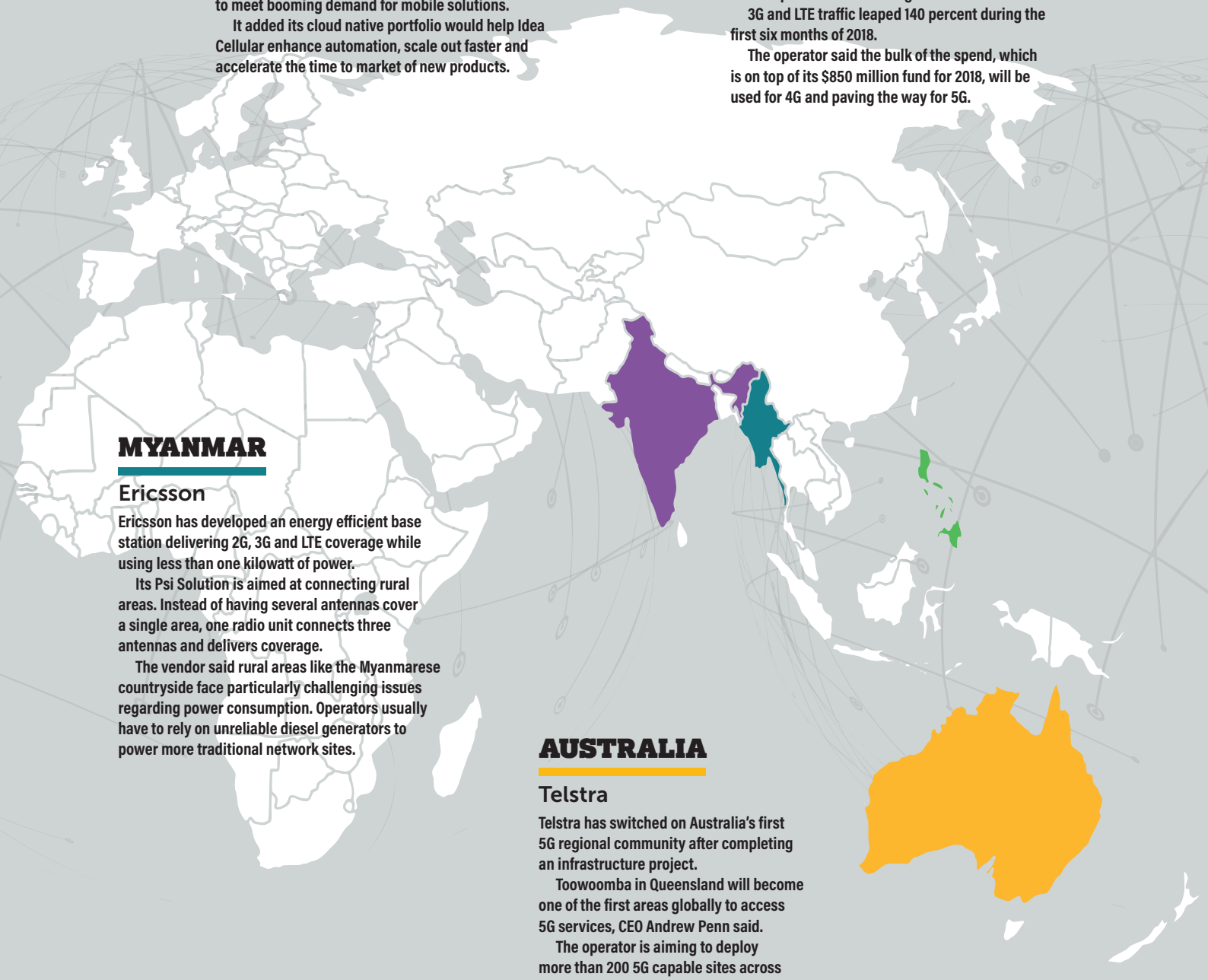
PHILIPPINES

Globe Telecom

Globe Telecom is adding an additional $100 million to its capex to meet booming demands for data.

3G and LTE traffic leaped 140 percent during the first six months of 2018.

The operator said the bulk of the spend, which is on top of its $850 million fund for 2018, will be used for 4G and paving the way for 5G.



MYANMAR

Ericsson

Ericsson has developed an energy efficient base station delivering 2G, 3G and LTE coverage while using less than one kilowatt of power.

Its Psi Solution is aimed at connecting rural areas. Instead of having several antennas cover a single area, one radio unit connects three antennas and delivers coverage.

The vendor said rural areas like the Myanmarese countryside face particularly challenging issues regarding power consumption. Operators usually have to rely on unreliable diesel generators to power more traditional network sites.

AUSTRALIA

Telstra

Telstra has switched on Australia's first 5G regional community after completing an infrastructure project.

Toowoomba in Queensland will become one of the first areas globally to access 5G services, CEO Andrew Penn said.

The operator is aiming to deploy more than 200 5G capable sites across Australia by the end of this year.

Swisscom's Heinz Herren calls time on CTO career

Swisscom's CTO is stepping down from his role after 17 years at the company. Heinz Herren will reduce his working hours to 60 percent from February and focus on strategic projects at the operator. He will be replaced by software engineering company ERNI's CEO Christoph Aeschlimann.

SmartCitiesWorld
SmartCitiesWorld.net is a site focussed on creating a central pool of smart infrastructure intelligence
This online community enables you to keep abreast of the latest developments and trends in smart cities
The aim is to help foster the partnerships and dialogue between the key vertical sectors of Connectivity, Transport, Energy, Data, Buildings and Governance
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Simplify. Automate. Transform.

Lost on your digital transformation journey?

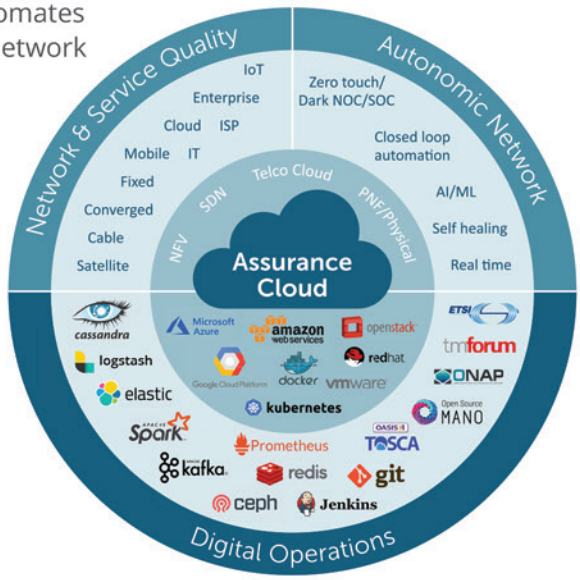
Whilst every CSP has a different route to digital transformation, deploying an **efficient, scalable, reliable and agile telco cloud** that supports on-demand digital services is a critical component. However, failure to assure digital experiences as well as network and service quality across hybrid (physical and virtual) networks during transformation can be a roadblock to success.

Have an experienced guide to help navigate transformation challenges?

As **service assurance partner for the world's first telco cloud implementation** and leading independent provider of award-winning **Assurance, Analytics and Automation** solutions to **8 out of 10 of the largest global CSP groups**, you can rely on MYCOM OSI to safely navigate the challenges of assurance at every stage of your digital transformation journey.

MYCOM OSI's award-winning cloud native **Experience Assurance & Analytics™ (EAA) suite of applications** visualizes, automates and optimizes digital experiences as well as service and network quality across hybrid telco and IT networks. It integrates **Digital Service Quality Management, Performance Management, Fault Management, Automation** and **AI/ML-driven Analytics** to help CSPs move to an autonomic network and meet their key digital transformation challenges of:

- Managing **digital experiences** and **hybrid networks**
- Enabling **digital**, **IoT** and **5G services**
- Achieving **agility**, **scale** and **efficiency** with **automated digital operations**
- Deploying **assurance in the cloud** with a **subscription business model**



Wherever you are on your journey, find out about our **transformation process** to consolidate and migrate your existing assurance solutions to the telco cloud

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