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Keeping up with market disrupters

Insight Report: IoT

Smart homes,
connected cars
and your thoughts
on the sector

17

CTO Interview

Telenor Group's
Ruza Sabanovic
on transformation
and Viking DNA

06

NFV roundtable

Operators debate
technology
transformation
and the obstacles
to achieving it

28



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Contents



06

Editors picks

06

CTO Interview

Telenor Group CTO Ruza Sabanovic talks to Graeme Neill about digital transformation, the Nords' appetite for change and Viking DNA

10

CTO Q&A

Piotr Jaworski, CTO, Network and Technology, Orange Poland

26

NFV roundtable

Industry experts from the likes of Deutsche Telekom and Telefónica on whether operators can realise the potential of NFV

31

Spectrum

Have regulators got it right in making sure operators are match fit for the 5G era?



16

Insight report: IoT

16

Reader survey

Your thoughts on the priorities and opportunities for operators within the Internet of Things

22

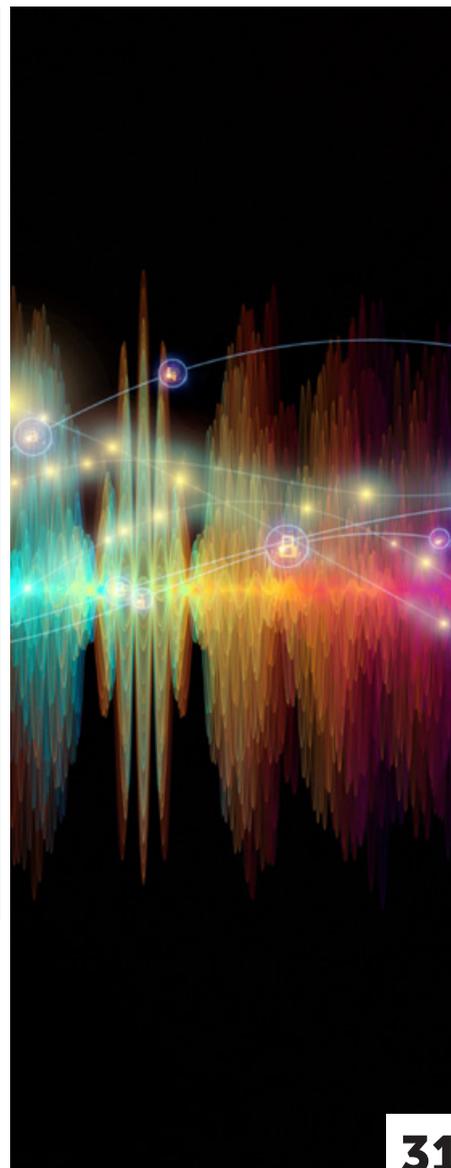
Smart homes

Has the door slammed in the face of operators as Amazon, Google and Apple carve up the home?

24

Connected cars

Will operators be in the driving seat, a passenger or left at the side of the road?



31

Full Spectrum

34

News spotlight

The latest developments in virtualisation, 5G and IoT

36

The Wireless World

The latest news and innovation from around the globe.

Executive Editor: Graeme Neill
graeme.neill@mobileeurope.co.uk

Design and Production: Alex Gold

Account Director: Fidi Neophytou
fidin@sjpbusinessmedia.com
Tel: +44 (0)7741 911 302

Publisher: Wayne Darroch
wayned@sjpbusinessmedia.com
Tel: +44 (0) 20 7933 8999

ISSN: 1350 7362

Free Subscriptions

Mobile Europe and European Communications is a controlled circulation quarterly magazine available free to selected personnel at the publisher's discretion. If you wish to apply for regular free copies please register online at: www.mobileeurope.co.uk/register

Paid Subscriptions

Readers who fall outside of the strict terms of control may purchase an annual subscription. 1 year UK subscription: £111 one year International subscription: £139

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Paid subscriptions: mobileeurope@circdata.com
Tel: +44 (0)1635 879 361

Printed By
Buxton Press



The views expressed in Mobile Europe are not necessarily those of the editor or the publisher.

Mobile Europe is published by
SJP Business Media
2nd Floor, 52-54 Gracechurch Street
London, EC3V 0EH



Average net circulation
January-June 2017 – 4,680

Welcome

No guarantees

Given the moving parts involved in a car, it is unsurprising that connected vehicles will comprise an ecosystem of different players working in harmony.. This is only set to increase as we move into the 5G era. CCS Insight's Kester Mann described it on Twitter as a reality check on Twitter, noting that in future that a network collapsing could lead to a worrying knock-on effect on driverless buses, to give one example.

The Internet of Things, coincidentally the subject of this issue's Insight Report, is a precursor to the ultra-dense networks that 5G promises, albeit ones delivering much less data. A network that's down affects a business's bottom line and as you can read in our reader survey, it is the enterprise sector that respondents believe will be powered by the Internet of Things. Networks going down is a fact of life, sadly; operators will need to respond adequately in order to avoid angering some lucrative sources of income.

However, we look beyond enterprise this issue to the consumer side of the Internet of Things, namely the smart home and the connected car. Operators are already playing catch-up in the smart home, considering the ubiquity of the likes of Amazon's Echo smart speaker. However, you will read how operators such as Telia are carving out their own space as a hub for services.

Given the moving parts involved in a car, it is unsurprising that connected vehicles will comprise an ecosystem of different players working in harmony. Given the moving parts involved in a car, it is unsurprising that connected vehicles will comprise an ecosystem of different players working in harmony.

I was also fortunate enough to speak to Ruza Sabanovic, Telenor Group's effusive CTO and the subject of this issue's CTO profile. Digital transformation is at the forefront of her mind, as it should be among operators across the industry, but she was positive about people's ability to change. It's pushing them in the right direction that's maybe the problem.

Finally, operators from across Europe took part in a network functions virtualisation roundtable. The technology side of the transformation equation is one that promises much but is tough to deliver. It's a fascinating discussion and one I was delighted to attend.

Enjoy the issue and happy new year.

Graeme Neill
Executive Editor

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06

CTO Interview

Telenor Group CTO Ruza Sabanovic

10

CTO Q&A

Piotr Jaworski, CTO, Network and
Technology, Orange Poland

Telenor Group CTO: building networks on Viking DNA

Ruza Sabanovic has gone from launching Montenegro's first mobile network to shepherding in the 5G era for Telenor group. She speaks to **Graeme Neill** about the importance of digital transformation, how sales can shape technology and how war shaped her approach to work and life

The road to becoming a CTO can be a familiar one – plenty of years spent in the trenches of network deployment, whether at an operator or vendor – but it is rare that sales comes into that journey. But such was the way with Ruza Sabanovic, Telenor Group's CTO (her precise job title is the more unwieldy EVP and Head of Technologies and Services). She spent the first 12 years of her career with Telenor in her native Montenegro after joining in 1996. In 2007, a year before she moved to Telenor's headquarters, she headed sales.

She laughs when it is put to her that it was an unusual change in direction from her tech heavy background. Thankfully she had a deal in place that gave her the option to go back to technology after a year in sales. But she adds: "That year was a fantastic learning for me because that was the first time I would look at delivering through the eyes of the customers and users. I was not in the product...I was dealing with real customers."

Sabanovic has a civil engineering background – her late father was a bridge builder – but shifted into telecoms, initially translating for engineering teams at ProMonte, the Montenegrin operator later taken over by Telenor, but quickly shifting into an infrastructure implementation role. ProMonte launched the country's first mobile network across a mere 21 sites.

Sabanovic has been Telenor's Group CTO since late 2015, responsible for network, IT, security and sourcing across Telenor's global business and around 4,200 staff globally. Operationally, Telenor splits its CTOs into three clusters; one for Europe, one for developed Asia and one for emerging Asia. She says the relationship with the regional CTOs is collaborative rather than top-down; they play a role in setting the agenda of the operator's technology strategy and it is up to them to execute.

In this time of tests, trials, demos and deployments, Sabanovic says CTOs can also suggest areas they want to explore as well as her team ruling from on high about which market they want to use to explore new technology. She says: "In the majority of cases, we would have [discussions] about where we think is the right market to test a certain solution and then ask how we should do it. Because it's not straightforward; sometimes it's the competencies and capabilities that need to be brought to mind to decide who is the right entity, what is the right process and how do we manage that."

Managing mindsets

Like other operators, at the forefront of Sabanovic's multi-faceted technology strategy is digital transformation. She says the goal is to enhance customer experience, and consequently the money Telenor makes from these, through more customised and personalised interactions. As anyone with even a passing knowledge of the telecoms industry would say, this is easier said than done.

She says: "When we talk about digital transformation, technology transformation is going to enable that but we believe this is more than just technology; it's about the mindset shift. It is about how do we empower and enable new possibilities. On sharing and personalising experiences, building transparency, trust and loyalty among customers and acting as a responsible business with security and privacy by default."

Even though it is a topic that is a must in seemingly every industry event, Sabanovic argues the telco transition is something that dates back to the first flush of the smartphone market some 10 years ago. She says: "We have been transforming ourselves from being a closed ecosystem in a telco stack and gradually started opening up. We believe that started with the introduction of the internet, even though we were not that conscious of it 10 years ago but that has created new opportunities in terms of different solutions, different vendors, increased competition."



Safety first: Sabanovic argues security is vital to an operator's digital transformation

As for transformation in 2018, she argues operators undergoing this people-focused mindset shift need to build their employees' skills within cloud and APIs, data management, or extracting and using data to its full potential, analytics, and security and privacy. The operator has a policy in place where employees are encouraged to spend 40 hours per year on upskilling – Telenor Group CEO Sigve Brekke has been learning about “Growth Mindset” and the much less jargony data analytics, for example.

Sabanovic expresses a degree of frustration with the rate of change; she says making telcos transform at the same speed as digital companies is the one thing she would change to make her job easier. But she admits: “If you had asked me 10 years ago, I would have said the same. It's a moving target but the pace of change now is rather high.”

The demands on an operator to change swiftly and decisively is something that makes her role “more engaging and fun” but also more challenging. She says: “I would not like to ask for more productivity because then we would not have fun and enjoy the work, but on the other side I do not feel we are sometimes challenged beyond the limits. That forces us to think different and to challenge ourselves to cope with that. It's a good thing to have it to make sure that we do move fast.

“The change is in the whole ecosystem; it's not just about Telenor. If the whole ecosystem gets aligned and pushes faster, it will be much easier for all of us.

“It boils down to this; we have to be optimistic and believe in everything we do. It's hard work and we need to be ready to make sacrifices but that's what it takes to pull through.”

Family first

And so a conversation about transformation inevitably tumbles into 5G. Just after we spoke, Telenor launched a family friendly 5G trial, connecting five households to test broadband and television over a test network. Further trials, involving the Coop supermarket chain, the Norwegian Air Ambulance Foundation and Applied Autonomy, will follow ahead of its commercial launch of 5G in 2020. The operator also recently launched a project with Ericsson to transform its network core.

The telcoms industry splits itself broadly between realists and optimists; those excited at the prospects but concerned about promising

“ The change is in the whole ecosystem; it's not just about Telenor

too much and disappointing on what they ultimately deliver and those looking towards the sunlit uplands of a world revolutionised by 5G.

Sabanovic treads a fine line between both – she would only be drawn on her stance when pushed – but marginally leans towards the former. She says: “We are optimistic for all the technologies that will drive value in everything that we do and that will create value for customers. That's how we will approach 5G and how we will drive it.



“We are moving from the hype to some concrete launches. It’s a learning journey but we need to stay ahead of the curve so we know what choices and decisions we are going to make for different markets.”

Telenor’s modern day digital transformation strategy is built to underpin its 5G ambitions. Sabanovic says the operator started the journey some two years when it starting moving towards more open, virtualised and cloud-based capabilities. Its Hybrid Cloud platform now handles almost half of its data traffic and around 100 million subscribers worldwide.

For Sabanovic, the opportunity largely lies within the enterprise space, offering customised solutions to both the public and private sector. She says: “We believe that 5G is the key for us to transform and that will drive efficiencies and customer experience. This will also impact the transformation and operating model of not only telcos and digital operators, as we like to call ourselves, but the industry. Because we are basically going to transform other industries as well.

“There are some basic fundamentals to 5G which need to be proved but any generation of technology brings much higher experience and quality with a much more efficient proposition. Fixed wireless access, for example, is just one that is expected not only to improve customer experience and improve the quality of services we are providing, but it will drive significant efficiencies in our delivery model.

“There are also innovation-specific ones that will be driven by the

end to end industry value creation. Those are different solutions that are on the borderline of IoT and 5G but these use cases will require higher throughputs or lower latencies, or some like emergency networks or others like the automotive or smart cities, health, those are something we are looking at or testing.”

Viking DNA

The enthusiasm around 5G in Europe doesn’t quite match that within Asia or the United States, albeit with some exceptions. Sabanovic doesn’t quite agree with that assessment and argues momentum has been growing across the continent since the beginning of this year. She says: “Europe has traditionally been the leader in telco, but Europe acts when it is the right time to act.”

The Nordic region has long had a reputation for mobile innovation, with Finland launching the world’s first GSM network back in 1991. This appetite has not abated – seven Nordic PMs vowed earlier this year to ensure the right conditions are in place for the parallel deployment of 5G. Telenor is leading the European Union’s VINNI project, which is exploring how 5G will perform using a combination of different technologies such as network slicing and virtualisation.

Sabanovic says the region has always encouraged collaboration and ensured the right conditions are in place to foster innovation and the deployment of new technologies. But she adds this spirit dates much further back than mobile connectivity. She says: “It’s a very Viking, explorative...it’s in their DNA. I truly believe that’s what drives it. This desire to explore is in their DNA. That’s what they have, they’re always striving for more and exploring; not just in their homeland but becoming world famous.”

This resolve and ambition extends to Sabanovic herself. She drily says she’s glad I’m asking the question when I raise her experiences of the Yugoslavia civil war in the early 1990s, when Sabanovic was at university

“ Europe has traditionally been the leader in telco, but Europe acts when it is the right time to act

in the early 1990s. She says: “It brought different challenges, different perspectives and different approaches to life. This may be daring but change is just something you have to deal with, right? There is no way back, you need to look forward to wherever you are. You need to find a way to deal. Wherever you are it’s very important that you focus so it’s very clear in your mind what you want and when and how.”

She says the war, and bombing that followed in the late 1990s, helped shape the person she is today. “My life taught me how do you position yourself when you face a challenge, how do you stand up for yourself and fight...It is very strange how difficult it is to talk about how humans can adjust and how we can change without thinking that we can. But we can,” she stresses. “We are much stronger, much more daring and much more focused than we believe we are.” 🇷🇺

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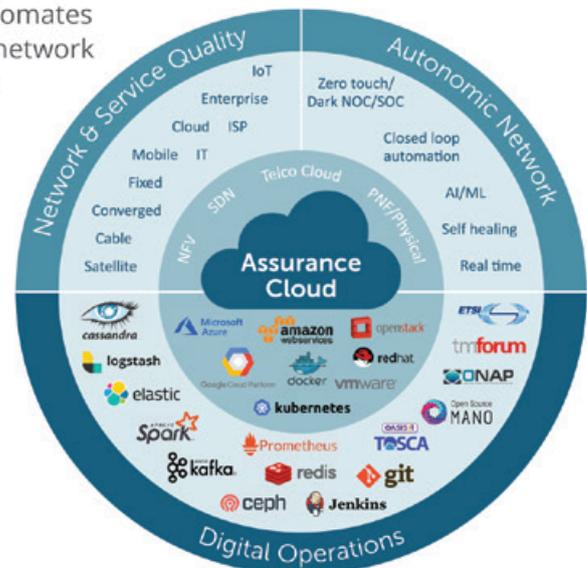
Whilst every CSP has a different route to digital transformation, deploying an **efficient, scalable, reliable and agile telco cloud** that supports on-demand digital services is a critical component. However, failure to assure digital experiences as well as network and service quality across hybrid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

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CTO Spotlight:

Piotr Jaworski

CTO, Orange Poland



What is the biggest issue you are currently thinking about?

Definitely FTTH rollout, although 4G, which still has plenty to offer, remains important to Orange Poland especially in light of the increasing speeds or IoT services that we are developing based on LTE-M technologies. It is also necessary to roll out the backbone network on an ongoing basis.

Who has been the most influential person on your career?

Jan Radziemski, the former head of the division of independent organisational units of Telekomunikacja Polska before we rebranded to Orange. In 2001, he recognised skills in me and tasked me with building the most complex operating structure in a transformation programme of key importance for the company. This allowed me, as a young manager, to spread my wings.

Another person was Bruno Duthoit, the previous CEO of Orange Poland. His diligence, inquisitiveness and incredible analytical skills were legendary and his unique style of work was challenging at times but I learnt a lot from him.

What's the most important lesson you have learned professionally?

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

You recently switched on your first 5G antenna in Gliwice. What is the biggest change 5G will bring to the telecoms industry?

In my view, thanks to the mind-boggling speeds, low latency and a substantial number of connected IoT devices, telco companies will be able to provide completely new services in many business sectors. This is a huge opportunity for growth.

What's the biggest obstacle to 5G being a success and what can be done to overcome it?

In order to deploy 5G, we need to organise and make frequencies available to operators, harmonise standards concerning the electromagnetic field as well as simplify the investment process.

What's your biggest professional achievement?

Since 2006, I have, directly or indirectly, been responsible at Orange Poland for the construction of access networks, and since 2016 also for mobile and core networks. I am convinced that it is not only the largest, but also the best network in Poland. One spectacular success is that we have connected more than 3.2 million households with our FTTH since 2015.

What do you like to do when you are not working?

I am passionate about AV technology. I used to design TV-sets so I devour knowledge from magazines, exhibitions, shows and the internet. I am passionate about technology in general so I want to keep expanding my knowledge in this respect. I do a lot of sports too. In winter, I go skiing, and in summer, I like cycling, water skiing, running and kayaking.

What's the biggest challenge facing the telecoms industry?

The biggest challenge is posed by huge investments related to rolling out of FTTH and 5G in the future. One has to remember that in Europe there are more than 400 operators, and thus fierce competition, high costs and a stringent regulatory environment. More and more high-margin services are being taken over by companies that rely extensively on networks but don't invest or contribute to the rolling out of networks. Local barriers can also be found in particular countries and in Poland, they can be more restrictive than in most other EU countries, making us more exposed to risk.

What single recommendation would you make to your fellow CTOs?

To look at the network from the point of view of a customer and not as an engineer purely fascinated by technology. It's important to be guided by this when choosing technology and planning development. ■■■



SMART IOT CONNECT

9 April 2019, London, UK

Operators: Finding your place and holding your ground in smart cities

Leading experts Panel debates Peer-to-peer networking

Smart cities will change the face of how we live, work and travel in the decades ahead. They present huge opportunities for cities, citizens and businesses – not least, telecom operators who have a significant role to play.

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The inside track on telecoms operators' technology strategies

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Red Hat: Keeping up with market disruptors

Disrupt or be disrupted is the survival motto for businesses in this era of digital transformation. For communications service providers, technology changes have been a fact of life for decades, but today, the speed of change is outpacing their ability to keep up with market disruptors.

The technical challenges facing CSPs today are the transitions to software-defined networking (SDN), network virtualisation and cloud native. These technologies dramatically change the way that CSPs build networks and deliver services, by reducing their reliance on dedicated network equipment and shifting functionality to software and the cloud. CSPs are under pressure to change as titans of the internet and cloud-based businesses enter their markets and bring new competitive threats, such as Amazon Web Services, Facebook and Google.

But disruption is nothing new for CSPs. The mobile sector, in particular, has been rocked over the years by several notable market disruptors. In France, fixed broadband provider Iliad upended the mobile market and sent traditional rivals reeling when it launched low-cost services in early 2012 under the brand Free Mobile. The operator quickly gained

market share, winning 5.2 million customers in its first year, or eight percent of the mobile market. Today, the operator has 13.5 million mobile subscribers and 6.5 million fixed broadband subscribers.

Not resting on its French laurels, Iliad has taken its disruptive model to Italy. The operator entered the Italian mobile market with aggressively priced offers in May this year and signed up 2.2 million customers in the first four months.

In India, Reliance Jio took the mobile market by storm when it launched 4G services in September 2016, adding 16 million customers in the first month of operation and surpassing 50 million subscribers in the first 83 days. By February 2017, the operator had more than 100 million subscribers. Today, Jio has more than 252 million subscribers, making it the country's third-largest mobile operator. The operator is now expanding into the fixed broadband services market.

In the United States, T-Mobile has built a reputation for being a feisty competitor. It shook up the market with its Un-Carrier marketing campaign in 2013, coupled with contract-free mobile plans and unlimited calls and data, that distinguished the operator from its competitors. And the company's social-media savvy CEO John Legere connects with customers and has a radically different management style compared to the more conventional approaches of the leadership teams at rivals AT&T or Verizon.

Disruptor commonalities

Market disruptors share numerous traits. They tend to have modern networks and automated back office operations, for starters. They enter markets by targeting specific market segments with laser-like focus and continue to add value to service propositions over time. They also have complementary offerings that are smartly bundled to reduce the likelihood of customers to leave them. Their brands are typically cooler and more enticing than traditional CSPs. And they understand user behaviour and what their customers want.

According to Susan James, Senior Director of Telecommunications Strategy at Red Hat, the success of market disruptors is not merely the result of offering the most aggressive, lowest prices in their markets. Rather, it's more about the value of those offers.

One could assume that offering the lowest price mobile plan is a money-losing strategy that can win customers quickly but ultimately results in lower average revenue per user (ARPU). But James says this isn't always the case.

"Typically, disruptors look at the market and come in with compelling offers at good prices in comparison with what's available from others," she says. "They've been really clever. Their offers are not necessarily cheaper, but they certainly have a lot more value, and it's the type of val-



by Orange



Orange Spain uses Red Hat's cloud-native platform to speed up service deployment

ue that the customers are looking for.” That value could be in the amount of mobile data offered, or data sharing allowances, or unique bundling offers with other services, like fixed broadband or e-banking.

In addition to market savviness and tapping in to consumer desires, successful disruptors are also not burdened by legacy networks, processes and business models. For traditional CSPs, their existing network can be a double-edged sword. It's both an asset as well as a liability when competing against plucky new entrants with more modern infrastructure. This is the case for any infrastructure-heavy industry, not just the communications sector. Disruptors, on the other hand, typically deploy the most advanced technology available in their networks.

“Existing networks become an absolute anchor to agility and a CSP's ability to be flexible in the market,” says James. “Also, the depreciation period for such assets is typically very long, which means telcos have major liabilities on their books to account for over a long period of time. So even if they want to radically change their network, it's quite a challenge both financially and logistically.”

Compounding the issues of owning legacy infrastructure are the processes and systems required to operate the networks. “In some cases, the only way to operate legacy infrastructure is in a legacy manner,” explains James.

It's difficult for traditional CSPs to streamline and modernise backend systems, but these systems slow down their ability to respond to changes in the market as well as provision new customers and services. It would be far easier to automate a system that is just two years old, versus one that is more than 10 years old.

New entrants focus on automation and self-service, with the understanding that their customer base is technologically fluent and can go

online to order subscriptions or add service features. Not only does this enable customers to get what they want, it also lowers operational costs for the service provider.

“[Disruptors] don't have the legacy that is expensive to maintain, so they're able to operate their networks on a much lower cost structure. They also have more focus on automation, and this is easier on a modern network than it is on an older network,” says James. “Look at the millions of subscribers that Jio put on its network in the first couple of months. Most CSPs could not provision that massive number.”

Along with legacy networks and operations, traditional operators also have legacy business models that are difficult and risky to change. To illustrate, James points to the difficulty that Microsoft had in transitioning its software business to a subscription-based model.

“That's similar to traditional telcos,” she explains. “They have huge income streams coming in every month based on an existing business model. No service provider in the history of the world ever wants to change the business model that their customers are on.”

If the model is changed, there is a high risk that customers could churn or that services are renegotiated at a lower cost, putting that known revenue stream at risk. Dealing with each of these areas of telco legacy is extremely challenging on their own. Addressing them concurrently and quickly is even more difficult to achieve.

Leaving legacy behind

One operator in Europe has taken a radically different approach to the legacy problem. Orange Spain recently launched a subsidiary called X by Orange to deliver business communication services to small and

medium sized enterprises (SMEs) and left its legacy network behind. Rather than evolving its existing infrastructure, the operator built the new business on a greenfield, cloud-native platform from Red Hat to help them get services to market more quickly.

X by Orange is an entirely cloud software-based service provider. Red Hat OpenShift Container Platform and consulting services enable the service provider to adopt DevOps and agile development approaches so that it can rapidly and progressively create compelling business services for the Spanish market.

“They said let’s not take any of this legacy with us and just go directly to the cloud,” says James. “They want to do it as it should be done from the start and see if they can be successful at the right price points and have the agility and flexibility to try things in the market. If something doesn’t work, they can tune the product to what it needs to be going forward.”

James noted that Orange’s strategy is also smart because they are targeting a market segment where they do not have a big footprint. “By going after the SME market in Spain, they’re not going to cannibalize an existing business,” she says.

“Disrupters don’t have the expensive legacy, so they’re able to operate...on a much lower cost structure

X by Orange is offering SD-WAN connectivity, managed network security as well as unified communication services. The service provider currently has about 120 employees. Important differentiators for the new service provider are the enhanced IT automation capabilities and DevOps methodology that will help them deliver customer value and remove manual intervention from the application development process. Red Hat’s OpenShift platform unites developers and IT operations so that applications can be built, deployed and managed consistently across hybrid cloud and multi-cloud environments.

As X by Orange starts offering business services with just 120 employees, the move highlights another challenge that traditional CSPs have – namely, their size and aging workforce. “The pace of technology change is so much faster now that they can’t possibly do all of the things that they used to,” says James. “Also, their workforces tend to be getting older and that reduces their attractiveness as an employer. And they have to compete with many other businesses for scarce tech expertise.”

“CSPs need to be clear on what it is that they need to do themselves and where they need to partner, and how do they move toward more manageable networks and new infrastructure at a much faster pace,” she adds.

But do CSPs have to shed their existing assets and strategies to survive in today’s disruptive market? In short, no. Orange Spain is one example of how an established operator can innovate by creating a new entrant in its own market. Although, there is certainly more willingness to change among CSPs today, according to the James.

Embracing open source and automation

Two of the pillars that will fortify traditional service providers during their digital transformation and help them fend off market disruptors are open source software and automation. “The focus needs to be on automation and how to do this with a much smaller footprint both from an infrastructure and management perspective,” says James.

Provisioning needs to be as low touch as possible. For example, historically it would take a CSP 28 days to deploy a virtual private network (VPN). Now, with automation, they can do it in five minutes. “A huge amount of cost is taken out of the network by automating that,” she says.

Part of the reason why it would take 28 days in the past is due to the way CSPs are organised in silos around technology. “If you start thinking about applications as cloud-native, as most of the web-scale companies have done, then your philosophies on how you do things are completely different. You do your planning on a horizontal and vertical manner, rather than just vertical,” she says.

So, rather than operating in silos or stovepipes, and thinking in terms of launching a content delivery network (CDN) or a mobile broadband network, deploying in the cloud means operators have a horizontal infrastructure that provides an end-to-end flow for services.

CSPs are now more willing to embrace open source technologies and participate in open source communities, which is a completely different mindset compared to the telco standardisation process. This in turn has sparked the emergence of new vendors that have developed software propositions based on open source code, which are disrupting the traditional vendors.

“Working in an open source model creates an environment for collaboration and problem solving across the industry,” says James. “Standardisation is about defining how to solve a problem, whereas participating in open source is actually solving the problem.”

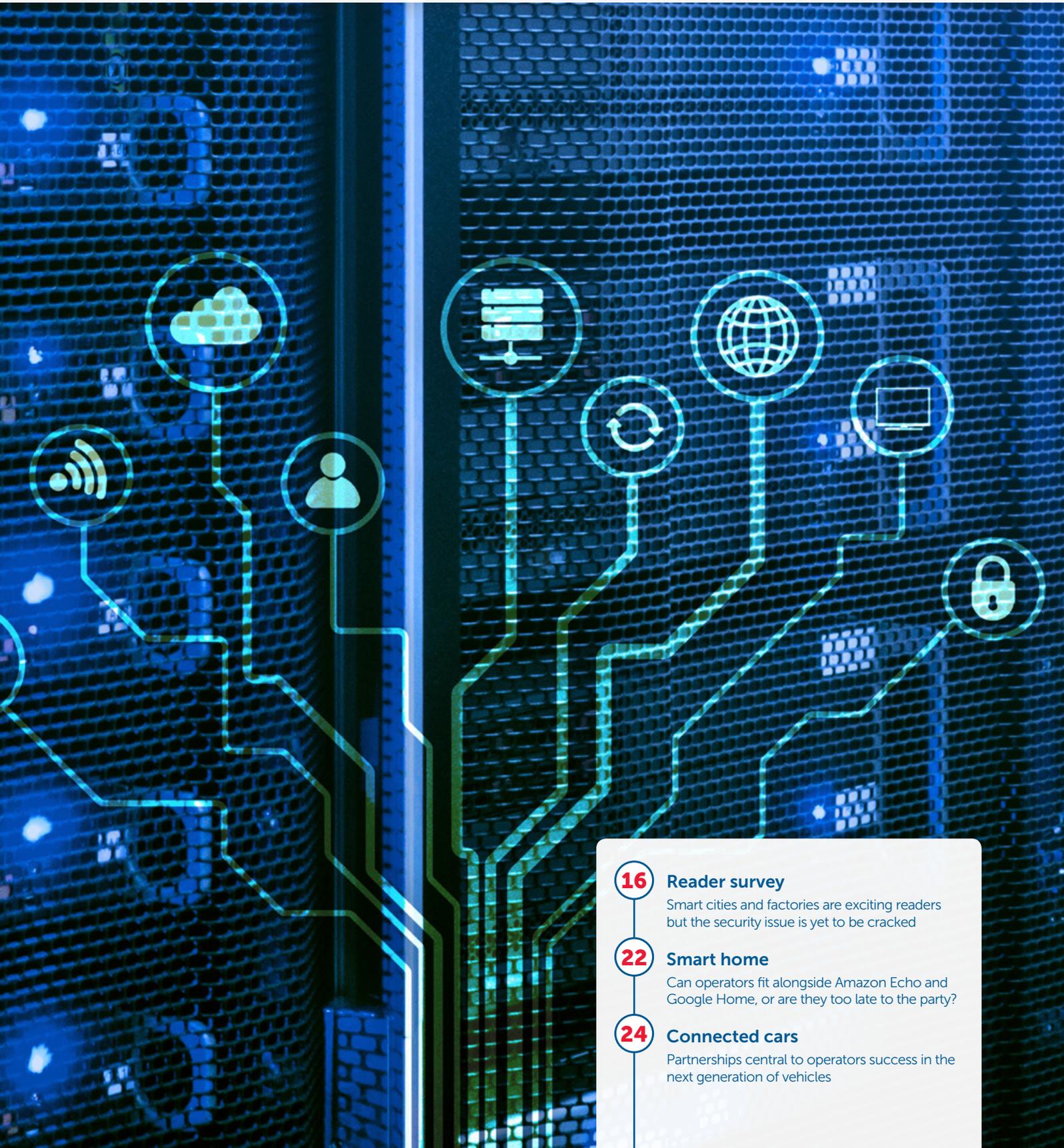
With its open source heritage, Red Hat recognises that this is a big leap for traditional CSPs to take. Red Hat can help navigate the open source waters for CSPs as well as provide technical support and expert guidance.

“We understand the direction that networks are taking and we can also support with consultancy,” says James. “Going from a native application to being virtualized to cloud native, how you build applications in microservices and take advantage of open source technologies. Whether it’s storage, automation, virtualisation or containers, we have the expertise.”

Despite all the legacy challenges CSPs have, James is hopeful that they can successfully adapt in the face of disruption. She points to the success of e-commerce giant Rakuten, which embraced an open source approach and is reaping the benefits in giving its customers the experience they want, whether it’s across entertainment, shopping or banking. “The journey is never easy, but industries find a way of reinventing themselves,” says James. “The shift has already started because most CSPs are no longer being only rewarded according to financial metrics, but on what their net promoter score is. That’s really what it’s all about – what is it that my customer thinks about me and how well am I addressing their needs.”



INSIGHT **REPORT** IoT



16 Reader survey

Smart cities and factories are exciting readers but the security issue is yet to be cracked

22 Smart home

Can operators fit alongside Amazon Echo and Google Home, or are they too late to the party?

24 Connected cars

Partnerships central to operators success in the next generation of vehicles

IoT survey: Huge growth expected within industrial space, but cyber security is a major concern

Opportunities around verticals including smart cities and factories are driving IoT strategies, but several issues must be overcome. Kate O'Flaherty reports





Optimism abounds about the Internet of Things and its growth opportunities but the industry has still to crack how to secure the billions of forthcoming connected devices. This was the headline finding of Mobile Europe and European Communications' latest quarterly survey.

Respondents, including mobile operators, vendors, analysts and carriers, think industrial IoT will drive the first surge of growth. Eighty percent say this area offers the biggest opportunity, compared with 20 percent for consumer applications. While one respondent points to a "multi-billion opportunity in the consumer space", another says "in terms of revenue, industrial IoT will lead".

One consumer use case that will be especially important is connected health, according to over half (52 percent) of survey respondents. Another popular choice was connected cars – the option selected by nearly half (46 percent) of people surveyed. Meanwhile, smart factories and smart meters were also cited as integral IoT applications.

But by far the most important use case for the future – and something that could transform multiple countries in a massive way – is smart cities, the option chosen by nearly three quarters (73 percent) of respondents.

While there are multiple opportunities, the biggest single IoT challenge for operators is how to create a viable business model. This is the opinion of 38 percent of those surveyed, with one saying it is "difficult to make business

cases, except for a few specific applications such as smart meters".

Cyber security is another challenge, according to 19 percent of respondents, with standardisation a whisker behind at 18 percent of those surveyed. "I think security is the most important challenge, with so many connected devices that would need to function to prevent everything coming to a standstill," says one of the respondents.

It's clear cyber security is a major concern within IoT. With this in mind, we asked those surveyed, "What is the biggest security risk in IoT?".

Most respondents (41 percent) think the huge volume of unsecured devices comprising the IoT is the greatest risk. This is followed by a lack of cooperation in the IoT ecosystem, which 28 percent say is an issue.

Yet security doesn't seem to be a priority for players in the market, according to one respondent, who says: "Most of the players are small start-ups and are either testing concepts or are too small to invest in such product features."

Making things worse, one respondent points out: "Currently there appears to be an assumption that security will be solved by somebody else. This is leading to a lack of cooperation and leakage of security responsibility."

It's a valid question; securing IoT is a complex task, but who is actually responsible? The operator or service provider is in charge of security, according to nearly half (48 percent) of those surveyed.

Device vendors also have a part to play, with 23 percent of respondents saying this

group should be securing the IoT. Of course, standards are important, but only 13 percent of those surveyed hold standards bodies responsible for security.

In the future, 38 percent of operators of respondents rate 5G as the most important technology impacting IoT. Among the benefits, 45 percent of operators are impressed by the low latency it provides for specific applications, while 49 percent cite new use cases. "Network slicing and new operator business models" was selected by 38 percent.

So which vendor is impressing most within IoT? "I believe Huawei is one of the few actors to have a complete strategy, from connectivity to devices," says one respondent, reflecting the views of others.

Meanwhile, the operator impressing the most is Vodafone, the survey's respondents say. But what do respondents think an operator such as Vodafone's role within IoT should be?

According to 60 percent, an operator is an end to end solutions provider. Meanwhile, "connectivity provider" was chosen by 32 percent.

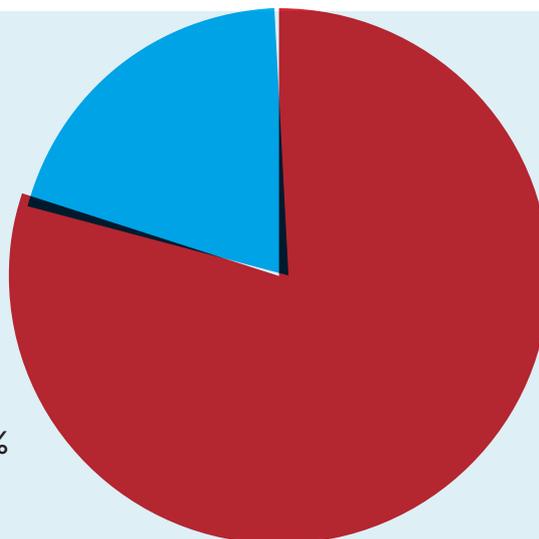
One person surveyed says: "There are multiple approaches, but I feel that, in partnership with third parties, operators will play an end to end role. It depends on the use case and the vertical: an operator cannot be all things to all people and must work with partners to build the use cases."

The full results of the survey, which polled 125 people in November 2018, can be found over the coming pages. Of the respondents, 42.4 percent work for a network operator, 29.6 percent for a vendor and the remaining 28 percent from interested third parties such as analysts, consultants and regulators.

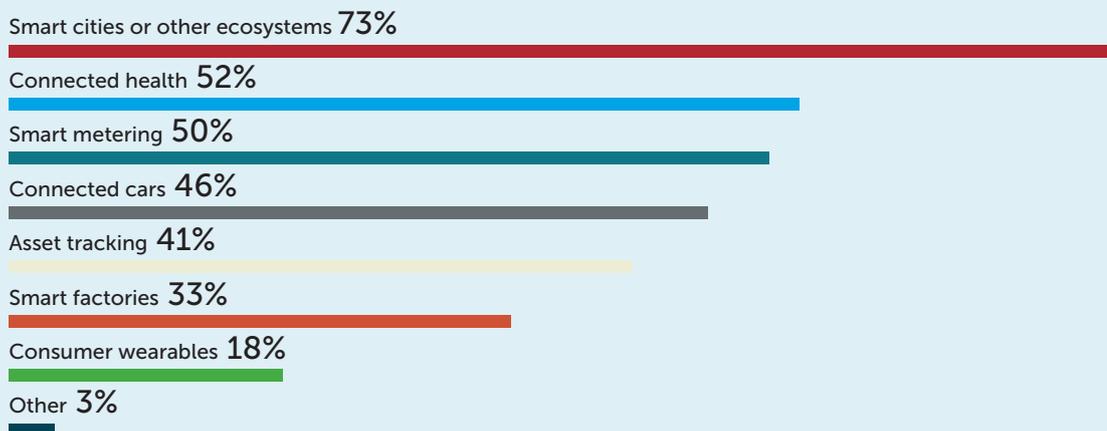
Q1 Where are the biggest growth opportunities within IoT?

Consumer 20%

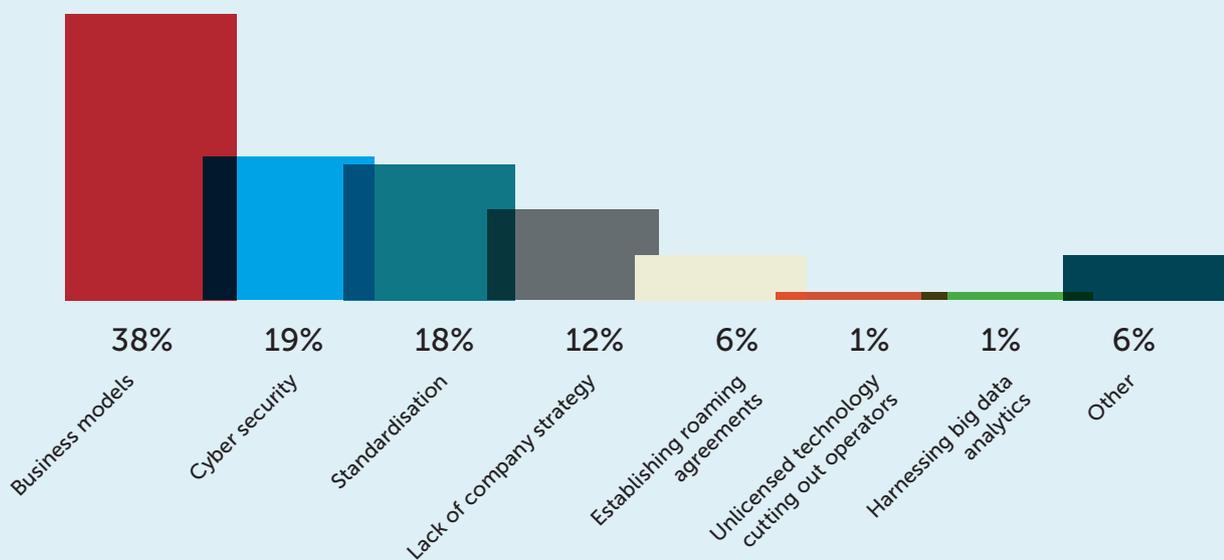
Industrial/enterprise/b2b 80%



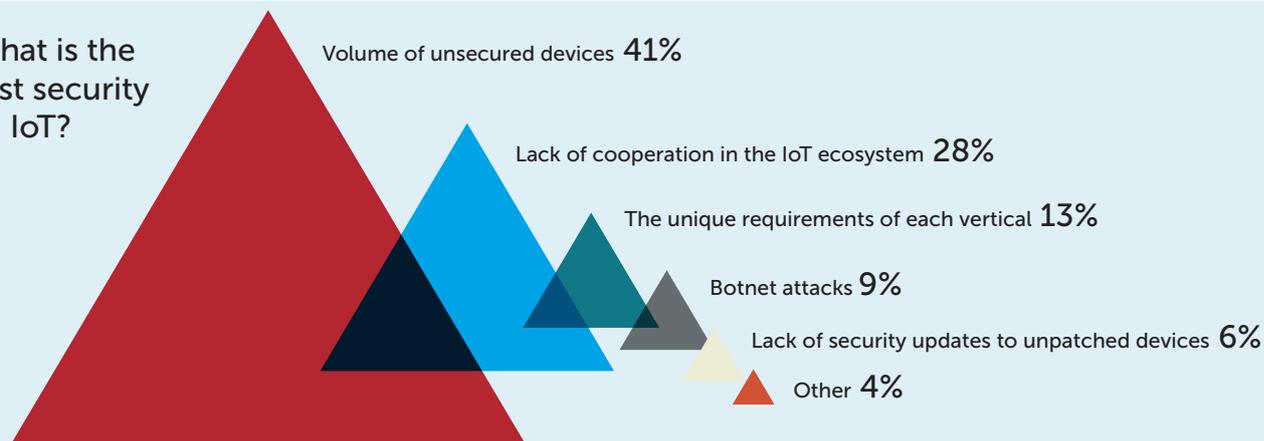
Q2 Which specific use cases do you see as most important?



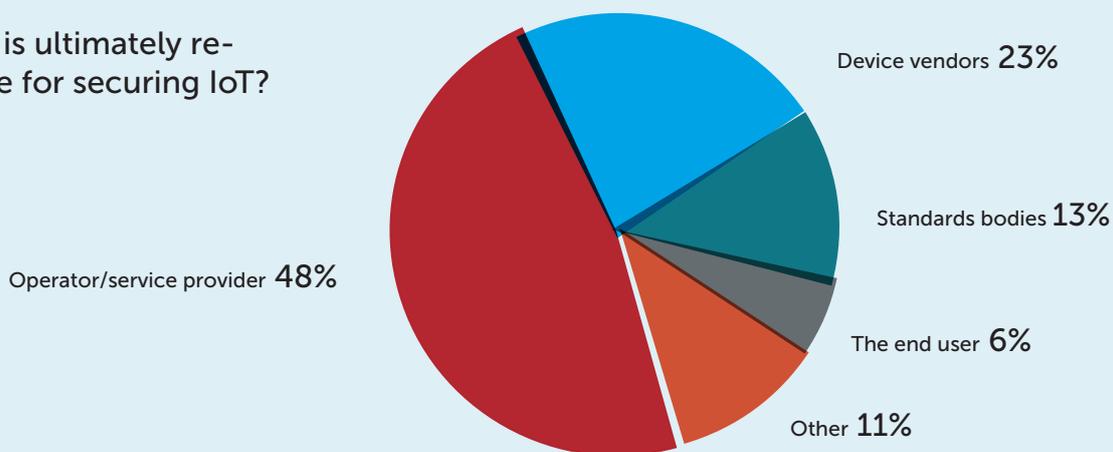
Q3 What is the single biggest challenge facing operators in IoT today?



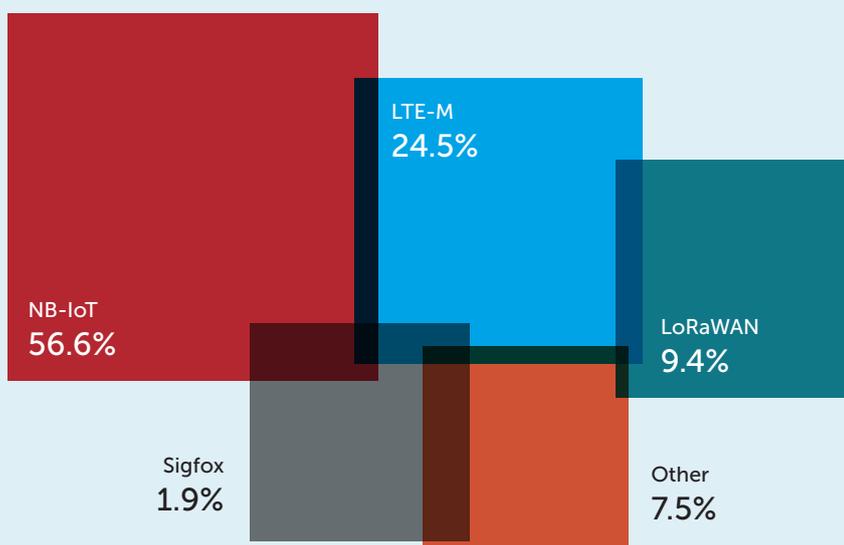
Q4 What is the biggest security risk in IoT?



Q5 Who is ultimately responsible for securing IoT?

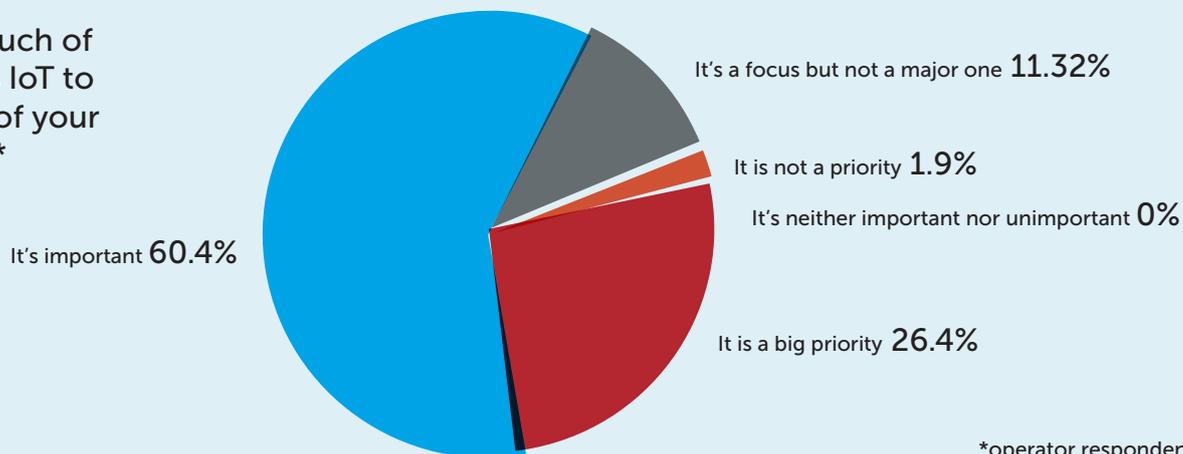


Q6 Which IoT technology will be the most prominent in Europe by the end of 2019?*



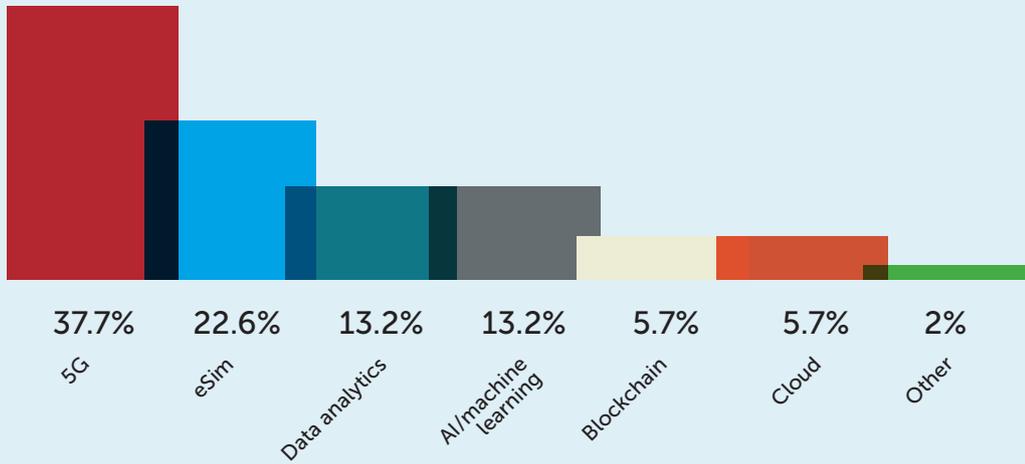
*operator respondents

Q7 How much of a priority is IoT to the future of your company?*

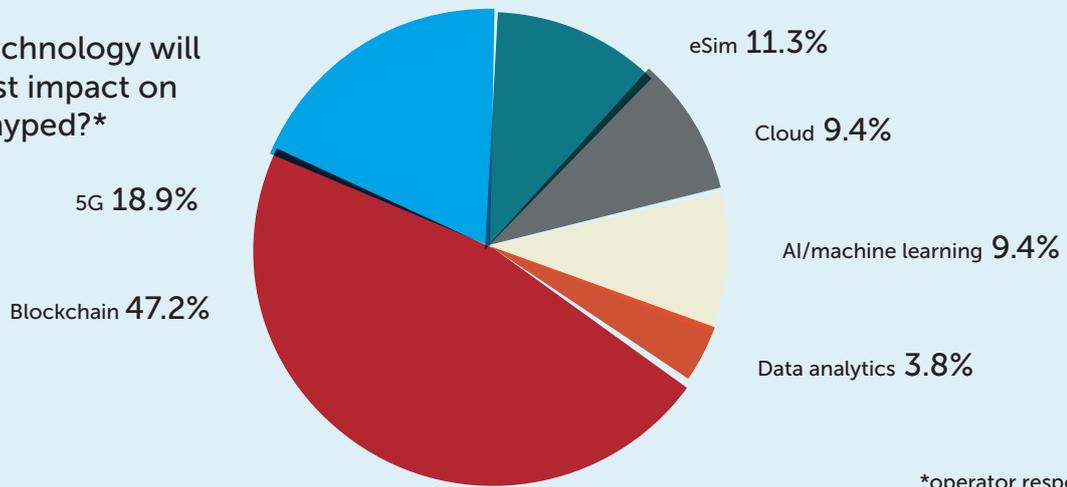


*operator respondents

Q8 Which technology will have the most impact on IoT within the coming year?*

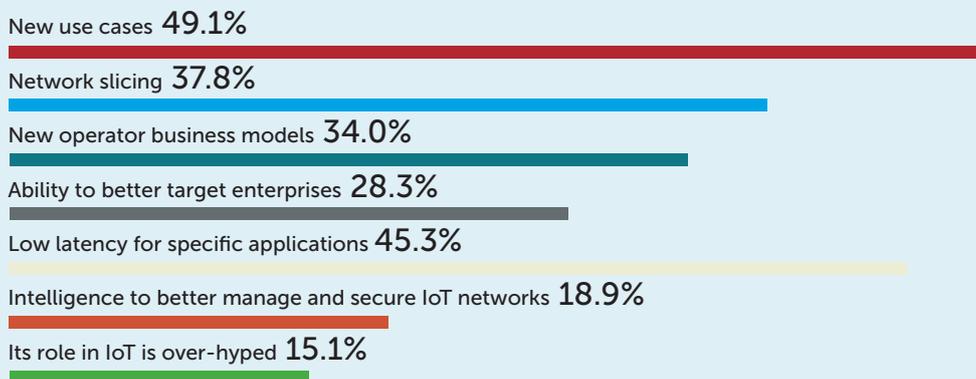


Q9 Which technology will have the least impact on IoT/is over-hyped?*



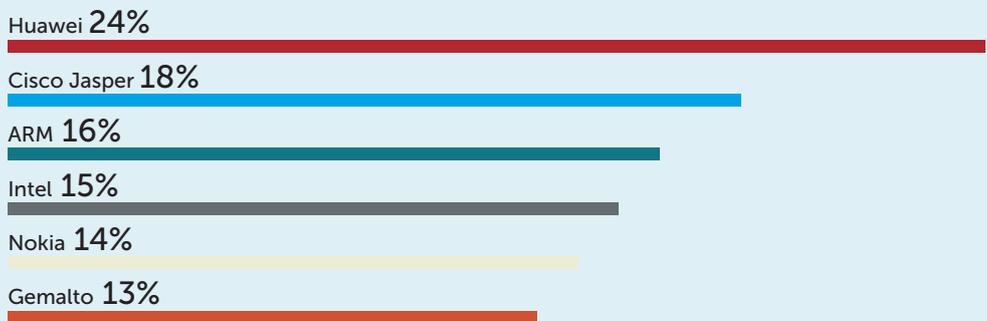
*operator respondents

Q10 What will 5G bring to IoT?*

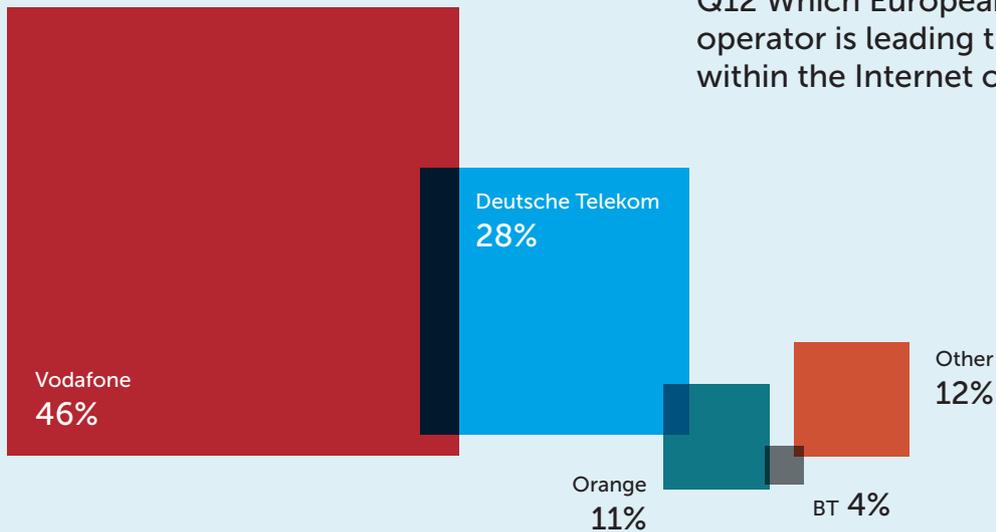


*operator respondents

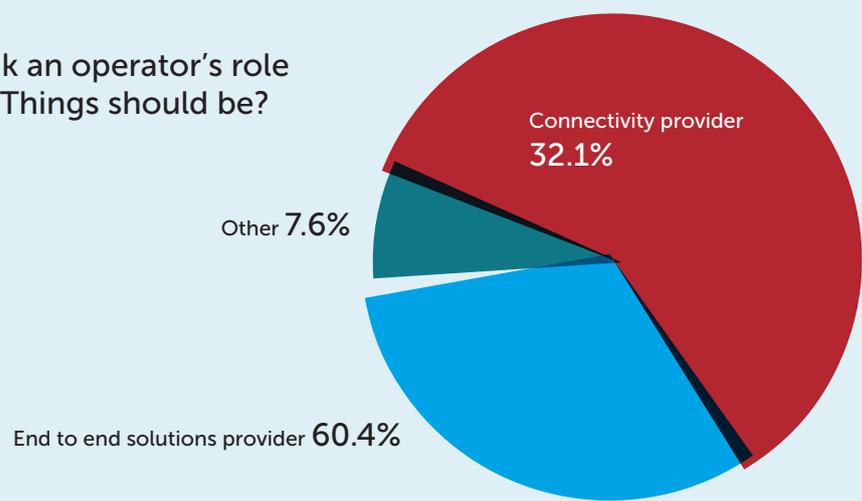
Q11 Which company is most impressive in the IoT sphere?



Q12 Which European mobile operator is leading the way within the Internet of Things?



Q13 What do you think an operator's role within the Internet of Things should be?



Is the smart home door closed to European operators?

Whether it's Hues, Echos or televisions, the European consumer is happy with smart home devices being part of the furniture. But where do operators sit? Michelle Donegan reports

European telcos have been knocking on the door of the smart home for many years, but they haven't had great success with their service offerings so far. As more competitors flood the market, operators are under pressure to find the right strategies that will ensure they're not locked out for good.

The competitive landscape for smart home services is vast and crowded with diverse rivals. Security companies, energy providers, appliance manufacturers, retailers, telcos and makers of a dizzying array of do-it-yourself smart home devices, from lightbulbs to thermometers, are all competing for European consumer spend at home. In addition, consumer electronics and internet heavyweights like Amazon, Apple, Google and Samsung are also fighting for dominance in the connected home.

IDC projects the smart home market will increase 31 percent in 2018 with 643.9 million devices sold worldwide. One of the fastest growing segments is smart speakers, such as Amazon Echo and Google Home.

While the U.S. is generally the leading market for connected home products, interest is picking up in Europe. A recent ABI Research report described this market as being at a "pivotal moment in its development" and poised for growth. In the next five years, the number of homes with at least one connected smart home device in Europe will increase more than threefold to reach 103 million, and annual smart device shipments will reach more than 154 million units by 2022.

As the European market appears ready to take off, how well positioned are telcos to benefit? "A number of operators have already failed in this area," says Michele Mackenzie, Principal Analyst, IoT Services, at Analysys



Home comforts: Chema Alonso, Chief Data Officer at Telefónica, at Aura's launch earlier this year

Mason. "We've seen quite a few services terminated or no longer marketed. [Operators] have been slow to capture the opportunity and where they have tried to, they've not been fully committed."

Some of the services that are no longer marketed or shut down include BT's Home Monitor, Orange's HomeLive and O2 UK's O2 Smart Home. When O2 shuttered its service in early 2018, which was based on AT&T's Digital Life platform, the operator cited low customer take-up.

Telcos have assets that should give them clear advantages in smart home services. They have long-term customer relationships providing broadband connectivity to millions of households with routers already installed and they also have established retail and online sales channels and customer support operations. But telcos haven't fully leveraged their assets, according to Mackenzie.

Jonathan Collins, Research Director at ABI Research, says there are opportunities for telcos to derive revenue directly from

smart home activities such as selling devices, subscriptions or providing a conduit for third parties. “But the real opportunity is in making their core services that bit stickier and more attractive. The value really comes from not being excluded from an increasingly valuable market that will perhaps pry their customers away from them or turn them into just the dreaded dumb pipes,” he says.

Being engaged in the smart home market doesn't mean that telcos will inevitably start supporting trucks to deploy home security systems or responding to break-ins, he explains. “But it certainly means that they're engaged in enabling those services.”

As operators continue to search for the key to the smart home, some are adopting new approaches and upgrading their installed base of home routers so that they can support an ever-widening variety of connected devices. Examples among European operators include Deutsche Telekom's Magenta SmartHome service as well as its Qivicon platform and device ecosystem, Swisscom's Smart Home, Telefónica's Movistar Home and Telia Zone.

Telia Adopts Open Approach

In Sweden, Telia's Division X innovation unit started a connected home project for application developers in June 2016, called Telia Zone. The operator also pushed software updates out to the home routers of its 1.2 million broadband subscribers and built backend analytics systems and open APIs to support the offering.

In November 2017, the operator rolled out Telia Zone to consumers, albeit on a limited scale. A broader consumer launch is likely to follow on 2019, along with a dedicated app that will allow customers to manage their smart devices.

Telia Zone forms a free feature of Telia's home broadband routers that supports smart products and services. Telia currently sells a handful of connected devices from partners, including surveillance cameras, smart locks and smart thermostats. The operator describes Telia Zone as giving these smart devices and applications even smarter features. For example, with Telia Zone, the smart lock application can send a text message to parents when their kids arrive home from school, or the smart thermostat app can remind people to turn down the heat when they are away.

Damm describe it as a different and more agile way of launching services and build-

ing on what works in the market. The role for telcos in the smart home is providing connectivity as well as guidance for customers “through the technology jungle,” as he puts it. “The smart home has and always will be a very close relative to our broadband service; it's a natural extension of it,” says Damm. “Our connected home is about content and utility. People should love us because they have peace of mind at home and it's more enjoyable when they're there.”

Telia has had previous smart home initiatives, he notes, but they were too early for the market due to the high price of the connected devices themselves as well as the fragmentation of smart home wireless technologies, like Zigbee and Z-Wave.

At the heart of Telia Zone is a graph database, which enables developers to recognise connections between different sets of data and create recommendations for services that are relevant to consumers. This type of data

“The real opportunity for operators making their core services that bit stickier and more attractive

model is used by the likes of Google, Netflix or Twitter for their core services. Damm believes Telia's graph database is likely the first large implementation among telcos.

“Telia Zone's approach is very different to many other [telcos],” says Damm. “We haven't seen a huge success from anybody that we could easily replicate for our market based on our customer research. We didn't find [another telco] who is doing what we're doing and we are doubling down on it for a reason.”

Even though Telia has adopted similar methodologies as digital giants, Damm says that it is not directly competing with them in the smart home space. “We will probably never build a better voice assistant than Google, but they will never build a better fibre network than we have. So our roles are pretty clear,” he says. Indeed, Telia envisions partnering

with the likes of Apple, Google or Samsung. “We have an open approach and want to be part of that ecosystem. We're not expecting to compete there.”

Telefónica's smart home Aura

In Spain, Telefónica just launched a Movistar Home device with a touchscreen and artificial intelligence-powered digital assistant called Aura. The device is designed to enhance the operator's quad-play offerings, by allowing customers to search and share Movistar content or make calls via voice commands to Aura. It also includes social media functionality with support for Twitter.

Even with its homegrown digital assistant, Telefónica does not consider Movistar Home to be a smart speaker like those from Amazon, Apple or Google, or even a smart home device. Rather, “it is an extended screen for your Telefónica services, and we believe that the new interaction paradigms include the right combination of voice, video and touch screen technology,” says Óscar Mancebo, Head of Movistar Home at Telefónica. “It allows our customers to use all our services at home in an easier way and enjoy a better experience using the latest technology.”

To show how Telefónica is positioning the device as an enhancement to its existing services, a tagline in one of the operator's promotional videos is “much more than a landline”. The operator plans to gradually add support for other connected devices in the home, based on user demand. Initially, only smart lights are integrated.

“Since the smart home space is so fragmented, the integration of Movistar Home with smart home devices tries to follow a different approach, starting by integrating only those devices that represent substantial [amount] of usage for users,” says Mancebo.

The recent initiatives of Telefónica and Telia suggest a renewed energy among European telcos to break into the connected home as competition intensifies from almost all directions. But the pressure is on.

As ABI's Collins explains, the smart home is becoming an operating system much like the smartphone OS, and the value of data and customers spans across a wide range of industries. “There is a landgrab going on for who owns that and gets value out of it by leveraging an installed base to third parties and other industries,” says Collins. “The competition is fierce.” ■

Operators ramp up the gears in connected car race

Car manufacturers are increasingly adding connectivity to its suite of services. Where do operators sit? Kate O'Flaherty reports



Road warriors: Mitsubishi is one car manufacturer exploring how connectivity can benefit its vehicles

Partnerships are central to the modern day telco as it attempts its shift from traditional connectivity provider to digital solutions company. The connected car proves to be one of the best examples of this.

If the predictions are right, the market is set to surge over the next few years. Figures from SBD Automotive suggest 175 million new connected cars will be sold globally between 2016 and 2020, as the automotive industry responds to legislative pressures, growing consumer demand, new revenue streams and opportunities to reduce costs.

Car makers can't do it on their own so ecosystems are key, something Henry Ford noted back when building a motorised vehicle was the end goal. As he put it: "If everyone is moving forward together, then success takes care of itself."

Hence the glut of connected car projects, partnerships and trials. In Europe, operators including Deutsche Telekom recently joined forces with BMW and Daimler to urge the EU for a connected car standard.

“The move to fully connected vehicles will be gradual

O2 recently signed a collaboration agreement with Wireless Infrastructure Group to develop what is expected to be Europe's largest fibre connected small cell network to support trials of driverless vehicles in the UK in 2020.

The 5G Automotive Association – the organisation created to help telecoms firms and car manufacturers develop end to end services – continues to work on making this ecosystem a reality. Most recently, it conducted tests to compare the performance of ITS-G5 Wi-Fi and Cellular V2X PC5 radio technologies in delivering vehicle-to-vehicle safety messages.

The appeal of operators to car makers is mutual. Angus Ward, CEO Digital Platform Solutions at the BearingPoint consultancy says: "eSIM and IoT connectivity are at the heart of these new services and automakers want to avoid becoming their own MVNOs. They want operators to remove the complexity and sell them fully integrated, simple to consume services."

Previously, the ecosystem was based on a siloed approach seeing service providers trying to get an end to end view, capture needs and

contract that directly, says Gion Baker, CEO at Vodafone Automotive. Now, he says, there is a “partner ecosystem where we can add value”.

He points to three types of services: safety and security; convenience and infotainment; and cost of ownership management. “Our customers ask us to provide more than connectivity to reduce complexity and have better integration of services,” he says.

BT sees the connected vehicle as “a natural evolution” for its 30 million mobile customers, says Colin Shillito, Head of Business Development, IoT Automotive. He thinks the operator’s role is important. “Unlike car manufacturers, we have 30 years’ experience in building connected customer propositions.”

Meanwhile, Orange has been enabling connected car programmes starting with 2G, 3G and then 4G, says Julien Masson, Head of Connected Car. In Europe, the operator partners with Renault Nissan and the firm is also connecting smart vehicles. “We are focusing on traditional telematics services where data such as mileage is collected for fleet management,” Masson explains.

Mitsubishi is just one car manufacturer firmly embedded in the connected car space. Bryan Arnett, Senior Manager, Product Planning, says the car maker works with tier one hardware manufacturers, as well as operators.

But car manufacturers already work on tight margins, so making money from connected vehicles is a challenge. In the US, Arnett says car manufacturers sell connected services to consumers based on a monthly, yearly or per use subscription-based model including a two year free trial period. He says the car maker is seeing “good penetration”, but it is yet to assess the appetite for renewals, given that subscriptions only launched eight months ago.

This subscription model does raise concerns in some quarters. Raj Kanaya CMO and MD, Automotive at IoT provider Aeris notes how these packages have proved a tough sell in the past. He says: “Consumers are accustomed to a smartphone level of application consumption: they download an app and it’s free so there’s value without spending money. Connected car programmes had short trial periods of one year, and you had to pay up to \$200 per year, so they had very low subscription rates.”

This could be a reason why Mitsubishi is also exploring free services to reduce or avoid costs. “We can get cost reductions at the back end,” says Arnett. “If a connected car customer

is more engaged - which we find they are - they would be more likely to return to the dealership. If we can increase retention to a high enough level, we can offer that for free.”

He adds: “If there is trouble coming from the vehicle, we can diagnose it more quickly. We can deploy the fixes faster, which avoids the cost of recall or claims.”

Bumps in the road

Operators are keen, car makers are keen, but what is not quite resolved is how telcos are going to make money from the connected car. BearingPoint’s Ward says many mobile operators’ business and operating models are unprepared to deliver much beyond basic connectivity. “They face their own capability gaps and barriers in integrating and selling higher value-added multi-party solutions. Many don’t have the right sales organisations

“ There is a partner ecosystem where operators can add value

or IT systems in place and others don’t have the right partner ecosystem.” Cybersecurity is another concern with a hack on a connected vehicle potentially catastrophic.

Orange’s Masson says solutions need to be secure end to end and for this reason the operator applies tools to prevent attacks and notify of threats.

Meanwhile 5G – a key enabler for truly connected vehicles – presents several challenges. One is the high frequencies utilised by 5G millimetre waves. “High frequencies don’t travel very far, and they get easily absorbed by environmental surroundings, such as rain or trees,” says Sudhir Sharma, Director, Global High-Tech Industry, at simulation software company ANSYS. “As a result, more base stations are required for reliable communication.”

Richard Woodling, the UK mapping agency Ordnance Survey’s Managing Consultant of 5G, cites a recent study: “We discovered that in busy urban areas with a large volume of buses, lorries or trams, there is the strong possibility

of reduced or blocked 5G signals from one side of the street to the other.”

Although the technology is starting to emerge, connected cars using 5G are some way off, says Mikael Schachne, BICS’ VP of Mobility. “The operators need to have networks for 5G and the whole 5G roaming environment will have a certain impact. We may see trials, but for a wide coverage footprint will take years.”

Of the countries in Europe, Germany is “furthest ahead” says Li-ke Huang, VP of Wireless Technology at VIAVI Solutions. In July, Deutsche Telekom and vehicle inspection company DEKRA announced they were expanding the facilities at the Lausitzring test and race track in east Germany to create Europe’s largest connected 5G car testbed.

As ever, regulation across the continent could stymie these developments. In October, it was reported by Reuters that the European Commission was poised to approve and set rules for the use of ITS-G5 Wi-Fi in cars to be adopted next year. The move would be good for Volkswagen and Renault, which have chosen to pursue the technology. But it would be a setback for those who have invested in 5G, such as Daimler, and mobile operators because the alternative 5G standard – C-V2X – might take much longer to approve.

At the same time, although connected vehicles are already on the road, their full capabilities are far from being realised. “The ability to share data between cars will take a long time,” says Martin Beltrop, Head of Automotive, Nokia Mobile Networks. He thinks in about 20 years “there will only be a few people who drive” but “the move to fully connected vehicles will be gradual”.

Charlie Henderson, Roads Expert at PA Consulting, predicts there will ultimately be niche ecosystems for different kinds of use. “They will be commonplace in cars or taxis on certain routes where vehicles travel in a relatively controlled environment”.

But is the eventual dream of fully autonomous vehicles backed by a seamless ecosystem realistic? The potential is vast, as Henderson points out: “You wouldn’t need stop signs; you wouldn’t need traffic lights. That means you can do massive improvements on flow in the networks. That’s where the benefits come from.”

However, Henderson quickly slows down on that prediction. “There will be connected autonomous vehicles, but the full benefits won’t be realised for many, many years.” ■



How do you solve a puzzle like NFV?

The technology benefits of virtualisation are clear, especially as operators gear up for the decade ahead. However, an industry roundtable recently heard how achieving those benefits is continuing to prove a challenge



that is an advocate of the technology. Yet Yoshihiro Nakajima, manager at the Japanese operator's network management and core network development teams, admitted that "there are huge gaps". He explained: "Many vendors said they were ready for cloud native apps for packet core, but implementation was too far away from [what we thought was] ideal."

Axel Clauberg, Vice President of IP End-to-End & Infrastructure Cloud at Deutsche Telekom, is another who thinks today's reality doesn't quite match the hopes the German incumbent had at the outset. "We started our virtualisation journey in 2012," said Clauberg, who is also President and Chairman of the Board for the Telecom Infra Project. "From the cloud native vision we set then we are still quite far away." Although he said there had been progress – he noted improvement in packet core elements in particular – overall he lamented: "We are not where we wanted to be. Virtual network functions (VNFs) are not at the maturity level we need."

It's not just the big operator groups who have had virtualisation roadmaps in place for several years who are finding obstacles along the way. Three UK began working on its strategy in 2016, chose its technology partners the following year and is currently in the middle of testing ahead of an expected launch in 2019. "When we embarked on this journey there was a lot of talk about the benefits of NFV and cloud," Dimitris Vasilaras, the mobile operator's End-to-End Cloud Solutions Lead, commented. "What we realised when we did a deep dive with the vendors is that this was not always the case. The solutions they provided were not always as mature as we had hoped. The majority was not cloud native. During the request for proposal (RFP) phase everyone was advertising that virtualised functions could run on commercial off-the-shelf (COTS) equipment but actually when we discussed performance levels... our own hardware [from vendors] was better optimised to run some NFV functionality."

Indeed, NTT DOCOMO's Nakajima said expectations were now for "cloud friendly rather than cloud native" solutions. But for William Crowe, a Technical Account Manager for Intel, it is not just a question of laying the blame at the door of telecoms vendors. "We need to have consistency in terms of what we're asking them," he said. "We're all guilty of using the word cloud native but we've no real

The road to a fully virtualized telecoms network is continuing to prove a bumpy one, executives from operators across Europe and Asia at two roundtable discussions have heard, with a range of obstacles holding implementations back from delivering on their promises.

Operators, vendors and other related third parties gathered at the events, hosted by Mobile Europe and European Communications and sponsored by Red Hat and Intel, to discuss the progress telcos are making as they look to transform legacy networks into an open, virtual infrastructure.

To listen to the opening words from Diego

Lopez, Senior Technology Expert at Telefónica's R&D arm, and Chair of the ETSI NFV Industry Specification Group, one would assume all is well. He noted the Spain-based operator's fabled UNICA virtualisation project is "now being deployed across the whole of Europe and most of Latin America". For good measure, Lopez added: "My formal work is more to do with applied research. NFV is not the hottest research topic right now because it is supposed to be part of normal operations soon."

Case closed? Not quite. NTT DOCOMO, which deployed the world's first multi-vendor ETSI NFV commercial system in March 2016, and is currently in an "expansion phase" that has seen it virtualise around 60 percent of its evolved packet core (EPC), is another telco

definition of what that means.”

Other operators present, including Liberty Global, Proximus, Saudi Telecom Company (STC), Turkcell and Verizon also shared where they were on their journeys. Tarik Cicic, Head of Networks and Engineering at Telenor Global Wholesale, arguably summed up the state of play best when he said: “We are all in for open source, we are all in for virtualisation, but in practice it is difficult.”

Ultimately, the sentiments being expressed by service providers were not, in Crowe’s eyes at least, unexpected. “It’s not surprising, it’s what I expect to hear when you pulse operators on where they are,” he admitted. Rather, he was interested to know how operators were learning the lessons from what he described as their “collective rush” to do proofs of concept (PoC) that majored on proving performance but which have ultimately struggled in a real operational environment.

Deutsche Telekom’s Clauberg was quick to agree. “A couple of years ago the industry was suffering from a PoC disease,” he said. “We did way too many and didn’t focus on bringing anything into production. PoC were done in isolation in artificial environments, which is why they didn’t address the operational challenges.”

The twin track approach

One of the key barriers currently to delivering NFV’s full potential in an operational environment is management and orchestration (MANO), according to Nikolai Stankau, Director, Telco Business Development EMEA,

at Red Hat. Telefónica’s Lopez concurred: “Orchestration was a real nightmare – the tech for this was really limited,” he said. Such tribulations led the Spanish telco to being a founder member of ETSI’s Open Source MANO (OSM) initiative, contributing code on which it is based. Around 50 other companies, such as Amazon Web Services, BT, Telenor and Verizon also signed up.

But such is the competitive nature of telecoms that it is battling a rival – the Linux Foundation-hosted ONAP (Open Network Automation Protocol), backed by the likes of Amdocs, AT&T, China Mobile, Orange and Vodafone – for dominance rather than being the standard bearer around which the industry coalesces. Some firms, such as Red Hat, are backing both OSM and ONAP – indeed, Red Hat is a member – while others, such as SK Telecom, are known to be developing their own bespoke MANO solutions. Clearly, there is still a long way to go – OSM is not yet being used in Telefónica’s deployments, Lopez admitted.

For the moment, uncertainty reigns. “Is ONAP the right place for us to invest,” asked Red Hat’s Stankau. “Is ONAP ready for commercial deployment,” Intel’s Crowe wanted to know. While no concrete answers to those questions were found – Lopez claimed that OSM is “mature enough for production” while ONAP is not, although his view could not be described as neutral – what is certain is that the two camps will continue to map out different routes to their destinations. “We had discussions with the ONAP guys about merg-

ing... but from a technical perspective it was extremely complicated... and making it work consistently was a complicated task,” Lopez said. Crucially, however, he added: “They can work alongside each other.”

This was music to the ears of Don Clarke, Principal Architect of Network Technologies at CableLabs, a consortium of around 60 cable operators that has put its flag in the OSM camp. “To avoid fragmentation you want implementation that is interoperable. So OSM and ONAP should have a common set of interoperable parameters,” he said.

While OSM and ONAP fight for dominance and interoperability, telcos have other pressing concerns as they look to embed virtualisation into their operations. “More than the technical aspects the biggest challenge for us is defining the operating model and defining a service model which can underpin these operational changes,” noted Prasath Jagathrakshakalu, Technical Design Authority at Three UK. A key change that is required, according to the exec, is to move to “a user-centric model where you monitor the service not the network”.

STC began its virtualisation journey back in 2013, a few years before its UK counterpart, but has similar concerns. The operator got “aggressive” in 2015, according to Cloud Infrastructure Lead Samer Hussein, by issuing RFPs for a range of virtualised platforms and functions. It decided to virtualise the EPC first but despite now having that infrastructure in place, Hussein said: “We don’t see a full operating model yet?”





Jagathrakshakalu thinks one reason why telcos are not as cloud native as they want to be is because they have not “developed from the ground up”. “We are very conservative, very traditional,” the Three UK exec said. VEON Group CTO Yogesh Malik concurred, likening telcos to traditional car manufacturers racing to compete with companies such as Tesla, which he described as “a computer on wheels”. There is just “something different” about Tesla that sets it apart from your average Volvo, Malik said before adding: “The challenge is also ‘are we ready to embrace opensource, make our own workforce software agile?’”

‘No one knows’

Three UK has looked to get around this, to a certain extent, by outsourcing much of the practicalities of virtualisation to third parties. “We are taking a back seat to implementation because Three is moving away from in-house design, testing and delivery teams,” Jagathrakshakalu said. “We are getting providers to do that and we are taking a more technical leadership, governance role.”

But if, as participants discussed at the outset, the vendor community is suffering from issues that limits their ability to deliver a truly virtual environment then this approach doesn’t get us much further forward. Take the view of Marcel Lucht, Complex Bids Manager at Belgian operator Proximus, as an example. “[Vendors] have told us ‘we’re overlooked – we only have one guy who knows about this and can help you implement it but he is fully booked,’” he said. “So it becomes a race of who asks first – it’s scary.”

NTT DOCOMO’s Nakajima is another who has witnessed the limitations of the vendors, citing a waiting time of up to six months for an

answer about their “very complicated” NFV system and even then sometimes “no one knows”.

Deutsche Telekom’s Clauberg thinks telcos need to take things into their own hands. “If we want to break away from the old way of doing things we have to take responsibility,” he said, citing the need for a transformation in culture and skills. Clauberg found a kindred spirit in VEON’s CTO: “You can’t survive if you don’t change,” Malik said. “We need to think about what’s next. There’s a balance – it’s not about making people irrelevant, getting new people in, it’s about continuously bringing them through the journey. It is not an option, we need to get there. There will be failures,

“ We are all in for virtualisation, but in practice it is difficult

some will be fast some will be slow [but] it’s about how quickly you can get [to where you need to be].”

Malik cited the example of how VEON’s opco in Algeria migrated 17 million subscribers to a new greenfield data centre “overnight” thanks to all the staff being “aligned” to the shift that was taking place. “We were aware there were risks but maybe it’s about mitigation, how risk averse we are. It’s a culture of handholding and it remains a point of inertia [in the industry] that needs to be overcome,” he said.

Telefónica’s Lopez said AT&T was “the only”

operator he has seen that is really changing the way they are going about things because they have been “aggressive”. “The mindset in most operators is that it’s more important to have people who are influential when it comes to regulation,” he lamented.

Despite his earlier tub thumping, Deutsche Telekom’s Clauberg is also realistic. “The top talent from universities wants to join the Googles of this world, then maybe Facebook,” he said. “Telcos come at the very end.” Three UK’s Jagathrakshakalu echoed this view: “These people start working for us but they leave really soon! In companies like Google or even in IT they can do things a lot quicker. We are on a journey but we are very orthodox. For skills like AI or machine learning they prefer to work for a company that embraces these technologies very fast. The telecoms industry has to change for us to attract them.”

Take back control

For CableLabs’ Clarke, however, the pendulum has swung too far in the direction of digital native companies and their ilk. “Over time, the software industry has tried to take over,” he said. “They said ‘this is a software game and we don’t need you – it’s all open source, all cloud and we’re going to do the job for you’. We spent two years worrying about orchestration and all those things that are really important but we lost sight of performance. It’s time again to reflect on the fact that we have some really good specs and look at performance again, put network discipline back into what have become software dominated disciplines.”

According to Clarke, CableLabs itself has been “a bit too software led”. “The software guys don’t seem to care too much when you break performance - they say it will get fixed in a future release. No! You can’t do that it will break the network,” he said. “Due in part to regulation we’re not in a ‘break things and mend them quickly’ type of game. We need to take control back on the network side.”

This tour de force came during a part of the discussion that focused on the performance and security aspects of virtualised infrastructure. Although Deutsche Telekom’s Clauberg noted that “it is not around open systems that there is concern when it comes to security – in fact people feel more comfortable taking open source-based systems into production from a security perspective”, he did warn how important it was not to get stuck with old versions of OpenStack



– the open source software platform. “You need to put pressure on some of the vendors,” he explained. “There is one who calls themselves cloud native but in fact they are still mandating a fairly old OpenStack release.”

There are other, more operational challenges, according to NTT DOCOMO’s Nakajima. He pointed to the “long lasting verification procedures” that are required at the operator once patches for security issues are purchased – although Stankau later noted this is not the case with Red Hat’s own solutions – and the inability of the core network system’s 5,000 servers to handle “massive” upgrades. It is “a headache” Nakajima said, and there is “no consensus” on how to solve such issues.

Wearing his ETSI NFV hat, Lopez said security was “a real concern”. “Security is one of the most active [ETSI NFV] groups – so much so that from time to time it is perceived as a real pain by the other groups,” he joked. “The common security practice in cloud is very much related to a particular way of deployment but the security practices of operators are so much concerned with physical security. It’s not going to be physical access any longer!”

Switching to his Telefónica hat, the exec said the Spanish telco was trialing quantum key distribution “to secure the different VNFs we are deploying”. The results of this trial were not shared but Lopez said he was “concerned about how to establish trust”.

Others have more prosaic explanations for the industry’s lack of progress. Aykut Demirkol, Network Virtualisation Program Manager at Turkcell, commented: “There is a

reason we are doing all this and it is cost. But if you are going to have to pay \$1 million for a legacy EPC and \$2 million for a virtual EPC no one will pay for the virtual one.”

Red Hat’s Stankau wanted to know how the industry could get operators, standards bodies, vendors and regulators into a more constructive conversation about delivering a telco cloud that is fit for purpose for the telecoms industry. Paul Overbury, Technologist at UK regulator Ofcom, said his organisation was keen to get more involved. “We’re very much at the beginning of the

“ You can’t survive if you don’t change

journey and trying to catch up with operators,” he said. “Often, operators forget to come and talk to us – they see us all as bad people for some reason! We’re trying to change that. We need to be closer to the action, understand how it impact consumers and get ourselves embedded higher up the chain.”

For Faiz Alam, Senior Architect, Access Strategy at Liberty Global, there is a triumvirate of entities who are key to progress – standards bodies, open source providers and vendors. “It is important to understand these three and be able to join the dots. That’s what I

feel is missing at the moment,” he said.

VEON’s Malik felt some of the conversation in the industry focused too much on how difficult virtualisation is and the problems inherent with it. “Should we not be discussing what would enable us to get to [where we want to be]? This [virtualised] world exists today. How do we get telcos to start participating regardless of the challenges?”

Three UK’s Jagathrakshakalu attempted to provide an answer. “Management has to lead the journey, explain why are we transforming,” he said. “From a technology aspect, we need to fail fast. We need to select the right partners and define the target operating model. Then we need to upskill people.” All this needed to be done, Jagathrakshakalu concluded, without degrading quality of experience for customers.

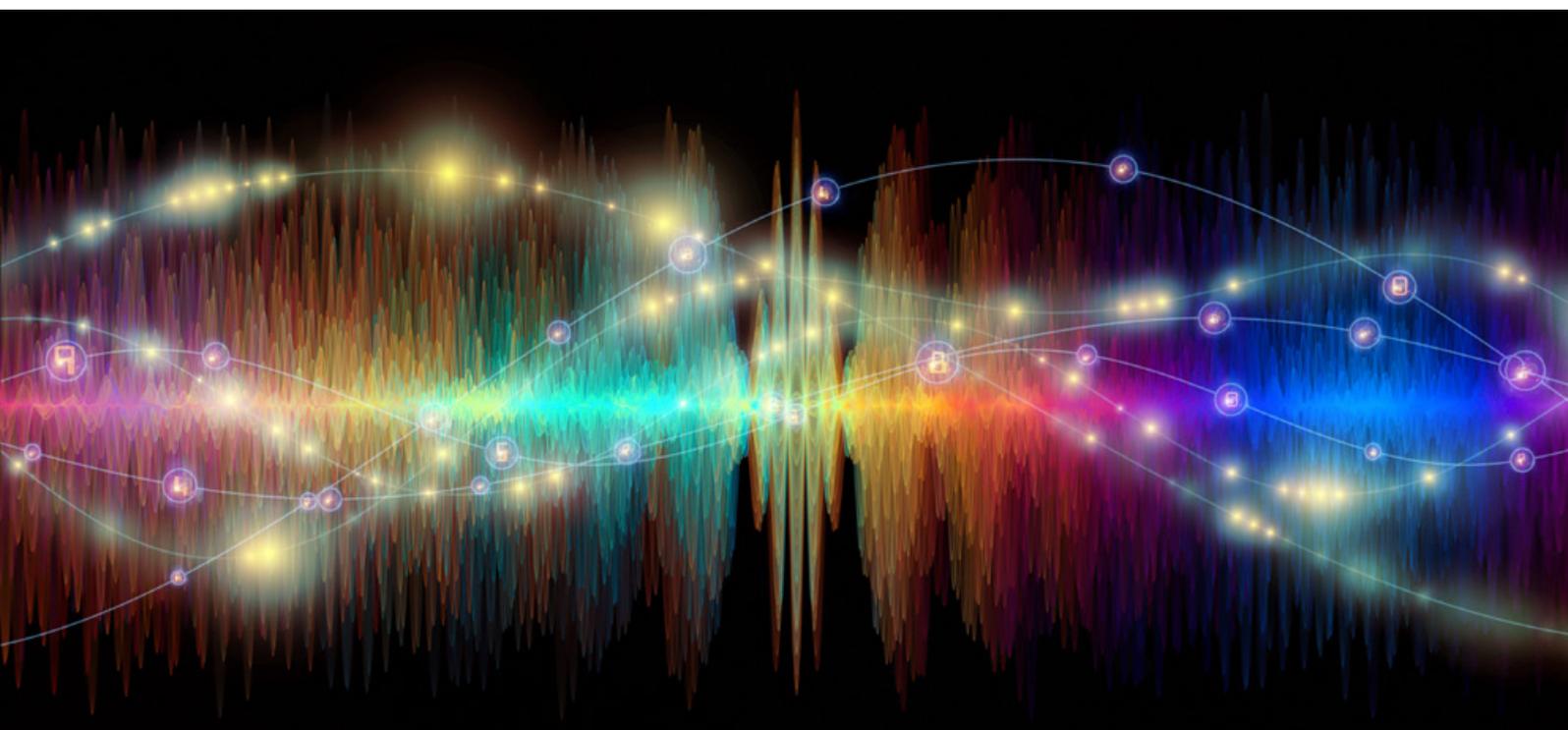
Mobile Europe and European Communications hosted two roundtable discussions, sponsored by Red Hat and Intel, in Amsterdam and London in October 2018.

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5G spectrum auctions: The good, the bad and the ugly

Does Europe has the right policies in place for allocating the mobile industry's dearest resource? Michelle Donegan reports



The recent 5G spectrum auction in Italy sent shockwaves through the mobile industry. When the final gavel came down and the bids totalled €6.5 billion, the result confirmed operators' deepest fears – that governments could view 5G auctions as easy ways to fill depleted public coffers.

Mobile operators have profound concerns about high-priced spectrum auctions, and with good reason. Many European operators still bear the scars of the UMTS auctions early this century when countries, notably Germany and the UK, raised tens of billions of euros for the national purse. The recent Italian 5G auc-

tion looked worryingly familiar and elicited warnings to not repeat mistakes of the past.

Some view the huge sums spent on 3G spectrum as one of the catalysts for the decline of Europe's leadership in wireless technology. At the annual FT-ETNO Summit in October, hosted by the Financial Times and the European Telecommunications Network Operators' Association (ETNO) and dedicated to policy issues, industry leaders discussed spectrum allocation practices and noted how the 3G auctions impacted European wireless competitiveness.

"Italy is one example, but please let's not go back to Italy being a prime example for Europe because that's what crashed our sector when [Europe] used to be number

one on everything in wireless," said Rajeev Suri, Nokia CEO, speaking on a panel at the summit. "Then we ceded the whole thing to the US, Japan and Korea."

The main concern with auctions that extract large, upfront sums is that operators will have less funds available for deploying 5G infrastructure. The knock-on effects would include slower build outs, fewer new services made available to consumers and Europe falling behind China and the United States on 5G technology development.

The Italian auction signalled that "there are countries that might be looking at spectrum as a cash cow for public budgets," says an ETNO spokesman. "But this is of course at odds with

a long-term vision on 5G and not what is needed to make 5G happen.”

One industry analyst is surprised that the auction model has lasted for so long considering its poor track record. “The only thing that the model for allocating spectrum through auctions has solved is really for the governments,” says Bengt Nordström, CEO at consultancy Northstream. “No one can dispute that the highest bidder wins, so governments don’t get sued when they are arranging spectrum auctions. That is basically the only benefit they have.”

In the past, spectrum was allocated primarily via beauty contests, whereby operators were rated on their ability to meet certain criteria and awarded licences accordingly. The problem was that there was some subjectivity in the process, which often resulted in legal challenges against governments if operators disputed the outcomes. In contrast, auctions were deemed to provide a cleaner result.

It’s all in the design

But the issue is more nuanced than simply whether the spectrum auction model is good or bad. It’s also about how national regulators design the auctions, which includes the reserve prices, eligibility rules, bidding process as well as the coverage obligations attached to the licenses. The choices regulators make on these and myriad other aspects will determine how competitive bidding will be. In addition, the overall European policy goals for the communications sector will also affect auction design.

Regulators can use an auction to introduce more competition in their market by mandating that spectrum goes to a new entrant. Or the spectrum could be divided up in such a way that will drive highly competitive bidding.

Different auction designs yield very different results. The recent 5G auction in Finland provides a stark contrast to Italy’s. The Finnish regulator auctioned three equal-sized blocks of 3.4GHz-3.8GHz spectrum and raised €77.6 million from the country’s three mobile operators, Telia Finland, Elisa and DNA. The Italian auction included 700MHz, 3.4GHz-3.8GHz and 26GHz spectrum and generated €6.5 billion. In a like-for-like comparison with Finland, the bidding for Italy’s 3.4GHz-3.8GHz spectrum totalled €4.35 billion.

One of the key differences between the two auctions is that Finland’s regulator offered three equal blocks of spectrum, whereas Italy’s

regulator offered two big and two small blocks, which sparked fiercer bidding for the more attractive, larger blocks. Also, Italy’s auction had more operators participating and a condition for allowing a new entrant, which also led to more competitive bidding. TIM and Vodafone won the larger two blocks of 3.4GHz-3.8GHz spectrum while Wind and newcomer Iliad won the smaller blocks.

But the Italian auction doesn’t necessarily portend doom for Europe’s 5G future. “You look at Italy and you get depressed. You look at Finland, UK and Spain, and you have the right answers,” said José María Álvarez-Pallete López, Chairman and CEO of Telefónica at the FT-ETNO Summit. “So in my opinion, we should not just focus on one example, there are other examples that are going in the right direction.”

In the UK, Ofcom is preparing to auction spectrum in the 700MHz and 3.6GHz-3.8GHz bands in 2019. Given that the regulator is currently working on its proposals, it declines to be interviewed for this article. But an Ofcom

threatening legal action.

Mobile operators say that the coverage and performance requirements are too onerous, while industrial groups and car manufacturers say the measures don’t go far enough to ensure broad coverage and make Germany a 5G leader.

According to the terms, licensees will be required to provide 100Mbps services to at least 98 percent of German households per federal state by 2022, as well as all highways, main roads and main railways. By 2024, the coverage requirements are more extensive. Operators will also have to deliver latency of 10 milliseconds for all federal motorways and highways.

Another condition obligates license holders to negotiate with other operators over roaming and network sharing arrangements to facilitate rural buildouts. Critics of this requirement claim it will open the door to new competitors.

Beyond these requirements, the regulator is also reserving 100MHz of 3.7GHz-3.8GHz spectrum for local, industrial use, and the allocation procedure will be determined before the auction.

To balance the tougher license conditions, the regulator substantially lowered the reserve prices for each block of spectrum – they are about 10 times less than the original proposed terms.

Is perfect spectrum allocation possible?

“One mistake I see is that regulators and policymakers, particularly in Europe, still behave like it is a growing market,” says Nordström. “So they refuse to see the need for the market to consolidate down to fewer players, and they do not see that in a market that is not growing, it doesn’t make sense to set up a licensing model where there is a big outlay of cash for the operators. Ultimately, it will reduce their ability to invest in networks.”

Nordström says that a better model is a hybrid one that combines coverage or service requirements with spectrum fees. Although it would be more cumbersome to manage, he said it would serve the economy and the mobile industry better than the current auction model.

“It’s reasonable that operators pay something for spectrum, but what is far more important is what they do with that spectrum,” he says. “But that would mean that governments have to sacrifice the upfront revenue and take the slightly longer-term benefit of densifying the digital infrastructure.”

The revised German auction is a kind of hybrid, although Nordström says it looks

“ It doesn’t make sense to set up a model where there is a big outlay of cash for operators

spokesman says: “Our duty is to manage the use of spectrum efficiently – not to maximise the financial value of any auction we run. So that is our primary concern when deciding on the approach we will take for each auction, rather than how much can be raised.”

In Germany, plans for auctioning the 2GHz and 3.4GHz-3.7GHz bands have been highly contentious. The Bundesnetzagentur regulator delayed the auction from 2018 to the spring of 2019 due to political pressure for universal 5G coverage requirements that were at odds with the regulator’s original plans. The final auction conditions were published at the end of November, and operators and industry stakeholders alike were strongly objecting at the time of writing, with Vodafone Germany

like the regulator “wants to both have its cake and eat it,” and that he understands operator objections.

At the European level, operators won't get much relief on long-standing spectrum issues from the new European Electronic Communications Code. The European Commission proposed measures to harmonise spectrum al-

location as well as lengthen license durations, which is important for investment certainty. The EC wanted license terms of at least 25 years, but had to compromise with member states and arrived at effectively 20 years.

“Spectrum is a national resource,” says the ETNO spokesman. “There is a limit to what the European Union can do without the agree-

ment of member states. It was a disappointing compromise from an industrial viewpoint.”

Spectrum auctions determine the fate of mobile operators for decades. As Belgium, Germany, Spain and the UK lead the next wave of 5G auctions in Europe, operators can only hope that the Italian auction remains an exception to the norm. ■■



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News spotlight

Vodafone explores how SDN can improve microwave backhaul

Vodafone has lauded an “important milestone in the transformation of the operator’s transport networks” after demonstrating how SDN could automate microwave backhaul.



Nokia heads to the bank to borrow €250m to back 5G R&D

Nokia has borrowed €250 million to finance research and development into 5G in the latest part of its turnaround plan.



Qualcomm to spend \$100m backing AI start-ups

Qualcomm has pledged to invest \$100 million in artificial intelligence start-ups as it shifts from the cloud to the edge.



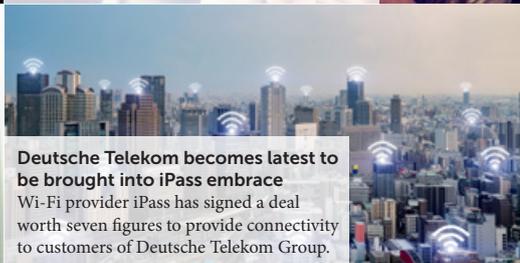
A third of Europeans will sign up to 5G by 2025, predicts Ericsson

Ericsson has predicted 5G will reach 1.5 billion subscriptions worldwide by the end of 2024.



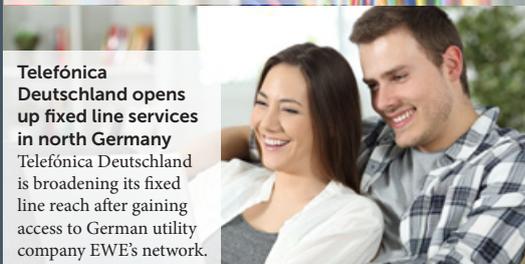
Openreach reveals one million more UK buildings will get G.fast

UK fixed line provider Openreach is planning to extend its Gfast network to an extra one million homes and businesses.



Deutsche Telekom becomes latest to be brought into iPass embrace

Wi-Fi provider iPass has signed a deal worth seven figures to provide connectivity to customers of Deutsche Telekom Group.



Telefónica Deutschland opens up fixed line services in north Germany

Telefónica Deutschland is broadening its fixed line reach after gaining access to German utility company EWE’s network.



Swisscom latest to claim 5G first in live network demo

Swisscom has secured the first over the air connection on a live 3.5GHz 5G network by connecting a prototype smartphone.



Orange brings LTE-M home, eyes Romania, Spain as next steps

Orange has launched a LTE-M network in France and is targeting Romania and Spain by the end of this year.



5G at risk without sensible spectrum approach, warns GSMA

5G’s potential could be under threat without a sensible approach to spectrum, the GSMA has warned.

TIM makes Italy's first 5G connection on a smart device

TIM has made its first 5G connection on its live network using a prototype handset, in its latest piece of research into next generation technology.

The operator held the trial at its Turin testbed using 5G NR technology and Ericsson's Massive MIMO solution.

The demo was the first time in Italy that a

smartphone powered by Qualcomm's Snapdragon X50 5G chipset was used.

The operator used a chunk of the 3.4-3.8GHz spectrum it acquired in the country's recent auction.

It described the test as "a fundamental step towards the implementation of 5G in Italy to benefit TIM customers".



Telia brings 5G robot to Helsinki airport

An autonomous robot will help carry out service tasks at Helsinki Airport after being connected to Telia Company's third 5G network in Finland.

The robot, which sadly is yet to be christened, will also oversee airport operations and also study the flow of passengers through the T2 terminal.

Telia and airport operator Finavia, which is Telia's first 5G customer, will research how staff and passengers react to the robot through real-time video feeds.

The robot will be connected to a Nokia 5G base station operating in the 28GHz band. This will be the first time in Finland that

millimetre waves have been used publicly and Finavia is Telia's first 5G customer.

Telia Finland 5G Program Director Janne Koistinen said: "5G will start with enterprise customers, especially for industrial automation and remote control."

"The low-latency connection and massive capacity of 5G will serve the airport well with its masses of passengers and data, and with the focus on security and fluency of services."

In November, Telia opened a 5G network in Oulu with the aim to explore industrial use cases of 5G. This came a month after Telia's first 5G network was launched at a Helsinki football stadium.

KPN aims to save €350m through new strategic plan

KPN is aiming to expand its FttH footprint by one million by the end of 2021 and make its network infrastructure 5G ready as part of a new strategic plan aimed at cutting opex by €350 million.

CEO Maximo Ibarra has identified three strands that will be central to its future success.

In addition to building future proof infrastructure and pushing heavily on fibre, it will target increasing its number of converged households by 300,000 and converged contract base to 70 percent by 2021. On its enterprise arm, the operator will simplify and digitise its product portfolio, increase the number of converged connectivity services it offers and "selectively" grow in IT.

Finally, it will speed up its internal digital transformation, using the inevitable buzzwords of "making the company lean, faster and more agile".

It launched a Simplification program in

2014 and said it has led to €650 million in savings by the end of September this year. It said this program will be incorporated into a new multi-year project launching next year.



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Malta

Melita

Melita, the smallest of Malta's three operators, has promised to deliver full LTE coverage by the end of 2018.

The operator recently broke through the 85 percent population coverage benchmark for its LTE-Advanced network.

Melita has been working with Ericsson on the rollout and said its network will also support LTE-M and NB-IoT.



Guam

NTT DOCOMO

A 5G technology verification centre will be set up in Guam next year, NTT DOCOMO has announced.

The centre will be the Japanese operator's first verification facility and will be open to some 1,900 partners participating its 5G test project.

The operator has two other labs in Japan and is set to open a third by the end of 2018.



Belarus

Velcom

Belarusian telco Velcom has bought Belinfort and is aiming to switch the Minsk-based company's ethernet and ADSL customers onto its own base.

The deal, for an undisclosed sum, is aimed at improving Velcom's breadth and quality of service, the A1 Telekom Austria Group subsidiary said.

Algeria

Mobilis

Mobilis, the cellular arm of Algeria Telecom, has broadened the reach of its 4G network to a further 10 provinces.

The LTE network now covers 40 of the country's 48 provinces, two years after it started introducing 4G services.

Mali

Malitel

Malitel has introduced 4G services just weeks after being awarded LTE compatible spectrum.

The country's capital Bamako is the first city to access the services but the operator has promised to roll out LTE to other parts of the country in the coming months.

Kazakhstan

Kazakhtelecom

Kazakh national operator Kazakhtelecom has fired the starting pistol in the country's 5G race by requesting spectrum.

The operator is aiming to launch testing of millimetre wave and C-band frequencies by the end of this year.

If all goes to plan 5G services will be launched by 2022.

Indonesia

Net1

Net1 is partnering with the television subscription service MNC to bring TV to remote parts of the country.

The services will be delivered over Net1's LTE network, which it said can reach all parts of the country.

Only 5.6 million Indonesians subscribe to paid TV, a tiny fraction of the country's 264 million population.

Uzbekistan

LTE and fibre

Every single Uzbek will be able to access LTE services by 2023, the country's government has said.

The country, which has a population of more than 32 million, is set to add to the 2,000 kilometres of fibre-optic cable and 4,000 LTE base stations introduced this year.

The government is backing the construction of two large data centres in the coming years and said 120,000 kilometres of fibre will be laid by 2023.

Swiss operator launches 5G network at Crap ski resort

Swisscom has launched its second 5G network at the LAAX resort on the Crap Sogn Gion mountain and aims to introduce a range of next generation connected tourism services.



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¹ Red Hat client data and Fortune 500 list, September 2018.
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