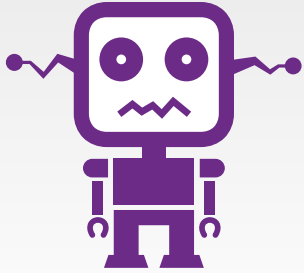# TELECOMS.COM INTELLIGENCE
ANNUAL INDUSTRY SURVEY 2016

86% OF OPERATORS SAY THEY'RE NOT READY FOR IOT

57% HAVE EITHER LAUNCHED OR ARE TRIALLING NFV
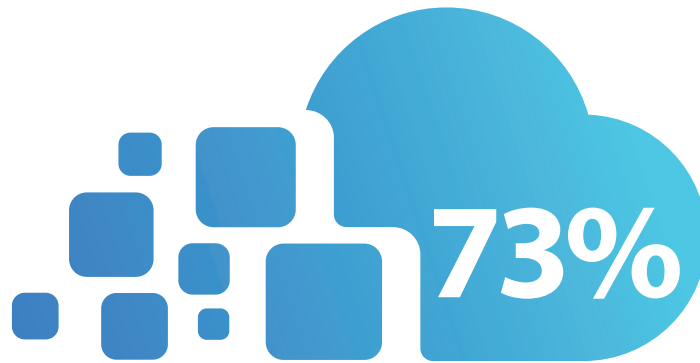
74% SAY M&A ACTIVITY WILL DRIVE TELCO NETWORK INVESTMENT
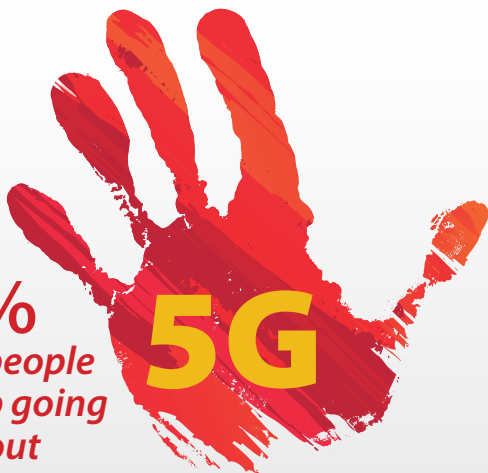
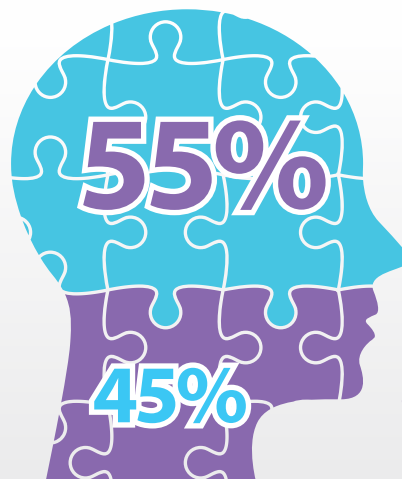**43%** say VOLTE will be launched in 2016

83% say LTE STILL hasn't reached maturity

73% say all Telco IT systems will be cloud-based in the future

25% want people to stop going on about **5G**

55% SERVICE PROVIDER RESPONDENTS

45% NETWORKING, IT & CLOUD VENDORS, AND OTHERS

CONTENTS

Operator opinions

The telecoms industry has been evolving with monumental pace in recent years; lest we forget the smartphone as we know it is still less than 10 years old. With that in mind, it's a tricky task trying to predict exactly where telecoms will be 10 years from now.

It's whimsical to try and hypothesise where communications could be 1,000 years from now; perhaps the need for physical devices will diminish in favour of holographic handsets or maybe bio-modification chips will allow us to communicate purely through thought alone.

It's completely impossible altogether, however, to even nearly predict what telecoms could look like in 20,000 years. But that's how much experience the respondents of the 2016 Telecoms.com Intelligence Annual Industry Survey had between them. 24,048 years to be precise.

The cumulative experience of our audience revealed some fascinating insights relating to a wide array of topics affecting to the entire telecoms industry today. We asked more than 60 questions across specific subject areas from big data to NFV, and this report reveals the results and learnings from our questionnaire.

We'll start with the operator landscape where we conduct a macro-level assessment of the current market, taking in factors such as consolidation, regulation and competitive pressures. We'll then deep dive into six topics: Big Data, BSS Transformation, CEM, Fraud & Revenue Assurance, IoT and NFV.

More than one third of the 1,500 respondents to this year's survey came from technical roles like architecture or engineering; another 20% came from research and product development roles; and nearly 40% of the respondents were involved in telecoms business practises such as corporate management or marketing.

Altogether, we unearthed some extremely interesting trends relating to current operator activity and attitudes towards industry threats, and we're sure this report will provide you with a few golden nuggets of information to take into your business this year.

For the last four years we've been delivering this report to help businesses in the telecoms sector keep on top of industry trends and shape their business plans for the year ahead; hopefully you'll find the 2016 edition an important tool in understanding what's happening in the sector today.

Thank you to all of our participants and supporters of the survey for making the activity both possible and insightful.

Enjoy.

Kind regards,

Tim Skinner
Head of Telecoms.com Intelligence

The telecoms industry is a phenomenally intricate market with overwhelming significance in the 21st century. As technological innovations and trends like IoT and 5G emerge and grip ever-tighter on society, that significance will continue to grow.

This makes analysis of an entire industry in one fell swoop a significant undertaking, so we chose to focus on the biggest trends we saw going into 2016, like consolidation, M&A activity, multiplay, new service creation and the hottest new tech.

Key takeaways:

- Nearly half of all respondents are to planning to invest in IoT as a priority in 2016.

- A lack of internal business commitment is the biggest barrier to new service creation.

- Three quarters of the audience believe M&A activity will benefit infrastructure investment.

About F5

F5 (NASDAQ: FFIV) provides solutions for an application world. F5 helps organizations seamlessly scale cloud, data center, telecommunications, and software defined networking (SDN) deployments to successfully deliver applications and services to anyone, anywhere, at any time. F5 solutions broaden the reach of IT through an open, extensible framework and a rich partner ecosystem of leading technology and orchestration vendors. This approach lets customers pursue the infrastructure model that best fits their needs over time. The world's largest businesses, service providers, government entities, and consumer brands rely on F5 to stay ahead of cloud, security, and mobility trends. For more information, go to f5.com.

You can also follow @f5networks on Twitter or visit us on LinkedIn and Facebook for more information about F5, its partners, and technologies.

Short term evolution

WELCOME TO THE TELECOMS.COM INTELLIGENCE ANNUAL INDUSTRY SURVEY, IN WHICH OUR UNIQUE AUDIENCE OF TELECOMS INDUSTRY PROFESSIONALS SHARE THEIR OPINIONS ON THE KEY ISSUES AND TRENDS AFFECTING THE SECTOR. AS EVER WE COMMENCE WITH QUESTIONS DESIGNED TO PROVIDE AN OVERVIEW OF TELECOMS OPINION BEFORE DRILLING DOWN DEEPER INTO SPECIFIC SUBJECT AREAS. WE HOPE YOU WILL AGREE THAT OUR FINDINGS PROVIDE GREAT INSIGHT INTO THE ATTITUDES AND EXPECTATIONS OF TELECOMS PROFESSIONALS AND HOPE YOU FIND THEM USEFUL IN SHAPING YOUR OWN.

The telecoms industry is in the middle of a period of great diversification. Operators can no longer rely on traditional recurring revenue streams and are having to constantly look for new ways of retaining a customer base being constantly seduced by internet companies and their freemium treats. At the same time the underlying technology is in a state of transition. With 5G approaching fast and virtualization blurring the boundaries between telecoms and IT, the decisions telecoms companies make over the next year will have enduring consequences.

The opening question of the 2016 Telecoms.com Intelligence Annual Industry Survey asked respondents to pick all of the technologies they would consider to be a priority area for investment this year. We listed 12 technology categories and they all got a fair bit of acknowledgment, with no clear leader, but with plenty of interesting trends.

The most significant finding was that almost half (47%) of respondents identified IoT (Internet of Things) as a priority investment, more even than LTE network infrastructure, VoLTE or LTE-Advanced.

This is an unambiguous illustration of how telcos are actively looking beyond their traditional markets for their business strategies and how, as we explore in depth in the dedicated IoT section later in the survey, this enduring tech buzzword is finally becoming a reality.

One of the things that has contributed to the commercial realisation of IoT is the understanding that the real value comes from being able to effectively process all that data being constantly transmitted by billions of embedded sensors. So it's fitting that another of the

most popular areas of investment outside of core wireless technology is Big Data – another enduring buzzword that is increasingly coupled with IoT.

Other than IoT some of the most interesting data points to come from the first questions are the lower scorers, with SDN only appealing to 22% of respondents despite 32% selecting NFV, with which it's often paired. It was also slightly surprising to see only 20% of respondents select small cells as a key investment area despite this technology considered to be a key tool in tackling capacity challenges that are only set to increase.

The flip side of this question concerns what respondents consider to be the biggest challenge for their company in 2016, so we asked them to identify just one. Again there was a pretty broad range of opinion on this question, with no clear leader, but the three that were selected by a double digit figure percentage of respondents had a familiar feel to them. 16% of respondents identified the cost of network infrastructure as the biggest challenge facing their company over the next year, while 14% went for declining ARPU and 12% selected customer service and support. One surprise, however, was that regulatory pressure was only chosen by 4% as their main challenge.

Which of the following technologies is a priority area of investment for you in 2016?

- Big Data
- BSS/OSS
- Content (ie. Programming content, Sports broadcasting, music streaming etc)
- G.fast/Broadband access technologies
- Internet of Things (IoT)
- LTE network infrastructure
- LTE-Advanced
- Network Functions Virtualization (NFV)
- Network Security
- Small Cells
- Software Defined Networking (SDN)
- VoLTE
- Other
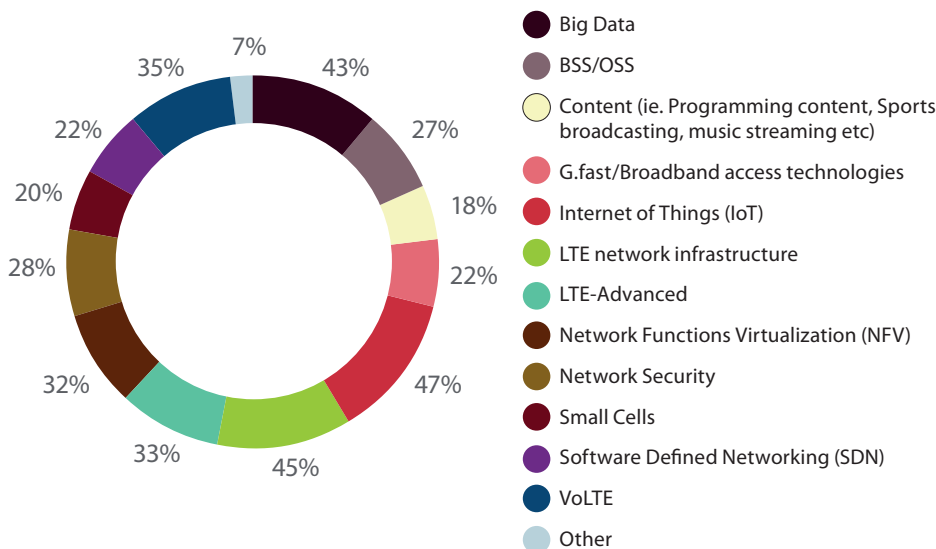
Having established the principal threats we then tried to explore what can be done about them by asking what the primary means of competitive differentiation are in respondents' markets. Multiple answers were permitted to this question but the only one that attracted the majority of respondents was network performance. Coupled with the previous question this shows that for all the talk of OTT completion, multiplay, etc, it still comes down to the quality of the network.

Close behind were other well established pieces of telecoms business best practice such as customer service, service pricing and network coverage. Non-core offerings such as device subsidies and content partnerships were only identified by a small minority of respondents as a good way to help them compete.

While only 10% of respondents identified VoLTE has a key way of differentiating themselves, 43% said their company was planning to launch VoLTE services this year – the most popular answer to our next question. The next most selected service launch was data bundle offers, which could include things like pooled or subsidised data, chosen by a third of respondents, while a quarter expected to launch fibre broadband.

The biggest barrier to creating new services was, unsurprisingly, Capex, which was selected by 27% of respondents who were asked to pick just one. This made it the clear leader with 18% indicating the time it takes to deploy new services as the main issue and 13% questioning the reliability of the underlying technology. If we combine the 11% that identified internal risk aversion and the 9% that selected cost of R&D and lack of human resource then we see that the majority of our respondents essentially blame a lack of commitment from their own company as the biggest barrier to

new service creation.

If, as seems to be the case, telecoms companies are feeling a bit conservative these days then another way to explore their strategy is to ask them where they're prioritising cost reduction in 2016. Inevitably Capex was once again the number one choice, with a quarter of respondents identifying it and the highest cost reduction priority for their organisation.

The other leading responses all covered core activities, with network consolidation getting 20%, workforce reduction 18% and network maintenance 14%. A surprisingly small proportion of respondents identified device subsidies (7%) and customer care (4%) as a cost reduction priority, which could be because costs are already relatively low in these areas or because they're considered too important to cut, or a combination of the two.

Another way of potentially creating greater efficiencies and economies of scale is via mergers

and acquisitions. Both operators and vendors seem to be constantly looking out for these kinds of opportunities, for example BT's acquisition of EE in the UK, so we asked respondents to indicate their level of agreement with a few statements on this matter.

The statement that was met with the greatest approval was "Telco consolidation will enable greater investment in infrastructure," with 74% of respondents either agreeing (58%) or strongly agreeing (16%) with it. Conversely only a minority of respondents agreed with the statement "Telecoms regulators currently have the balance between consumer and operator interests right," and with the statement "Each market should have a minimum of four mobile network operators." So it would seem the balance is in favour of consolidation and perhaps also a bit less regulation.
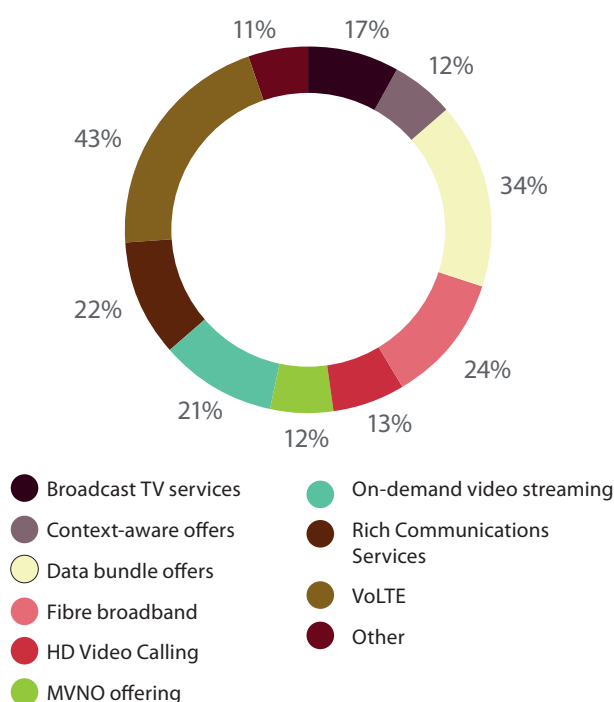
One of the most dominant and fastest growing trends of 2015 was the rapid uptake in mobile

video consumption. It comes as no surprise to see data becoming an increasingly consumed and commoditised service from operators, with unlimited data buckets being liberally offered commonly by market challengers (think T-Mobile USA and Three UK), much of which is going directly towards frequent mobile video streaming. Therefore, by extension, it is unsurprising to see the majority of our audience say that video streaming will become the most lucrative service enabled by LTE – voted for by 37% of the audience.

Following that, 20% of respondents reckon data roaming will be one of the most lucrative services LTE will bring to operator revenue streams. That said, it would be reasonable to suggest that a number of prohibitive factors exist before LTE-based data roaming can be considered a feasible reality. Firstly, there would require a broader pervasion of 4G data users before LTE-roaming is a fully supported feature among carriers and their international partners. It must also be considered that firmer regulatory stances are being adopted on the subject of data roaming fees; particularly when we consider the European Commission's recent confirmation that roaming fees across the continent will be abolished by mid-2017. However, there still exists a broader opportunity for intercontinental data roaming, assuming that operators can find a price point that is lucrative for them while being compelling and affordable for users. As it stands, charging upwards of £6, €8 or $9 per megabyte of data used is not an attractive proposition for users.

Coming back to respondents to the survey, 19% said IoT will be one of the most lucrative services being enabled by LTE in the coming year; this being said after a wide array of "LTE-M" (machine) and low-power

Which new services are you planning on launching in 2016?

- ● Broadcast TV services — 17%
- ● Context-aware offers — 12%
- ● Data bundle offers — 34%
- ● Fibre broadband — 24%
- ● HD Video Calling — 13%
- ● MVNO offering — 12%
- ● On-demand video streaming — 21%
- ● Rich Communications Services — 22%
- ● VoLTE — 43%
- ● Other — 11%

Which of the following services do you think is the most lucrative for LTE?
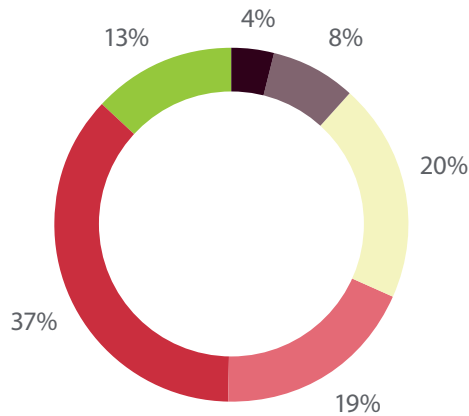
- ● Critical communications/ emergency services
- ● HD video calling
- ● LTE data roaming
- ● M2M/IoT connections
- ● Video streaming
- ● VoLTE

cellular protocols for the machine to machine-based technology emerged in 2015. Other lesser-identified services included VoLTE applications as a revenue-generating tool, HD video calling and critical communications and emergency services on LTE networks, with 13%, 8% and 4% respectively.

So we have examined which opportunities operators believe exist for them today in terms of monetising LTE-based services, but where is the service provider community in rolling out LTE and what level of maturity does it see in its market today? The next question looked at just this point, and it would appear that nearly one in three (32%) operator respondents said there still exists a great opportunity to bring in new LTE users and customers who are yet to make the move from 3G to 4G. This answer was closely followed by another 29% of the audience which said that LTE still has a long way to go before it reaches maturity, and that a highly lucrative opportunity for operators still exists. This is likely due to a number of emerging markets where

LTE infrastructure is currently being developed, or where operators are investigating and developing carrier aggregation-based technologies enabling LTE-A.

With that in mind, another 22% of the audience said that we are only beginning to scratch the surface of what LTE is capable of, and that as a result a huge opportunity for monetisation still exists. Conversely, 10% of respondents said they are now way beyond 4G as well as LTE-A or carrier aggregation, and they are now looking into 5G development. Just 7% of the audience said that LTE has peaked in maturity and has already maximised its monetisation potential.

The next question relating to LTE asked respondents on their level of progress with deploying LTE-A. Nearly half of respondents said they've either already rolled out LTE-A or are undertaking trials, 29% and 19% respectively. A further 21% said they're expecting to launch LTE-A services at some point in 2016; while 13% acknowledged that 2017 or beyond is a more realistic time frame for them

at present. Finally, nearly a fifth of all respondents said that they have no intentions of introducing LTE-A services for their customer base. This may be representative of the emerging segment of the telecoms sector currently in the process of developing LTE networks and beginning the monetisation of rudimentary 4G services.

The final three questions of this section of the survey sought to gain attitudes on some of the biggest technological trends we witnessed on Telecoms.com in 2015.

We started with 5G. At least since the dawn of technology, society has been constantly in search of the next big thing. When we had WAP we wanted 3G; when 3G arrived we immediately went in search of 4G, and so it's only logical that in this incredibly fast-paced and increasingly impatient world, we're already demanding 5G – even if very few people actually know what it is. Lots of industry vendors and operators have already publically stated what they're doing on 5G. Lots of standards bodies have jostled

for position to get the ball rolling; the European Commission even weighed in and created task forces with improbable and slightly forced acronym names like "FANTASTIC 5G" and "MMAGIC 5G". Mobile World Congress last year was awash with vendors showing off what they're doing and even after MWC had packed up and left town, news was being broken on a weekly basis of supposed world "firsts" for 5G.

With that in mind, we asked the audience what their views on 5G are. 25% said they're looking into a few of the technologies behind 5G, but won't expect any trials before 2020. A further 23% said they're more than five years away from even considering 5G and that it's just a vague buzzword at the moment. 17% said they're actively researching 5G technologies now, and expect trials and a possible launch by 2020. Just 10% of respondents stated they're really pushing ahead with some areas of 5G and expect trials and a potential launch by the end of 2018. Coming full circle with some of our earlier LTE-based
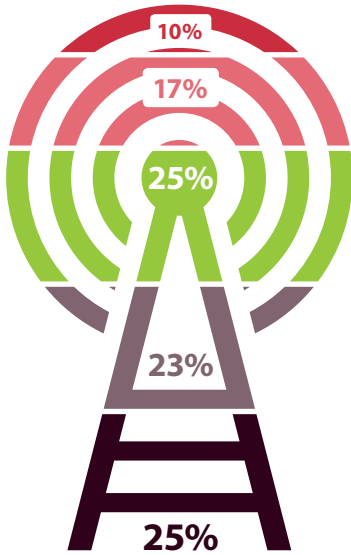
What is the current status of LTE-Advanced on your network?
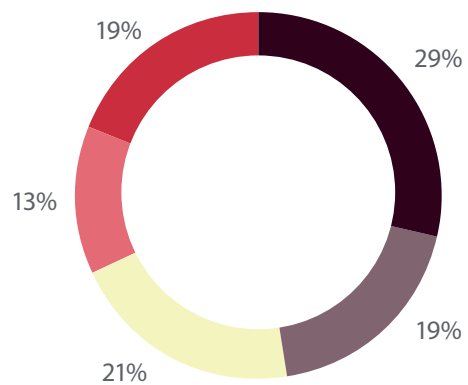
- ● Already commercially rolled-out
- ● Undergoing trials
- ● Expected to roll-out in 2016
- ● Will not roll-out until at least 2017
- ● No current plans to introduce LTE-Advanced

What are your views on 5G?

- **10%** We're really pushing ahead with some areas of 5G, and expect live trials and a potential launch by the end of 2018
- **17%** We're actively researching 5G technologies now, and expect trials and a possible launch by 2020
- **25%** We're looking into some of the technologies behind 5G, but won't expect any trials before 2020
- **23%** We're more than five years away from even considering 5G; it's just a vague buzzword
- **25%** I wish people would stop talking about 5G; we've not even finished with 4G yet

trends, 25% of all respondents said "I wish people would stop talking about 5G, we're not even finished with 4G yet."

The Internet of Things (IoT) was another of last year's biggest trends, and continues to be so at the start of 2016. We asked the audience to identify one of a series of statements about IoT they would most agree with. 45% of respondents said that IoT is going to develop a whole new business model for them and that it will change everything.

It has been a common assertion that IoT will struggle to flourish without the telecoms operator's network gluing all of the elements together. 26% of respondents said that operators around the world will be essential to the existence of IoT and that it's nothing without telecoms. Meanwhile, 16% said they're already pressing ahead with offering IoT services which are generating revenue; while 13% said IoT is just an overhyped marketing term so far, and that it means nothing to their business. It would appear that the vast majority of operators already see the potential IoT possesses as a transformative business segment in the years to come.

The final question related to attitudes towards the emerging virtualization principle network functions virtualization (NFV). 2015 saw a wave of live rollouts of infrastructure laced a bit of NFV, with more than 30 operator use-cases of virtualized functions in the network. To quantify how the broader industry views NFV and to understand their intentions, we asked the audience to identify which statement most accurately reflects their approach to NFV.

40% of all respondents said they are currently investigating use-case scenarios for NFV; 24% said trials are currently being undertaken into use-case possibility. In terms of benefiting from live NFV, 15% of the audience said they have already launched live services in the network; while another 15% of respondents conversely said they do not have the time, cost of human resources required available to explore NFV deployment despite their desire to do so. Finally, just 6% of the audience said they have no interest in deploying NFV of any kind.

These numbers would back up our previous assertion that NFV is indeed alive and kicking, as we will explore in greater detail in the dedicated NFV section of this report.

You'll also find detailed sections on big data, BSS transformation, CEM, fraud & revenue assurance and IoT. We hope you find this year's report useful in shaping some of your strategic decisions in 2016, a year full of possibility as the industry embraces a variety of technologies fundamental in delivering the next generation of telecoms services. Hopefully this report will help you more fully understand the emerging trends out there.

SPONSOR'S COMMENT – F5 NETWORKS

For service providers to stay innovative and profitable, they understand that the network that delivers new revenue generating services including IoT, Big Data, VoLTE, RCS, and Video services to their end customers needs to be efficient and secure.

Service providers are taking initiatives to evolve their networks. They are investigating use case scenarios for Network Functions Virtualisation (NFV) to stay competitive, to bring innovation, and efficiency to meet the demands of today's ever-increasing growth in user applications and services.

In addition to evolving the networks with NFV, the next generation of mobile technology, 5G, is to provide ubiquitous connectivity for all devices supporting all applications that may benefit from being connected. 5G will provide wireless connectivity for a wide range of new applications and use cases including IoT and very-high-speed media delivery. 5G is in the early stages of being defined for International Mobile Telecommunication systems (IMT-2020) by the International Telecommunication Union (ITU-R Radio Communication Assembly) as requirements of mobile communication beyond 2020.

In support of standardisation including open source in the global eco-system around 5G, the Next Generation Mobile Networks (NGMN) Alliance started by top 20 mobile operators formed an alliance to define 5G.

Many evolved 4G technologies including NFV/SDN efforts are paving the way for 5G. NFV and software-defined networking (SDN) enable service providers to transform how they build and scale their networks with more flexible and agile architectures, allowing rapid delivery of new services in pursuit of profitable business models.

Operators will benefit from working closely with vendors that have been invited to join the NGMN and are helping to lead the Internet evolution to 5G. Vendors must offer a rich portfolio of products and solutions in NFV environments to help operators optimise and secure the most critical applications and services in the network spanning across the data, signalling, and application planes.

Telecoms.com Intelligence, the analysis arm of the website, is a bespoke research and analysis service tailored to clients' individual needs. Our intelligence products deliver bespoke data and insight, drawing on our extensive market knowledge, contacts, and reach to give an independent 360° view.

Working closely with clients, we produce industry-specific content – such as white papers, reports and webinars – all designed to enhance online brand discoverability, be thought-provoking and long-lived; as well as drive leads, raise awareness and directly contribute to your business objectives.

In 2015 Telecoms.com Intelligence generated more than 25,000 leads for clients across 50 campaigns.

BIG DATA

Big data is hardly a new term, and has certainly fallen victim to the dreaded hype cycle in the past. It would appear to have come through the other side of the technology adoption lifecycle now, as recent years have been primarily dedicated to understanding the potential use-cases and best ways of managing the swathes of data operators are now able to gather.

This section of the survey intends to understand the audience's current attitudes to big data implementation, as well as the potential CEM and service benefits of big data done right.

Key takeaways:

- 80% of the audience think big data is best used monitoring negative network conditions affecting customer experience.

- More than half the audience doesn't think it's making good, valuable use of big data.

- Nearly three quarters of the audience says IoT is useless without big data support.

OPENET

Openet - Experts in Smarter Engagement:

Openet provides the systems and expertise to assist Communication Service Providers to grow to become Digital Service Providers. Openet enables Smarter Engagement across a range of domains:

- Smarter Engagement with Customers – sell personalised services and enable a better customer experience
- Smarter Engagement with Big Data – get a holistic view of the customer, the service and the network
- Smarter Engagement with Technology – using NFV to run smarter systems, including real-time charging and policy
- Smarter Engagement with Existing Systems - reconfigure legacy/diverse networks and systems

Since its foundation in 1999, Openet has constantly been at the forefront of telecoms software development and innovation. Its success is personified by the many long-term relationships it has fostered with the largest, most progressive, and demanding operators across the globe.

Crunching the numbers

THE TERM 'BIG DATA' HAS BECOME A FAMILIAR ONE TO EVERYONE ASSOCIATED WITH THE TECHNOLOGY INDUSTRY AND BEYOND. IT'S ONE OF THOSE SUPER-TRENDS THAT SEEMS TO HAVE IRRESISTIBLE MOMENTUM BUT WHICH IS STILL SPOKEN ABOUT AS MUCH FOR ITS POTENTIAL AS ITS PRACTICAL APPLICATION EVEN AFTER ALL THESE YEARS.

Big data shares this characteristic with another of the defining buzzwords of our time: IoT. It's no coincidence that IoT is also emerging as a tangible reality at the same time as big data since the two of them are becoming increasingly inter-dependent. What's the point of having all those billions of embedded chips and sensors constantly streaming data into the cloud unless you can make sense of it all and furthermore make useful decisions on the back of it.

In the big data section of our annual survey we wanted to get a sense of attitudes towards big data and then drill down a bit fur-

ther into its practical applications to telecoms organisations. Our first question asked respondents to pick which one of a range of statements best represents their view of big data.

We deliberately picked five statements that cover the whole spectrum of potential attitudes and the response indicated respondents clearly value big data and what it offers their business. 48% of respondents picked "A good big data strategy would give my organisation a competitive advantage," while 28% went for "Correct use of data is critical to the success of my organisation." Only a very small percentage of

respondents were even indifferent, let alone dismissive of big data.

Our next question revealed a gulf between how much respondents value big data and how good a job they think their organisations are doing in exploiting it. When asked "Is your organisation making good, valuable use of big data?" only 46% of respondents answered "Yes". While this does represent a large proportion of respondents it's still a minority and indicates that even after all this time companies still have some work to do on their big data strategies.

A broad concept such as big data can mean very different things to different people, so in

order to uncover which business functions within telcos value big data the most we asked respondents to select their single most important use for it.

A clear leader emerged from this question, with 42% of respondents identifying customer analytics as the most important use of big data. Customer care is a massive overhead for operators and they're constantly on the lookout for ways to streamline it without compromising on quality. Timely access to high quality customer and network data is considered to be a very valuable tool to resolving customer care issues quickly and conclusively. In second

Which of these statements best represents your view of big data?

Correct use of data is critical to the success of my organisation	28%
A good big data strategy would give my organisation a competitive advantage	48%
Data management is important to my organisation, but no more so than a number of other functions	15%
A big data strategy is a 'nice to have' but we will cope without one	5%
'Big data' is just another buzzword and its importance is over-estimated	4%

place was 'business intelligence' with a 25% share.

Opinions on the main obstacles to a successful big data strategy were a bit more diverse, with no clear leader. 25% of respondents identified 'A lack of required skill sets in organisation', while 21% went for 'Not enough clear business cases to warrant investment'. This implies that while the will is there to fully embrace big data, many respondents feel their companies lack the capability to make the most of it. There is a clear opportunity here, therefore, for big data vendors to clarify the arguments in favour of investment.

Drilling down into the practical applications of big data for telcos, our remaining questions in this section of the survey looked to gain more granular insight on the technical and business implications of the analytics-based technology.

Big data has the potential to deliver an unprecedented level of detail into user behaviour and preferences; insight which was previously impossible to achieve and which advertising and marketing firms would be desperate to get their hands on. The relationship today's consumer has with their smartphone phone, and by extension their service provider, is intimate in the extreme; so intricate analysis of geolocation tracking data, app-based utensils, browsing patterns and mobile commerce behaviour, for example, becomes an extremely valuable tool for brands to tailor advertisements and product placement. Therefore, it potentially becomes an extremely lucrative opportunity for operators.

The next question of the survey asked respondents to estimate the potential proportion of operator revenue that could be generated

by selling anonymised usage data to third parties this year. It would appear that respondents aren't sure that 2016 will be the year they really stand to benefit extensively from the selling off of anonymised data; 24% of the audience said that 1% or less of operator revenue will be generated by these means. A further 30% said 2-4% of revenue will come from the sale of data, 19% said 5-7%, 12% said 8-10%. There does exist, however, an optimistic segment of the audience which reckons more than 10% of operator revenues will be down to data sales, 15% of the audience in fact.

Presumably, the value of behaviour-based data will increase when M2M data revealing behavioural interaction with machines becomes more significant. To that end, we next asked the audience whether they think that big data support is essential to the success of IoT. An overwhelming 71% of respondents said they believe IoT will be meaningless without comprehensive big data support, while 29% disagreed. One questions exactly what the

29% think IoT will be without the ability to analyse and act upon the relentless stream of machine-generated data in an M2M world.

We see CEM-related topics become something of a recurring theme in this year's Annual Industry Survey, and in the next question we wanted to understand how influential big data tools will become in an operator's CEM strategy. The respondents to this question voted overwhelmingly in favour of its importance in providing full and immediate visibility of negative customer network experiences. 51% said it's very important, and then in descending order 32% said it's quite important, 17% reckon it's a useful option, while just 1% said it's not important. The CEM section of the survey investigates this further, but our final question yielded a response again indicating that big data may well hold the key to advancing CEM in the future.

We asked our audience which events should be automatically triggered by big data being held used by the operator. 97% said that proactive network mainte-

nance and identifying network issues in real-time is an important or very important feature of big data. A further 96% said the same for triggering proactive customer care based on network performance and customer experience. Elsewhere, personalised marketing and content based services were indicated as important by 87% of the audience with intelligence wi-fi offload and addressable advertising receiving 78% and 71% respectively.

One of the biggest trends we have observed in this section of the survey is that big data, if it's not already in live use by operators, is being seen as a tool principally intended to aid the customer experience and the management thereof. In order to do so, however, there's a need for more experienced data analysts or scientists coming in to maximise the efficiency of a big data strategy. At present, there's an element of doubt over whether the data itself is valuable, but it certainly possesses the potential to support the battle against churn and help stabilise ARPU.

How important to a successful CEM strategy is full and immediate visibility of negative customer network experiences?

Very important — 51%

Quite important — 32%

A useful option — 17%

Not important — 1%
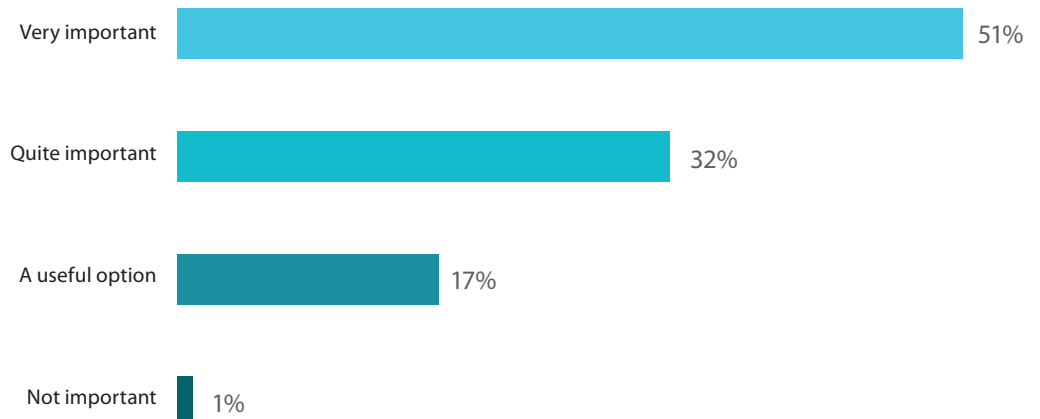
The Internet of Things will be meaningless without comprehensive big data support, do you agree?

71% Yes

29% No
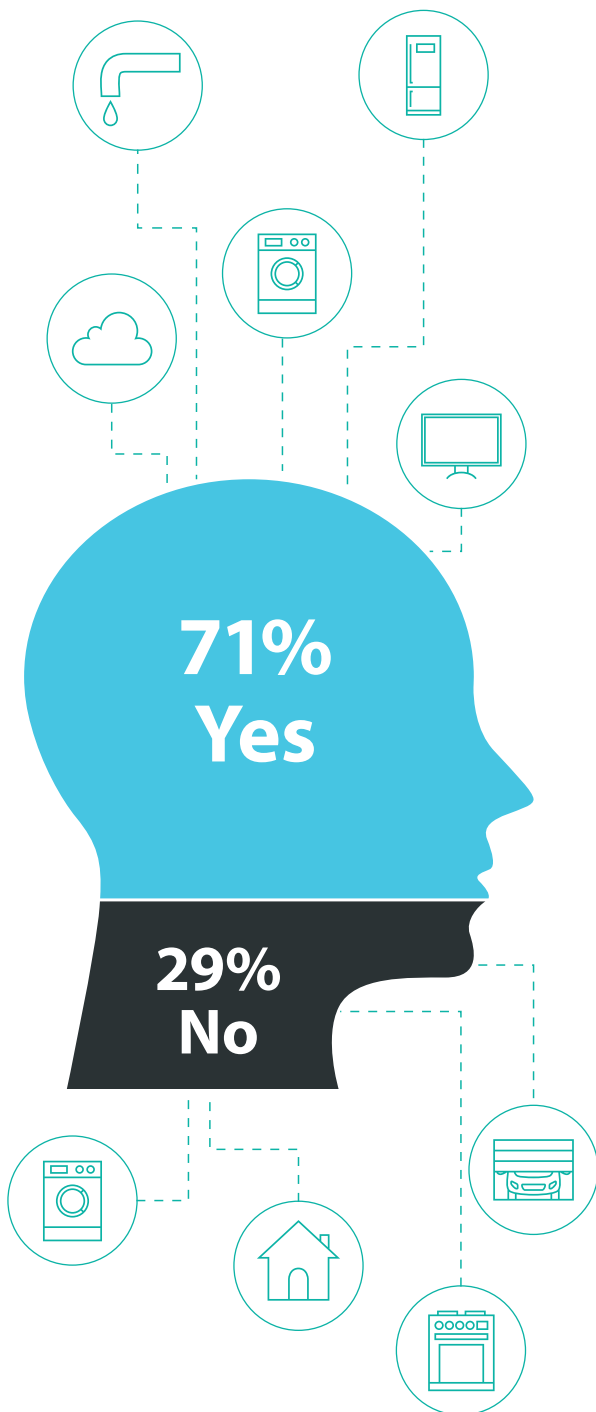
SPONSOR'S COMMENT – OPENET

It's not a surprise to see the results of the telecoms.com survey show that while most operators see the importance and value of big data, the majority are currently not making good, valuable of use of big data.

One of the problems is that big data is, well just too big. There's too much of it, and getting to the value has always been a problem. All too often big data is collected and then sits in a data lake which goes stagnant. The survey also showed that the most important use of big data is customer analytics. Many operators are transforming to become digital service providers and sell a wide range of digital products to their customers. So, it's no surprise that using big data to drive customer analytics and get a clear understanding of customers comes out as the top use case.

One of the new approaches to getting value from big data is using big data preparation. This is a way to 'right size' big data sets as they are collected. This means transforming the raw collected data into "Smart Data". This provides real-time, holistic views of the customer plus context. This smart data is also available for action in minutes rather than months.

As for customer analytics, having the combination of real-time usage data, plus historical contextual data (e.g. NPS, value, churn propensity score, etc.) can provide the intelligence to drive real-time contextual offers. These offers could be anything from sending a customer care message to upselling personalised offers for new digital services.

There are many use cases that big data preparation can enable. Customer analytics and real-time contextual offers that can help drive smarter engagement with customers could well provide the quick win that delivers value from big data.

BSS TRANSFORMATION

Evolving consumer behaviours, psychologies and consumption of services mean operators are facing new and unprecedented pressures to ensure their customer facing systems are capable of meeting the challenge. This section of the survey explores some of the transformational requirements of operators looking to take BSS to the cloud.

Key takeaways:

- Almost three quarters of the audience reckon all telco business IT systems will be cloud-based.

- 72% plan on having a cloud-based BSS system in place by the end of 2017.

- Pricing innovation and competitive differentiation is seen as the biggest benefit of cloud BSS transformation by 92% of the audience.

AsiaInfo

About AsiaInfo

With over 14,000 employees and about $700 mn in annual turn over, AsiaInfo is one of world's leading telecoms IT software and services company. Founded in USA in 1993, we are headquartered in China where our market share is over 50%. Our Business Support Systems (BSS) serve more than a billion end-customers throughout Southeast Asia, Europe and the Indian subcontinent. The company has a proven track record of helping operators to create a differentiated customer experience, especially through enabling omni-channel engagement and leveraging real-time contextual awareness. We are now bringing innovation from Asia to the wider international telecoms market.

AsiaInfo: Innovative, Economic, Reliable and Friendly!

A personal touch

THE SERVICES BEING OFFERED BY TELECOMS OPERATORS HAVE BEEN IN A STATE OF TRANSITION OVER THE PAST COUPLE OF YEARS. SINCE LTE ROSE TO PROMINENCE AS A PRIMARY OFFERING FOR MOST MOBILE OPERATORS, THE PRODUCTS AND SERVICES ON DISPLAY HAVE EVOLVED RAPIDLY TO REFLECT THE NEW BANDWIDTH CAPABILITIES NOW IN CUSTOMERS' HANDS.

As evidenced in the operator landscape section of the report, 43% of operators are launching VoLTE in 2016, 34% are targeting data bundling offers to their customers, while 22% of respondents plan on launching RCS on the back of pervasive LTE and 21% are looking at on-demand video streaming. By reflecting on these statistics we are enlightened as to how broad the range of services being managed by operators has become. These services are broad by both the nature of the content on offer and by the density of the data being consumed.

LTE and RCS, for instance, don't by themselves highlight a need for Business Support Systems transformation. However, by extension, it can be inferred that a range of new services and products available to the consumer of 2016 puts a considerable level of pressure on operator strategies for optimising customer experience. Evolving business models in fiercely competitive and innovative markets, while continuing to target reduced operational cost remains a top priority for operators, and a key driver for transforming BSS.

This section of the Telecoms. com Intelligence Annual Industry Survey focuses on the extent to which operators need to undertake transformation of their Business Support Systems, utilising cloud computing based technologies

and the principles of ICT and/ or virtualization. We asked the survey respondents which new BSS related services and pricing models they're planning on launching in 2016 to understand the scope of service evolution in the mobile industry; whether cloud-based BSS is a consideration for them; what the perceived benefits, threats, challenges, opportunities are; and whether cloud technologies have reached a sufficient level of stability, reliability and security to host mission critical telco BSS systems.

We began by asking the audience what BSS-related services their company will support by the end of 2016 in a bid to understand
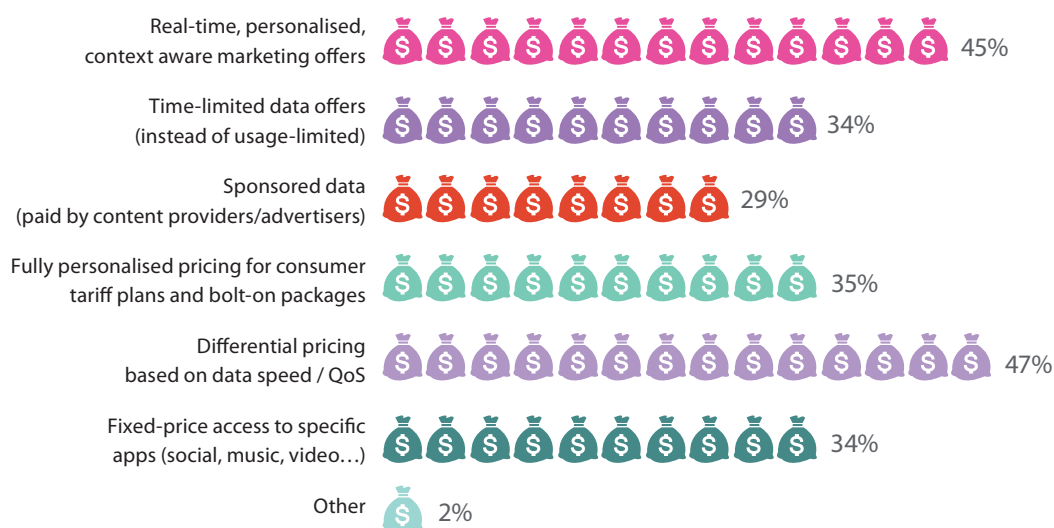
the primary pricing models and service trends being eyed-up for launch and what sort of additional workloads BSS systems can expect. The two stand-out trends related to varying services, bundles and charges in order to personalise the customer experience. The most commonly identified service the audience is looking to roll out in 2016 is differentiated pricing models based on data speeds and quality of service, identified by 47%. Meanwhile 45% said real-time, personalised and context aware marketing offers are a priority service to be launched this year.

The two services highlighted here are comprised in no small part

by features aiming to increase the level of personalisation available to customers. It is no surprise that operators are exploring this route; it's been in the pipeline for years as providers try to find means of increasing ARPU and stickiness. Again, the third most frequently identified service relates to personalisation, where 35% of the audience said they'd be rolling out fully personalised pricing for consumer tariff plans and bolt-on packages by the end of 2016.

So why has the audience been so unrelenting in its identification of personalised services as a solution going live this year? From a price perspective it would be

Which of the following BSS-related services will your company support by the end of 2016?

Real-time, personalised, context aware marketing offers — 45%

Time-limited data offers (instead of usage-limited) — 34%

Sponsored data (paid by content providers/advertisers) — 29%

Fully personalised pricing for consumer tariff plans and bolt-on packages — 35%

Differential pricing based on data speed / QoS — 47%

Fixed-price access to specific apps (social, music, video…) — 34%

Other — 2%

reasonable to suggest that flexible, personalized tariffs are needed in order to make sure customers are getting what they pay for and that they only pay for what they need, while simultaneously aiding the betterment of customer experience and providing a competitive differentiator. Traditionally, telco offerings have been delivered with a level of rigidity: get X amount of data, unlimited texts and minutes for a fixed rate every month. Consumers in 2016 have greater choice, greater education and greater demands than those of five years ago, and consequently operators face the existential need to evolve their pricing strategy to suit the modern customer.

In order to manage the new paradigm of fully personalised and tailored services, it is likely that an equally flexible approach to BSS will be required. Cue the introduction of another of the telecoms industry's biggest trends of recent years, Cloud computing. Our next question asked the audience of their current progress in deploying cloud-based BSS services. 34% of respondents said they either already have or are currently implementing cloud-based BSS, while 38% said they will be doing so either this year or next. A further 19% said it will be done by 2020, and as little as 6% indicated they have no desire in doing so at any point.

The progress illustrated in the previous paragraph suggests an implicit knowledge of the primary benefits of implementing cloud-based BSS systems. To gain clarity, we next asked the audience what they consider to be the most compelling reasons for moving to the Cloud. The most commonly cited feature is the ability to reduce the OPEX and maintenance cost of IT systems, along with on-demand scalability of IT infrastructure with
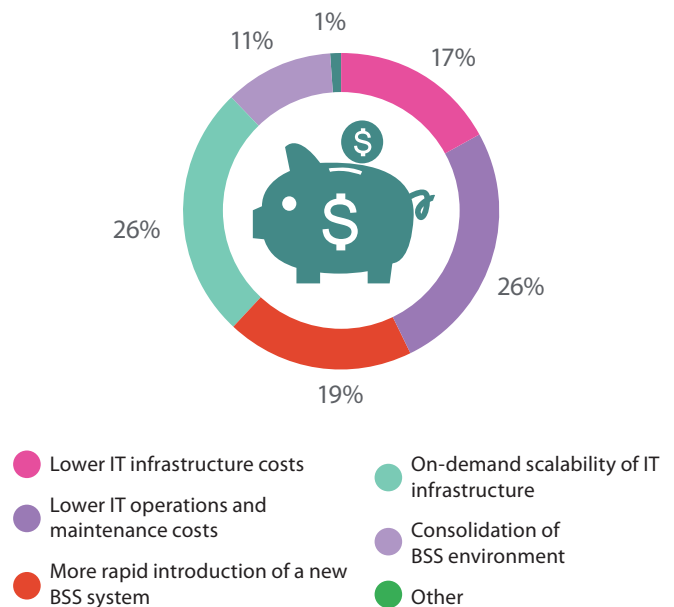
each getting 26% of votes. This, it would seem, is unsurprising considering that cost saving is the most commonly touted benefit of Cloud-based IT practices in the telecoms sector.

In the quest for BSS transformation, the principle benefits of cloud-based software have been identified; but what would appear to be the biggest barrier preventing operators from making the switch? Our audience was united in saying that, by far and away, security and data privacy concerns remain the highest inhibitor to cloud adoption, gaining 56% of responses. This in itself is not a huge surprise; surveys on IoT and mobile network infrastructures conducted by Telecoms.com Intelligence in 2015 indicated that security was at the very top of the concerns list on a variety of topics. High profile attacks on operators across the world last year only serve to reinforce security anxieties.

However, with this in mind, security challenges would only seem to postpone the inevitable, according to the audience. While the audience generally disagreed that "public cloud is now robust enough and secure enough for deploying mission critical telco IT systems" (56% either disagreed or strongly disagreed), they nevertheless largely agreed that all telco business IT systems will be cloud-based in the future (73% either agreed or strongly agreed); which infers that the payoff in terms of business benefits will, in the long run, be worth the risk.

More generally, we asked our audience about the most compelling drivers for BSS transformation. For this question in particular, the audience was unable to pick a single standout response when asked to rank in order of importance. All possible factors received an importance rating of between

Which is the most compelling benefit of implementing a cloud-based BSS solution?

- ● Lower IT infrastructure costs
- ● Lower IT operations and maintenance costs
- ● More rapid introduction of a new BSS system
- ● On-demand scalability of IT infrastructure
- ● Consolidation of BSS environment
- ● Other

60% and 70%, while no factor received a rating of "completely unimportant" by more than 2% of the respondents.

The most important driver for our respondents was delivering pricing innovation and competitive differentiation, with 92% voting it either important or very important as a factor for IT/BSS transformation. Improving omni-channel customer experience and enabling monetisation of customer analytics came in second and third respectively, with 90% and 87%; once again illustrating the desire by operators to deliver more personalised customer experience-enhancing services. Other responses focussed on reducing the cost of legacy equipment (86%), creating new business models (86%), IT system convergence for all customer segments (84%) and finally adding value to digital service provider partnerships by driving effective collaboration (81%) made up the rest of the answers.

The penultimate question of this section of the survey sought to understand the importance of a flexible BSS platform. The most strongly supported answer was that flexible BSS systems are critically important for delivering an optimal customer experience – agreed with by 90% of respondents. 86% agree that flexible BSS is essential for achieving competitive differentiation, while 82% of respondents say BSS transformation is central to enabling telcos' future business strategies. Seemingly less enthused, yet still forming a majority, were the 60% who said most existing BSS platforms are incapable of supporting future telco business models, and therefore transformation is essential.

The final question of this section of the Annual Industry Survey 2016 asked the audience how they plan on implementing BSS transformation. There's a variety of options available to operators looking to

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undertake the task, ranging from a Greenfield deployment, to a "big bang" switchover or somewhere in between.

It appears that a "softly-softly" approach by operators looking at BSS is the most commonly favoured, as 38% of respondents said that a gradual upgrade of certain aspects of current BSS is the way to go – a digital overlay approach. This suggests that operators are looking to cause minimal disruption to BSS operations, while staying naturally risk-averse to critical billing functions.

Secondly, 27% said they're starting from scratch with a totally Greenfield transformation, migrating customers gradually to a new system and phasing out legacy systems in stages. 14% said they're going to shift straight onto a cloud-based BSS-as-a-Service, while just 12% said they'll go for a complete overhaul of existing systems, a full

IT transformation big bang switch over to a new system.

This section of the survey has illustrated how forward thinking the majority of respondents are. Firstly, respondents overwhelmingly identified personalisation as the driving motivator for the majority of BSS-related investment or upgrade; this was seen extensively in early questions relating to new services and opportunities existing today. The audience also sees cloud-based services as an inevitability, with the vast majority of respondents saying they will definitely move to cloud-BSS by 2020. Their reasons for doing so, apparently, relate to the requirement for more tailored and personalised services which need more sophisticated, flexible, agile and affordable systems.

It is fair to say, to that extent, that service providers are looking for a more personal touch.

Which statement most accurately reflects your views about the best approach to upgrading BSS platforms?

9%   12%

14%

27%   38%
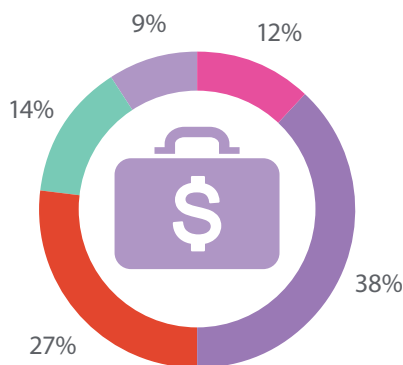
- ● Complete overhaul of existing systems: full IT transformation with a 'big bang' switchover to the new system
- ● A gradual upgrade of certain aspects of current BSS: a 'digital overlay' approach
- ● A greenfield transformation: migrating customers gradually to a new system and retiring the legacy in stages
- ● A shift to cloud-based BSS-as-a-Service
- ● Traditional telco BSS is too complex – we need simpler, cheaper, more standardised (albeit less flexible) IT systems.

SPONSOR'S COMMENT – ASIAINFO

Personalisation has been an important trend in BSS for a while, as part of a broader initiative where operators are seeking to enhance customer experience. The ability to tailor price plans and real-time marketing offers to the precise needs and context of each individual customer has historically been a big challenge for BSS, but today's technology makes it much more straightforward to achieve this level of personalisation without creating enormous complexity in the IT systems. This generally requires a BSS transformation using components which are pre-integrated and based on a common data model, so that the product catalogue, charging platform, front end channels and other components of the BSS work according to the same concepts and are driven by embedded real-time analytics.

The survey reveals that operators are enthusiastic about cloud-based BSS, not only for the future but also for today's transformation projects. Nevertheless, they still have concerns about data security and privacy for deploying mission critical BSS systems in a public cloud environment. This is something we also see in the market – existing use of public cloud is limited to overlays and bolt-on systems, whereas the mission critical core business systems are still deployed on premise or in a private cloud environment. However, the benefits of using public cloud – particularly in cost savings and reducing time-to-market – are very compelling indeed. The survey reveals that these benefits are clearly understood by the market, so it will be interesting to see how the attitude to public cloud changes in the coming months.

❝The audience sees cloud-based services as an inevitability, with the vast majority of respondents saying they will definitely move to cloud-BSS by 2020.❞

CEM

Of all the themes observed in this year's Annual Industry Survey, Customer Experience Mangement (CEM) is arguably the most dominant. This dedicated section investigates operator attitudes towards churn, influencing factors on CEM as well as behavioral analytics.

Key takeaways:

• Half of voters think tariff pricing is the single biggest cause of churn.

• Nearly a quarter say successful call centre customer care is the best way to improve CEM.

• IoT will make operators re-evaluate their CEM strategies, according to nine tenths of the audience.

gemalto
security to be free

Due care and attention

WITH THE THREAT OF CUSTOMER CHURN AND DECLINING ARPU, THE NEED FOR EXEMPLARY CEM IS AS PRESENT TODAY AS IT EVER HAS BEEN.

Solving the conundrum of how to achieve perennially optimal customer service is a long-sought after panacea for telecoms operators. If it were possible to lock the perfect experience in a bottle and apply it to every customer, surely any ails or declining revenue streams witnessed across the telecoms industry would be remedied. The truth is, though, that even if the perfect approach to customer experience was achieved, it will soon be made defunct again as the industry continues to evolve and change at a startling pace. Customers are more selective, more demanding, better educated about their products and benefit from greater consumer rights in 2016 than those did 10 or even five years ago.

This section of the Telecoms.com Intelligence Annual Industry Survey sought to understand operator attitudes towards modern day CEM, and ascertain how operators are planning on anticipating future changes and challenges in the industry.

We began by asking the audience what they thought of the customer experience being provided by their business. We saw that 65% of the audience thought it was good, while 18% said it was excellent. A surprisingly high proportion of the respondents, 15%, said that the customer service they provided was either poor or very poor. It was assumed that the majority of respondents would like to think the customer experience

they provide would be a generally positive one, in typical self-evaluation style; yet the 15% of responses to the contrary indicate a level of candour and self-criticism suggesting there may well be room for improvement.

In the operator landscape section of the Annual Industry Survey we saw that nearly 30% of all respondents identified customer churn, service or declining ARPU as the biggest challenges they face in 2016. That being the case, the next question in the CEM section looked to identify the primary causes of customer churn, in order to investigate that previous statistic in more detail.

In descending order, the most commonly identified cause of

churn is as a result of tariff pricing, with 44%. Similarly, 34% of voters also said than customers move to other providers as a result of more compelling bundles being available elsewhere. Sandwiched between those two is network reliability, meaning downtime or lack of geographical coverage causing customer frustration, which gained 35% of the votes. Similarly, connection speed was cited as one of the primary reasons for customers changing service provider – voted for by 26%.

Of course, there are a plethora of problems that could lead to subscribers contacting a customer service call centre, and that may be seen as the final bastion for customer retention – 24.4% of respon-

What are the primary causes of customer churn in your organisation?

Tariff price	44%
Network reliability	35%
More compelling bundles elsewhere	34%
Connection speed	26%
Poor contact centre experiences	24%
Billing errors	17%
Handset subsidies	11%
Other	6%
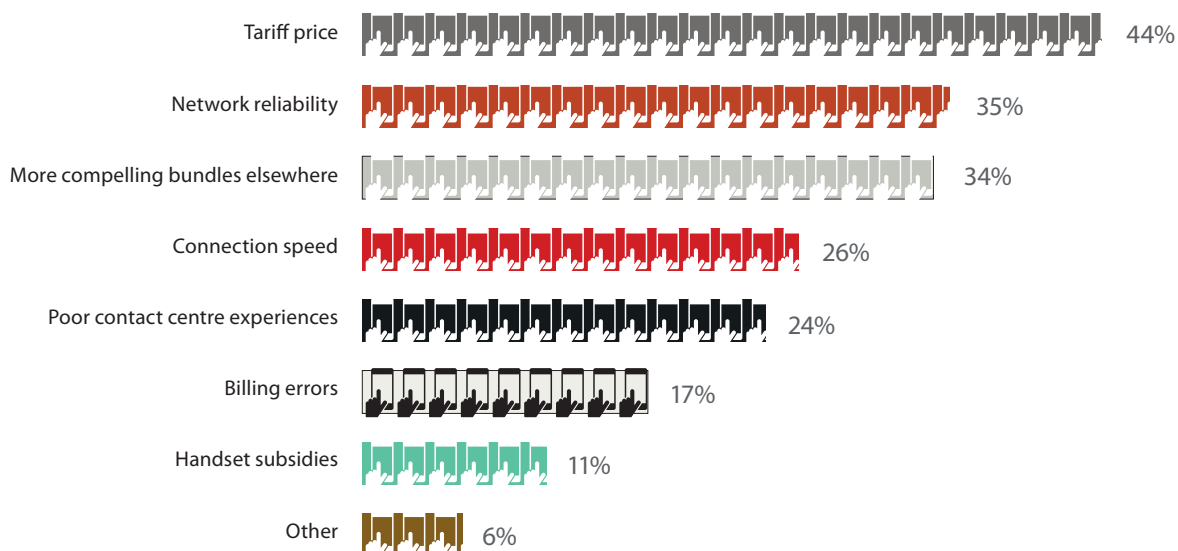
dents to the survey say that a bad experience there causes customer churn. Other cited reasons for churn include billing errors (17%) and handset subsidies (11%).

So what does our audience think their organisation could do to optimise the general customer experience they offer, thus minimising the risk of churn and potentially improving ARPU? Well, the audience reckons the top way of minimising churn is to improve first time to resolution call rates – meaning that customers needn't have multiple, protracted conversations with multiple different support staff, frequently resulting in qualified resolutions, or potentially even failing to find one. 24% of the audience see this as the single biggest way in which their organisation could improve customer experience.

21% say it's about personalisation and making each customer feel unique, saying they should tailor services to subscriber needs. A further 19% say they need to introduce new and diverse services for customers; 18% reckon operators should be utilising customer behaviour analytics to pre-empt potential issues arising; 14% say they need to upgrade network infrastructure to retain customers, while just 3% reckon operators need to offer more subsidies to support broader uptake of the latest handsets. The minimal response of the final answer there would appear to closely represent the wider attitudes across the industry since the four major carriers in the US have been reported to be moving away from two-year contracts in a bid to decouple the cost of handsets from the cost of voice and data.

Judging from our previous question, where respondents identified customer analytics as a core part of helping to optimise customer experience, it is perhaps unsurprising

to see 30% of the audience select customer behaviour analysis and monitoring as the most important feature of a CEM strategy. This is closely followed by network performance management, with 27%. What these two answers appear to indicate is a growing desire to see more pervasive use of analytics across the network and subscribership in order to more accurately manage customer experience, and in the development of a CEM strategy.

Other significant responses relating to the most important factors in the development of CEM strategies are contact centre experience (17%), offering value added services, such as inclusive roaming and wifi hotspots (12%) and the reliability and performance of both applications and handsets (9% and 3% respectively).

We previously alluded to the use of analytics as a core function

in the optimisation of a customer-centric management approach as well as the strategising of CEM, and our next question asked the audience to identify with one specific statement relating to how their organisation utilise analytics tools.

91% of the audience said they use analytics of some kind as part of a broader CEM strategy. 29% said they just use customer-behaviour analytics as one element of a broader CEM, while 24% said the same but exclusively for analysing network behaviour and appropriately attempting to optimise traffic and signal strength for the user. 21% are taking a more holistic approach encompassing both elements, saying "we utilise analytics to pre-empt customer behaviour and assess network conditions so we can tailor services to the individual".

Significantly, 17% rely almost

entirely on analytics to influence their customer-oriented decision-making: "analytics are vitally important to CEM in my organisation; we don't make a single customer-related discussion without using them."
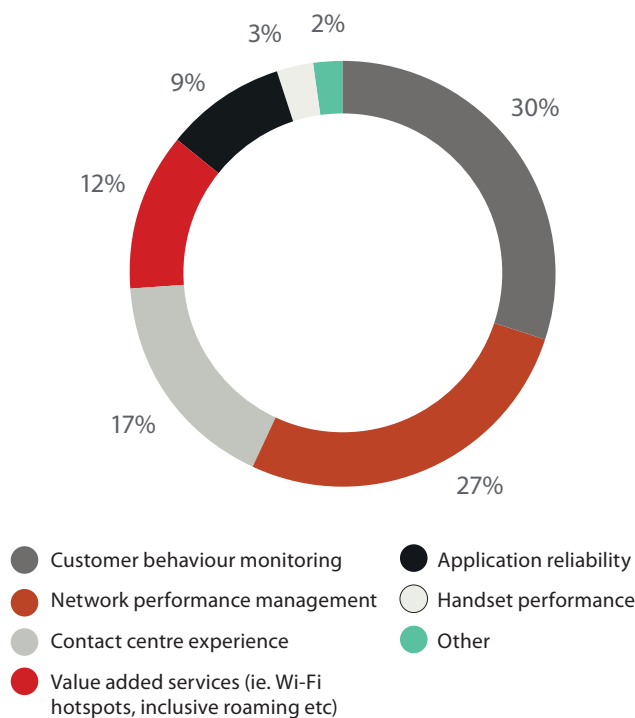
Finally just 9% of all respondents said they don't use analytics as part of their CEM strategy. So it would appear that the majority of the audience are already largely familiar with the use of analytics in order to make more informed decisions; but how may that paradigm change when faced with an industry-disrupting technological trend? The internet of things has been forecasted to bring with it a fundamental change to the way in which consumers live and businesses operate; industries will become more efficient, it's been predicted, and lives will get smarter.

With IoT comes a new customer experience challenge as operators can automate several aspects of customer care, and be faced with the requirement of providing additional layers of customer service to consumers with smart homes and automated M2M connections provided for by the operator.

For starters, the majority of the audience believe they'll need to upgrade to meet the IoT challenge. 57% of all respondents said they disagree with a statement suggesting existing tools are sufficient: "Our existing CEM tools will comfortably cover any and all IoT services we'll be launching," disagreed the majority.

That previous statement, however, makes the assertion that all operators will be encompassing IoT within CEM-based strategies. 71% of all respondents said that, at this moment, IoT does not feature heavily in their future CEM strategy; thus spinning doubt on the potential of how the M2M-based technology will utilised by opera-

What do you see as being the most important feature of a CEM strategy?

- **Customer behaviour monitoring**
- **Network performance management**
- **Contact centre experience**
- **Value added services (ie. Wi-Fi hotspots, inclusive roaming etc)**
- **Application reliability**
- **Handset performance**
- **Other**

3% 2% 3% 9% 30% 12% 17% 27%

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security to be free

Which sector of telecoms do you believe is the market leader for customer experience?

- ● Device manufacturers
- ● Internet service providers
- ● Mobile network operators
- ● Mobile software platforms
- ● OTT communications providers
- ○ Other
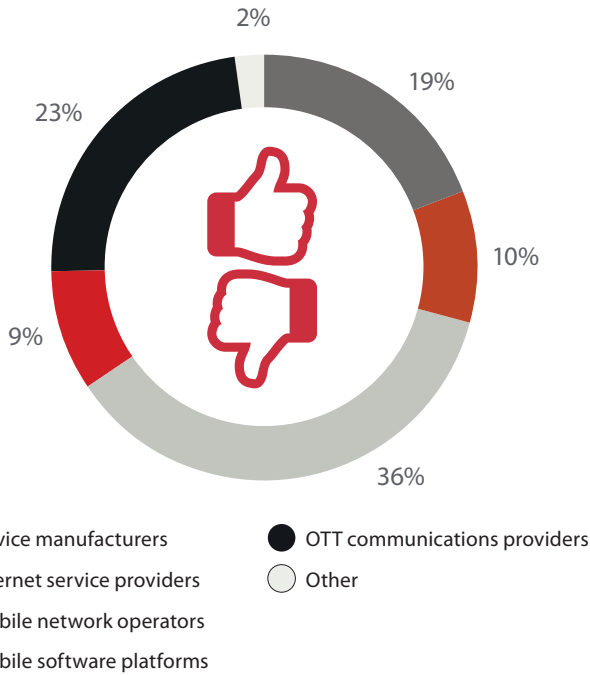
tors. The audience was unanimous in saying that they'll need to be ready for consumer-IoT, however, with 91% agreeing with the statement: "We will need to expand monitoring of customer experience beyond traditional services to cover IoT services."

In an age of perennially increasing consumer expectation, a further 83% saying that IoT will raise customer expectation levels again, which operators need to match. Tangentially related to this, mobile network operators were flagged up by the audience as the market leader within telecoms for customer experience – 36% of respondents gave it the majority, with 23% saying OTT communication providers demonstrate the best CEM, and 19% say device manufacturers are the leading example within the industry.

Finally, we asked our respondents to summarise their company's stance on CEM by identifying with one particular

statement more than the rest. The majority of respondents, 57% said customer experience is one of the more important factors differentiating them from competitors. 35% vouched for a slightly more definite response, saying optimising customer experience is of paramount importance to their organisation. Just 5% said none of the companies in their market are driven by CEM, and 4% reckon users don't expect outstanding customer service in their market.

From this section of the survey it would seem relatively conclusive that CEM comes in as one of the top concerns among telecoms operators today. While mobile operators apparently raise the bar in terms of customer service and experience, the telecoms industry was largely united in indicating it has a long road ahead in tackling the potential problems which may arise with the realisation and subsequent pervasion next generation technology trends, such as IoT.

SPONSOR'S COMMENT – GEMALTO

This survey brings unique insights to the strategic importance of Customer Experience Management (CEM) for mobile operators. In 2016, their biggest challenges are to improve ARPU and foster customer loyalty.

Main CEM weaknesses do relate mostly to network reliability and performance. Getting to know their customers' perceived experience is one of the key pillars for success thanks to Quality of Experience (QoE). Improving CEM means working on improving core network experience which can be reached out via new, valuable and more tailored services such as Wi-Fi network monetization. Operators can also get robust data analytics to evaluate their current CEM policies and plan service improvements.

The survey also shows the emergence of a more personalized approach to delivering diverse, tailored services. For example, to improve mobile marketing campaigns' reach, dynamic profiling (based upon users' past services usage, prepaid reloading habits, device type…) can be used, coupled with real time campaigns execution.

But it also means bringing additional and differentiated value added services to the consumer. Mobile ID is a good example: by becoming digital ID providers mobile operators can dramatically improve the online experience of customers.

At last tomorrow's smart connected objects will have to be included in CEM strategy; thus extending QoS to IoT to allow their reliable cellular connectivity monitoring.

❝ 57% said customer experience is one of the more important factors differentiating them from competitors. ❞

FRAUD & REVENUE ASSURANCE

When many of the traditional operator revenue streams are being challenged from a variety of directions, protecting money-making business assets from fraud or revenue leakage seems like it would be essential. This section of the survey reveals some interesting findings in terms of operator attitudes towards the fundamental assurance of primary revenue streams.

Key takeaways:

- Nearly one third of respondents do not consider revenue assurance a priority in their organisation.

- Fraud resulting in billing issues is a major worry for nearly half of the audience.

- Almost half of all respondents see SS7 attacks as an entry point for further exploitation as their biggest security worry.

About HAUD

HAUD provides mobile network operators with a complete service to detect fraud, filter spam and protect revenue. HAUD puts operators in control of their networks with flexible solutions, unrivalled expertise and round-the-clock customer support.

The proprietary technology safeguards revenue from telecommunications traffic, enhances network security and enriches customer experience through the elimination of fraudulent and spam SMS.

Headquartered in Malta and with representative offices in Singapore, Dubai, Croatia, Luxembourg and UAE, HAUD offers MNOs globally traffic audits, system trials and various pricing models to meet their specific needs.

Visit www.haud.com for further information.

Assure thing

IT'S ALREADY ESTABLISHED THAT OPERATORS SEE DECLINING ARPU AND CHURN AS A COUPLE OF THE BIGGEST FEAR FACTORS IN THEIR BUSINESSES TODAY. IT IS ALSO FAIR TO SAY THAT GENERATING NEW REVENUE STREAMS IN TODAY'S RAPIDLY EVOLVING YET STABLE AND MATURE TELECOMS MARKET IS A DIFFICULT TASK TO UNDERTAKE.

With that in mind, operators are looking to squeeze and sweat every drop of revenue from existing assets. In order to do so, protection from revenue leakage and fraud is seen as a top challenge by the audience of the Telecoms.com Intelligence Annual Industry Survey. Fraud is not exactly a new concern to the operator community, but it has always been nigh-on impossible to quantify the exact numbers of lost revenue – there's also, naturally, a hesitancy from operators to disclose such information publically for competitive, reputational or regulatory reasons.

In today's market, there's an increasing spam and nuisance text or calling sub-industry which, while illegal, perpetually innovates new means and methods of avoiding detection and circumventing operator and industry countermeasures. Recently, Ofcom announced measures to minimise the effectiveness of illicit and unsolicited "marketing" calls or SMS messages by enforcing mandatory caller identification requirements, thus theoretically empowering the user to know whether or not to answer the phone.
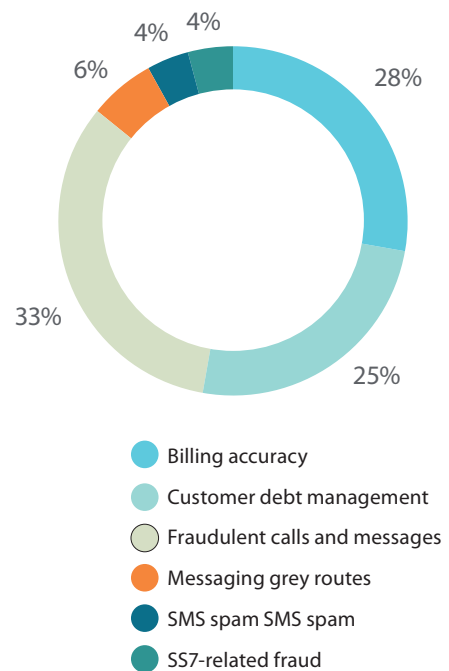
Meanwhile, vulnerabilities in the SS7 network have led to incidents involving interception of communications and geo-tracking in recent years. Flaws in the SS7 network were identified by researchers in

Germany, which suggested that the network is open to meddling or interference with communications by wrongdoers through eavesdropping or message spoofing.

But to begin this section of the survey, we began by seeking to understand how operators are viewing fraud and revenue assurance issues in their organisation. It would appear, on the whole, that the majority of respondents believe they are doing well or very well – with 59% and 24% of votes respectively. This could probably be interpreted as an unsurprising result when respondents are asked to self-evaluate. 15%, though, did admit to poor handling of fraud and revenue assurance issues, while 2% went so far as to say their handling was very poor.

Our next question sought to understand how important revenue assurance is to our respondents' organisation; and the earlier assertions made in this section proved founded as 67% said they most agreed with the statement "revenue assurance is seen as vitally important in my organisation". Some estimates within the industry have suggested that fraud and revenue leakage at operators around the world has the potential to cost the industry upwards of $20bn annually; but it is difficult to get concrete evidence supporting this estimate.

What is the biggest cause of fraud or revenue assurance concern for your organisation?

- 4%
- 4%
- 6%
- 28%
- 33%
- 25%

● Billing accuracy
● Customer debt management
○ Fraudulent calls and messages
● Messaging grey routes
● SMS spam SMS spam
● SS7-related fraud

It is somewhat surprising that nearly 30% of respondents said revenue assurance doesn't appear to be a major consideration for them today. 16% of the respondents said that revenue assurance is seen as a low priority area for investment for them; while 13% conceded that there's reticence among top-level management, saying that executive support for assuring revenue streams is somewhat lacking. Just 4% of respondents said that there is a

general lack of awareness of the importance of revenue assurance in their organisation.

As we identified at the start of this section, fraudulent calling and messages is one of the fastest growing concerns for operators in terms of revenue protection today. 33% of the audience identified this as the top cause of fraud or revenue assurance concern within their organisation today. However, more than 50% of all respondents combined identified billing related

issues as their top concern; with 25% highlighting customer debt management issues arising, and 28% identifying billing accuracy.

This concern surrounding billing issues is unsurprising; fraud, spam or nuisance communications has a direct and significant impact on customer experience, the consequence of which can't be underestimated. Even if the end-user is unaware of suspicious activity affecting their account, when discrepancies in their monthly bill arise contact centres and customer experience agents will inevitably have to appropriately and delicately manage a disgruntled subscriber. As we said in the dedicated CEM section of this report, that comes with an inherent level of risk of churn.

We then sought to understand how users view SS7 as a potential avenue for fraudulent activity to occur on the network. To clarify, SS7 is the primary signalling protocol for directing and delivering voice calling, SMS services and data between operators. The SS7 network has been around for about 40 years, since the dawn of modern telecoms as we know it, so vulnerabilities and frailties in the

system are inevitable. Instances have occurred in countries around the world where the privacy of cellular customers has been compromised and communications have been affected. From the USA, to Russia and on to Australia, telecoms companies of all sizes have felt the pressure to more adequately secure the SS7 network and its protocols.

While LTE networks don't necessarily rely on SS7 in order to operate, 3G networks do, and a major design consideration for new networks is the interoperability between the two. Therefore despite worldwide focus on the deployment of new tech such as LTE and beyond, SS7 and particularly the security thereof still need major consideration by operators today.

69% of respondents said they're fully aware of the threats SS7 vulnerabilities present to their organisation, with the remaining 31% saying they, conversely, are not aware. 84% of the audience then said they see the security of the SS7 as either critically important or important to their organisation (33% and 51% respectively).

But what specifically does the audience think is the biggest threat

posed to their business by network intrusion? The majority of respondents believe the threat to services enabled by the SS7 network isn't itself the biggest concern, 29% said the consequential exposure of further network insecurities is their biggest worry. With 18%, flooding leading to potential denial of service attacks is the second most commonly identified fear; leading one to deduce that nearly 50% of all respondents see SS7 attacks an entry point for further exploitation or as the biggest worry.
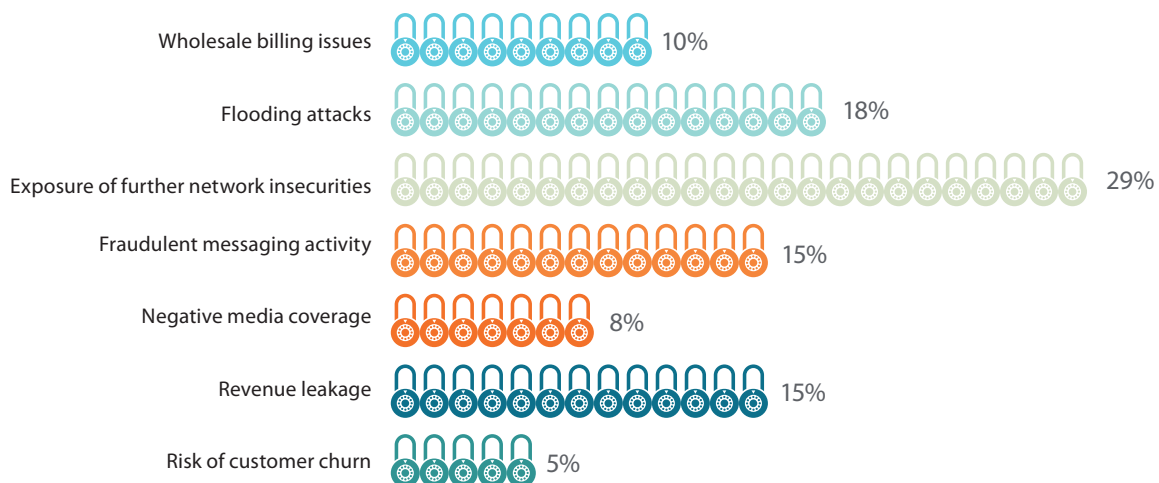
Other significant results from this question saw fraudulent messaging and revenue leakage each receive 15% of responses, with 10% saying wholesale billing issues is a concern for them. Just 8% of the audience were worried about the negative media consequences of falling prey to SS7 attacks, while 5% said churn was their biggest concern.

Our final set of questions in this section of the survey asked respondents for their thoughts on SMS spam and fraud activity which has become a prominent trend in recent years. In some regions, unlimited SMS tariffs pave the way for what is known as SIM

farming, where a large number of SIM cards are purchased and all send out multiple unsolicited spam messages in the hope of gaining customer data for sale or to dupe unwitting consumers into signing up to premium rate numbers. With unlimited SMS tariffs being accused of facilitating SIM farming, we looking to understand whether the audience agreed with this connotation by proposing a variety of statements and asking for the level of agreement.

The most commonly agreed with statement said "unlimited SMS tariffs undermine the potential of A2P as a revenue generating service", with 65% of the audience either strongly agreeing (12.5%) or agreeing (52.5%). Also receiving a 65% agreement rating was a statement which vouched more in favour of the tariff. 9% strongly agreed and 56% agreed with the statement which said that unlimited SMS tariffs are a means of helping operators combat OTT messaging apps for market share. This reminds us that not only are operators combatting fraudulent spammers and wrongdoers who threaten their revenues, but also the legitimate competitors in over the top players

What is the biggest threat posed to your business by SS7 network intrusion?

Wholesale billing issues	10%
Flooding attacks	18%
Exposure of further network insecurities	29%
Fraudulent messaging activity	15%
Negative media coverage	8%
Revenue leakage	15%
Risk of customer churn	5%

HAUD
STAY IN CONTROL

Which of the following statements most accurately reflects your experiences with SMS fraud?

24%
12%
26%
39%
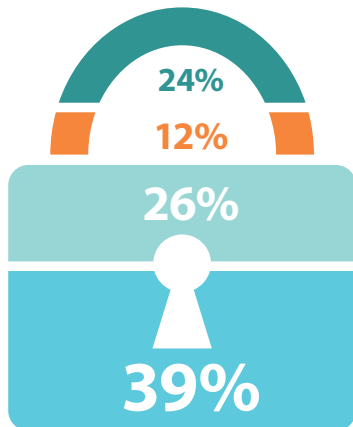
- ● We successfully mitigate any and all attempts at SMS fraud.
- ● We outsource all fraud prevention activity, so it's something we don't consider.
- ● We've had SMS fraud problems in the past, but not in 2015.
- ● We regularly have to deal with SMS fraud activity on our network.

and other MNOs or MVNOs.

The most disagreed statement in this question said that SMS is a primary revenue generator for them, and that unlimited SMS tariffs are a key competitive differentiator, with 59% of the audience disagreeing or strongly disagreeing with the notion. Equally damning of SMS as an important revenue source for them is the 62% of the audience who met the following statement with agreement: "Unlimited SMS tariffs are the main source of spam text messaging and revenue loss."

The final question in this section asked the audience to indicate their level of experience with SMS fraud in a bid to understand whether it's a regular struggle for operators. 39% of respondents said they regularly have to deal with SMS fraud activity on their network, with just over a quarter of the audience (26%) saying it's a thing of the past, indicating that

they've had SMS fraud problems before, but didn't have any in 2015. A further 24% say they are able to successfully mitigate any and all attempts at SMS fraud, while 12% outsource all fraud prevention activity, so they don't even have to consider it.

What we can glean from this section of the survey, then, is that fraud and revenue assurance in varying forms is still a major concern for operators the world over going in to 2016. Whether it's the risk presented by SS7 while it remains a major requirement for inter-operator communications, or the abuse of SMS tariffs around the world for spam or unsolicited messaging, it is comforting to see that the majority of respondents now see such activities as something they either can manage themselves, outsource to a third party, or see as something which is becoming a historical problem, rather than a continuous one.

SPONSOR'S COMMENT – HAUD

From the position of a fraud protection and revenue assurance vendor, understanding industry trends is critical. Without this knowledge and understanding, we can't control what happens around us and provide the appropriate solutions. The same is true for business, and that's why market intelligence reports such as this one are so important. They provide a snapshot of the current knowledge and attitudes of the market and allow the industry to respond accordingly.

What is most interesting in this report is not the majority of the industry doing the right thing, but rather the gaps that need to be filled or protected. For example, it's not surprising that the vast majority of the industry believe they are handling fraud and revenue assurance well, but rather that as much as 17% admit they are doing it poorly. That a third of organisations are not prioritising revenue assurance in a time that margins are under greater pressure than ever simply boggles.

While the majority are making great strides to be secure and fight telecoms fraud, the significant minority could leave loopholes that effect the industry as a whole. All interested parties need to take responsibility, communicate and educate about the importance of staying in control of our networks for the good of the global telecoms sector.

❝62% of the audience met the following statement with agreement: 'Unlimited SMS tariffs are the main source of spam text messaging and revenue loss.'❞

IOT

Service providers stand to gain in a variety of ways as IoT technologies mature and become more pervasive. While 2015 was an instrumental year for the burgeoning machine-to-machine technology there are still a number of challenges involved and a necessity for clarifying use-case scenarios for operators embracing IoT.

Key takeaways:

- Nearly half the audience thinks LTE will be the most commonly-used network for IoT.

- More than half see new revenue generation as the way their organisation will utilise IoT.

- A third of respondents think networks need overhauling to keep up with IoT traffic.

SIERRA WIRELESS®

About Sierra Wireless

Sierra Wireless is building the Internet of Things with intelligent wireless solutions that empower organizations to innovate in the connected world. We offer the industry's most comprehensive portfolio of 2G, 3G and 4G embedded modules and gateways, seamlessly integrated with our secure cloud and connectivity services. OEMs and enterprises worldwide trust our innovative solutions to get their connected products and services to market faster. Sierra Wireless has more than 1,000 employees globally and operates R&D centers in North America, Europe and Asia. For more information, visit www.sierrawireless.com.

Things are getting interesting

THE PAST YEAR WAS A PIVOTAL ONE FOR THE INTERNET OF THINGS, WHEN COMPANIES OF ALL KINDS PROGRESSED FROM MERELY DISCUSSING ITS POTENTIAL TO EXPLORING ITS COMMERCIAL REALITY.

IoT as a concept has been around for over a decade. LG launched the first 'smart fridge' way back in 2001 and that concept has, for many, come to epitomise what IoT is all about – intelligence and connectivity in previously unremarkable, functional objects. The vision we have been fed since then is essentially an evolution of the 1950s automated utopia, where robotic gadgets automatically take care of any task we find tedious, leaving all of us free to live a life of carefree leisure.

Fast forward 60 years and the emphasis is less on robotics and more on connectivity. Now we have chips which can provide unprecedented computing power, internet connectivity, location data, tracking, and sensing all in a tiny form factor. The complexity challenges associated with reaping the benefits of said chips cannot be underestimated, however in principle we are now able to benefit from devices which can broadcast data, be controlled remotely and even make autonomous decisions. The smart fridge still exists but its primary function seems to be to provide the media with quirky material for their CES round-ups.

Where IoT is starting to find its commercial feet is far more down to earth, principally in industry, performing functions such as tracking, logistics, monitoring and diagnostics. Tiny embedded modules enable industries to
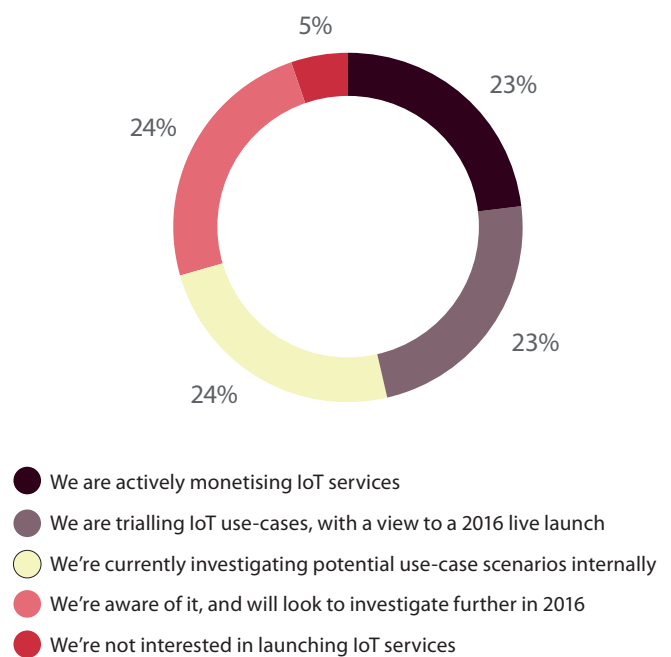
make themselves more efficient by reducing overheads, protecting assets and optimising processes. None of this is as exciting as a washing machine that also anticipates what you'd like for dinner and has already cooked it by the time you get home, but it does represent real return on investment for what is widely considered to be the defining technological trend of the current era.

2015 also saw Telecoms.com Intelligence conduct its first dedicated survey of industry attitudes to IoT. Among the findings were that our audience still associates the concept primarily with consumer devices, that the main barriers to the development of IoT were security and platform standardisation challenges, and that over half of respondents thought their company would be in a position to monetise IoT in 2016.

To start the IoT section of our 2016 Annual Industry Survey we asked how active respondents' organisations are currently. While only 5% said they had no interest in launching IoT services, there was more or less a straight split between those actively monetising IoT services or expecting to do so within a year, and those who were at a more preliminary phase of investigation, with no immediate commercial plans.

The fact that the number of respondents actively commercialising IoT is still a minority illustrates

How active is your organisation in IoT today?

- ⚫ We are actively monetising IoT services
- ⚫ We are trialling IoT use-cases, with a view to a 2016 live launch
- ⚪ We're currently investigating potential use-case scenarios internally
- ⚫ We're aware of it, and will look to investigate further in 2016
- ⚫ We're not interested in launching IoT services

how nascent the IoT industry still is, despite the years of hype. On the flip side, that this minority is so large emphasises that the commercial ball is definitely rolling for IoT, and if we were to ask the same question at the end of the year we would expect the majority of respondents to be actively looking to generate revenue from IoT services.

Revenue generation was the dominant theme arising from our next question, in which we asked respondents to select any ways in which they think their organisation will best utilise IoT. While a sub-

stantial minority of respondents pointed to improving internal processes (internal operational process optimisation – 16%; internal network optimisation – 23%; optimise user & customer experience – 29%), the majority thought their organisation would best utilise IoT to develop new consumer revenue (53%) and to generate new B2B revenue (58%).

Pressure in business to demonstrate return on any investment is as intense today as it has ever been. While it may be true that the best way to extract ROI from IoT right now is via business

process optimisation, Telecoms. com respondents clearly see their primary roles as providers of this technology rather than recipients, which begs the question of who is best placed to provide IoT solutions. There are so many potential stakeholders in the IoT value chain, from chip manufacturers to software developers to infrastructure vendors, but it could well be that telecoms companies are the most strongly positioned to coordinate all these players into a single, coherent IoT solution and sell that into industry.

On top of existing commercial relationships and their service provider DNA, telcos also have the advantage of being the custodians of the networks on which IoT is built. Our next question asked which specific communication technology respondents think will be most commonly utilised for IoT traffic. Unsurprisingly, LTE was the clear leader, accounting for 43% of respondents. Next came the other established wireless protocols with 18% selecting Wi-Fi and 17% going for 3G.

The most intriguing data-point to come from this question, howev-er, was that a tenth of respondents already think specialised low-power networks, such as eMTC/LTE-M, will be the main route for IoT traffic. The arrival of these standards has coincided with the emergence of IoT as a viable commercial proposition. Minimal energy consumption is even more of a priority for IoT than it is for mobile, as most IoT modules will need to be as small as possible and will usually be embedded, making battery replacement difficult and expensive. While the concept of a parallel IoT network is something with which the industry is becoming more familiar, there is something to be said for optimising existing LTE networks towards machine-based communications. LTE-M or eMTC would appear to be at odds with some proprietary low-power networks and could feasibly become a more accessible and compelling option for operators implementing an IoT strategy.

Our next question concerned perceived inhibitors to the development of IoT and was similar to the questioned asked in our dedicated IoT survey, but with respondents asked to pick only one answer. While security challenges (11%) were still one of the leading perceived inhibitors, this time round technology immaturity (18%), platform standardisation issues (17%), cost (13%) and lack of business prioritisation (13%) were all considered to be significant issues.

To get a more detailed sense of anticipated security issues we then asked respondents to indicate their level of agreement with a selection of statements relating to this topic. The statement 34% of respondents said they strongly agreed with, and only 7% expressed any kind of disagreement with, was: "Industry-wide standards will be required in order to effectively secure data." This implies telecoms professionals conflate standards and security and implies, as has so often been the case in the past, that there will be a lot of pressure to consolidate around one universal standard for networking, protocols, etc.
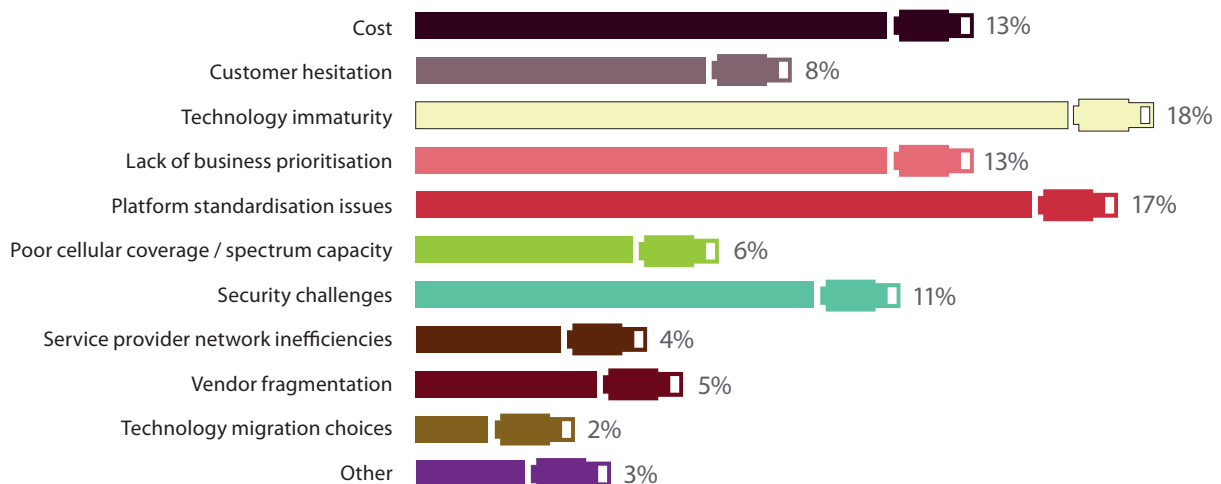
All of the statements in this question were agreed with by the majority of respondents, indicating a consensus that security needs to be adequately addressed before we can expect mass adoption of IoT, although over a third of respondents disagreed with the statement "Public & media distrust of IoT security will inhibit its development and limit its potential."

Just as with the internet in general, data interceptions or cyber-attacks such as DDoS are likely to be a principal threat for IoT. When asked which part of the service provider network they thought was most vulnerable to attack, 30% of respondents identified the gateway or CPE. Next came the access network/RAN with 24% and then the clouds with 22%, to which you can effectively add the 12% that identified the data centre. Of relatively minor concern were backhaul and the core.
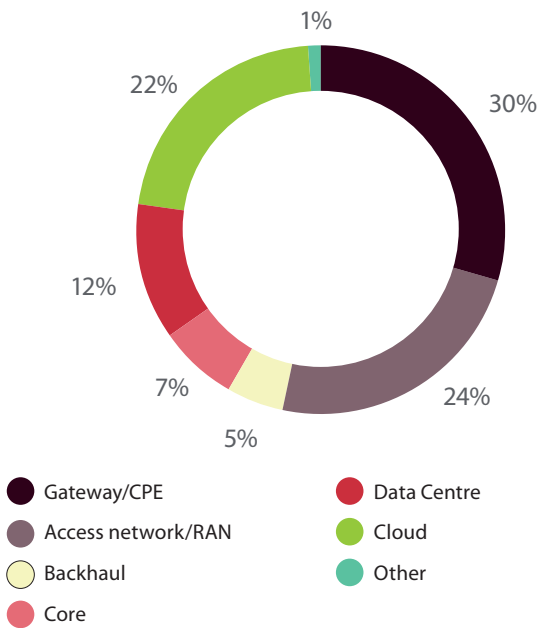
Focusing once more on the service provider network we asked respondents to pick which one of three statements about the readiness of existing networks to handle the additional load from IoT they agreed with the most. The clear winner was "As more applications are developed for IoT, existing network infrastructure will be heavily strained," with 49% of the vote, with the further 36% selecting "Telecoms networks need significant upgrades before they'll be able to handle IoT traffic," and

What do you consider to be the biggest inhibitor to the IoT's development?

Category	%
Cost	13%
Customer hesitation	8%
Technology immaturity	18%
Lack of business prioritisation	13%
Platform standardisation issues	17%
Poor cellular coverage / spectrum capacity	6%
Security challenges	11%
Service provider network inefficiencies	4%
Vendor fragmentation	5%
Technology migration choices	2%
Other	3%

Which part of the service provider network do you believe is the most vulnerable to interception or attacks in an IoT environment?

Legend:
- Gateway/CPE
- Access network/RAN
- Backhaul
- Core
- Data Centre
- Cloud
- Other

SPONSOR'S COMMENT – SIERRA WIRELESS

Things are getting interesting indeed! With more than 20 years' experience as a provider of connectivity solutions for IoT applications, it is very exciting for us at Sierra Wireless to see the market really picking up pace and huge numbers of new players starting to apply IoT technologies to solve an incredibly diverse range of business needs.

The fact that a large number of respondents still have no immediate commercial plans is hardly, however, a surprise. Bringing an IoT application from concept to deployment remains a complex, time-consuming and expensive proposition. The most significant culprit: the need to integrate all of the essential components as a bespoke solution for each application. All too often, organizations spend the bulk of their resources on basic system integration tasks, not on the application itself.

To reach the IoT vision of everything connected, interoperability between technologies is essential. At Sierra Wireless, we believe open source technology is the answer, and we are invested in several open source projects to this end.

Another technical barrier to IoT market growth is the need for more energy-efficient wireless solutions. Many IoT applications must operate for many years with no available power source. Currently, the lack of low-power solutions means that some applications are simply not viable, even when there would be a clear business value in deploying them.

Enter low-power wide-area (LPWA) technologies. Designed specifically for low-bandwidth, low-power IoT applications, LPWAs are poised to unlock the potential of a much broader set of applications than was possible before.

While many different LPWA technologies are still being discussed, there is little disagreement on one point: Standardized solutions are invariably more viable long term than proprietary solutions. Again, interoperability and standardization will be keys to success.

No one can envision every possible application for IoT technology, but committing to a standards-based and open-source strategy will help drive IoT innovation and bring new IoT services to market faster and at lower cost.

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only 14% thinking there will be no need for major network upgrades to support IoT.

Our final question concerned the kind of standards wars that everyone in the technology, and especially telecoms, business will have become all too familiar with over the years. While there is a totally understandable business benefit from owning the technology that eventually becomes a key component of a major technological trend, standards wars tend to delay progress and frustrate nearly everyone else.

When we asked respondents to pick a single statement they agree with the most regarding IoT standards, 29% selected "Industry-wide standards cooperation is the only way that IoT can really flourish," while a further 25% selected "Standards wars will emerge between conflicting technologies, parties and industry bodies". Conversely only 8% agreed with the statement "Existing standards

in place for internet-connected devices will suffice for IoT devices and data."

The IoT section of the Telecoms.com Annual Industry Survey reveals a major technological trend on the cusp of taking off, but with a few challenges yet to resolve before it can do so. It looks set to be an exciting era for telcos, just as traditional revenue streams such as consumer subscriptions start to dwindle, with CSPs arguably the best positioned to develop and sell IoT services, and thus best positioned to reap the commercial rewards . But with any new technology come teething problems and the sheer size, complexity and diversity of the IoT opportunity means those challenges are considerable. Our survey identified security and standards as two of the most important issues to address and the feeling seems to be that agreeing on a unified set of IoT standards will be an important step forward.

Right now, NFV is one of the hottest technological trends in the telecoms industry. 2015's survey found there was likely to be a number of live network roll-outs before the year was out, and so it transpired to be. More than 30 live deployments happened last year, and 2016 promises a great deal for the virtualization technology.

Key takeaways:

- Nearly nine tenths of the audience have either launched or are trialling live NFV in the network.

- The majority of targeted use-cases are based on LTE optimisation, such as vEPC, vIMS and vRAN.

- Nearly half of respondents can't identify with industry association groups, calling them unrealistic and idealistic.

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It's alive!

2015 SAW NFV COME ALIVE, WITH THE VAST MAJORITY OF RESPONDENTS ACTIVELY MANAGING LIVE NFV OR STRATEGISING ITS DEPLOYMENT. THAT TREND IS SET TO CONTINUE THIS YEAR.

Last year's Annual Industry Survey was the first time Telecoms.com Intelligence actively polled its audience on attitudes and progress being made with regards to the subject of network functions virtualization – with an additional emphasis on the apparently symbiotic software defined networking.

At the start of 2015 we saw about 40% of respondents say they were looking to make sure they had either launched, trialled or begin launching NFV-based services before 2016 came rolling around. In reality, what we saw over the last 12 months was a defining year for the technology, where more than 30 live service provider examples of NFV in action saw all of the potential and discussion from the previous three years come to life. It would be fair to say that NFV leapt from a presentation deck in the boardroom to real networks.

Use cases we saw last year largely saw a variety of operators grabbing hold of the low-hanging fruit when it comes to NFV. The majority of rollouts pertained to the virtualization of customer premises equipment (vCPE) or evolved packet core (vEPC), as operators look to bolster enterprise services and LTE capabilities. In a handful of implementations, tier 1 operators have gone all-in on virtualizing elements of their infrastructure and utilising complex multi-vendor architec-

tures controlled by sophisticated management and orchestration platforms.

These early exploitations of virtualization technologies means there's a core group of operators who are beginning to realise the gamut of benefits NFV possesses, while simultaneously giving encouragement to the wider majority of telcos that NFV is possible, it is here and that its success is a business decision away, and no longer a technological problem.

We began the NFV section of this year's survey by asking respondents what they believe to be the most compelling proposition of the technology. The early primary benefits of NFV were well touted as being the reduction of capex and opex, principally, which garnered 26% and 14% of the votes respectively. Another of the quintessential NFV benefits predictably came in second, reducing time to market for new services was voted for by 18% of the audience; while 16% and 12% of respondents said the primary reasons for their organisation rolling out NFV-based infrastructure were to better compete with operators and to more effectively compete with OTT players, respectively. A minority of the audience (6%, 5% and 3%) said automated network service assurance, to demonstrate organisational innovation and the ability to enter new markets quickly were the primary reasons for NFV.

What would be the primary reason for your organisation rolling-out NFV-based infrastructure?
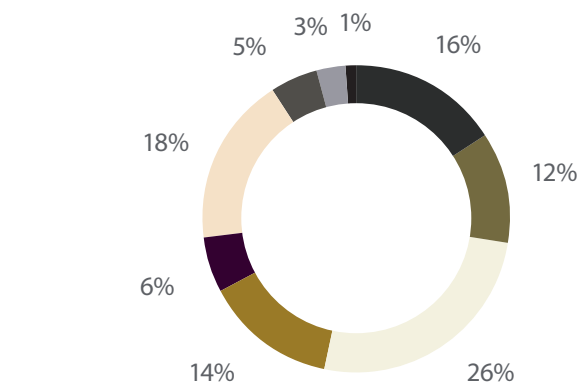
- ● Ability to compete more effectively with other operators
- ● Ability to compete more effectively with OTTs
- ○ Capex savings
- ● Opex savings
- ● Automated network service assurance
- ○ Reduced time to market for new services
- ● To demonstrate innovation within your organisation
- ● To enter new markets more quickly
- ● Other

So the perceived benefits of NFV remain largely similar to 12 months ago, with the added view-point of more effectively dealing with competitors making its way into consideration this year. Last year, we saw 40% wanting to make sure they'd rolled out NFV by the end of the year, so where is the audience at the start of 2016?

Starting off with respondents that have either already launched

NFV or are getting close to doing so; 21% of the audience has said it's currently participating in field trials of potential use cases, while 20% have already pressed ahead with rolling-out basic virtualized network functions (VNFs) into the live service provider network. A further 10% are conducting lab trials and proof of concepts, and 6% have adopted or are currently adopting sophisticated orchestra-

tion platforms to manage multiple VNFs.

These numbers serve to illustrate the progress being made in the realm of live service provider NFV. 57% of respondents have either launched live NFV services already or are field trialling the tech.

Beyond that, 16% are looking at evaluating the business benefits of NFV and 15% of respondents are considering use-case scenarios. Therefore, 31% of the audience have NFV on their radar on top of the 57% already running it. It turns out that just 12% of respondents have no interest in rolling out an NFV-ready architecture at this time.

A fair percentage of the NFV rollouts that 2015 brought us were made up of operators looking to virtualize the EPC and customer premises equipment. It's unsurprising then to see that vEPC use-cases dominate the prioritised launch areas for survey respondents. 45% of all respondents said vEPC was one of the use-cases they were

prioritising for launch; with vCPE voted for by 34%. Other areas identified by the audience related to service-oriented functions of the network, such as the content delivery network (37%) and the IMS (32%), which is being seen as a key for operators looking to roll out VoLTE and its associated services with more agility and flexibility.

Elsewhere, enterprise services like firewall were identified as a launch priority by 27%, and 23% of the audience say they're focussing on virtualizing the RAN and/or mobile base stations first; which would dovetail very nicely with new ETSI initiative "Mobile Edge Computing" which focuses on moving caching and compute capabilities nearer the network edge to help deliver mobile video and high data-consuming services in ever-decreasing time.

We've determined that a considerable percentage of the Telecoms.com audience is in the midst of an NFV programme of some kind, and so we sought to understand the biggest prohibiting

factors preventing the audience from realising the potential of the virtualization technology.
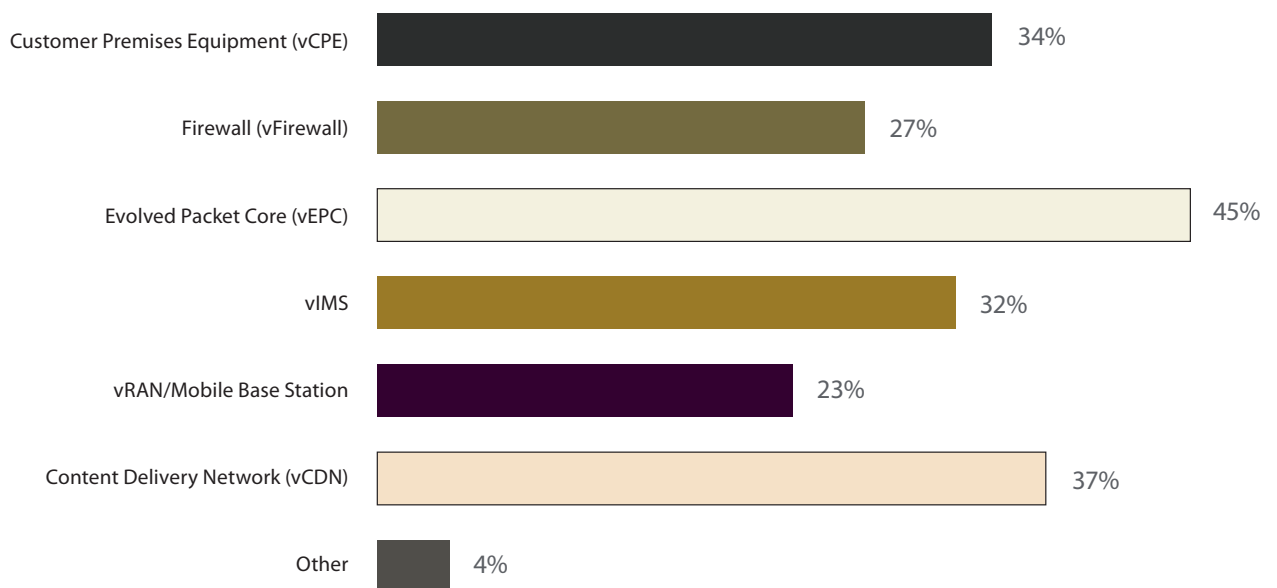
The biggest response came from the segment of the audience which cited the immaturity of available products offerings; seemingly the work being done by industry vendors and standards groups hasn't quite come along quick enough or far enough to convince everybody that it's time to jump on board. In two instances, exactly 16% of the audience identified both a lack of a compelling value proposition and other technologies or business areas taking priority; indicating that while the benefits of NFV are there to see, they're perhaps not quite as compelling or crucial as other areas of investment right now.

Elsewhere, there are management and orchestration of multi-vendor environments as well as vendor lock-in concerns (14% and 13%) among the audience; with 12% citing a lack of available resources required to suitably evaluate possible options. Finally,

10% of the audience said a generally confusing stance taken by vendors around their strategies is putting them off.
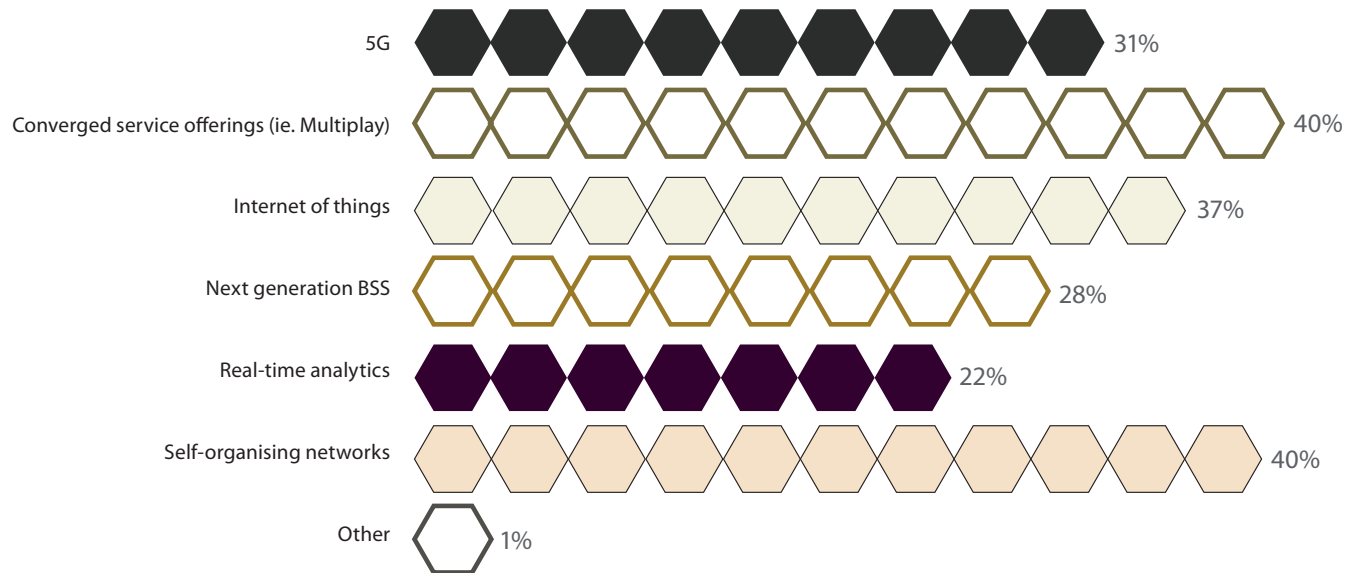
In among all of the positivity and potential benefits surrounding the implementation of NFV, it is interesting to speculate as to which specific technology will be most enabled by it. There is talk of 5G as a collection of radio technologies which will enable an 'era' of 5G; and presumably a networking requirement of 5G will be to have agile, flexible and softened control of the radio access network. IoT, too, is speculated to be one of the telecoms services trends that requires one of the biggest network transformations in order to realise its true value to the operator community. It may come as some surprise that neither of these feature as the most commonly identified technology by our audience when asked what they think NFV will enable most, with 5G coming in at 31% and IoT coming in at 37 %. The most commonly identified services being the ability to easily

Which of the following NFV use-cases are you prioritising for launch?

Use-case	Percentage
Customer Premises Equipment (vCPE)	34%
Firewall (vFirewall)	27%
Evolved Packet Core (vEPC)	45%
vIMS	32%
vRAN/Mobile Base Station	23%
Content Delivery Network (vCDN)	37%
Other	4%

Which technology do you think NFV will enable the most?

5G	31%
Converged service offerings (ie. Multiplay)	40%
Internet of things	37%
Next generation BSS	28%
Real-time analytics	22%
Self-organising networks	40%
Other	1%

launch and manage converged service offerings (ie. Multiplay) and the ability to develop self-organising networks (SON), both of which came in with a response rate of 40%. Other services identified by the audience include next generation-BSS (see earlier survey section dedicated to BSS transformation), and real-time customer analytics, which received response percentages of 28% and 22% respectively.

This part of the annual industry survey has now ascertained how many operators are implementing NFV, what elements of the network they plan on virtualizing, what their hesitations are and which services they think it will benefit. The next question we asked related to orchestration and determining which approach to the management of a virtualized infrastructure the majority of respondents were likely to adopt.

We asked respondents to identify with one particular approach to NFV management and orchestration, which is a core area of optimising the capabilities of the tech. 45% most strongly

agreed with the statement saying they will implement "orchestration capable of chaining together multiple VNFs for complex service delivery", while 36% agreed with the statement saying they will implement "sophisticated orchestration technologies capable of automatically spinning-up multiple VNFs, chaining them and rolling out services for users on-demand". This suggests the majority of the audience knows there's a need for orchestration which can perform the fundamentals of VNF management and attempt to gain optimal benefit. 20%, meanwhile, said they'll be looking to implement "rudimentary management and orchestration capable of spinning-up and down individual VNFs on an ad-hoc basis."

ETSI's NFV industry specification group has been working on more clearly defining the carrier requirements for the management and orchestration of an NFV infrastructure. Work has been undertaken as part of the MANO working group, where integration between multiple vendors' virtualized network function offerings

has required the development of specific recommended architectures to appropriately achieve effective orchestration as well as the ability to chain services together. Other working groups, such as the Open Platform for NFV (OPNFV) have been working on similar practises, but OPNFV particularly has been working on an entire topology for an NFVI – with orchestration counting for just one facet of the organisation's strategy.

The penultimate question of this year's annual industry survey asked the audience for their views on these industry groups and their level of agreement with a variety of statements. An overwhelming 96% of respondents either agreed or strongly agreed with the statement which said industry organisations, like ETSI or OPNFV, help the industry realise and implement the potential of NFV.

More self-motivated view points on NFV industry groups received very positive agreement ratings from the audience too. 84.4% of respondents agreed with the statement which said industry

groups raise awareness of NFV within my organisation, which corroborate with the earlier assertion that NFV has become more of a managerial and awareness conundrum than it is a technical one. A further 83% said they're allowed to more closely monitor competitor activity and keep up with the latest developments by engaging with industry collaborative groups.

One of the interesting revelations from this question is the audience's view on whether industry standardisation groups can relate to the majority of operators and their resources. 43% of all respondents agreed with the statement which said "industry groups are idealistic and don't represent the technological capabilities of my business". The same question did, therefore, receive a 57% disagreement rating, but the significance of apparently discontent 43% of respondents does suggest that there is a significant proportion of the industry that doesn't believe these groups are relatable.

The final question asked the audience what they thought NFV would ultimately look like. 52%

What do you think NFV will ultimately look like?

52%

28%

20%
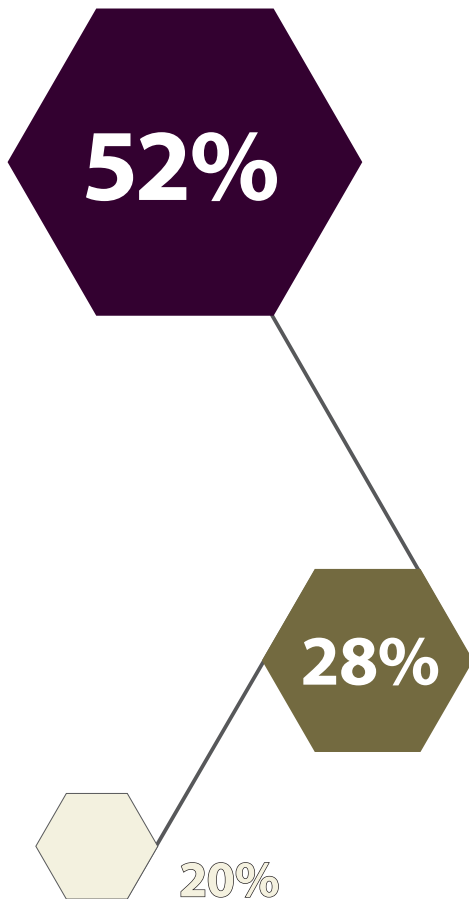
- A converged IT and networking infrastructure utilising automated service rollout
- Siloed network servers hosting individual virtual network functions
- Massive data centres dedicated to hosting all of the required virtual network functions

said it will be a converged IT and networking infrastructure utilising automated service rollout. 28% said it will be massive data centres dedicated to hosting all of the required virtual network functions; while 20% said NFV will be siloed network servers hosting individual virtual network functions.

So it would appear conclusive that the majority of the telecoms industry now knows what it wants to achieve from NFV; and that apart from those who have already began implementing live network virtualization, there's a lot of jostling for position around specific services and use-cases. 2015 saw NFV take off big time among international tier 1 operators, the next logical step for 2016 will likely see more domestic telcos launch basic NFV services, with the industry pioneers moving ahead with more convoluted function chaining and orchestration to optimise the monetisation opportunities NFV presents.

SPONSOR'S COMMENT – EMC

EMC is energized to see how rapidly the industry is moving toward NFV adoption and how closely this Telecom.com survey confirms what EMC has been hearing from operators of all sizes around the world.

The fact that respondents to this survey are looking to virtualize a targeted set of VNFs as a first step on their NFV journey confirms our observation that tier 1 operators are more likely to embark on broad transformation projects whereas tier 2 and 3 operators tend to be pragmatists. The pragmatist is an operator that seeks an NFVi platform that can initially deliver turnkey, "VNF-in-a-box" deployments and scale over time into a composable environment capable of hosting a multitude of workloads side by side, on demand, with advanced automation, management, and self-healing properties. The pragmatist journey is one that starts with a focus on quick time-to-value and leads to a focus on increased agility and OPEX efficiencies.

The 3 responses from this survey that stand out most to EMC are:

- The tendency of operators to deploy vCPE and vEPC first. This aligns with EMC's observation that pragmatists seek first to prove the business value of their chosen NFV infrastructure before moving on with broader transformational initiatives. At EMC we call this approach: "Modernize then Transform"
- The perception that NFV will make operators more competitive. This supports EMC's view that virtualizing the network is only the first step toward achieving business success in a rapidly changing market. The true benefits of NFV come with the agility to collocate network services with nontraditional services like video streaming, Big & Fast Data services, and next generation IoT applications, and to be able to spin those services up and down as business needs dictate.
- The concern about immaturity of existing offerings. EMC has heard from many operators who have been frustrated by the lack of functional maturity across the spectrum of technology offerings. This is why EMC is taking the time to build an NFV offering that is carrier-grade and that offers superior value in management and orchestration, analytics, data protection, and disaster recovery, and that provides choice of VNFs and between proprietary and open source technologies.

EMC shares the excitement of Telecoms.com in the findings of the 2016 survey and looks optimistically to a year of growth ahead.

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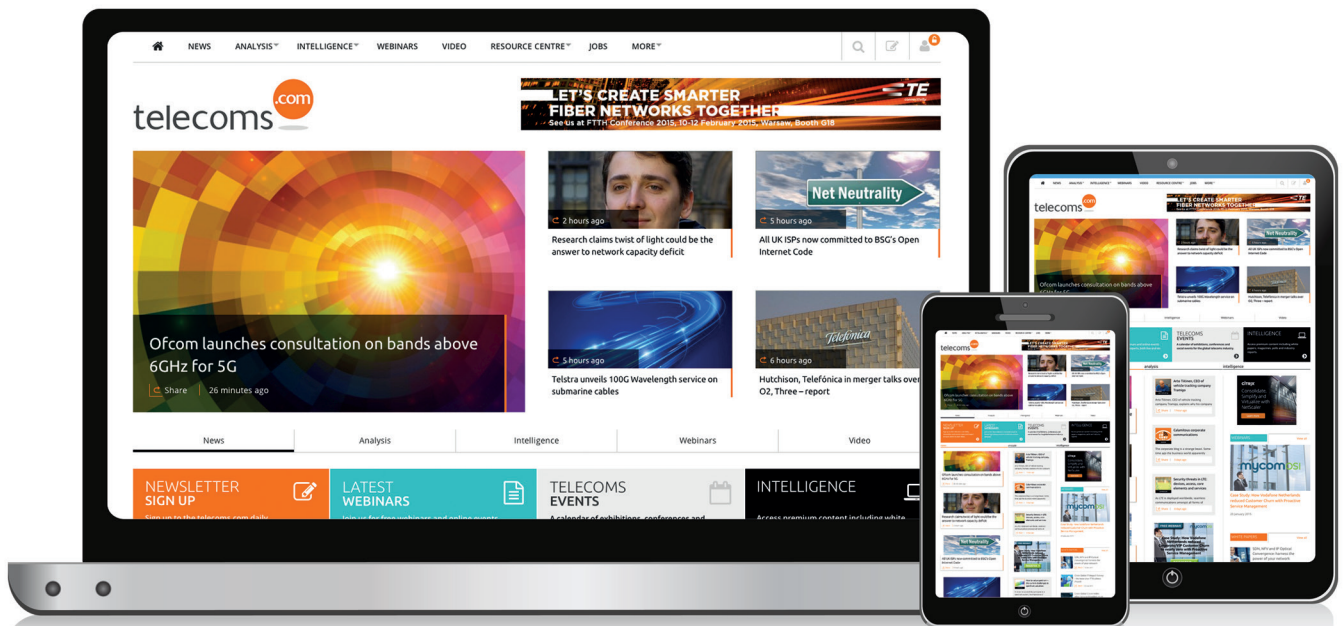
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