

Embracing the gigabit era

Introduction

Welcome to the 18th edition of *Inside Telecommunications*. Our regular sector review draws on EY's deep industry knowledge to provide unparalleled market intelligence on critical issues affecting telecommunications worldwide.

Operators continue to expand their service propositions across a number of domains. Smart home services are by no means new, but both technology and telecommunications companies are renewing their focus on the digital home, deploying a variety of business models to capture upside in a market forecast to be worth US\$100 billion by 2020.

Service providers are refining propositions where they already have a substantial foothold. Mobile financial services are well-established, with operators, retail banks and start-ups all innovating at pace. This more diverse landscape is prompting operators to overhaul their approach, either by partnering with other ecosystem players or by adopting a more holistic approach to service creation that places payments within a larger cluster of use cases.

Mergers and acquisitions remain buoyant, with 273 deals announced in the first half of 2016, in line with the preceding six months. The rationale for in-market convergence remains strong, and we are now witnessing a number of mergers between pay-TV and mobile operators. Adjacent market acquisitions are also popular, particularly for larger players with ambitions in video streaming and the Internet of Things (IoT).

Against this backdrop, we hope you find this material useful. Please do not hesitate to share your feedback with me or any of my colleagues at EY.



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Contents



Service Innovation

4

Smart home strategies
move forward

4

Operators refine their
approach to mobile
financial services

6

Technology

8

Gigabit 4G is coming
of age

8

Cable providers eye
DOCSIS 3.1 upgrades

9

Regulation

12

India spectrum prices are
in the spotlight

12

European roaming debate
rumbles on

13

M&A

16

Introduction

16

In-market convergence
remains buoyant

17

Dealmaking heats up
in Canada

17

Carriers bolster their
OTT video capabilities

18

Bolder moves into IoT
are underway

18



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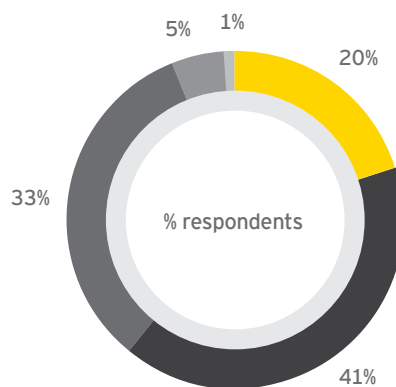
Foreword

The telecommunications industry is undergoing a step change in infrastructure capability. By mid-2016, more than 500 operators worldwide were offering 4G mobile services. And in February, researchers achieved a world-record broadband speed of 1.125 terabits per second – enough to download an entire high-definition television series in a fraction of a second.

Although commercial gigabit speeds underline the quest for differentiation, the challenge for carriers may be a little more prosaic than offering the fastest network. EY research suggests that many users prize the reliability of their broadband connection more than the speed it delivers; in fact, 4 in 10 households do not know the advertised speed of their broadband service.

Figure 1: UK household views on broadband speed and reliability¹

“The reliability of my household’s broadband connection is more important than broadband speed.”



- Strongly agree
- Slightly agree
- Neither agree nor disagree
- Slightly disagree
- Strongly disagree

Source: EY

Greater reliability may provide new ways for operators to distinguish themselves, particularly as bundle packages become more sophisticated. Indeed, more trusted customer relationships are vital as players focus on cross-selling new services: too many choices can overwhelm more functional users.

Nevertheless, the hunt for new use cases continues. In this edition, we explore new opportunities in the smart home. Operators are just one of many industry actors looking to provide new services based on energy management, entertainment and home automation. Carriers have long sought to meet new customer needs in mobile financial services, but rising competition is forcing many to refine their approach.

Adjacent market services aside, the key driver of data traffic will be video, and it remains to be seen how new devices offering virtual reality experiences will affect overall data traffic growth. The good news for operators is that the latest iterations of fixed and mobile technologies are already promising a step change in data throughput, well ahead of the much-vaunted transition to 5G at the end of the decade.

¹ *Navigating the Bundle Jungle*, EY, September 2016 (based on a survey of 2,500 UK broadband households).

1

Service innovation

Smart home strategies move forward

Players from across the technology, media and telecommunications sectors have long sought to increase their share of wallet among households. The last decade has seen a wave of innovations rolled out to support growth strategies, from 3-D TVs to new residential connectivity packages that offer over-the-top (OTT) TV services and extra mobile subscriber identification modules (SIMs) for families.

However, the connected home refers to more than technological innovation in established product categories or more sophisticated broadband and TV packages. Smart homes, underpinned by multi-device streaming and home automation, are expected to ramp up in years to come. Juniper Research forecasts that consumer spending on smart home services – including entertainment, health, energy and automation – will top US\$100 billion in 2020, more than double the US\$43 billion spent in 2015.²

At present, entertainment services are at the vanguard of innovation. Streaming TV and music services are well-established, voice-activated smart speakers are becoming more popular, and virtual reality headsets promise new types of content creation and consumption. Home automation is also making its presence felt. Both Amazon and Google have unveiled smart home assistants, while Apple has the HomeKit automation framework.

Meanwhile, operators are recalibrating their strategies. In the UK, O2 has launched O2 Home, a service that allows users to control a range of functions via their mobile devices, from lighting to security. Three monthly packages offer various combinations of smart home devices and services, all controlled with a smartphone app.

Singtel has launched a smart lifestyle solution that leverages a Smart Hub to connect with more than 200 compatible devices, including motion sensors and smart cameras, and lets customers choose from a range of monthly contracts.³ In Australia, Telstra has unveiled a home technology platform that offers two packages directed at home automation and monitoring respectively.⁴

Carriers with well-established smart home programs are also taking new value chain positions, exporting their technology capabilities by wholesaling their platforms to other operators. O2 UK's smart home service leverages AT&T's Digital Life platform with O2's parent, Telefónica, the first European carrier to license the US operator's technology.⁵

This kind of partnership also supports KPN's smart home proposition. The Dutch incumbent is licensing Deutsche Telekom's QIVICON, an open platform that itself leverages third-party vendor relationships with the likes of Philips, Samsung, Sonos and others.

Collaboration with device manufacturers and developers is the lifeblood of connected-home propositions, and it may make sense for some operators to leverage the partner-centric platforms of their peers to shorten time to market and maximize ecosystem relationships. But as more players make their smart home ambitions clear, real questions remain about consumer demand. An EY survey of 2,500 UK households in April 2016 revealed a marked resistance to using or purchasing smart home technologies across a range of use cases over the next five years.

More than half of households say they are unlikely to use or pay for any form of smart home product in the medium term, suggesting that adoption will depend on tech-centric early adopters for some time. For operators, the good news is that home automation and security services appear to resonate the most.

Industry watchers are already questioning demand for smart home products as some specialist tech companies underperform expectations. Nevertheless, successful innovation hinges on a tolerance for missteps and a willingness to learn from them. Feedback loops with consumers are more important than a "right first time" attitude.

Looking ahead, all players have much to consider as they refine their offerings. Many early initiatives have centered on a do-it-yourself approach to products, yet ease-of-use will be vital to attracting a mass market for smart home features. Some companies are already leading with a "support first" approach, such as HomeServe, a UK provider of insurance and emergency repair services that offers smart thermostat installation.

² "Smart home revenues to reach \$100 billion by 2020, driven by automation and entertainment services," Juniper Research, 20 October 2015.

³ "Singtel launches smart lifestyle solution," Singtel, 17 October 2016.

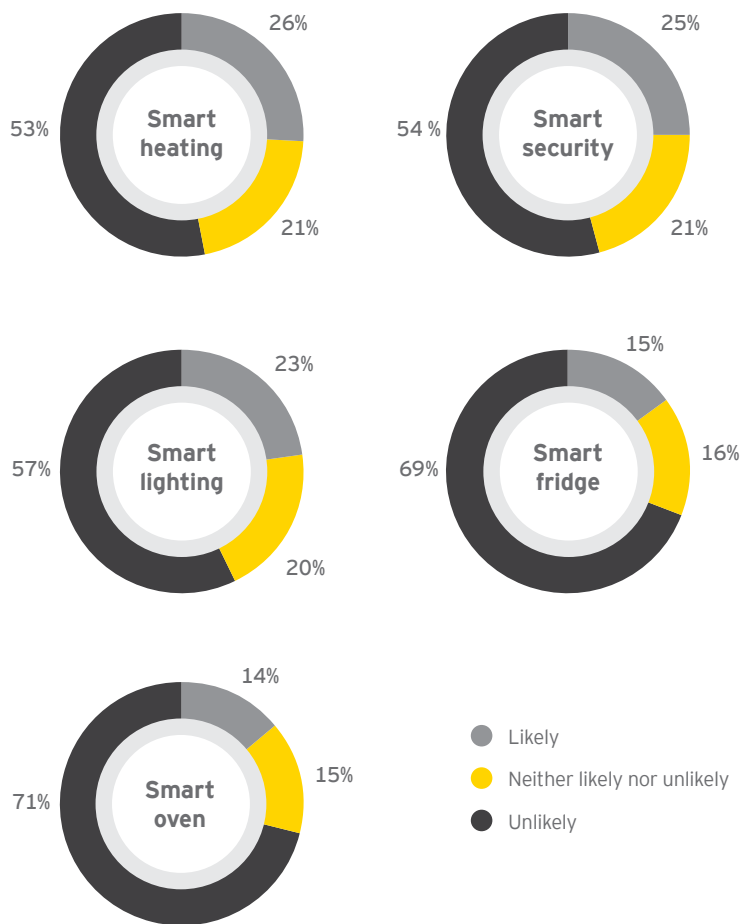
⁴ "Introducing Telstra Smart Home", Telstra Exchange, November 2016.

⁵ "O2 to offer AT&T Digital Life Platform and tado° to UK consumers in 2016," O2, 5 January 2016.



Figure 2: UK consumer attitudes toward smart home technologies⁶

Please rate your household's likelihood of using or purchasing the following smart home technologies over the next five years.



Source: EY

Creating the right customer experience must be at the forefront of product development. New products that emphasize simplicity and offer tangible benefits to real-world problems are best placed to succeed.

Packaging and pricing have important roles to play. Balancing one-off fees with subscriptions will be key, as will an assessment of how far smart home products can be housed within existing bundles of broadband and pay TV. All the while, delineating between “open” and “closed” approaches to ecosystem engagement will be a delicate process.

Larger operators will view smart home technology as merely one of many avenues to solidify their relationships with the digital household, and flexible partnering frameworks can help adapt to changing customer demands. Ultimately, all players should recognize that the smart home is a long-term opportunity to build new customer relationships, not a short-term exercise to push new technologies on an unsuspecting mass market.

⁶ Navigating the Bundle Jungle, EY, September 2016

1

Service innovation

Operators refine their approach to mobile financial services

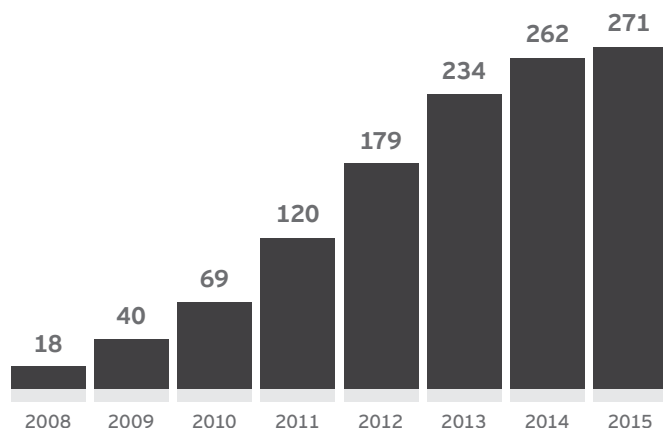
Mobile operators have a long track record of providing financial services through the handset. Since the rise of Short Message Service (SMS) money transfer in the early 2000s, operators have looked to capitalize on high levels of infrastructure reach and device penetration to widen financial inclusion while providing new forms of convenience at the point of sale.

There have been some landmark successes. Vodafone's M-Pesa service, which began life in Kenya in 2007 and now operates in 11 African and Asian markets, had 25 million customers as of March 2016, making it the world's largest payments platform in emerging markets.⁷

All told, mobile money services are now available in 93 countries, principally developing markets in Africa and Asia. They are clearly transforming people's lives: in 85% of countries where fewer than one-fifth of the population has a formal bank account, unbanked citizens now have access to a mobile money service.

Figure 3: Operator mobile money services worldwide

Aggregate number of live deployments



Source: GSMA

⁷ "Vodafone rings up record growth on mobile money platform," *Financial Times*, 25 April 2016.

⁸ "Apple Pay gets a million new users a week but profit remains elusive," *Computer Weekly*, 27 April 2016.

Although growth in new deployments has slowed since 2013, service providers are now focusing on increasing interoperability between platforms to stimulate usage and improve the customer experience. The last two years have seen interoperability implemented in a number of markets, including Indonesia, Madagascar, Pakistan, Rwanda, Sri Lanka, Tanzania and Thailand. At the same time, partnerships between operators and banks are prominent, with operator platforms in some markets – notably Latin America – now interoperable with the banking sector.

Yet the competitive landscape in digital payments has widened. Banks are pursuing more aggressive mobile strategies as they try to assert more control over the value chain. Financial institutions in Kenya, Russia and South Africa have all launched mobile virtual network operator (MVNO) services, for example.

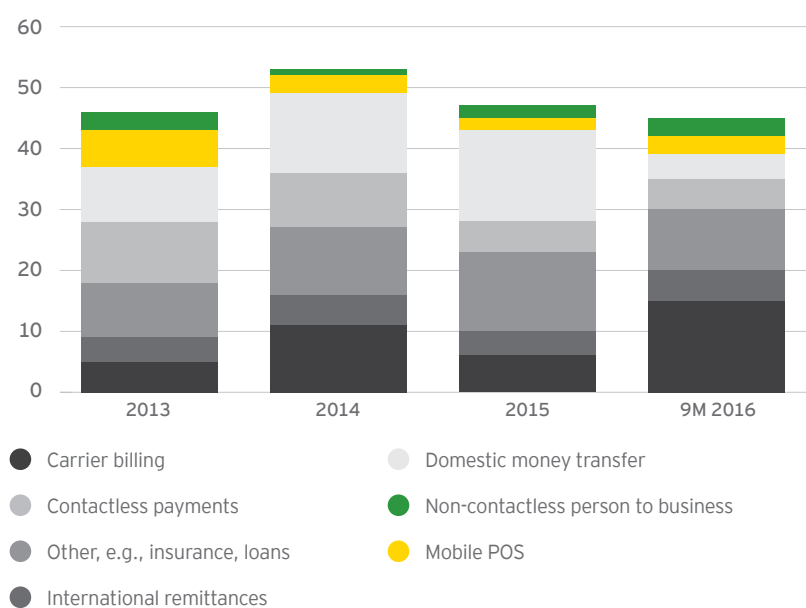
Meanwhile, technology and web giants are now making significant inroads into mobile payments, particularly retail contactless payments. Having launched in 2015, Apple Pay is winning more than 1 million new users a week. By April, more than 10 million contactless reader terminals were accepting Apple Pay worldwide.⁸

Such developments are forcing operators to rethink their positioning. New partnerships are forming in developing markets to support retail payments, with some operators now offering their customers access to Apple Pay and Samsung Pay, for example.

This switch in emphasis is apparent in a breakdown of operator service launches over the last three years. Domestic money transfer service launches are declining, reflecting a slowdown in the launch of new platforms. Contactless-payment launches have also dipped as operators look beyond near field communication technology. Direct carrier billing is on the rise as operators work with app store owners to support smartphone app payments in markets with low card penetration.

Figure 4: Operator mobile payment service launches by use case

Annual service launches



Note: These figures exclude credit-card-based mobile financial services launched by operators with partners.

Source: EY analysis

In a fast-changing landscape where new payment ecosystems continue to appear, some operators are taking bolder steps. In April, Orange acquired a 65% stake in Groupama Banque, and the two entities are developing a digital banking service. Set for launch next year, it will incorporate traditional retail banking functions – from current accounts, savings and loans to payment services – as a digital experience by phone.⁹

This move represents a new phase of the French operator’s diversification into payment services and builds on last year’s strategy refresh, “Essentiels 2020.” Orange plans to increase revenue from mobile financial services to €400 million by 2018.

Another operator ramping up its presence in mobile payments is Norway’s Telenor. Having pioneered mobile money services in Bangladesh and Pakistan, it acquired a banking license in Serbia, where some 80% of transactions are cash-based, ahead of launching a mobile banking service in 2014. Initial progress has been encouraging, with 150,000 accounts opened in the first 18 months.¹⁰

Elsewhere, Telefónica has launched a mobile-only banking service in Germany in conjunction with Fidor Bank that offers quick account setup, provides

incentives for existing-contract customers and caters to millennial users.¹¹

In emerging markets, the SMS technology of old is giving way to a new breed of OTT services as operators work with start-ups. Last year, Philippines-based PLDT set up a payments joint venture with Germany’s Rocket Internet to drive payment solutions in emerging markets. Subsequently, PLDT invested in PayMaya – an app offering online transactions via a virtual Visa card.¹²

Meanwhile, established money transfer systems are providing a wider set of use cases. The Lesotho Government now pays welfare grants using M-Pesa, and the Indian incarnation of the service allows customers to pay for online goods and buy train tickets.

As the industry looks ahead, an agile approach to proposition development will be crucial. Picking durable use cases is no easy task. The market for mobile point-of-sale terminals was buoyant two years ago, but early adoption among small traders has not been matched by larger retailers, with some start-ups suffering as a result. At the same time, smartphone purchases are reaching mass adoption phase – 39% of London subway commuters now browse and make purchases while traveling.¹³

Flexible business models will be crucial for operators to sustain their payment strategies in the long term. Use cases will continue to evolve, and new opportunities may appear for those willing to take more discrete value chain positions via partnerships. Local market factors related to technology, regulation and competition will also do much to dictate the opportunity at large.

⁹ “Orange to acquire a 65% stake in Groupama Banque, which will become Orange Bank,” Orange, 22 April 2016.

¹⁰ “Otvoreno 150.000 tekućih računa u Telenor banci,” Novinska agencija Beta, 25 March 2016.

¹¹ “Available now Mobile-only bank account in cooperation with Fidor Bank AG: Telefónica Deutschland launches O2 Banking,” Telefónica, 25 July 2016.

¹² “Local telcos target 2.5 billion global users via PayMaya,” Manila Bulletin, 9 October 2015.

¹³ “Londoners go mobile shopping on the tube,” Computer Weekly, 8 June 2016.

2

Technology

Gigabit 4G is coming of age

Over the last year or two, 5G has been a major talking point. Many industry watchers are mulling the possibilities heralded by a new generation of mobile technology, with IoT-based use cases such as robotics and autonomous driving seen as ideal environments for the new standard.

However, the reality is that 5G has yet to be standardized. Although some operators are talking up technology trials, commercial launches are not expected before 2020 at the earliest. High-profile R&D partnerships and demonstrations aside, many operators will be keen to make the most of their existing 4G investments in the intervening years.

Newer iterations of 4G are gaining ground as the ideal stepping-stone to 5G upgrades. LTE-Advanced (LTE-A) appeared in 2013 as part of the 3GPP Release 10, with carrier aggregation included as a key feature to increase data rates. However, additional concepts are now making themselves felt as part of LTE-A capabilities, from coordinated multipoint, which improves coverage for high-speed data, to features designed for vertical market and IoT use cases.

As LTE networks continue to perform better, the 3GPP has also provided a new "marker" called LTE-Advanced Pro to highlight 4G technology that can raise data throughput to several gigabits per second, provide latency of just a few milliseconds and increase overall network efficiency.

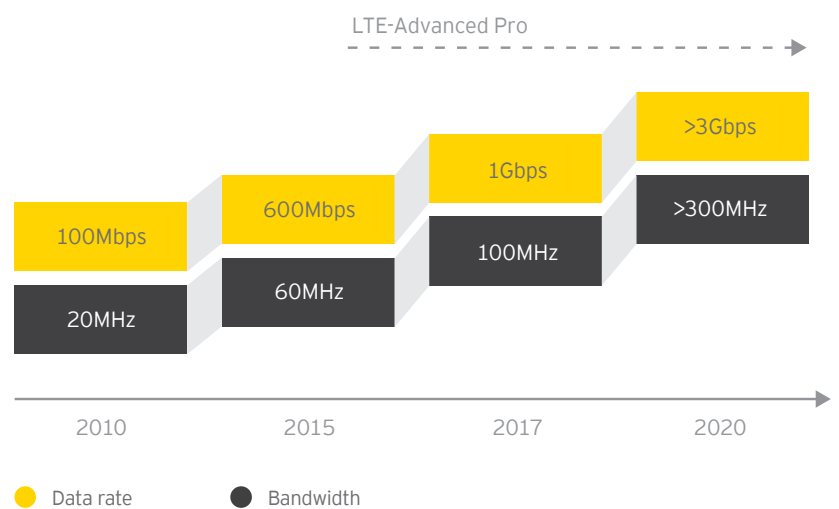
This is reflected in the rise of new vendor offerings billed as 4.5G. Nokia announced plans to make its 4.5G Pro technology available before the end of 2016, offering speeds 10 times as fast as early 4G networks. The Finnish vendor has also unveiled a 4.9G offering, which will increase data rates to several gigabits per second through additional carrier aggregation while using the cloud to reduce latency levels.¹⁴

At this year's Mobile World Congress, Sweden's Ericsson announced plans to use new software to upgrade commercial LTE networks to deliver gigabit speeds. And in October, Qualcomm, Telstra, Ericsson and NETGEAR announced they had delivered a gigabit-capable LTE mobile device and a commercial-ready gigabit LTE network.¹⁵

China's Huawei is also making headway with its 4.5G solutions, with plans to deploy more than 60 4.5G networks before the end of 2016. In October, it formed a strategic partnership with China Mobile to roll out LTE-Advanced Pro capabilities.

This vendor activity signals a step change in data rate and bandwidth capabilities available through pre-5G technology. The advent of LTE-Advanced Pro networks will not only boost data rates but also lead to extended coverage, lower latency and longer battery life.

Figure 5: Mobile data rate and bandwidth development



Source: Nokia, EY analysis

¹⁴ "Nokia announces AirScale-powered 4.5G Pro and 4.9G to establish smooth path for operators to 5G," Nokia, 1 September 2016.

¹⁵ "Qualcomm, Telstra, Ericsson and NETGEAR Announce World's First Gigabit Class LTE Mobile Device and Gigabit-Ready Network," Qualcomm, 18 October 2016.



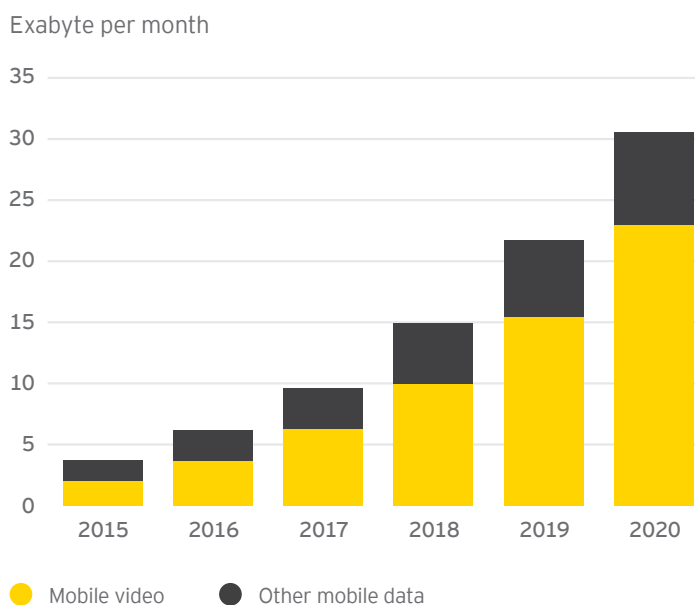
Service providers are responding to the latest wave of 4G equipment: 47 operators had tested, deployed or commercially launched LTE-Advanced Pro solutions by June 2016.¹⁶ Furthermore, the move to more sophisticated mobile infrastructure is underway in a number of regions, regardless of market maturity. In Turkey, all three operators are now investing in LTE-Advanced Pro.

Despite the burgeoning market for 4.5G, operators should address numerous questions as they bulk up their LTE capabilities. Having a clear sense of new use cases that will pivot on LTE-Advanced Pro is essential to long-term network planning.

While vendors are positioning 5G as a building block for services such as autonomous driving and remote surgery, 4.5G may have a more immediate role to play in supporting virtual and augmented reality services, for example.

Although industry forecasts already recognize the primacy of mobile video as a growth driver for consumer mobile data, the pace of growth remains difficult to predict. Much depends on how quickly the market for augmented reality matures and how extensively such new experiences are driven by web and device giants.

Figure 6: Mobile video traffic growth forecast



Source: Cisco

Assuming that mobile video continues to follow its predicted growth trajectory, it is crucial to have enough 4.5G-capable devices available. One potential barrier is that the vast majority of smartphones shipping in 2016 still feature low-speed modems that cannot take advantage of LTE-Advanced and LTE-Advanced Pro capabilities. Making certain that device strategies dovetail with improving network performance is vital.

Gigabit 4G speeds will also influence approaches to mobile data pricing. Mobile video usage among US millennials tripled in the year to June, according to one survey,¹⁷ and zero-rated plans will further fuel growth in mobile data consumption, giving operators an ever-more-nuanced task in balancing different charging models.

Cable providers eye DOCSIS 3.1 upgrades

The battle between cable TV providers and fixed-line carriers to differentiate on broadband speeds is heating up as cross-selling becomes the norm and more players combine connectivity and content options within household bundles.

Historically, cable providers have enjoyed an advantage in infrastructure performance, offering higher broadband speeds to users while the telecommunications sector busied itself with asymmetric digital subscriber line (ADSL) and very-high-but-rate digital subscriber line (VDSL) deployments. However, the performance gap has narrowed somewhat in recent years as incumbent carriers leverage technologies such as vectoring and G.fast to improve the performance of their hybrid copper-fiber infrastructure.

To maintain the lead on network quality, a number of cable operators are looking to the latest Data Over Cable Service Interface Specifications (DOCSIS) standard. DOCSIS 3.1 was standardized in 2014 and offers advantages on network speeds and spectral efficiency, with scope for additional improvements. Gigabit uplink and downlink data rates are expected, along with a 50% increase in data capacity by using the same spectrum. It is also compatible with earlier DOCSIS standards.

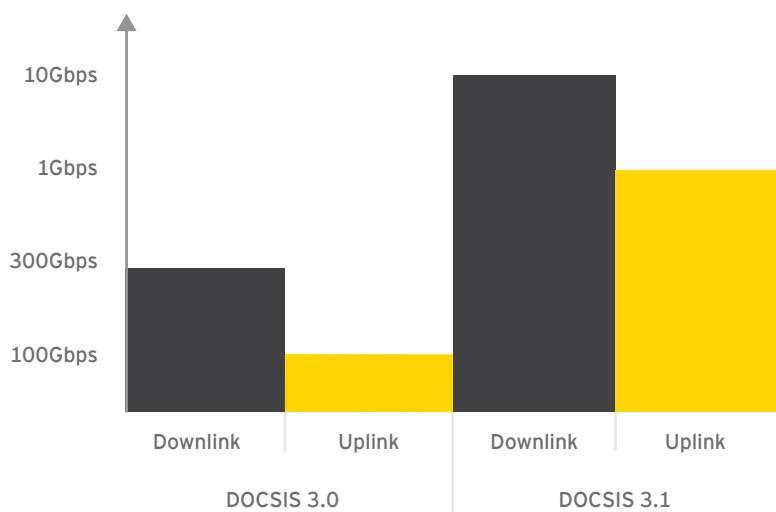
¹⁶ "Global LTE-Advanced Pro Development," Global Mobile Suppliers Association presentation, 30 June 2016.

¹⁷ "Video Calling, Shopping and Video Streaming See Highest Smartphone Usage Growth Among Millennials," NPD Group, 4 October 2016.

2

Technology

Figure 7: Data throughput comparison of DOCSIS standards



Source: EY analysis

Various cable operators are now migrating their networks to the new standard. Liberty Global plans a footprint-wide upgrade beginning in 2017 and estimates that it can offer gigabyte services to households for €20 per month, not including customer equipment costs. In the interim, the multi-market operator is also improving the top-end speeds of its existing DOCSIS 3.0 networks, with 500Mbps now available in Switzerland.¹⁸

Earlier this year, Altice Group and its French subsidiary, Numericable-SFR, tested DOCSIS 3.1, achieving download speeds of more than 3Gbps per subscriber.¹⁹ In Denmark, incumbent operator TDC has begun upgrading its cable infrastructure to offer gigabit speeds and expects to complete the network migration by the end of 2017.²⁰ Australia's NBN company, which launched a cable network this year, plans to incorporate DOCSIS 3.1 in 2017.

The move toward DOCSIS 3.1 is also underway in the US. Earlier this year, Comcast announced it was rolling out a gigabit internet service in select US cities, introducing DOCSIS 3.1 to consumers for the first time following extensive testing.²¹ Cox Communications is testing DOCSIS 3.1 before the end of 2016, with a view toward rolling out services in 2017. RCN launched gigabit cable in New York in October, with prices beginning at \$69.99 per month.²²

These announcements underline that cable providers are keen to take a lead on speed in the gigabit era. But the upcoming shift in infrastructure will not suit all players. Some believe that overlaying additional fiber on their existing DOCSIS 3.0 networks represents a more economical route to higher capacity, and smaller cable providers may well consider taking full advantage of their existing DOCSIS 3.0 investments before upgrading.

Meanwhile, even the DOCSIS 3.1 standard itself is set for further refinements. Standards group CableLabs is exploring a fully symmetrical version of the new technology that can substantially raise uplink speeds. In May, Nokia Bell Labs announced that it had achieved 10Gbps download and upload speeds as a proof of concept.²³

Taking full advantage of the new standard requires more than a well-planned upgrade program. Understanding how best to combine various infrastructure improvements – from DOCSIS 3.1 to converged cable access platforms – with overarching technology shifts towards software-defined networks is also paramount.

At the same time, providers with IoT ambitions may need to factor in their approaches to low-power widearea networks and home network middleware. In this light, DOCSIS 3.1 is just one element of an increasingly heterogeneous network agenda for cable operators as they widen their service portfolios.

¹⁸ "Liberty Global Preps for DOCSIS 3.1," Light Reading, 10 August 2016.

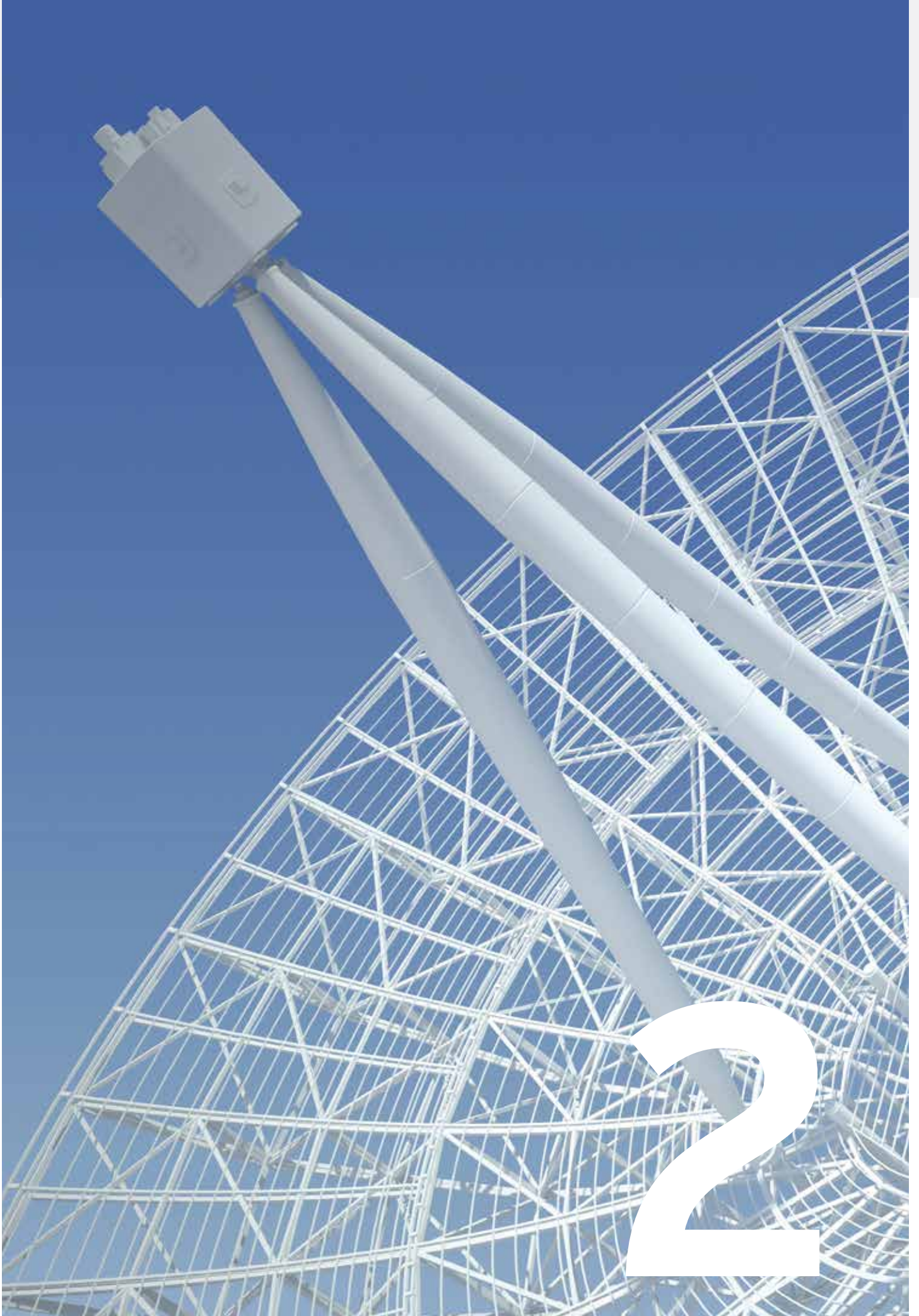
¹⁹ "Altice Sets Speed Record with Cisco cBR-8 Enabling Best-in-Class Broadband and Video Experiences Across Its Global Markets," Cisco, 6 June 2016.

²⁰ "TDC begins DOCSIS 3.1 rollout to offer 1Gbps speeds," TeleGeography, 20 May 2016.

²¹ "Comcast to introduce world's first DOCSIS 3.1 powered gigabit internet service," Comcast, 2 February 2016.

²² "RCN throws hat in to Gigabit ring with NYC DOCSIS 3.1 launch," TeleGeography, 28 October 2016

²³ "Nokia Bell Labs achieves world's first 10 Gbps symmetrical data speeds over traditional cable access networks," Nokia, 16 May 2016.



3

Regulation

India spectrum prices are in the spotlight

For many years, the Indian mobile market has suffered from an acute shortage of spectrum. Before the recent multiband auction, Indian operators underperformed their peers on spectrum holdings, standing at an average of 18MHz per operator, compared with a global average of 50MHz.²⁴

The nation's largest-ever spectrum sale offered a chance to address this deficit. The October auctions delivered proceeds of US\$9.87 billion for 2,200MHz of available frequencies in the 700MHz, 850MHz, 900MHz, 1,800MHz, 2.1GHz, 2.3GHz and 2.5GHz bands.

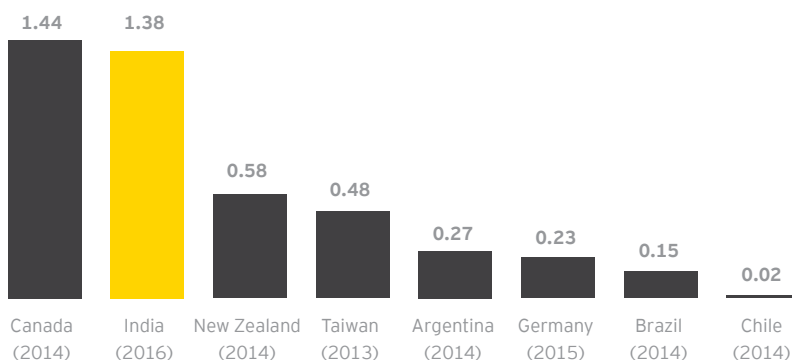
Nevertheless, the sale fell well short of the Government's goal of US\$84 billion. Only 40% of the offered spectrum sold, and none of it was in the 700MHz and 900MHz bands, which support more efficient mobile network rollouts. Seven operators participated in the auction, and four of them – Vodafone India, Bharti Airtel, Reliance Jio and Idea Cellular – bid more than US\$1 billion for the new frequencies.

Although the new frequencies have helped alleviate India's spectrum crunch, operators will face various challenges as they support a new wave of demand for mobile data.

The number of Indian 4G users is expected to rise to 230 million by the end of the decade.²⁵ At the same time, the Government's Digital India initiative positions mobile infrastructure as a pillar for productivity growth, with mobile's contribution to GDP increasing in years to come.

Figure 8: Comparison of 700MHz pricing in select national auctions

US\$/MHz/population



Source: Ovum, EY analysis

To realize their role in the digital society, operators will need to increase their network expenditure, with capex set to rise from INR154,100 crore in the last five years to INR227,800 crore for the five years to 2020.²⁶

However, operator balance sheets remain constrained, and operating margins, which stood at 12% in 2015, are three percentage points below the regional average and six below the global average.²⁷

Operators argue that high reserve prices add to their capex burden, constraining further network investment. Between 2010 and 2016, the Indian Government raised a total of over INR350,000 crore across six different auctions, including the recent multiband auction.²⁸

In the most recent auction, the reserve price of US\$1.7 billion in the 700MHz band dampened demand. When set in a global context, the price of spectrum per megahertz per population in India clearly exceeds levels observed elsewhere.

Earlier this year, the GSMA noted that the Government's total recommended reserve prices for the seven spectrum bands in the multiband auction were equivalent to almost double the cost of spectrum investment to date in the subcontinent.²⁹

Indian policymakers have made significant progress toward improving supply-side dynamics in the mobile industry, notably by harmonizing frequencies in the 1,800MHz band earlier this year, which created a contiguous and more efficient spectrum. But the issue of reserve prices remains a thorn in the side of long-term growth prospects.

24 "Recommendations on Delivering Broadband Quickly: What do we need to do?" Telecom Regulatory Authority of India, April 2015.

25 "New GSMA study projects almost one billion mobile subscribers in India by 2020," GSMA, 26 October 2016.

26 "The Mobile Economy India 2016," GSMA, October 2016.

27 Ibid.

28 Ibid.

29 "GSMA calls for India to reduce 700MHz reserve price," Mobile World Live, 3 May 2016.



Looking ahead, regulators in India should consider specific factors at play in their local market – low tariffs, low market share concentration and continuing price pressure – when they set reserve prices. More realistic prices can safeguard the price-discovery element of the auction process, which is central to the success of market-based auction frameworks.

At the same time, a more forward-looking approach to spectrum planning can reap other benefits. New use cases related to smart cities and the IoT, for example, can leverage additional frequency bands. Bands identified at the World Radiocommunication Conference 2015 for future mobile use include the L band and C band, as well as additional sub-700MHz frequencies.

Ultimately, a more holistic view of the enabling role that mobile operators can play in the digital society is essential. The economic multiplier effect of mobile infrastructure is well-documented, and sustainable network upgrades can deliver substantial benefits to India's economy in the long term. A more conservative approach to spectrum pricing would do much to incentivize continued investment in infrastructure.

European roaming debate rumbles on

Regulation of roaming rates has been a focus area for European Union (EU) regulators over the last decade. Prices for mobile voice and data services have been on a downward trajectory for years as regulators work toward a mid-2017 cutoff where roaming surcharges become a thing of the past and traveling mobile users can roam for the equivalent of domestic charges.

However, draft laws to introduce EU-wide free roaming for traveling users were withdrawn in September within a few days of being proposed. The initial draft limited the time that mobile users could roam for free to 90 days a year, including a maximum of 30 consecutive days, after which regulated rates would apply.

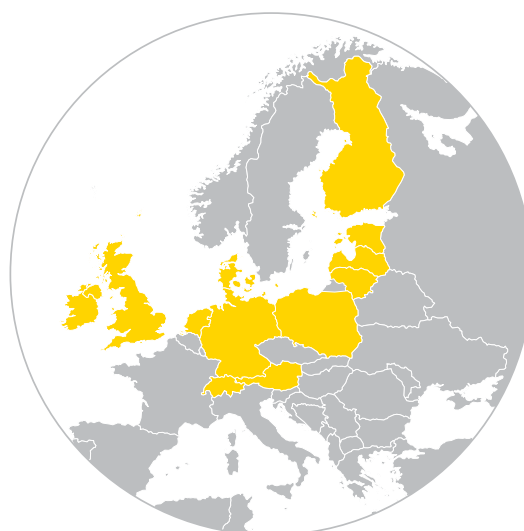
This “fair use” policy was designed to prevent abuses of charge-free international services, whereby SIM cards bought in one EU country could be used in another where domestic rates may be higher. It recognized exceptions to this approach – cross-border commuters were exempt from the limits – and made provisions for those on unlimited or high-use mobile plans, who could roam at “average use” domestic prices. Charges for use outside the 90-day limit were subject to price caps.

However, the measure faced heavy criticism from consumer groups, which said the limits violated the spirit of the European Commission's overall plans. Many Member States and operators also opposed the proposal. Subsequently, the European Commission revised its approach, adjusting limits on time and volume of usage abroad.

Yet the revised rules may cause headaches of their own. They saddle operators with the responsibility to vet roaming customers to verify that they are not engaging in “permanent roaming.” And although the plans call for safeguarding against abuses of “free roaming” by allowing operators to measure roaming usage against domestic usage, these procedures could be costly to implement.

The continuing debate over roaming should probably not come as a surprise. The potential consequences of roaming legislation on domestic pricing has long been top-of-mind among regulators. But until now, consideration of “fair use” policies that cater to a market where unlimited tariffs are popular, as well as detailed descriptions of what exactly constitutes roaming behavior, have been far less prominent.

Figure 9: EU countries where operators offer unlimited data usage mobile tariffs



Source: DF Monitor

3

Regulation

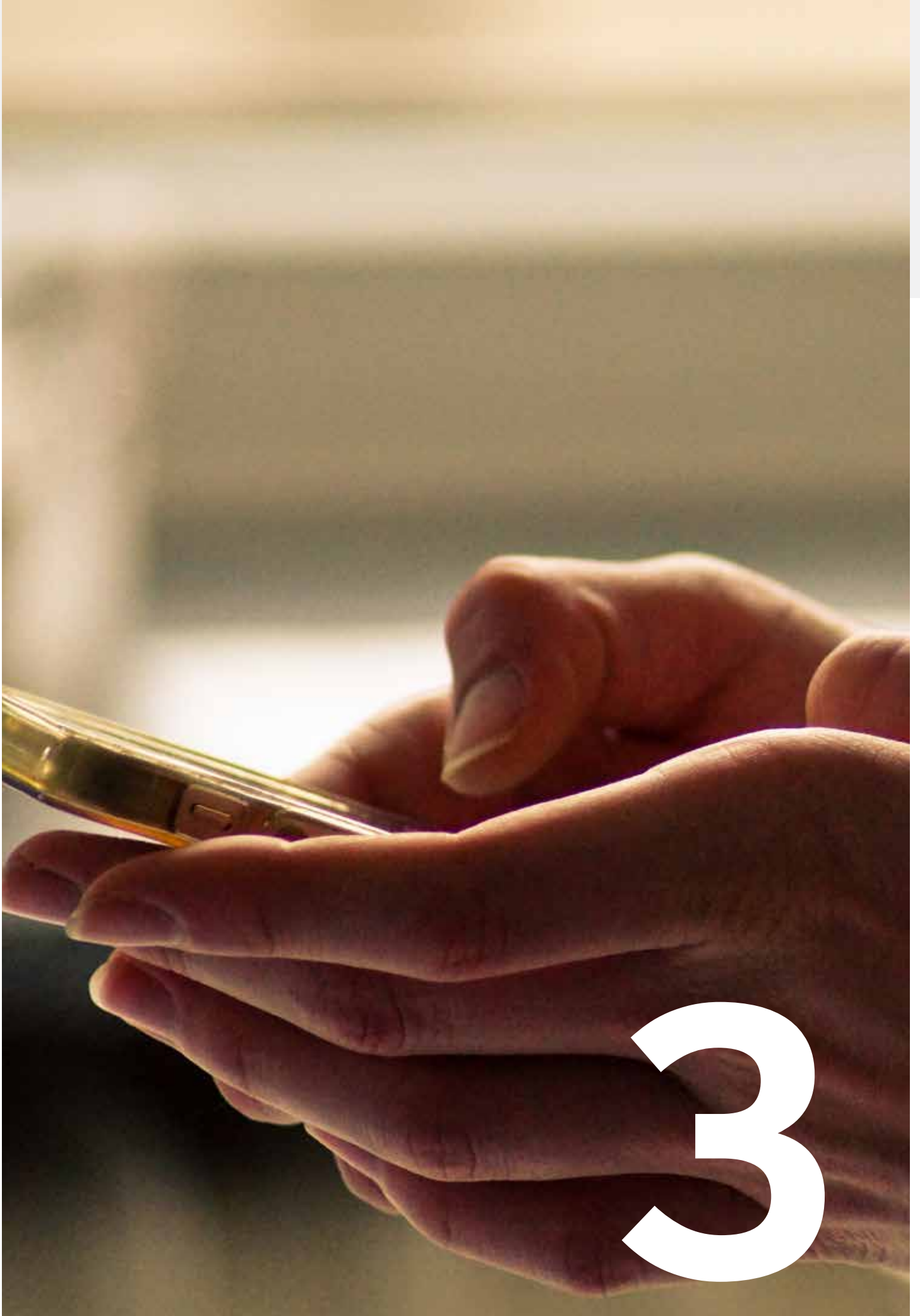
Although the EU has achieved much during a decade of roaming-price reform – cross-border calls and texts are 92% cheaper now than in 2007 – devising rules that both meet the needs of consumers and provide a predictable regime for operators is less than straightforward. Nevertheless, the Implementation Act – including final details on usage caps and the amount of time roamers can spend abroad – was published in December 2016.

Meanwhile, further consensus is still required to create an effective wholesale roaming regime in the EU that can support the removal of retail roaming surcharges. In October, the Council of the EU, which represents the governments of EU countries, achieved a preliminary compromise on lowering the rates that operators in different Member States charge one another. However, the European Parliament subsequently recommended even lower wholesale price caps in November, equivalent to €0.03 per minute and €4 per gigabyte.

Looking ahead, achieving full agreement is complicated by a number of factors. Operators in Northern Europe typically have more outbound than inbound roamers when compared with their counterparts in Southern Europe, and domestic mobile data prices are low. These considerations mean that northern EU countries typically favor lower wholesale rates to minimize losses incurred when they allow their subscribers to “roam like at home.” Meanwhile, operators in southern EU countries likely favour higher wholesale rates.

As things stand, the wholesale prices set by the European Parliament, the European Commission and the Council of the EU demonstrate considerable variation. This reflects different assumptions about the wholesale costs required to support roaming, which remains a contentious issue.

The body of European national regulators, BEREC, has highlighted that the importance of considering domestic retail prices when recommending wholesale caps, while the Finnish regulator has already outlined its opposition to the EU Council’s higher wholesale rates. Simply put, achieving a wholesale rate that works for all member states will be difficult, yet these caps will play a vital role in ensuring that the removal of retail roaming charges is a success.



4

M&A

Introduction

Global telecom M&A volume in the first half of 2016 was consistent with the second half of 2015, reaching 273 deals, compared with 277, and signaling a steady appetite for transactions. Deal volume in the first quarter of 2016 was 117, outpacing the year-ago figure of 89, which was the lowest in the last two years.

However, deal value fell to US\$44.7 billion from US\$92.1 billion in the first half of 2015 and US\$89.4 billion in the second half of 2015. This was primarily due to the lack of megadeals (>US\$10 billion) apparent in recent years. Still, we are seeing a steady volume of convergence M&A, as well as forays into adjacent markets designed to help operators build out new competencies and capabilities.

Western Europe was the leading target region in deal value, representing more than 55% of the total in the first half of 2016 and accounting for three of the top five deals:

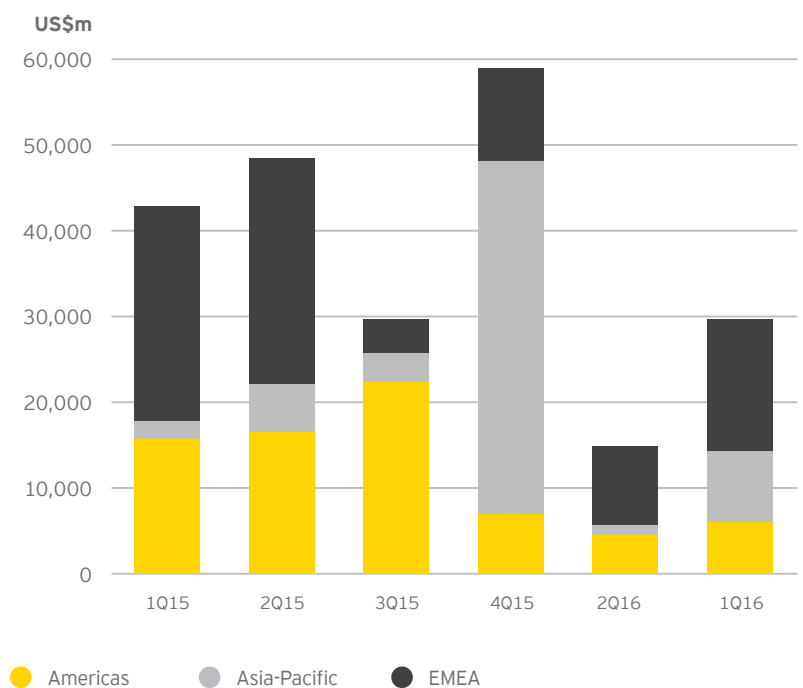
- ▶ Tencent's purchase of most of SoftBank's stake in Finnish mobile game company Supercell
- ▶ The merger of Liberty Global's fiber business with Vodafone's mobile operations in the Netherlands
- ▶ Satellite provider SES Global's acquisition of full control of satellite internet access provider O3b Networks

Deal value in the Americas totaled more than US\$10 billion for the first six months of the year, driven by a number of deals in Canada, as well as Verizon's acquisition of additional fiber network capabilities. At a country level, Russia was second only to the United States with 19 deals during the first two quarters. No. 3 mobile operator VimpelCom acquired a 50.2% stake in SIM Telecom, an MVNO specializing in services for migrant workers, while Rostelecom unit Bashinformsvyaz OAO embarked on a number of deals to scale up in its core segments.

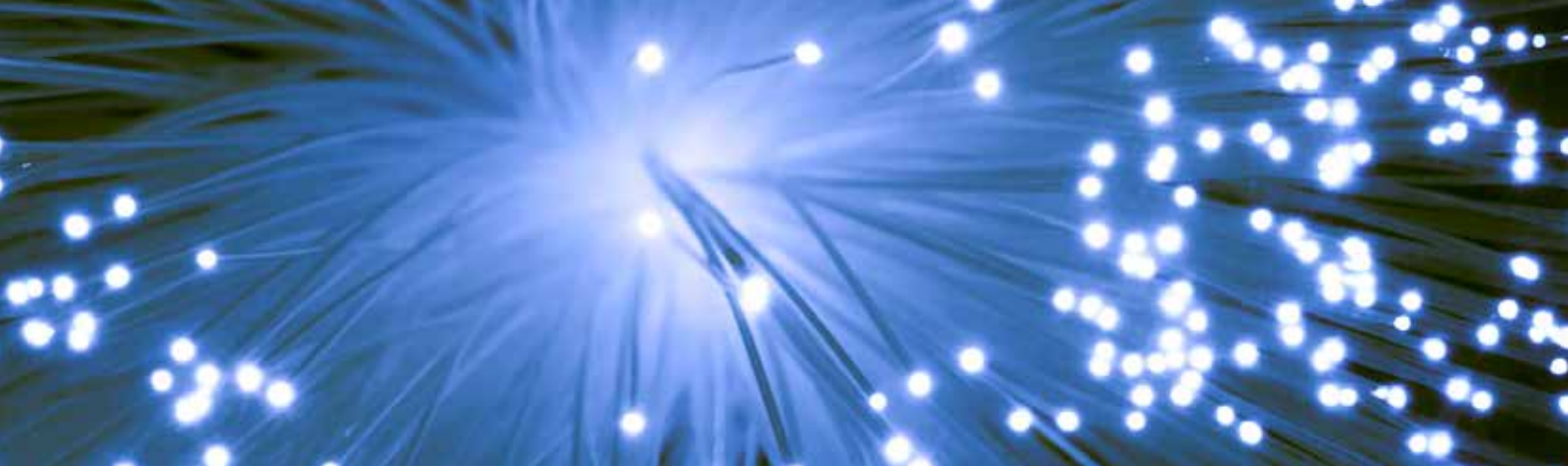
Meanwhile, carriers in Asia-Pacific continued to take advantage of consolidation opportunities. Notable deals during the first half of the year saw:

- ▶ Vodafone merge its New Zealand subsidiary with the country's largest pay-TV operator, Sky Network
- ▶ PLDT and Globe Telecom of the Philippines jointly acquire SMC's local telecommunications assets

Figure 10: Global telecom M&A by target area



Source: Capital IQ, Thomson One



In-market convergence remains buoyant

We continue to see a number of deals where operators are scaling up in core market segments at the country level. Pure-play consolidation in a single market segment remains popular, as do more convergence-oriented deals where players combine telecom and media capabilities. This comes as bundling different service elements to increase customer satisfaction, reduce churn and increase share of wallet is top-of-mind for many.

UK-based Vodafone has pursued a market-by-market convergence strategy, acquiring cable assets in recent years. In February, Vodafone and Liberty Global announced they would merge their Dutch operations to form a 50-50 joint venture with complementary strengths in consumer and enterprise services. The combination of the Vodafone and Ziggo brands creates an integrated fixed and mobile provider with more than 15 million revenue-generating units across broadband, video, fixed telephony and mobile.³⁰

In June, pay-TV provider Sky and Vodafone announced they would combine their telecom and media assets in New Zealand to create an integrated provider that could meet the growing demand for packaged services. Prior to the deal, Vodafone was New Zealand's leading mobile provider and No. 2 broadband provider, while Sky brings 830,000 pay-TV customers and a portfolio of premium content.³¹

Operators in emerging markets are also exploring convergence opportunities – a more recent phenomenon given the mobile-first nature of many of these markets. In March, Vodafone India signed an agreement to acquire cable firm YOU Broadband to boost its fixed-line proposition. YOU Broadband has around 3,000km of fiber and 6,000km of last-mile cable serving homes in 12 cities.

In January, Vietnamese mobile operator Viettel acquired a 95% stake in local pay-TV operator Audio Visual Global to broaden its offerings. The move comes as the Government plans for the migration from analog to digital TV by 2020.

In June, Orange Moldova acquired cable provider SunCommunications as part of plans to offer a converged package of fixed-line and TV services. SunTV has over 100,000 customers, more than a third of whom take internet and VoIP calling services.

Dealmaking heats up in Canada

The Canadian market has witnessed a number of deals in recent months predicated on convergence opportunities. In May, Bell Canada Enterprises (BCE) bid to acquire Manitoba Telecom Services (MTS), the leading operator in the western province of Manitoba. MTS offers a quad-play of communication and pay-TV services.

As part of the deal announcement, BCE promised to invest CAD1 billion over five years to accelerate both wireless and wire-line broadband communications adoption. The deal positions BCE to deploy its broad media assets, including television broadcasting, radio and digital media, to the MTS customer base.

The transaction would reduce the number of mobile carriers from four to three, bucking Canadian regulators' desire to have at least four mobile operators to promote competition and network investment. To quell these concerns, BCE agreed to sell one-third of MTS' and Bell's Manitoba postpaid mobile subscribers and one-third of the MTS stores in Manitoba to fellow operator TELUS. The deal awaits approval from the Canadian Radio-television and Telecommunications Commission.

In January, Shaw Communications sold its broadcasting subsidiary, Shaw Media, to Corus Entertainment, an integrated media and content company; the deal received regulatory approval in March. Shaw Media's assets include a conventional television network, Global Television, as well as 19 specialty channels. Shaw intends to use the cash proceeds to fund the acquisition of WIND Mobile, completed in March 2016, and help the company focus on network investment.

Telecom and media provider Quebecor boosted exposure to the enterprise segment for its Vidéotron unit by acquiring Fibreoire, which provides business connectivity in Quebec and Ontario through its own 4,500km+ fiber-optic network. Vidéotron is a legacy cable provider that moved into the mobile space in 2006, and the move for Fibreoire aligns with Quebecor's growing focus on business users, which saw it acquire data center business 4Degrees last year.

³⁰ "Liberty Global and Vodafone to merge their Dutch operations," Vodafone, 15 February 2016.

³¹ "SKY and Vodafone NZ merger to create a leading integrated telecommunications and media group in New Zealand," Vodafone and Sky, 9 June 2016.

4

M&A

Carriers bolster their OTT video capabilities

Numerous carriers are seeking upside across different elements of the video services value chain, recognizing that video drives data traffic growth and presents new business model opportunities.

During 2016, acquisitions by US carriers underlined this growing interest. In May, AT&T acquired OTT video platform Quickplay, a cloud platform that serves a number of content providers and operators, including AT&T. Its open, modular platform can be deployed over managed internet protocol television set-top boxes and unmanaged OTT devices, and the Canada-based company offers services including dynamic ad insertion and personalization.

News of the deal followed AT&T's announcement that it would launch a cross-platform streaming service. Quickplay had previously supported the operator's U-verse TV offering, and it will support new streaming offers such as DIRECTV Now and DIRECTV Mobile. Meanwhile, Quickplay continues to expand its managed services capability for enterprises worldwide.³²

Fellow US operator Verizon is also expanding its video-related business, building on its ad-supported digital video service go90, which was launched last year. In April, it acquired a 24.5% stake in AwesomenessTV, a youth-focused digital media company that will support the development of its free mobile video service into a paid-for offering. With the US\$159 million deal, Verizon shifts from partner to shareholder in AwesomenessTV, with existing shareholders DreamWorks and Hearst Corporation both retaining stakes.

In March, Verizon Digital Media Services, now part of AOL, acquired Volicon, which provides video capture, archival, compliance monitoring and clip creation workflow services for broadcasters. Volicon's technology, combined with Verizon Digital Media Services' Video Lifecycle Solution, will provide customers with a seamless option to take existing broadcast feeds and channels directly to OTT cloud-based delivery models.

Bolder moves into IoT are underway

Operators are already playing an important role in the IoT by providing machine-to-machine (M2M) connections, and acquisitions are adding capabilities in key verticals as companies look to monetize their offerings beyond pure connectivity.

In April, Spain's Telefónica took full control of AxisMed, a Brazilian chronic-care management provider in which it already had a controlling stake. AxisMed works with health care providers to remotely monitor outpatient conditions, and Telefónica plans to integrate AxisMed into Brazilian mobile unit Vivo's infrastructure to contact and monitor patients.

The multinational carrier plans to develop business intelligence solutions for health and population management, with an e-health strategy emphasizing digital hospitals, remote patient monitoring and self-care. Last year, it expanded its partnership with Spanish IT consultancy Indra, forming a global agreement to roll out major integrated digital health projects in hospitals and the health care field, concentrated on Latin America.³³

Meanwhile, Verizon remains focused on opportunities in the telematics market, with recent deals centering on connected-car and fleet-management solutions. In June, the US operator announced the acquisition of Telogis, whose cloud-based platform enables enterprises to track and monitor vehicles. Established in 2001, Telogis already builds and integrates its services into original equipment manufacturer offerings.

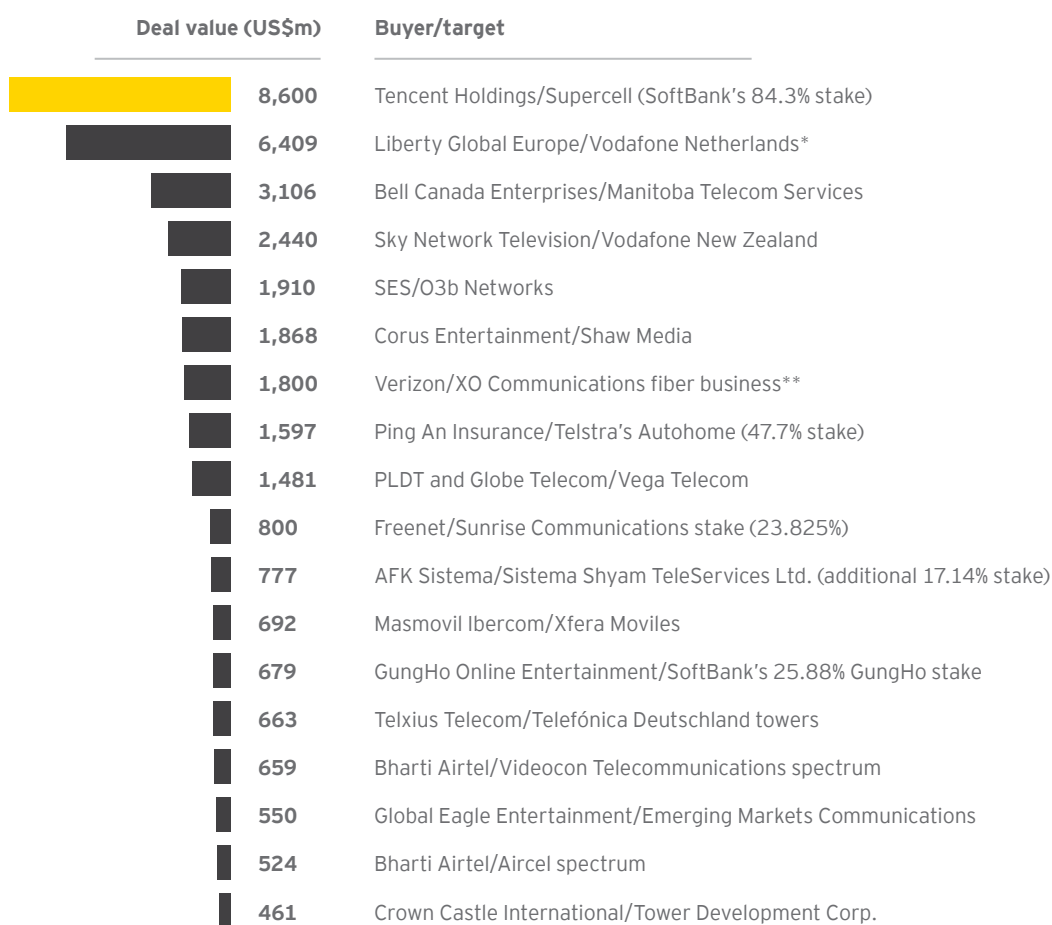
In August, Verizon acquired Fleetmatics, a global provider of fleet mobile workforce management solutions targeted at small and medium-sized enterprises. Services offered by the Irish company include location services, driver and car security services, fuel tracking, and dispatching and billing services.

By moving into adjacent markets, many of the world's largest carriers can explore new value chain positions. This is apparent in EY's own research, which reveals that telecom companies are more focused on the impact of digital technology on their legacy business models and are more likely to cite growth-oriented M&A as a leading boardroom consideration

³² "AT&T to Enhance Next-Generation Video-Delivery Platform with Acquisition of Quickplay from Madison Dearborn Partners," AT&T, 16 May 2016.

³³ "Telefónica and Indra partner to deliver global digitization of the health sector," Telefónica, 10 September 2015.

Figure 11: Top 20 announced telecom M&A worldwide by deal value, first half of 2016



* 50-50 joint venture merger of Liberty Global's Ziggo fiber broadband network in the Netherlands with Vodafone's Dutch mobile operations

** Under regulatory review

Source: Capital IQ, Thomson One

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