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MWC19 Barcelona: beyond the headlines

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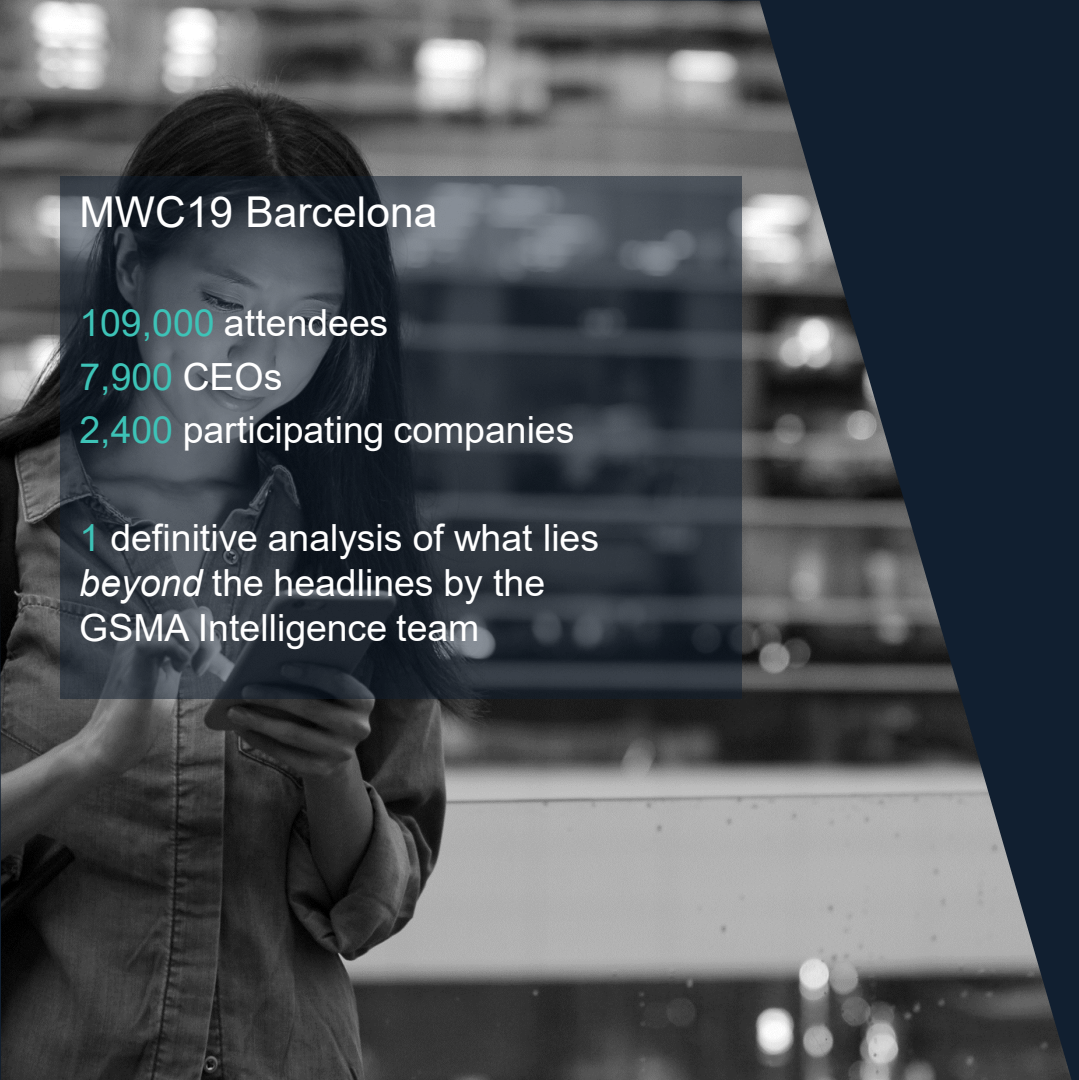

MWC19 Barcelona

109,000 attendees
7,900 CEOs
2,400 participating companies

1 definitive analysis of what lies *beyond* the headlines by the GSMA Intelligence team

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Critical infrastructure and supply chain constraints

5G is increasingly positioned as "critical infrastructure" because of its potential for societal digital transformation. The critical nature means 5G security is paramount. Though questions around infrastructure vendor national allegiance are not new, the arrival of 5G has been accompanied with a renewed focus on Huawei – particularly from the US government. The potential impact of this focus on network investments, vendor revenues and national bans follows naturally as a clear topic for the industry.

The topic was a point of discussion at MWC19 Barcelona for many firms, including the following:

- **Cisco plays up software development rigour**. In an MWC analyst event, Cisco's Service Provider Business GM, Jonathan Davidson, noted the vendor's long history of secure, process-oriented software development.
- **Ericsson flags ban and infrastructure testing concerns**. In an interview with CNN and a presentation to media and analysts, Ericsson CEO Börje Ekholm noted that market apprehension around potential infrastructure vendor bans could impact 5G investment, but that post-development product testing was not a solution.
- **Huawei fights back on security.** In an MWC keynote Huawei rotating chairman Guo Ping reiterated the company's commitment to security, while calling out US concerns as hypocritical.

The EC promised to address 5G network security, but unless everyone agrees to a solution, the way forward is still unclear.

The topic nobody could avoid

Going into MWC19 Barcelona, it was clear that network infrastructure security concerns would be top-of-mind – in particular, the potential ban on Chinese vendors from US and European networks. After MWC, the strategies and realities facing vendors on this front were more apparent.

First and foremost, there's the reality of operator concerns around security and vendor bans. Ericsson might claim no position on specific competitors, but it still (loudly) flagged customer worries around bans and their potential impact on 5G investments. While vendors might not publicly question Huawei or ZTE's focus on security, Cisco's claims of secure software development send a competitive message: views around a vendor's national allegiance aside, without secure software development, the resulting solution could be compromised.

If there was one question, it was how Huawei would respond. Focus on its product capabilities? Repeat past messages? Go on the offensive? It did all three, suggesting it understood concerns, but that – absent a clear way forward – it was getting frustrated with the high-stakes uncertainty. Framing Huawei's frustrations, the EC promised to address 5G network security, but unless everyone agrees to a solution, the way forward is still unclear. While Huawei's push-back on US security activities might suggest it has given up on proving itself to the US, it is well known for playing a long game, rarely ready to give up on its goals – as seen in more recent legal moves it has made in the US.

The situation is likely to play out over a period of months, if not years, with the consequences potentially global and far-reaching.

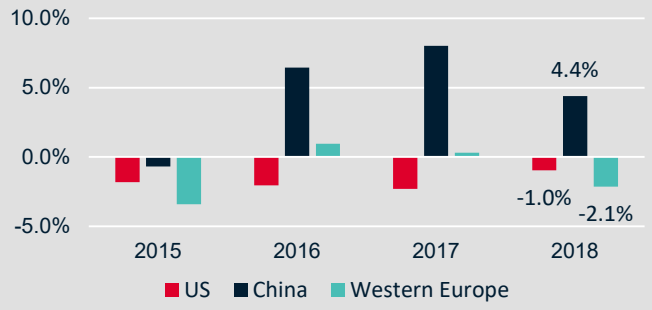
If 5G is for everyone, who makes the money?

5G, AI and big data were showcased at MWC as means to catalyse a wave of enterprise digitisation, smart cities and new consumer-led use cases in immersive entertainment. This has the potential to be a societal-level change compared to the 3G-to-LTE transition that was primarily a speed upgrade enabling video streaming on smartphones – a success for the operators but one confined to consumers. However, the question of where the incremental revenue will go from 5G and IoT was given far less billing.

News highlights

- **Daimler moves big data to cloud.** Together with Microsoft, it announced a big data platform (eXtollo) for the car built on the Azure cloud.
- **Digicel chooses Lifecell.** Turkcell announced that the Digicel group would adopt its Lifecell services platform.
- **Intel launched a smart city 'in a box' product.** This is designed to bring 5G and AI capabilities in a miniature environment for city street furniture (such as streetlights).

MOBILE SERVICE REVENUE GROWTH



The importance of cultural change

MWC's changing attendee profile is indicative of a broader blurring of industry lines in TMT, and adjacent sectors moving into advanced technology to overhaul operations or help drive new product strategies. Machine learning algorithms are in play just as much for British Airways as for Facebook. 5G and the shift to automation are just as valid to BMW and Daimler as they are to Vodafone and Verizon.

Emanating from this convergence are outward changes in corporate identity. AT&T now portrays itself as a 'media' company. Turkcell claims to be the world's first 'digital operator'. Vodafone's Johan Wibergh claimed it was "moving from being a telecoms company to a technology company, changing how we think and behave". Similar sentiments were expressed by CEOs of auto makers and media outlets. 'We're all in tech now' comes to mind.

However, the *distribution* of incremental value created in the coming 'age of automation' represents an open question. In consumer, 5G is still a speed story; it will command a limited pricing premium on LTE that will eventually be competed away (as can be seen in telco growth over the last two to three years). AR and VR could drive a fillip, but these are years from mass market. IoT is set to be a $1.1 trillion market – a huge number; the majority of this will come from enterprise and will reside in the applications and services layers, with connectivity a shrinking slice (5% by 2025). For operators, the risk is that they invest a lot of money to provide a great pipe without participating in the growth segments on top. Technology doesn't solve problems. People do. It was therefore telling and encouraging to hear a range of voices talk of the need to re-orient telco cultures to a more nimble, agile and consultative mindset that works alongside enterprise customers rather than simply supplying a service.

Devices: designs on a new form factor

On the devices front, MWC this year regained some of the ground covered by CES and vendors' own shows in recent years, with handset launches providing plenty of razzmatazz. New designs (foldable screens) and features (AI-supported camera capabilities) generated significant interest in the media, among the analyst community and with attendees on the showfloor. Less clear is whether this changes any of the structural challenges in volume and pricing faced by OEMs.

News highlights

- **Samsung launched a number of new handsets.** During the event build-up, it announced the Galaxy S10 5G and the $1,980 Galaxy Fold.
- **Huawei announced the foldable Mate X**. This is also 5G-capable but, at €2,299 (over $2,600), does not come cheap.
- **Xiaomi revealed the 5G-ready Mi Mix 3**. This is expected to hit the market in May at €599 ($700), positioning it at the lower end of the pricing range among announced handsets.
- **Nokia (via HMD) showcased the $699 PureView.** With its five 12-megapixel cameras, this is targeted at the professional content creator segment.

> "Huawei Mate X showed more innovation [than the other contenders] and helped move the smartphone category into a new era."
>
> GLOMO Award judges' comments

Foldables make the headlines but much more hinges on 5G

Real innovation in smartphone design plateaued many years ago as the industry settled on a clearly preferred form factor. With limited differentiation between high-end smartphones and their previous generations, replacement rates have widened to three years, which continues to be reflected in falling unit sales.

Manufacturers are keen to reignite consumer demand for premium-tier handsets to mitigate the structural decline. And so, the 'foldable' made its debut. Though no one vendor will be able to capitalise on complete originality, foldables are undoubtedly creative and innovative, and demonstrate a feat of engineering. Unfortunately, fundamental questions abound. Firstly, multi-task usability and transitions in form must be made consistently seamless. Secondly, pricing at $2,000+ confines the audience to tech fanatics. Thirdly, it is not at all clear there is a compelling upgrade justification from a high-end Samsung or iPhone, nor for tablet substitution. In short, foldables provided much needed fuel for OEM marketing but are unlikely to go much further without a distinct USP and significant price reductions.

More important in the near term are 5G handsets. Six 5G-ready smartphones were announced at MWC, building on earlier launches at CES and intervening OEM events. Cost details were largely undisclosed, but we expect pricing to be at a 10-20% premium to high-end 4G models. The premium would be higher if new use cases in VR and AR scale, but there is little evidence of this as of now. For operators, 5G will likely drive some pricing uplift from the speed upgrade (albeit temporary), although benefits from LTE capacity offload and reduced site congestion are equally important.

Devices: mixed reality is Microsoft's game to lose

Microsoft's HoloLens 2 was officially launched at MWC alongside a range of new apps and cloud services. The hardware represented a clear improvement over its predecessor, being lighter and offering an improved field of vision, alongside more accurate hand tracking and voice commands. Software and developer kits are equally important to develop new use cases and grow the developer ecosystem. Though there were no actual new consumer device launches, a range of entertainment use cases were demonstrated.

News highlights

- **Microsoft unveiled Hololens 2.** The company demonstrated its second-generation mixed reality (MR) headset with improved functionality, and announced new Azure MR services offering spatial anchors and remote rendering.
- **Vuzix debuted its M400 enterprise smart glasses**. This is one of the first products to use the Qualcomm Snapdragon XR1 platform.
- **Nreal demonstrated a version of its 'Light' MR glass**. This was tethered to an LG 5G smartphone and runs on Qualcomm Snapdragon 855.

The eventual success of immersive reality depends heavily on enabling infrastructure from cloud, edge computing and 5G.

Standalone AR glasses for consumers still a longer term vision

Enterprise-focused MR devices are finding fertile ground, with the range of use cases growing and cloud analytics capability vastly improved. MR has emerged as a key component of Microsoft's enterprise strategy, with the company combining both hardware and software components into an increasingly compelling proposition. Magic Leap announced its first distribution deal outside of the US with SK Telecom. The company indicated that future versions of the device would be 5G compatible, while SK Telecom suggested that 5G would allow AR glasses to integrate with smartphones and laptops, eventually replacing both.

Consumer-focused devices target potential media and entertainment use cases, but the form factor does not appear ready for the mass market. The current crop of devices are bulky and require tethering to separate processing units, while price points are still a significant barrier to mass adoption. Technical issues persist around the miniaturisation of key components including modems, suggesting a mainstream standalone AR wearable device is still at least a couple of years away.

The eventual success (or failure) of immersive reality depends heavily on enabling infrastructure from cloud, edge computing and 5G. There are strategic and operational issues to work through on this front. In the short term, enterprise offers more tangible use cases and will likely be the primary focus for initial 5G and edge computing deployments. Mass-market consumer adoption of MR devices will rely both on thinner form factors and far more extensive network and edge compute deployments for an acceptable user experience to be delivered.

5G: closer to reality, for everyone?

5G dominated proceedings at MWC with announcements on commercial launches, partnerships and a host of use case examples and demonstrations. These underline that 5G has arrived, albeit in a clutch of vanguard markets. However, the position of several suppliers at MWC was that a strong sense of caution is needed, particularly around the economics of deployment and rollout strategies. With excitement and progression on one hand, and pragmatism and reality checks on the other, exactly how 'real' is 5G for operators, enterprises and consumers?

News highlights

- **5G smartphones hit the headlines.** A swathe of smartphone announcements. particularly from Samsung and Huawei, bring 5G for consumers closer to reality.
- **Key launches revealed by chipset manufacturers**. Intel announced its 5G chipset launch due at the end of 2019, and Qualcomm announced its Snapdragon Mobile Platform with 5G integrated into a system-on-chip (SoC).
- **5G in business?** NGMN gathered operators for a briefing on industry use cases, signalling the importance of 5G for enterprise.

15%
of total connections
globally will be 5G by 2025

Source: GSMA Intelligence

Lift-off for enterprise but consumer searching for stars

The focus at MWC was rightly on enterprise. NGMN's industry briefing summarised well the state of 5G-enabled use cases in this varied domain. Deutsche Telekom, for example, covered 4G and 5G industrial campus network solutions with a dual-slice approach that integrates public and private LTE and 5G connectivity. In our view this will be an important approach as organisations benefit from the private network deployments that replace or augment campus Wi-Fi networks.

Smartphone launches from leading OEMs signalled 5G availability for consumers to much fanfare. In infrastructure, 12 network deals were announced between major vendors, pointing to the growing reach of 5G and the intensifying competition between suppliers. Intel and Qualcomm showcased vastly improved chipsets, an important pre-requisite, particularly for VR and AR – even if those are still further down the road.

However, beyond Sprint's deal with Hatch Entertainment, there were few consumer use cases exhibited with a genuine 5G value-add. This is the business case problem operators face: fund 5G networks and wait for 'killer' apps to materialise after. Many operators are therefore still focussed on sweating their LTE networks before redistributing capex to 5G. Regional differences are clear in this respect. CJK and the US are at the vanguard, while operators in Europe and the Middle East have pledged a more cautious timeline for network rollout.

GSMA Intelligence's current forecast is for 5G to account for 15% of mobile connections by 2025. However, this paints only part of the picture. Enterprise is a separate category, with revenue implications of higher potential and variability.

5G: Rakuten gets radical on network model

MWC19 was always going to be dominated by news of equipment vendors announcing 5G deals with operator customers. Any new generation of mobile technology is, of course, greatly welcomed by vendors. Operators are more circumspect, with clear marching orders to achieve cost efficiencies in the network given high 5G spectrum prices and unclear business models. Rakuten, Japan's impending fourth operator, stood out. Adopting a fully cloud-based infrastructure, the disruptive potential of a web-scale player wielding a greenfield network is clear. Its impact should not, however, be overstated and does not present a new operating model for larger telcos.

News highlights

- **Rakuten was linked to a number of vendor announcements.** These included deals with Nokia for its IMPACT IoT platform, Siena for optical networking, Red Hat for NFV, Sercomm for small cells, and NEC's Netcracker for OSS and BSS.
- **Cisco offers 5G funding.** In addition to highlighting its work with Rakuten, Cisco announced that it would commit $5 billion in 5G funding (vendor financing) over the next three years to help drive rollouts.
- **Working Group Two launches cloud mobile network**. The Telenor spin-off, funded by Cisco, announced a new platform to offer a cloud-managed mobile network, running both control and user planes on AWS.

> "Our biggest advantage is that we are not a telecommunications company. Rakuten understands running IT very, very well"
>
> Tareq Amin, CTO, Rakuten

Rakuten symptomatic of wider network cost-reduction imperative

Having hired the ex-SVP of Technology Development at Reliance Jio to head up its technology stack, Rakuten's entry into the Japanese mobile market was sure to be disruptive. Rakuten has targeted a fully virtualised cloud-based network and software architecture, scheduled for October 2019. Tareq Amin, now CTO at Rakuten, claims 35% opex reductions (in-situ) compared to traditional operators by using software equipment in the RAN.

Rakuten represents the type of radical thinking being invested in how to operate LTE/5G networks in a different way to reduce cost. It is particularly interesting as it came from an internet company. It's tempting to suggest Rakuten may be laying down a genuinely new operating model. In reality, the company is taking a clever approach to managing life as a fourth operator with an inferior spectrum position. It can do this at the passive level by leasing pole space from Tokyo's power company. RAN softwarisation works because datacentres can be compressed into Japan's ultra-dense cities. This is not an option in suburban or rural environments, which will rely on roaming agreements.

For mobile operators with national networks, the focus remains on driving virtualisation. Vendor demonstrations covered zero-touch provisioning (even 5G fixed-wireless installs), AI-based service assurance tools, and the use of hybrid cloud solutions to enable operators to scale edge deployments to meet peak demand. But this takes time. T-Mobile CTO Neville Ray cited the complexity of the RAN as one of the principal barriers to network virtualisation, with additional radio technologies such as MU-MIMO and those supporting the use of high-frequency mmWave spectrum increasing the challenge.

IoT: operator moves in private enterprise networks

5G enterprise use cases are now centring on IoT. While NB-IoT and LTE-M address the needs for massive IoT, critical IoT (low latency, high bandwidth, network slicing) is yet to be fully defined. Operators and vendors have adopted a graded approach to test the viability of slicing by rolling out private LTE networks and/or campus networks. A number of demos at MWC showcased the usability of such networks in practice – a welcome advance from previous discussions at the conceptual level.

News highlights

- **Deutsche Telekom and Osram launched Campus Network.** This is based on a 'dual slice' that combines a public and a private LTE network on a common platform to enable a smart factory use case.
- **Telefónica highlighted its LTE- Enterprise (LTE-E) solution.** This has been developed for industrial environments in partnership with Ericsson, ASTI and Geprom.
- **Nokia and KT signed an MoU to cooperate and trial 5G technologies**. The partnership includes NFV and network slicing, as well as developing new applications and business models for KT's enterprise clients.

> "5G is here – and so are the tools to build next-gen services"
>
> Friedhelm Ramme,
> Business Development Manager, Transport & Automotive at Ericsson
> Blog

Repositioning to capture the enterprise opportunity

Enterprise verticals present the largest incremental revenue opportunity in the 5G era, most of which involves IoT. However, operators can no longer be assumed to be the default connectivity providers. MWC reminded the industry that several verticals are prepared to do it themselves if spectrum can be secured in licensed or unlicensed bands (e.g. CBRS). Organisations in mining, manufacturing and the public sector were on show to give updates on private networks already deployed or in gestation.

For operators, we view success in enterprise IoT as reliant on two factors: high-grade, flexible and secure networks, and a reorienting of corporate culture. For now, campus networks are built using LTE, as it can handle most of the bandwidth and processing requirements. Latency gains from 5G are obviously absent but systems have been configured to be software upgradeable.

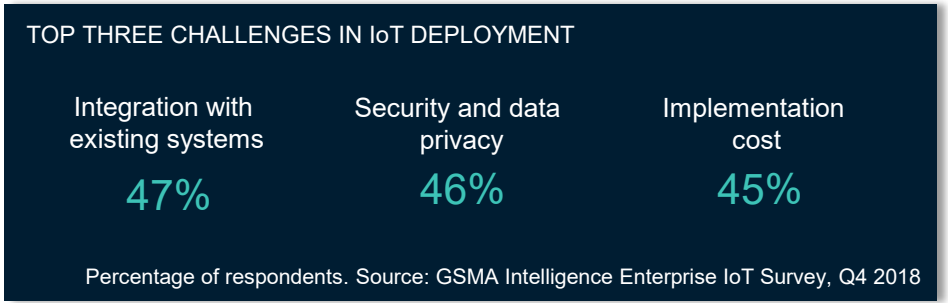
Cultural change is harder. The GSMA Intelligence IoT Enterprise Survey suggests that two thirds of companies have deployed an IoT solution but only 10% use operators as the primary provider. When asked which technical capabilities would make it compelling to deploy 5G for future IoT deployments, higher speeds (74% of respondents), network slicing (49%), edge computing (41%) and low-latency services (31%) all featured. Enterprises are agnostic about which technology solves a problem – it just needs to be solved. To succeed, operators need to clearly articulate the 5G value proposition in terms of how it addresses enterprise painpoints and needs.

IoT: “keep it simple, stupid”

GSMA Intelligence’s IoT Enterprise Survey revealed that the top three barriers to IoT deployment are integration, security and cost. Accordingly, the theme of “making deployments simpler” was evident at MWC, with improvements in each of the aforementioned areas publicised.

News highlights

- **Vodafone and ARM join forces.** Vodafone will become the default iSIM profile bootstrapped on all ARM’s IoT chips from 2020.
- **Deutsche Telekom launched eSIM (nuSIM)**, data marketplaces (Data Intelligence Hub) and demonstrated automotive solutions.
- **Singtel has chosen Microsoft Azure as its IoT cloud partner**. This will support a refined strategy focused on business outcomes for enterprises.
- **Nokia launched Digital Operations Fabric.** This targets operators in need of an agile architecture that provides security, network, device and application visibility for automated management.



The need for pragmatism, practicalities and purpose

MWC19 highlighted that the IoT ecosystem is gradually moving towards simplicity to unlock the necessary deployment demand.

Integration challenges: Integration announcements are usually operator-cloud partnerships. This year was more unusual. Vodafone’s partnership with ARM on iSIM (Integrated eUICC) allows enterprises to avoid lengthy connectivity renewal contract negotiations. Meanwhile, Oracle/HERE and Azure/SAP both expose enterprises more quickly to useful data such as location analytics and enterprise systems.

Security assurances: Machine learning algorithms now complement existing encryption protocols to give transparency to enterprise clients on security threats and responses. ARM’s creation of an industry-wide safety certification (PSA Certified) to companies who pass its three-tiered security testing programme should also help reduce confusion around how to robustly assess the rigour of would-be providers along the supply chain.

Cost challenges: IoT economics are driven from scale for hardware and connectivity. Given the vast volume of objects under the IoT umbrella (25 billion by 2025), connectivity and hardware pricing will follow a deflationary path. However, for enterprises, it is the *overall* bill that matters. The value-add lies in the applications and service layer, which is currently dominated by a limited number of cloud majors and enterprise SaaS companies, which constrains pricing rationalisation.

Content: enterprise AR hits a target

Immersive reality demos were hard to miss at MWC19. Most of the leading VR and AR companies are focused on enterprise applications. Such use cases are tangible, provide clients with clear cost savings and benefit from a virtuous circle of expanding content libraries and enterprise take-up. Gaming was the most visible consumer-side attraction. While there are longer-term punts with live entertainment and social VR, the nearer term outlook is far more subdued there.

News highlights

- **Microsoft unveiled mixed reality (MR) services for Hololens 2.** The company announced new Azure MR services – spatial anchors and remote rendering.
- **Sony, Intel and Nokia are creating immersive experiences.** The companies have partnered to bring a Spiderman VR gaming experience over 5G.
- **SK Telecom showcased social VR.** The operator demonstrated Oksusu social VR in partnership with Deutsche Telekom.
- **Vuzix exhibited several consumer AR applications.**

Content availability, economics and customer experience all work better for the enterprise segment. The consumer story is more sobering.

Consumer VR remains one to watch for now

Three key factors influence immersive reality take-up: content availability, economics and customer experience. All currently work better for the enterprise segment.

The content library for enterprise may not be as big as for consumer, but it is targeted at specific needs. Common examples are product development, training and remote collaboration. There are clear, demonstrable cost savings – for example, from reductions in product development lifecycle or travel costs. Consider oil rig or mining workers conducting remote rather than on-site inspections, for instance. Bentley Systems, a construction company, showcased a collaborative experience of 4D objects in space and time, as opposed to traditional interaction with a 2D screen depicting 3D objects.

Open access platforms have helped drive scale. For example, enterprises can use Hololens with MR apps from non-Microsoft stores and use Azure MR apps with iOS and Android devices – as we highlighted in our report Future of Devices. Partnerships across multiple industries to create customisable immersive reality applications are also helping expand the enterprise content library.

The consumer story is more sobering. Costs, headset ergonomics and ease of interaction have proven difficult issues to overcome. Weak content libraries reflect very high production costs that few studios are willing to meet (even Netflix) given the dearth of formats that would be sufficiently enhanced by VR. Live sports and entertainment would be a notable exception but are further off given the need for partnerships and yet-to-be-worked-out monetisation settlements for broadcasters (or other rights holders), telcos and venue owners.

Content: the gaming renaissance

Across the show floor at MWC19, attendees could find numerous gaming demonstrations over 5G. Vendors and operators showcased 5G's capabilities to accommodate gaming's low-latency, high-speed requirements. Mobile and VR gaming require low latency, particularly on multiplayer modes. High speeds support the ability to stream a rich gaming environment. Announcements from Sprint and Deutsche Telekom illustrate telco efforts to support gaming as a beachhead 5G use case to validate and draw attention to the technology.

News highlights

- **Sprint announced a partnership with Hatch**. Hatch's cloud streaming service for mobile gaming is designed to run over 5G. Subscribers have access to multiple games and can play on different screens.
- **Deutsche Telekom announced a partnership with Niantic and MobiledgeX.** Niantic is a mobile game developer, while MobiledgeX supports the implementation of edge computing technology. The AR multiplayer game 'Neon' was demonstrated, following several years of development.

> "5G is going to help us take gaming to the next level"
>
> Roger Solé, CMO, Sprint

"Netflix for gaming" – head in the clouds?

The concept of shifting gaming to the cloud has been around for nearly a decade. Much of the rationale is modelled on a Netflix-style subscription model where customers move to all-you-can-eat consumption on-demand, either via a PC or mobile.

But there is a fundamental difference between games and TV shows/movies. Games require real-time rendering, which requires far more computational resource than the static presentation of video content that Netflix, Amazon or Hulu offer. The bandwidth demands mean providers must rent extra GPUs along with core data centre space to avoid buffering or other irritations to the gameplay experience. OnLive was a pioneer in this space but ultimately closed under the weight of these economics. On the content front, publishers have remained reluctant to license rights without a clear willingness for customers to stop buying individual titles. The music industry's plight is a reminder of the pitfalls.

Does 5G change this? There are an estimated 2 billion gamers worldwide, of which perhaps a third play through the latest generation consoles (e.g. Xbox One, PS4) or have a PC capable of high definition. This group would be the subset to upgrade to a streaming model were it to materialise. Amazon, Microsoft, Tencent and Alibaba are probably best placed to take advantage given their immense data centre scale, existing consumer product lines, and negotiating power with publishers. Telcos can use 5G to drive pricing leverage; AT&T recently discussed offering premium 5G plans for gaming. In some cases, operators may also try to expand into content aggregation (e.g. Verizon has been testing its game streaming service Verizon Gaming) though this is more difficult.

Enabling tech: edge hype versus concrete strategies

Edge cloud innovations, driving compute and storage closer to users, have captured much attention as part of 5G network and service evolutions. In part, this is because 5G will require network transformation into which edge capabilities can be integrated. It is also because edge assets will be key to supporting 5G use cases such as AR/VR, autonomous driving and critical communications. As 5G arrives, further detail around edge solutions and strategies is expected.

News highlights

- **AT&T leverages edge for VR over 5G**. In a blog post leading up to MWC19, AT&T detailed 5G and VR work at its Foundry Edge Computing Zone.
- **MobiledgeX enabled public mobile edge network for Deutsche Telecom.** Announcing the release of its Edge-Cloud R1.0 solution, MobiledgeX detailed how it was connecting "mobile users to application cloud containers" within the DT network.
- **Telefónica outlines convergent edge computing architecture**. Building on its UNICA virtualisation programme, Telefónica presented a prototype of what it termed an open access network, converging fixed and mobile access technologies with edge computing.

Operators see edge supporting new revenues and operational efficiencies equally

Operator edge strategies come into focus among all the hype

It is worrying when any one technology is showcased nearly ubiquitously at MWC – in an almost obligatory fashion. It suggests a level of hype that could lead to over-inflated expectations while driving marketing that could confuse. This was the case for edge computing at MWC.

No amount of demos would answer key questions the edge ecosystem is grappling with. Who will drive the market – operators or public cloud players? Which use cases will drive edge? How and when will operators move? Will they focus on internal use cases (saving money on their own operations) or external ones that will drive revenue?

The launch of edge solutions and architectures by key operators suggests a balanced focus on internal versus external applications. This chimes with our survey evidence that operators see edge supporting new revenues and operational efficiencies equally (see our report Distributed edge cloud). While operators do not have a good track record exposing third-party applications, it was encouraging to see a range of partnerships and signs of a budding ecosystem that will help on this front.

Although our research identified enterprise edge cloud use cases as the top focus for operators and vendors, consumer applications seemed to get more attention at MWC – despite little evidence of a route to monetisation. Directly related is the impact on capex budgets, which are already under strain with LTE upgrades and fibre expansion. Large operators may be able to absorb the incremental spend, but this will be much more difficult for smaller groups with a number 3 or 4 position in a given country.

Enabling tech: blockchain and the need for consolidation

It was back in 2017 when the Carrier Blockchain Study Group (CBSG) – a telco alliance focused on advancing blockchain and DLT adoption in telecoms, was founded by a handful of operators. Since then, a limited number of PoCs have been announced and there has been a sense of putting blockchain on hold. However, this year's MWC suggested renewed interest in blockchain and that, based on announcements made, we are closer than ever to large commercial implementations in 2019.

News highlights

- **SoftBank and TBCASoft launched a Blockchain-based working group**. This will work on identification and authentication solutions under CBSG.
- **New cross-carrier payment solution announced.** FarEasTone, Softbank and LGU+ aim to helps travellers overcome transaction fees when purchasing abroad and plan to integrate with other OTT payment applications (non-crypto).
- **Electroneum announced a partnership with The Unlimited**, a South African MVNO. The Unlimited's users will 'mine' ETN, Electroneum's cryptocurrency, and receive double the amount of airtime and data from The Unlimited.
- **Hyperledger launched a telco-specific group.** This will to work at the intersection of blockchain, cloud native and networking technologies.

This is mostly a cost savings story rather than a vehicle for revenue accretion.

Telcos and blockchain: cost savings are reason enough

Blockchain experimentation among telcos has so far been limited to the trial stage. MWC sent signals of a sense of urgency in transitioning to live deployments in 2019.

This is mostly a cost savings story rather than a vehicle for revenue accretion. Roaming continues to be viewed as the lowest hanging fruit. Digital identity is touted as a potential 'killer app', though few have cracked it so far. Other telco-led and telco-participant use cases that will mature from trial to commercial phase in 2019 include mobile payments, number and credit portability, and phone theft prevention. A ream of operational processes are also targets, such as managing supply chains for retail outlets, content distribution and data management for IoT.

Several challenges remain. One is choosing the right ledger technology, from many options. Interoperability both between carriers and externally to OTTs will also be needed for scale. Finally, there is the need to consolidate the array of consortia and working groups to form a common set of standards to help drive scale economies in deployments and the third-party developer ecosystem.

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