

The 5G operator



Foreword

I would like to welcome you to this MIT Technology Review Insights report sponsored by Ericsson.

As we hear from the operators in the report, 5G brings many exciting opportunities but also new challenges.

5G will give operators the opportunity to evolve their role in the value chain. We foresee operators playing three distinct roles: “Network Developer,” “Service Enabler,” and “Service Creator.” These allow operators to provide increasing value from 5G network infrastructure, providing tailored connectivity solutions through a 5G digital platform for business customers to build their own processes and offers including “massive IoT,” and providing new digital services to collaborate on use cases beyond just communications.

The combined opportunity for those roles is expected to reach \$700 billion annually by 2030¹, but deciding on which role to take on over time will be challenging. With that in mind, we believe our 5G expertise and technology leadership, combined with a stepwise BSS capabilities evolution, will prove to be a key accelerator for operators as they seek to monetize 5G and its new opportunities.

This value chain evolution will demand a similar progression of BSS capabilities. It begins with “5G-enabled BSS”—supporting 5G standards and features like virtualization (NFV) and network slicing, while maintaining all of the end-to-end business capabilities. This is also the time to begin the containerization of some subsystems to provide flexibility for scaling. The next step in BSS is “B2B, IoT, and Edge”—handling devices at IoT scale while supporting new revenue models and billing-on-behalf. This step is focused on supporting enterprise customers. The final step is “Full IoT Ecosystem,” in which IoT and Edge partners are customers, suppliers, or both at the same time.

Being use-case driven, 5G will require the capability to very quickly define, deploy, and adapt new offerings to capture new business opportunities. BSS will have to provide partners with tools that can request network capabilities, present configuration options, determine prices, and orchestrate the order—all in real time and without human intervention. I believe the insights from this report will be critical to many 5G operators considering the step-by-step approach to BSS evolution as they move toward a multi-dimensional ecosystem of customers and partners.

Mats Karlsson
Head of Business Support Systems
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Preface

“The 5G operator: Platforms, partnerships, and IT strategies for monetizing 5G” is an MIT Technology Review Insights report sponsored by Ericsson. The report was produced through interviews with senior IT and network executives at telecommunications operators worldwide, conducted in November and December 2019, to evaluate how they are preparing for the opportunities and challenges of 5G, and particularly how business model shifts will impact IT, network operations, and business support systems (BSS). Claire Beatty was the editor of this report and Nicola Crepaldi was the publisher. The research is editorially independent and the views expressed are those of MIT Technology Review Insights.

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01 Executive summary



5G network technology gives telecommunications operators the ability to deliver many new applications and services in dynamic ways. Low-latency connectivity, ultra-high broadband speeds, and mobile edge computing capabilities will create myriad innovative business opportunities as well as consumer experiences. Many of 5G's clearer use cases—such as autonomous vehicle fleets, IoT, and management of fully-automated factories—are enterprise focused, which gives operators a path to new revenue creation. But such services are still only just emerging, and carriers do not possess all the vertical industry knowledge or specific application development experience to effectively explore the seemingly infinite service opportunities that 5G presents. There is a growing understanding that operators cannot do it alone, and that an innovative ecosystem of partners will be crucial to future success.

This report explores how IT and network executives at leading operators worldwide are creating a roadmap to 5G, including strategies for rethinking network operations, IT, business support systems (BSS), and business processes to accommodate a growing number of digital service partners in rapidly expanding ecosystems. The key findings are as follows:

- **Collaboration is the operating model for 5G delivery.** 5G provides telecoms operators with powerful technological capabilities that can dramatically accelerate the digital transformation of companies

across industries and geographies. But executives interviewed for this report state that getting the full value of 5G is not something they can do on their own. To take advantage of the infinite possibilities will require an ecosystem of partners, and partner collaboration will become the baseline for success. Partnerships will include hardware and software companies, traditional and digital players, and large and small innovators—all of which can bring specific application and domain expertise needed to exploit new niches.

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- **Scaling 5G services will require an “app store” style of customized connectivity.** To be an effective innovation partner in the 5G era, BSS functions such as billing, service creation, and catalog management must be open and agile, and provide opportunity for partners to “plug-and-play.” One implication of this is that BSS capabilities, empowered by AI, analytics, and

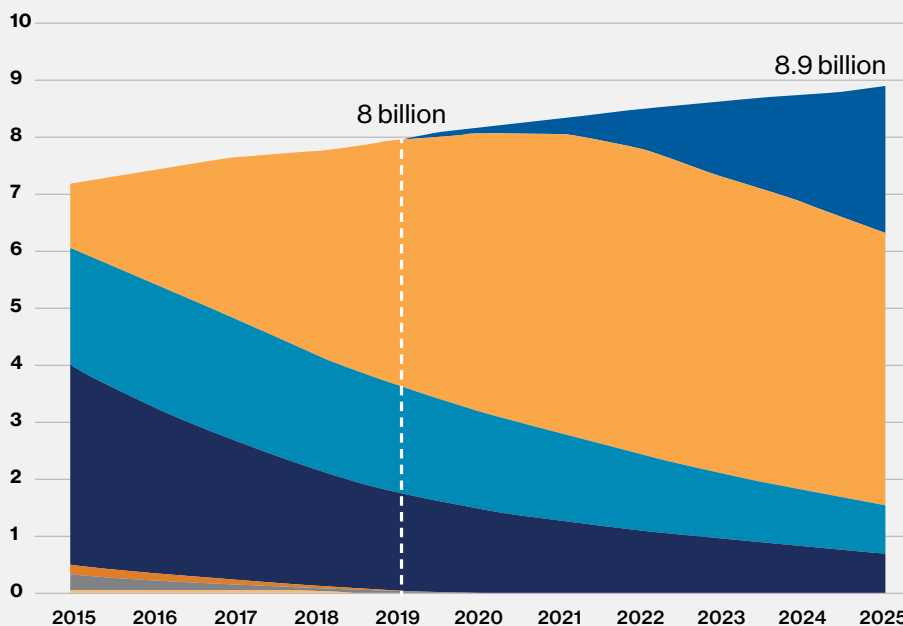
02 A future platform for business growth

As the telecommunications industry enters 2020, its impact on the global economy has never been more profound. With an estimated 8 billion unique mobile subscribers at the end of the third quarter of 2019, mobile penetration well exceeds 100% in all regional markets save Africa, and stands at nearly 114% in the world's most populous region, Asia Pacific. According to Ericsson's latest Mobility Report (November 2019), mobile broadband subscriptions are still growing strong: over 10% in the third quarter of 2019, to total over 6 billion connections, or 75% of total subscribers.²

Devices to dwarf subscribers

The industry continues to be gripped with questions over the implications of the transition to 5G broadband services. As 2020 dawns, there are only a handful of commercial 5G launches globally, mostly in mature markets such as the US, the UK, Germany, and Korea—which reportedly already added some 5 million subscribers by the end of 2019, an estimated 8% of the country's subscriber population.³ Ericsson's most recent forecasts place the world's 5G user base at 2.6 billion by 2025, nearly 30% of the world's mobile subscriber base by that time (see Figure 1).

Figure 1: Mobile subscriptions by technology (billions)



2.6bn

In 2025, 2.6 billion 5G subscriptions are forecast.

- 5G
- LTE (4G)
- WCDMA/HSPA (3G)
- GSM/EDGE-only (2G)
- TD-SCDMA (3G)
- CDMA-only (2G/3G)
- Other

Note: IoT connections are not included in this graph

Source: Ericsson Mobility Report, November 2019

Significantly for the future of the global telecoms services economy, these estimates do not even take “non-human” connections—sensors, monitors, and other computers and digital devices that constitute IoT—into account. Estimates vary—the mobile industry association GSMA expects service networks will connect some 25 billion IoT devices globally by 2025⁴—but the signals are clear, that telecoms will soon be supporting many more connections of smart water meters and articulated robots on factory floors than smartphones in the hands of subscribers.

Automation, analytics, and boundless new services

This presents a two-fold opportunity for telecoms operators. Being able to load networks with more devices will shore up flagging subscriber levels and develop new sources for basic connectivity revenue. But more meaningfully for the digital economy, 5G will allow enterprises across all industries to harness increasingly ubiquitous data to increase productivity and security in business operations, and add convenience and value to customer experiences. 5G-enabled data-rich business environments that enable unprecedented opportunities for automation, business intelligence, and new value creation are seen by the telecoms services industry as pivotal platforms for future growth.

Echoing the narrative of the industry’s past three technology transitions toward 2G, 3G, and 4G—where investments yielded seemingly exponential gains in transmission speeds, service coverage, and quality—5G also represents a break with the past. It is envisioned as a technology framework that will address some of the challenges wrought by the industry’s rapid growth, improving congestion, reducing latency, and enabling a step-change in data transmission speeds. More than that, 5G network capabilities around virtualization and multiplexing will enable carriers to provision more discrete service environments catering to specialized requirements, such as ultra-low latency, enhanced analytics, or service guarantees through network slicing. Carriers will realize these advantages by enabling open and agile service creation environments with a growing ecosystem of partners and service providers. This compelling proposition is underpinning a significant acceleration in capital investment: GSMA estimates that carriers will spend \$480 billion on 5G technology between 2018 and 2020.⁵

Successfully reorienting to take advantage of these new opportunities will require operators to build network and business processes around cloud and virtualization



To take full advantage of 5G network capabilities that include ultra-low latency, real-time and predictive analytics, and a step-change in transmission speeds, telecoms operators will need to enable open and agile service creation environments with a growing ecosystem of partners and service providers.

principles. In the future, this will allow operators to become innovation partners to their customers, spinning up new services practically instantly and onboarding new business partners with speed and agility. As operators drive toward 5G, they will need to develop market-responsive BSS and customer experience capabilities to open up agile, cloud-based service delivery technology to a wide ecosystem of digital partners. This will create compelling new opportunities for carriers, breaking the cycle of commodification of network capacity and data speed that have plagued the industry for the past decade.

03 Partnerships and the enterprise opportunity

Enabled by all-digital business networks, communication service models are rapidly evolving to become more open and collaborative. Telecoms operators are increasingly focused on offering creative new business-to-business (B2B) and business-to-consumer (B2C) partnerships as well as IoT and other new services. 5G will accelerate this strategic direction, but requires a new model of working to enable and empower network teams to forge ahead, without relying on IT to devise and approve solutions.

Executives interviewed for this report largely point to enterprise opportunities as holding the most revenue potential for 5G. Along with most industry peers, “We believe that most of the 5G value will come from the business segment and not the consumer segment,” says [Michael Sherman](#), chief strategy and transformation officer at **BT**, the UK’s largest network operator. “There will be some new consumer things that come to market, and largely the consumer use case around 5G is much higher-speed broadband, lower latency, and better quality of service. But most of the new applications, we believe, will come from the enterprise segment.”

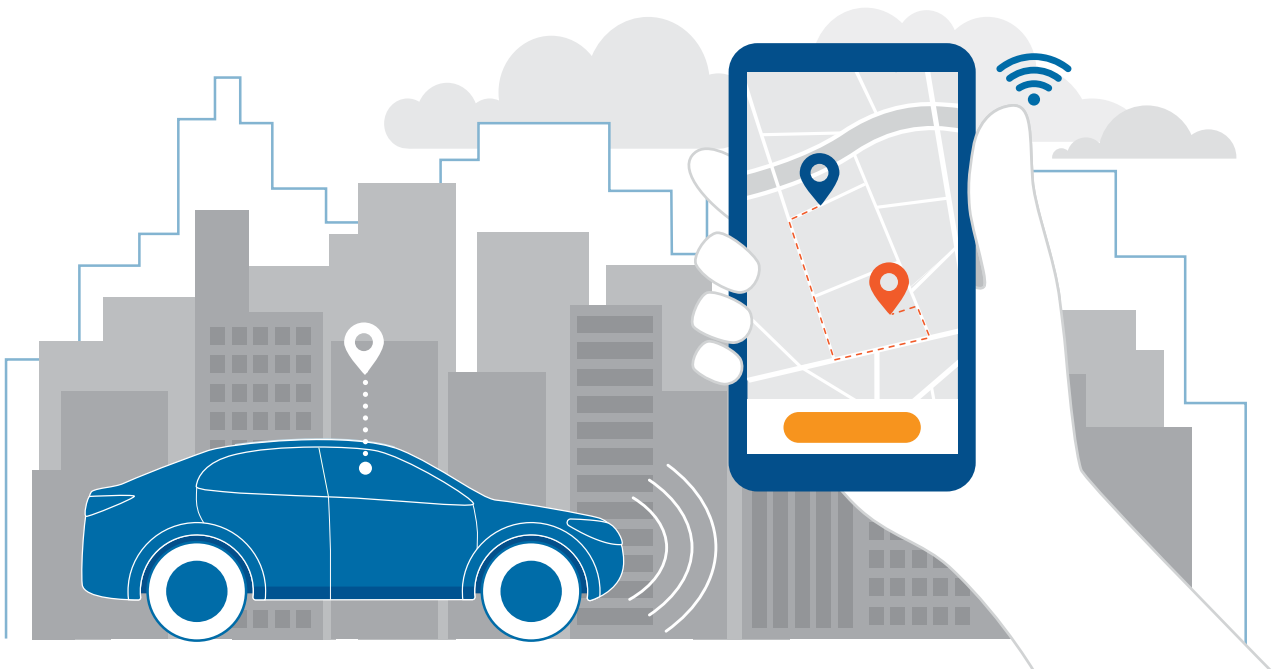
It takes an ecosystem

Partnerships will “foundational” for delivering on enterprise opportunities, says Sherman. “We believe that a lot of the new value, particularly looking at areas like ultra-low latency, will come from densified networks and edge compute platforms, which will all sit on a 5G

converged core. So, in the next two to three years, as we get into industrial-type scenarios, they will require partnerships across what would have been traditional hardware providers, other software providers, new emerging entrepreneurs, and the traditional telecom. It’s going to be the combination of those that, we think, deliver the new solutions to market.”

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Industry partnerships will stem from the demand for critical control in applications that require absolute reliability, such as autonomous vehicles and vehicle safety systems.

Any industry requiring large amounts of real-time data presents an opportunity for 5G. Sherman points to hospitals: information about the distribution of medical equipment, location of staff and patients, and details about workflow and treatments can be transformational within resource-strained health-care facilities. Other industry partnerships will stem from the demand for critical control in applications that require absolute reliability, such as autonomous vehicles and vehicle safety systems.

Sherman believes that the sheer scale of the technology capabilities that will be delivered by 5G networks, particularly for enterprise services, will mandate partnership models in nearly every instance. He points to automated factories, which “have reached their (productivity) limits because you still have robots with wires attached to them. In an automated digital factory, with a 5G private network, you can have mobile robots that are adaptable and flexible so that you can do more precision-based work,” requiring AI, cameras, and sensors. For a network to provision that, Sherman says, “you need edge compute, you need low-latency video, and

then you need the algorithms to help make sure that the robots are able to do things smartly. That’s a partnership ecosystem, ripe for change and disruption.”

But building an ecosystem is much more than the simple partner management operators are used to. It is no longer just about careful filing of legal agreements and monitoring network service-level agreements. Key to these capabilities are systems that allow partners to rapidly create new offers, and providing platforms for the operator and partners to work together on innovation.

Customized connectivity

5G’s proposition to operators is fundamentally one of enhanced technological capability. In this, industry observers expect that investments in infrastructure and operational systems will further operators’ strategic goals of reducing total cost of ownership, converting capital expenditure to operational spend, and, hopefully, provide them with the ability to build new services and pursue new revenue opportunities. It is this last goal that has frustrated the telecommunications industry the most. Previously, more-powerful network technology has

provided faster download speeds and better service coverage, but these propositions have been easily replicated, leading to greater competition on price.

5G changes this. [Shankar Arumugavelu](#), chief information officer at **Verizon**, explains that the evolution of “1G to 4G” was primarily focused on speed and throughput; those were the only currencies available, and also more focused

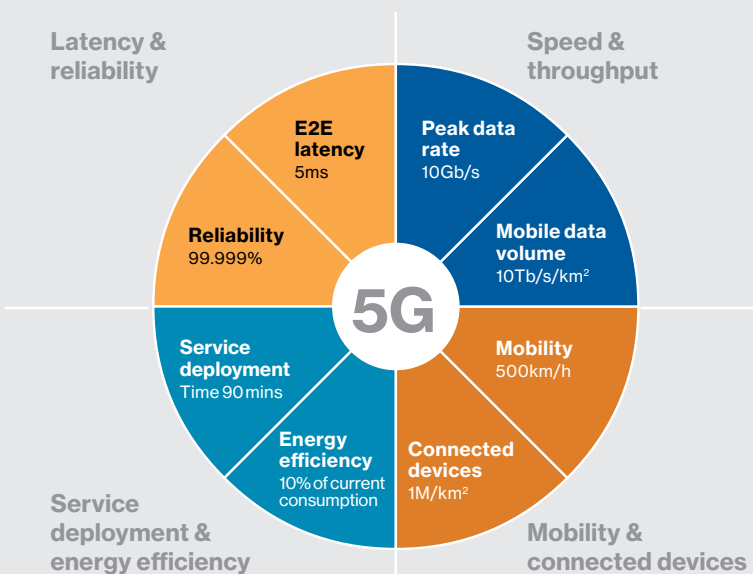
on the consumer market. When we talk about 5G, 5G gives us the opportunity to think about this in terms of eight currencies in play, which can be customized for specific customer connectivity requirements (See box). We are looking at what the customer’s future is going to be, how we can enable that customer to get to that future, and what we can learn from the problems and opportunities there.”

Verizon’s eight currencies

In January 2019, Verizon’s chief executive, Hans Vestberg, introduced the “eight currencies of 5G” at the Las Vegas Consumer Electronics Show, codifying a set of technology capabilities that can be provisioned to businesses and consumers in what he described as “a quantum leap compared to 4G.” These eight currencies are throughput, service deployment, mobility, connected devices, energy efficiency, data volume, latency, and reliability.

As in the 1G to 4G eras, “speed and throughput are certainly two of those currencies,” says Shankar Arumugavelu, but beyond that will be mobility “in the range of 500 kilometers per hour, where you can sustain that connection when you are on high-speed trains,” and the ability to support a million connected devices per square kilometer, faster service deployment, reduction in energy consumption, and decreased latency. “The beauty of these eight currencies,” he says, “is that they’re not ‘all or nothing’ and depend on what the service provider wants to do.” 5G is an opportunity to create a flexible technology platform and

5G currencies / capabilities



Source: Verizon

leverage a diverse ecosystem of collaboration and partnerships to enable “the art of the possible” for customers. “This isn’t something that one provider, one company, can do all by themselves.”

Underpinning Verizon’s strategy for bringing the currencies to fruition are three disruptive technologies: 5G, mobile edge computing (MEC), and network slicing. “5G in itself is the

standard, is one of the 3GPP wireless standards that we are working on,” Arumugavelu says, and with MEC “we are bringing cloud computing capabilities to the edge of the network.” Network slicing will allow operators to create multiple logical networks on a shared common physical infrastructure. “These three things put together—5G, plus MEC, plus network slicing—truly enable all eight currencies”

The outlook for network slicing

Executives interviewed for this report, on the whole, consider network slicing—providing virtual networks with a specific set of requirements and service level agreements—to be a medium-term, but important, prospect. The ability to slice networks allows operators to deliver unique and efficient service customization, as many service elements are already virtualized, offer flexible, responsive on-demand service catalogs, and quickly build services with partners. There are obvious use cases, such as IoT fleet management, use by emergency services, and supporting immersive experiences at major sporting events. These network slicing applications did not originate with 5G: Telstra, for example, creates slices of its LTE network for Australia's police and ambulance services in closed user groups through an arrangement with the government, allowing separate transmission paths and maintaining dedicated capacity for them at sporting stadiums.⁶ 5G greatly increases the potential number of slices and options for configuration, allowing carriers to manage much more complex use cases.

“A 5G network gives you many more currencies to play with, with the carrier providing certain guaranteed experience levels,” and a wide range of opportunities for customization, says [Srinivasa \(Srin\) Kalapala](#), vice president of technology strategy at **Verizon**. “That’s part of the anticipation: the network can do lot more, and not everybody needs that lot more.” Kalapala sees network slicing as being fundamental to meeting those expectations. To manage network slices effectively and at scale, he expects enterprise customers will self-manage the network allocation and capabilities through policies, dashboards, or other BSS services, while the carrier manages the overall experience across the network.

Giving an enterprise the ability to manage its own private network would give them control over who can onboard devices and which users get priority access—for example, in a hospital, says Kalapala, where there are varying levels of priority between users, devices, and environments. “In a normal operating environment, you would give about 10% of the capacity network to visitors, 20% to the patients, and the rest to the hospital staff, doctors, the instruments, and others.” Self-managed slices would allow administrators to dynamically shift those policies during emergencies, “prioritizing only doctors and the staff, and giving network control to the

To manage network slices effectively and at scale, enterprise customers may self-manage network allocation through dashboards or APIs.



The telecoms carrier would be responsible for service deployment and overall performance but not necessarily the dynamic allocation of provision on the slice.

hospital management so that particular instruments and users get priority on this slice. All the carrier is doing here is managing the deployment, the overall performance, and user experience. The policies are run by the hospital administrator and the carrier exposes APIs to them so that they can manage the product.”

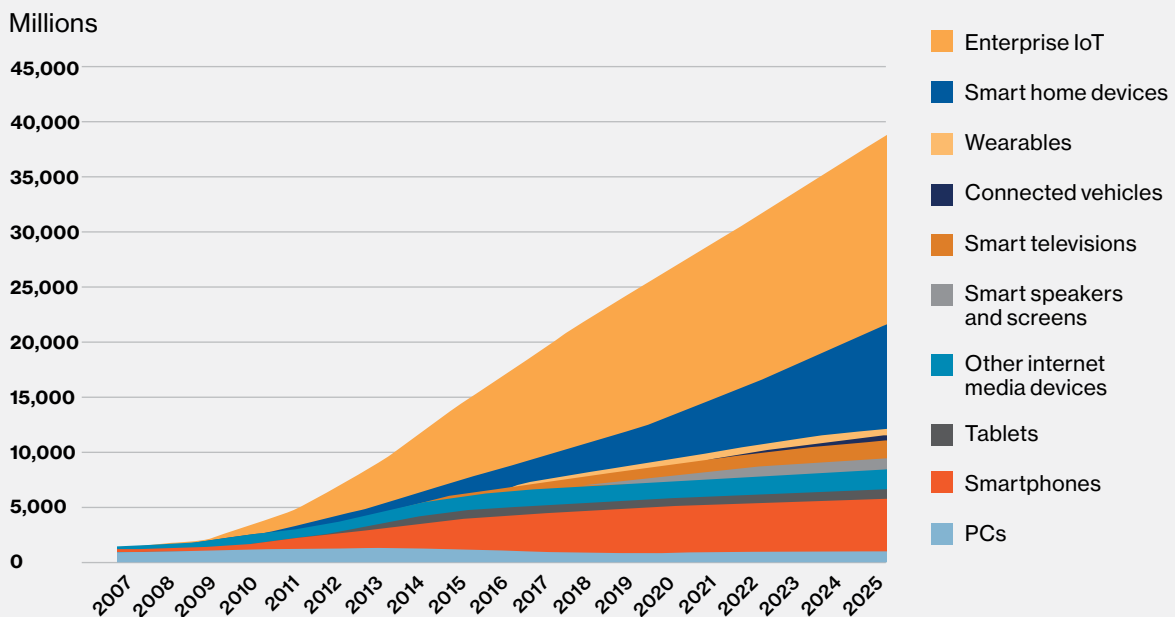
04 New models of engagement

Getting new capabilities to market requires network service provider teams to focus on different verticals, including retail, manufacturing, logistics, and smart cities, and develop solutions in partnership with key end-users as well as other third parties.

Verizon's collaboration with the University of Michigan, called Mcity, is focused on transportation, safety, the

future of autonomous vehicles, and smart cities using 5G. The company also has partnerships with Disney StudioLAB, The New York Times, the National Football League, and fiber optics technology manufacturer Corning, where 5G is enhancing factory automation and quality assurance management solutions. Verizon partnered with global cloud giant Amazon Web Services to offer the ultra-low latency service platform Wavelength on Verizon 5G Edge, which, Arumugavelu says, "is one of

Figure 2: Global connected device and IoT device installed base forecast, 2007-2025



Source: Strategy Analytics, 2019

the capabilities that we get with multi-access edge computing—it's how we are able to bring cloud computing closest to the edge of the network.” The ability to do so quickly and accurately allows carriers more time to invest in exploring and building new partnerships.

Realizing the potential of IoT

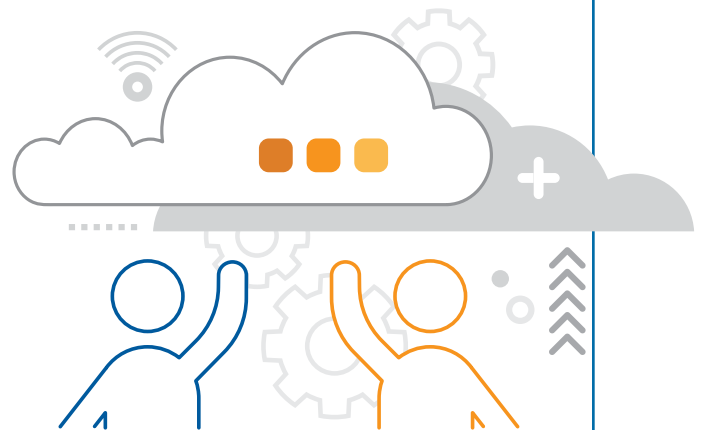
IoT is a huge area of potential growth for telecommunications operators. Research company Strategy Analytics predicts that 38.6 billion devices will be connected by 2025, and 50 billion by 2030, with enterprise IoT accounting for more than half of the market.⁷ Juniper Research forecasts that by 2025, 5G commercial IoT connections in automotive, augmented and virtual reality, smart cities, smart homes, and digital health wearables will amount to more than \$8 billion in billed operator revenue.⁸

Helping enterprises develop and manage IoT networks is a particular area low-hanging fruit and leverages a carrier's traditional strength as a connectivity player. IoT, says [Rik Harris](#), global platforms, strategy, and architecture principal at **Telstra** in Australia, “provides quite interesting, practically infinite use cases—and the industry haven't figured out a tenth of them.” Telstra is developing IoT solutions for specific vertical requirements, including transportation (applications such monitoring heavy vehicles with sensors and cameras, and workflow management) and public utilities—water management in particular. To accelerate its capability development, Telstra both acquires specialized solutions firms—it acquired transportation solutions firm MTDData in 2017⁹—and pursues ecosystem partner models for other IoT segments (see box).

Being able to innovate effectively and at scale with a host of new partners will, in the short- to medium-term, put operators out of their comfort zones.

IoT partnerships

In IoT segments where Telstra has fewer industry use cases, the carrier engages with partners to develop the ecosystem. The operator's IoT platform is openly available to smaller developers, with APIs that allow developers and integrators to create applications for NarrowBand-Internet of Things (NB-IoT) and Cat M1 standards. The carrier has a library of capabilities to develop solutions, including SIM management and activation, custom device design, manufacturing, sourcing, and distribution, which can be reused across various vertical applications by its ecosystem partners.



One such offer is an Arduino developer board popular with hardware integrators and hackers. Developers can buy location-centric devices (small computers on a credit card-sized board, with USB ports, Cat M1, and NB-IoT interfaces) and data collection services. Telstra also partners with a number of US and Indian system integrators and has a partnership with Microsoft to create the “Telstra Data Hub” platform for data-sharing.¹⁰ This will initially focus on water use and management (the solution is being deployed to monitor water quality in Queensland's Lower Burdekin River), agribusiness, and connected supply chains for retail customers.

To become an innovation partner to third parties, leading operators such as Verizon are creating “app store”-style partner marketplaces with plug-and-play services that can be quickly scaled up and down. Moving toward “zero-touch” removes bottlenecks from the carrier-partner relationship and allows new use cases to be explored quickly and efficiently.

Zero-touch services

Being able to innovate effectively and at scale with a host of new partners will, in the short-to medium-term, put operators out of their comfort zones. They will face new service provisioning challenges and be required to support applications, catalog development, and billing capabilities from a growing ecosystem of third-party providers. Arumugavelu believes BSS capabilities will be deployed in agile “building blocks” with customers choosing to “plug-and-play” different components to create their own service platforms. This will require a few critical things in the BSS stack. “Number one would be the creation of a partnership marketplace,” which supports “zero-touch partnering capabilities.”

Arumugavelu likens it to a consumer “app store” with a menu of enterprise use cases or services such as employee safety, predictive maintenance, and many more. And for all of the possibilities and use cases that are currently known, there are many more things that have not yet been imagined. “The first thing we are doing is having the technology teams work side-by-side with our business partners in each of these engagements to figure it out. What kind of [defined services] you would have in the marketplace, what should be the consumption models, what should be the monetization models, et cetera?” The teams are then asked “what are the common features?”, and can a service be applied to all verticals or is it something that necessitates being offered on a case-by-case basis?

New technological capabilities in BSS platforms, particularly blockchain and automation, are needed to enable successful “zero-touch” partnering. Carriers need the ability to provision new services in real time and service level agreements will need to be developed quickly, and potentially accessed and managed by multiple partners.

Blockchain-enabled smart contracts are seen as an effective solution for automating service-level management and, says Arumugavelu, are “a good way to have an easy onboarding process for third-party suppliers.”

A business model transformation

In the future, says Koralage at edotco, customer lifecycle management will look a lot more like an enterprise model. “For most telecom operators, particularly in Asia, it’s [lifecycle management] very focused on the mass market. And now many of the use cases—IoT, fixed wireless access—are closer to the enterprise world, or the government world. All of the interactions with customers and with also suppliers, intermediaries, partners, and brokers are going to change. Marketing is going to change very much. For example, consumer marketing is characterized by fast-changing offers and campaigns,

Carriers need the ability to provision new services in real time and service level agreements will need to be developed quickly, and potentially accessed and managed by multiple partners.

mainly on pricing. With enterprise marketing for IoT and 5G, customers are going to be far less susceptible to campaigns, and are looking for predictability, stability, and longer-term relationships.”

The impact of 5G as a large-scale organizational change should not be underestimated. The shift will be quite relevant for many departments, says [Nikos Angelopoulos](#), group chief information officer at **MTN Group** in South Africa, pointing to significant process changes that will occur in operations, service management, IT, product creation, and contract

management. Where in the past, enterprise engagements were put together based on volume and duration, the variety and complexity of new service offerings will require new models for sales and marketing. Carriers will require account managers who can understand and communicate the business case to enterprise customers. Operators will need automated and streamlined processes for onboarding large numbers of IoT devices with differing configurations and installation requirements. And there will be a far greater number of suppliers in the 5G era, each requiring separate onboarding, management, and revenue split.

Decentralizing the network

The physical network implications of 5G will also galvanize carriers into exploring new partnership models. “Mobile operators are yet to recover their last investments in 4G and the use cases for 5G, such as augmented and virtual reality, connected cars, or remote surgeries, will have limited financial upside for them,” says [Gayan Koralage](#), director of group strategy for **edotco Group**, an integrated telecoms infrastructure company and Axiata subsidiary. “The future 5G network needs to be cost-efficient and shared across the industry to make the business case better for operators.”

“In an ideal world,” says Koralage, “each country should find a collaboration model for building a single data grid, a standalone 5G network, where each operator or industry player will get a slice of the network and pay a price per GB based on their

Rather than paying rent for sites, carriers would trade network utilization with a building owner in exchange for right-of-way to the location.

requirements.” The current duplication of networks, he says “causes costs for all parties including rent, preventive maintenance, truck rolling, fuel, and electricity.”

The capacity and latency capabilities of 5G networks will mean high site density, shorter inter-cell distance, “triple-nine” uptime requirements, stronger and more reliable backhauling, and many more antennas per site.

One model for making these investments viable could be network “Uberization” where ownership would be decentralized and part of a national shared economy. Rather than paying rent for sites, carriers would trade network utilization with a building owner in exchange for right-of-way to the location. “The new sites required by 5G are street lights and poles, clock towers, walls, etc. The carrier could offer an exchange of city traffic surveillance, or other smart city application, for the use of the site.” That, says Koralage, “would be the right partnership.”

Moreover, 5G network elements will be software-defined, meaning that many more network management elements will be cloud-based. “When you put all this together, the whole ecosystem will need to change, and at some point in time the network has to be on the cloud completely.”

05 Data and AI as a catalyst for cloud

Moving network capabilities to the cloud is fundamental for operators to achieve dramatic improvements in network performance and work as an effective innovation partner. Moreover, cloud-native application development can transform network economics as operators seek lower operational costs while also scaling network performance. Having the network in the cloud is important, says Pedro Uria-Recio, group head of analytics and artificial intelligence at Malaysia-based regional carrier **Axiata**, “because it facilitates the many, many aspects where you can apply machine learning and AI—such as forecasting peak utilization, resource utilization, and optimizing and fine-tuning the network capacity parameters for capacity expansion, such as predicting when congestion is going to happen, or to eliminate coverage holes.”

Cloud-based capabilities facilitate the automation of network functions and provide better access to real-time data for predicting and forecasting network resources, such as dynamically modifying network resources and managing capacity. “By having everything on a cloud, all these many applications become much easier to do,” he says. “It will help carriers predict mobility patterns in subscribers or in IoT devices ... or enhance 5G network security, preventing attacks and fraud,” with all of these services having opportunities for monetization.

While carriers recognize the importance of the cloud in attaining this higher-order functionality, the necessary network evolution is far from straightforward. “We are conscious of the need to become ‘cloud native,’ and we are working towards converting workloads to the cloud as part of our overall transformation roadmap,” says Luu

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Pedro Uria-Recio
Group Head of Analytics and Artificial Intelligence, Axiata

Nguyen, group strategy director at Vietnamese operator **Viettel**, but adds that this “presents a complicated planning process due to our legacy network.”

Differing levels of maturity

A particular challenge is that IT and network organizations are often at very different levels of cloud maturity. “The current convergence of IT and network cloud infrastructure within the organization, which we’ve come to know as the ‘telco cloud’, does bring significant benefits, but there are also challenges to overcome, as IT and network functions can have very different technical requirements,” says Nicholas Naidu, managing executive for technology strategy, architecture, and innovation at **Vodacom Group**. Cloud environments for standard enterprise IT applications have already reached a significant level of maturity, says Naidu, noting that Vodacom’s big data platforms are already running on Google Cloud.

“We have made significant progress in migrating core network functions onto private cloud environments,” says Naidu, but notes that this is more challenging compared to IT functions, “due to the stringent computing infrastructure requirements imposed by virtual network functions.” He points to some emerging examples where this is being implemented—such as Japanese e-commerce company Rakuten, which recently launched what they have called a “cloud-native mobile network.” “The big challenge therefore becomes using a common fabric across different IT and Network applications while meeting the varying technical requirements of all the different applications.

For Viettel, these higher-order capabilities are some time away, says Nguyen, since the company is “still largely using basic data in serving our customers.” While he is optimistic that the inexorable march toward 5G will eventually lead to a greater focus on digital capability, in Vietnam at least, the business case is still unclear. “We hope that within five years, the revenue contribution of digital services [non-voice or standard data provision] will be 30-40% of Viettel’s business—but we worry about our ability to implement, and we worry about market demand.”

Cloud priorities

Shifting all of an operator’s capabilities to the cloud should not be seen as the panacea. “There is a long tail of

“There is a long tail of established applications that do not have a compelling reason to be moved to the cloud ... do not migrate stable applications to the cloud ‘just because’—it won’t necessarily save you money and may cost more with added storage costs that the cloud brings.”

Rik Harris
Global Platforms, Strategy, and
Architecture Principal
Telstra

established applications that do not have a compelling reason to be moved to the cloud,” says Rik Harris at Telstra, pointing out that the cloud clearly has not yet taken over the IT environment, especially at large, digitally-centric enterprises. Most carriers on the road to 5G, says Harris, “should not migrate stable applications to the cloud ‘just because’—it won’t necessarily save you money and may cost more with added storage costs that the cloud brings.” Yet Harris considers there is a compelling reason to migrate BSS: the need for carriers to deliver a seamless customer experience and maximize opportunities for sales and personalization.

Moving BSS to the cloud, says Naidu, could allow carriers to offer services more quickly and with greater agility. This has several advantages: “One is that out-of-the-box solutions for BSS would mean that the carrier does not have to do all of the software development from scratch. Another is that customers really want to be treated with a digital-first mindset, where having things in the cloud helps speed up development and delivery time, particularly when you consider using open APIs that simplify integration with third-parties.”

Some carriers opt for a hybrid public-private cloud strategy in order to accelerate their overall BSS transformation strategy. “We have deployed most of our digital channels, billing, and catalog capabilities on our private cloud,” observes the chief information officer of a leading communications service provider in the Middle East, noting that some AI capabilities such as natural language processing for contact center chatbots are using public cloud platforms. In some instances, it makes sense to keep standalone applications: “A completely cloud-native approach is not yet feasible for most carriers—some key applications are still simply not cloud-ready.”

Greater business relevance

For all the tangible operational and performance benefits 5G will bring to carriers (and the resulting ability to manage their networks more cost-effectively), Nikos Angelopoulos, group chief information officer at MTN Group, believes that the strategic impetus for carriers in their next-generation technology deployments should be focused on increasing the presence and centrality of the communications service provider in the overall marketplace. “It’s not about just building future-proof platforms, it’s increasingly about making your business

more and more relevant to customers and the market. If telecom service providers cannot take advantage of the unique position they have in the evolving ecosystem, they will be bypassed.”

He goes on to say that being “cloud-native, open, and easy” presents great operational benefits and “more importantly, amazing business opportunities, provided we create frictionless interactions for our customers and partners to explore the ecosystem. Telecom service providers have the richest datasets for their customers, and are in an excellent position to create the most relevant customer experiences and offerings respecting our customers’ preferences. Value creation and trust must be integral in our service propositions.”

Other challenges abound for carriers aspiring to capitalize on 5G’s value proposition, particularly in emerging markets where digital maturity is lower. Naidu at Vodacom Group points out that “until recently, many ‘hyperscale’ cloud providers did not even have significant local presence in Africa, and this has generated considerable challenges when migrating latency-sensitive applications to cloud environments located overseas. With the advent of 5G,



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Group Chief Information Officer
MTN Group

A roadmap for BSS

For BSS, greater capabilities will be required in terms of slice management, orchestration, and service-level management to avoid bottlenecks. Many processes will need to be automated. New service creation is “done very manually at this moment, but AI can do it automatically,” says Pedro Uria-Recio at Axiata. A high level of automation will also be required to facilitate dynamic network slicing with the specific provisioning and management requirements, he says.

Rapid and automated service creation runs counter to the way that carriers have typically operated, says Michael Sherman at BT. “In the past, we built products that were deployed into a physical network that was rigid and hard to change. Historically, telcos ran legacy products in their network for decades.” In the future, product development and network operations teams will need to “decouple” service-development processes from those which oversee hardware, he says. “Decoupling hardware and software is a mentality shift for managing product life cycles; when you get into a software mindset, you enter the world of DevOps, which means you can deploy new software, new products, new services 10 or 20 times a day. Well, that just blows the mind of the telco, that used to deploy a new product maybe once a year—and even at once a year, the whole organization is up in arms.”

This evolution will have a substantial impact on the relationship between IT and network teams, with far-reaching implications to the organizational structure and to the actual technologies deployed. “We are always re-examining our technology stacks, and are currently working to modernize our BSS across all those,” says [Oliver Fortuin](#), group chief enterprise officer at **MTN Group**. But he observes that this process will be “fairly traditional” until they get to 5G—when there will be “quite a lot of work to change the way we are organized.”

To accelerate change while maintaining its organizational structure, one major communications service provider in the Middle East has adopted a “dual operating system”, which involves “pulling resources from up and down the hierarchy to create cross-functional teams,” says the chief information officer. This has helped speed up several new business efforts, such as building a more small- and medium-sized business-centric enterprise services group. It has also begun to cultivate a DevOps operating environment, and this agile approach to IT development has allowed the carrier’s business-function teams to be more effective. “By implementing new services using a microservices architecture and containers, we provide a higher level of autonomy for cross-functional teams,” he says.

new mobile edge computing infrastructure will be required to support low latency applications such as cloud gaming, cloud robotics, and autonomous vehicles.”

A conundrum for operators in developing 5G services is that many customers don’t know what they don’t know: they do not have a clear roadmap for investing in process automation, so then it becomes difficult for carriers to also plan to make significant investment. This creates a more immediate and tangible challenge for emerging market carriers, for not only do their consumer and enterprise market segments lack the appetite and ability to take aggressive bets on new, undefined technology propositions; often these user groups find themselves at

the mercy of globalization trends that are difficult to innovate around.

“We know that manufacturing is big,” says Nguyen, “and will be a big 5G vertical opportunity. It seems like a good idea: factories investing in IoT and process automation will certainly need our services to manage their networks. But on the ground in Vietnam, there is still a question as to how willing manufacturers are to invest in tech.” He points out that, as these technologies are also being used in advanced countries, “automation could create ‘near-sourcing’ and cause Vietnam’s export customers to pull back their manufacturing to their own countries,” which could be damaging to Vietnamese manufacturers.

06 Conclusion

Operator executives interviewed for this report are at varying stages in their 5G journey, with some of those, particularly in Asia, the Middle East, and Africa being more strategically focused on recouping their 4G investments. Yet the roadmap of capability-building and digital transformation that will be required to capitalize on 5G is relevant for all providers as they seek to build relevant and sustainable revenue opportunities in a competitive and partnership-driven future. The findings of the report are as follows:

- 1) No more asymmetric partnerships.** In the 5G era, operators are learning the lessons of past partnerships with regard to customer ownership and distribution channels. To build up successful ecosystems and innovation platforms for services such as IoT, operators must look for relationships with a wide variety of specialized players, taking thoughtful account of how tie-ups will play out in the marketplace and what each partner's relationship to the customer will be. As custodians of vast and rich datasets, operators also have newfound confidence about their pivotal role in the innovation ecosystem, their value as partners, and the opportunities for monetization.
- 2) Build partner ecosystems based on collaboration and innovation.** As they seek to understand industry needs and trial new use cases, operators are taking technology teams closer to customers. But in the future, building scale will require a step back, to create platforms of plug-and-play templates for different services, cloud-native applications with microservices
- in containers, developer portals and APIs, and opportunities for swift trial-and-error. This will also require innovation in systems and processes for joint offer creation and catalog management.
- 3) Network services and management will move toward “zero touch.”** To truly scale 5G capabilities with the number of connections multiplying exponentially and service-level agreements requiring flawless network performance, operators will have to rapidly transform network operations and service delivery. In addition to developing marketplaces and collaboration platforms that allow partners to develop solutions more self-sufficiently, operators will need increasingly self-managing and self-healing networks. AI, machine learning, and cloud capabilities will be key pillars to successfully moving toward “zero touch.”
- 4) 5G roadmaps must plan for organizational as well as technological change.** It's well understood that 5G will require substantial leaps in technical capability, digitizing processes and services and moving from hardware-defined to software-defined networks. What's less discussed, but no less substantial, is the organizational change that will be required when enterprise solutions and partner ecosystems deliver a greater revenue share. This widespread change will span sales and marketing, product management, IT, operations, supplier management, contract management, and many other areas.
- 5) Speed and agility will require the integration of IT, network, and business functions.** The business agility required in the 5G era—innovating at scale, rapidly launching new offerings, managing network slices and an explosion in the number of connections—will need an increasing integration of IT and with network and business functions. Carriers are considering changes to organizational structures, putting together cross-functional teams, or adopting DevOps principles to create the agility, speed, and partner-centricity they will need to succeed in a 5G era.

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Footnotes

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