



Transforming telecoms' internal ecosystems

How to rethink business support systems and operational support systems in the age of 5G

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Executive summary

Why agility will be key in a 5G world

Telecom operators worldwide are beginning to roll out 5G networks. This new standard is around 100 times faster than 4G and has 1,000 times more bandwidth, offering an exponential improvement in functionality: far higher capacity and reliability, dramatically lower latency, reduced energy usage and mass connectivity for devices.

Though the technological advantages of 5G are evident, the ways in which operators will generate an adequate return on their huge investments in the new networks are less clear. We believe that the winning solution lies in 5G's ability to support entirely new service offerings, use cases, business models and revenue opportunities. Instead of relying mainly on end users paying for connectivity, operators in a 5G world will likely generate most of their revenues by charging the companies that are providing 5G-based services to customers.

It's a model widely termed *business-to-business-to-X* (B2B2X) in which X can be a consumer, a business or a public agency. Monetising 5G will require operators to develop collaborative, multi-partner business models, supported by agile experimentation, to find sweet spots. The result will be a new landscape of business and monetisation models.

However, for communications operators, it isn't just the external industry landscape that will change. To support and enable the forthcoming wave of innovative 5G-based services, telecoms' own business support systems (BSS) and operational support systems (OSS) will also need to undergo radical reinvention in order to become more flexible, agile

and connected. Accompanied by a move away from usage-based billing to simpler charging models, this evolution will position operators' 5G networks to act as the foundation for an effectively infinite array of third-party services, many yet undreamt of.

There are numerous drivers for this shift. The coronavirus crisis, for example, has triggered an increase in remote medicine, an area in which higher usage is likely to continue after the crisis—opening up the prospect of real-time connectivity between doctors and patients being included in the BSS provisioning process for 5G networks. That's just one instance among many described in a recent joint publication from PwC and the World Economic Forum, [*The Impact of Mobile Technology on the Response to COVID-19*](#). Post-pandemic, it's clear that the whole work environment will change to leverage the experiences, technologies and processes that have been implemented during the crisis, with broader business and consumer opportunities for expansion. The common requirements for these services will be high bandwidth, flexibility and simplicity in the underlying network, enabled by a redesigned BSS/OSS platform.

We argue that the way to achieve all this is by combining software-defined networking (SDN) and network function virtualisation (NFV) to bring technology and business functions together in an integrated manner. In a 5G world, we think that's the future of BSS/OSS—and therefore the future of the telecom operator.



Operator business models for 5G: The rise of B2B2X

In our recent publication, *Making 5G pay: Monetizing the impending revolution in communications infrastructure*, we investigated the potential monetisation models for telecom operators' 5G networks through a series of interviews with leading participants in the global 5G ecosystem. We conducted this research amid a rising tide of investment in 5G by telecom companies around the world. In March 2020, GSMA Intelligence projected that mobile network operators will invest more than US\$1.1tn in their networks over the next five years, with about 80% of that total going into 5G technology.¹

Moving beyond selling broadband to consumers...

The scale of the investment in 5G underlines telecom operators' confidence that the networks will ultimately generate significant revenues and adequate commercial returns. But how will 5G do this? Traditionally, telecom revenues have come mainly from end users. But the consumer pull that spurred the rollout of 4G mobile services is likely to be much weaker with 5G. There may be some segments, such as gaming, in which consumers will be willing to pay more for 5G—but overall, it seems that consumer demand and the willingness to pay for 5G connectivity are still nascent.

The operators we interviewed said they were generally pursuing three main ways to obtain a return on their 5G investments: unlocking new revenue streams, reducing costs and improving the customer experience. On the revenue side, opinions were divided on precisely which monetisation models would dominate in a 5G world. Yet there was a consensus that to achieve returns sufficient to justify their 5G investments, operators will need to look beyond selling broadband connectivity and target new types of use cases that are specifically enabled by 5G's unprecedented capabilities.

...to selling a connectivity platform to businesses

This concept leads to a monetisation approach focused on selling 5G services to other businesses—which then sell those services as part of their own customer offerings. For operators, this involves expanding away from the traditional business-to-business (B2B) and business-to-consumer (B2C) models by adding B2B2X—business-to-business-to-third-party. Under B2B2X, which encompasses both B2B2B and B2B2C, operators collaborate and share the rewards with their B2B partners.

B2B2X represents a significant break. Under the model commonly used for 4G services, the operator sells voice and data connectivity directly to end users, who simultaneously contract separately with their chosen third parties—such as over-the-top (OTT) network and content providers—to access services over that connection. However, a new pattern is already evolving: some operators have started to partner with OTT service providers to bundle their service with connectivity. In the 5G world, operators will have far more opportunities to develop these types of collaborations with a variety of partners.

¹ GSMA, *The Mobile Economy*, accessed in October 2020: <https://www.gsma.com/mobileeconomy>. Hill, Kelly, "GSMA: Network investment will hit \$1.1 trillion over the next five years, focused mostly on 5G," *RCR Wireless News*, 16 March 2020: <https://www.rcrwireless.com/20200316/wireless/gsma-network-investment-will-hit-1-1-trillion-over-the-next-five-years-focused-mostly-on-5g>.



Four B2B2X models

We see four main B2B2X models operators can use to monetise 5G's greater functionality.

Connectivity provider: Operator-led B2B or B2C

The telecom company extends the typical 4G pricing and bundling model by offering additional elements and innovation. This may involve adopting an airline-type approach, delivering a multi-tiered connectivity service to both B2C and B2B customers based on the package of services selected by the customer. An operator implementing such a model might offer different speeds, service levels and pricing levels to match each customer's needs and budget.

Solution enabler: Third party-led B2B2X

A third party such as a cloud provider or video streaming service incorporates 5G connectivity sourced from the operator as part of its own offering. The third party markets the bundled offering to its customers, paying the telecom company for the network usage and variable functionality via either a network charge or a share of revenue. The third party effectively buys a slice of the operator's 5G network capacity for its own use, with the interface between them managed and enabled through application programming interfaces (APIs).

Solution creator: Operator-led B2B2X

An operator creates new digital propositions by bundling third-party products and services with its core connectivity and markets the bundled solution directly to its own customers. Telecom companies might use this approach to create vertically integrated solutions that bundle access to their 5G networks with third-party offerings such as augmented reality (AR) or virtual reality (VR) services and equipment. Under this model, a telecom company could offer its customers a data plan that comes complete with VR gaming, including content subscription and a headset, at no additional upfront cost.

Ecosystem enabler: Collaborative B2B2X

The fourth model is similar to the solution enabler and solution creator models, but the operator creates an ecosystem of innovators to target changing customer needs and wants. Under this model, the operator works with third parties to identify and tailor experiential products and services that can be delivered to the marketplace quickly. A customer-focused ecosystem model allows directed collaboration, not just with the operator but between third parties as well, and positions the operator as a key player in driving 5G innovation. For example, one ecosystem member may identify a high-potential use case, find a hardware maker to build a prototype and test it on the operator's network. This model encourages the operator to participate more directly in the value creation process and the commercial innovation that goes with it.

What this means for BSS/OSS: A simpler, more flexible architecture

The availability of widely varying business and monetisation models will enable operators to benefit from greater choice and differentiation in terms of their services and pricing, and allow them to spread value more evenly into different areas of the 5G ecosystem. Across all four B2B2X models, operators and their partners will tailor their service offerings to capitalise on emerging technology trends such as the internet of things, artificial intelligence, drones, robotics, smart cities and Industry 4.0.

Given the diversity of options for telecom companies, it's clear that finding and establishing the right profitable B2B2X partnerships and models will require experimentation, speed and a well-developed ability to collaborate in different ways with different partners. To meet these requirements, the traditional, workflow-driven—as opposed to event-driven—BSS and OSS architectures still in place at most telecoms will need to undergo radical change.

These legacy systems are complex, costly and siloed, requiring frequent manual handovers. As a result, making changes to the network to enable B2B2X services will entail cumbersome workflows across multiple systems and take an unnecessarily long time—several days to adapt existing services, and months to bring new products to market. In that way, current BSS and OSS setups are fundamentally incapable of meeting the needs of both telecoms and their diverse collaborative partners in the 5G world. Put simply, the existing approach to these systems is running out of road.

As we enter the 5G era, telecom companies need to create BSS and OSS architectures that are more flexible, agile and connected. This means putting in place a platform that will enable them to carry out a wider range of dynamic, real-time changes. The platform will equip telecoms to implement new billing and pricing models at a fast pace, allowing 5G-enabled B2B2X products to be brought to market in days rather than months.



Updating BSS and OSS for a 5G world

How to gain this blend of speed and flexibility? In our view, the solution lies in moving away from traditional BSS and OSS architectures and adopting an approach based on combining software-defined networking (SDN) and network function virtualisation (NFV). (See “New networking tools for the new era of 5G.”)



New networking tools for the new era of 5G

Software-defined networking (SDN) combines the roles of gatekeeper, controller and traffic cop. It manages reports and information coming in from the network and BSS/OSS by decoupling the system that makes decisions about where traffic is sent (the control plane) from the underlying systems that forward traffic to the selected destination (the data plane). This simplifies the management of the network and makes it more efficient and faster to configure.

Network function virtualisation (NFV) is the component that actually executes programmed network functions. It's a network architecture that virtualises entire classes of network node functions into building blocks that may be connected—or chained—to create communication services. An evolution from traditional server virtualisation, it introduces virtualised network functions that consist of one or more virtual machines running different software and processes, instead of using custom hardware appliances for each network function.

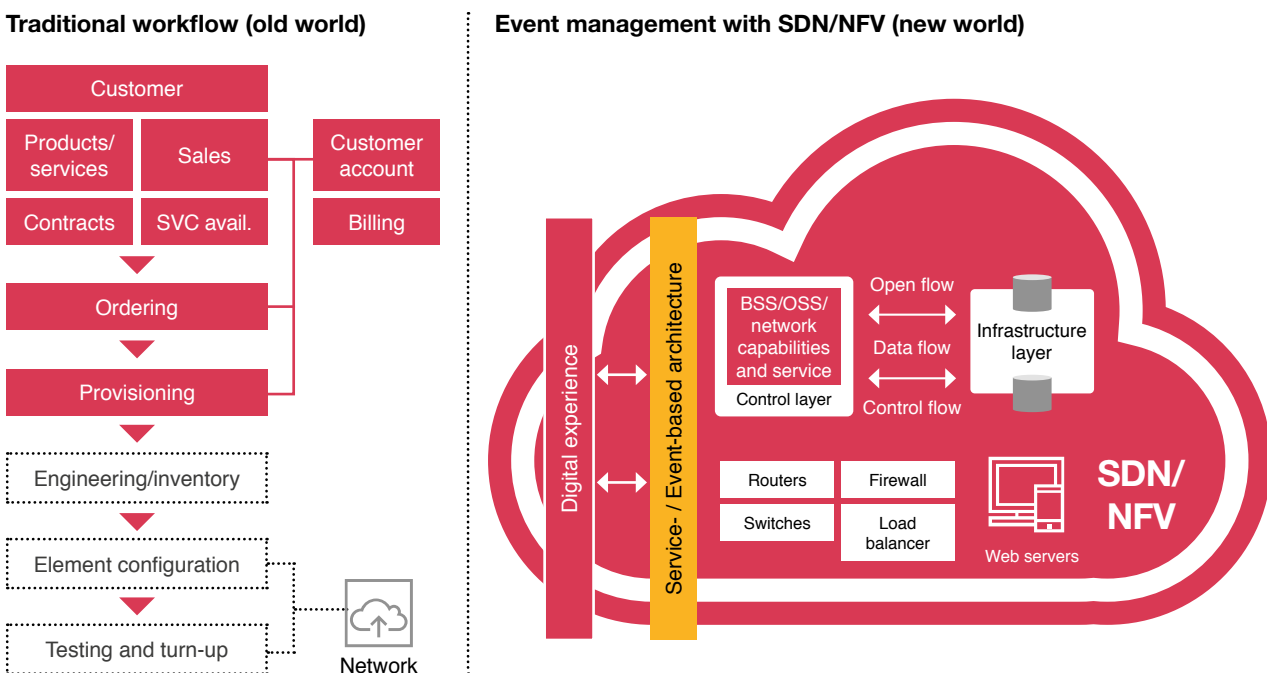
In recent years, leading operators have made great strides in implementing virtualisation in their communications networks; transformation enabled by SDN and NFV has become a critical component of strategic technology agendas. But the benefits achieved to date—improved automation, reduced costs, faster service request responses, and better security and reliability—are only the start. As operators roll out their 5G networks, they have a great opportunity to combine SDN with NFV and expand these tools across the enterprise, from the IT and data centre network to the wider business, and throughout the entire service delivery/service assurance (SD/SA) stack.

The impact of this change is profound and pervasive. The traditional service delivery stack is linear, starting with sales and ending with the network providing the service. Collapsing network capabilities into the SDN/NFV controller layer means that key BSS/OSS ordering and provisioning functions no longer need to pass data up and down a linear stack. The SDN/NFV backbone replaces the old workflow with an event-driven architecture based on network-as-a-service capabilities and immediate activation of changes in the 5G network. It also supports a move away from traditional usage billing to simplified all-you-can-eat models.

Agility at scale

By taking this route, a telecom firm can create a technology architecture that supports an agile, adaptable operating model at scale—one ideally suited to supporting the fast-paced and collaborative nature of a 5G-enabled B2B2X ecosystem. By bringing technology and business functions together in a shared, event-driven environment, a telecom gains the speed, flexibility and capacity for automation and virtualisation it needs to create new partnerships and products at pace, customise and streamline the customer experience, simplify management and delivery, and reduce operating costs—all at scale. Exhibit 1 shows the transformation of a telecom company's operating and systems architecture from traditional workflow to event-driven environment with SDN/NFV extended to the SD/SA stack.

Exhibit 1: 5G requires a transformation from traditional, linear workflows to an integrated approach



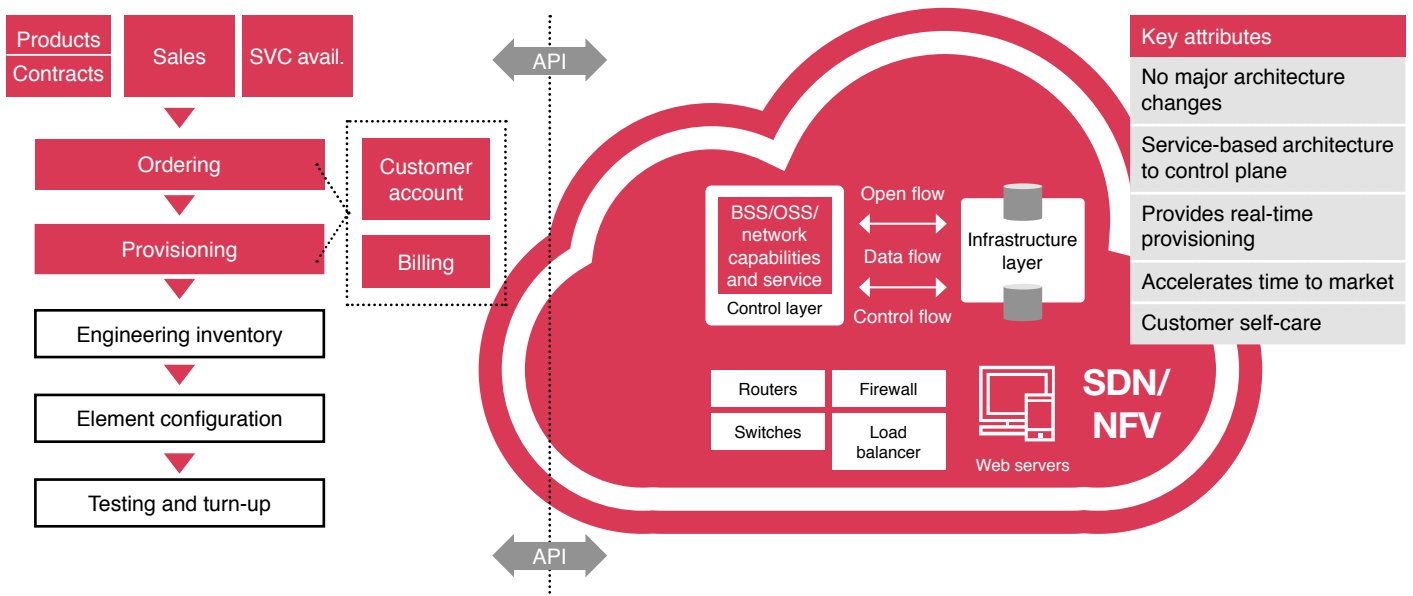
Source: PwC

A three-stage evolutionary transformation

This kind of agile architecture equips a carrier to fully capitalise on the unprecedented capabilities that 5G enables. Aside from well-known attributes such as superfast broadband, ultra-low latency and the ability to handle mass connections, these capabilities include the ability to slice a network. Network slicing enables operators to offer differentiated services to users and create powerful collaborative partnerships by allocating segments of their network capacity to third-party service and application providers on a dedicated basis, supported by simplified pricing.

Many telecom companies around the world have now embarked on the evolutionary path to harnessing the full power of 5G's capabilities by replacing their ageing BSS/OSS with an SDN/NFV backbone. Most operators are still at the initial stage of this journey (see Exhibit 2). Having built the new event-driven SDN/NFV architecture, they've implemented APIs to link it to their legacy workflow-based systems and processes. This approach has some advantages—it doesn't require major architecture changes, so operators can get to market faster and begin capturing the benefits. However, it represents a complex hybrid environment that fails to realise the full potential value of their investment in SDN/NFV.

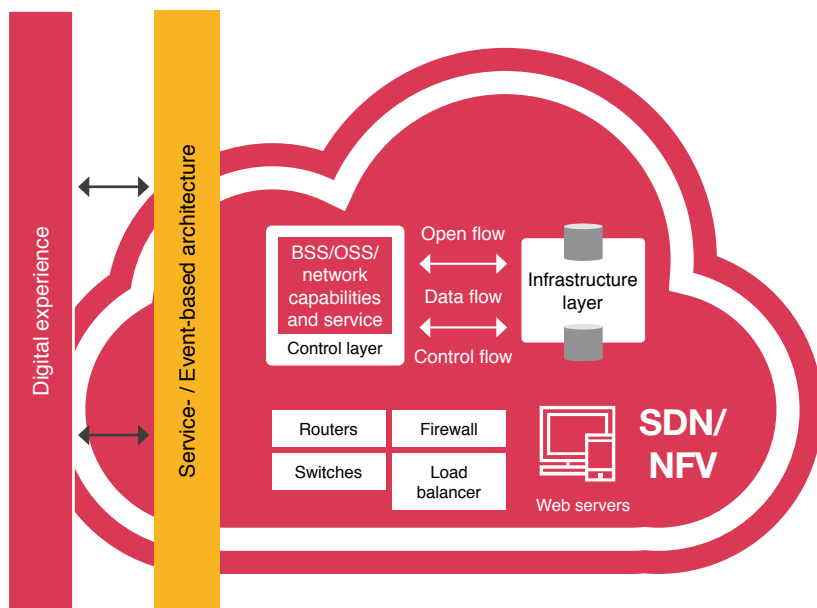
Exhibit 2: As an intermediate step, telecoms can use APIs to create a hybrid model that links the old and new platforms



Source: PwC

The next evolutionary stage is to combine the legacy BSS and new SDN/NFV environments (see Exhibit 3). This enables virtual network capabilities to be exposed to the front end as services, creating a simplified, event-driven, end-to-end delivery model. As a result, an action such as changing a customer's bandwidth no longer requires a series of workflow steps but can instead be executed simply by initiating an event (and triggering a corresponding billing event automatically if appropriate).

Exhibit 3: A fully integrated BSS/OSS and SDN/NFV platform includes several key attributes



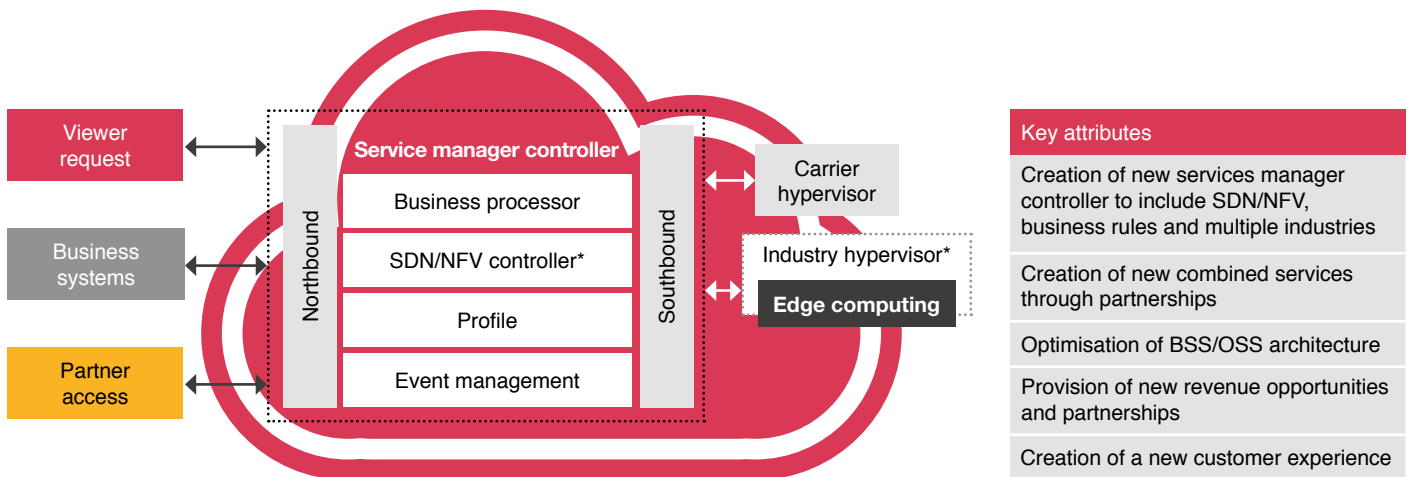
Key attributes
Replaces workflow with event-driven architecture
Integrates BSS/OSS and SDN/NFV capabilities and business rules into a shared library and processor
Optimises BSS/OSS architecture
Reduces operating and development costs
Simplifies digital experience architecture

Source: PwC

The third stage of the evolution will be to look beyond the transformational potential of SDN/NFV in telecoms' internal operations and open up the architecture for other industries to leverage (see Exhibit 4). Broadening the platform will require operators to combine and centralise the key telephony capabilities of the network with the processing functions

associated with each industry's service needs. The new service manager controller would include the SDN/NFV controller, business rules and processing for the industry, and it would enable collaboration and integration with back-office and front-office systems.

Exhibit 4: An open SDN/NFV architecture allows telecoms to better meet the needs of other industries



*Industry independent

Source: PwC

For example, a broadcaster would be able to integrate its delivery environment with the operator's SDN/NFV network architecture to track changes in consumption by different customer segments in different geographies in real time, and then serve ads dynamically targeted at those individual segments. This is impossible with current offline monitoring methods.

The ultimate outcome is a new, flexible, collaboration-ready BSS/OSS platform equipped to support 5G B2B2X models. An illustration is presented in the case study "Using a VNF to hire out a drone to a business customer," which describes a landscape gardening company hiring the use of the drone—and shows how the telecoms spin up a virtualised network function (VNF) to manage the customer's access to the drone and trigger a billing event to charge for it.

A high-level systems architecture for a telecom company with the capabilities to operate this kind of service would combine event-driven service delivery and seamless, real-time collaboration with customers via cloud platforms—all augmented and accelerated by 5G. Customers gain a whole new level of visibility, control and customisation over the services they consume, together with faster and more transparent billing that can be viewed in real time or close to it.

In the not too distant future, we believe the BSS/OSS architecture deployed by all successful carriers will look like this. The key questions for every telecom company are: How far along the journey have you come thus far? And how quickly can you take the remaining steps?

Case study

Using a VNF to hire out a drone to a business customer

Rick & Ben, the Flowerpot Men is the name of a landscape gardening firm located outside of London. Exhibit 5 shows that a customer asks Rick & Ben to assess a large tree that needs felling, and the company decides that using a drone is the best way to handle the job (step 1). To access the drone, Rick & Ben contacts a local drone provider, Drones4You, to order the service (step 2). The drone provider has a service agreement with the local incumbent telecom operator, which provides the data services to operate the drone and stream the video from its onboard cameras. When Rick & Ben executes the drone rental agreement, the drone VNF instance is spun up by the telecom.

Rick & Ben then registers a simplified flight plan so the 5G network edge can be prepared to provide specific processing and data support for the drone assessment of the tree (step 3).

This is an Uber-type service, providing the history of the flight plan and where and when the drone was used. This data is stored on an app or website.

When the rental agreement is activated and the tree survey takes place, the drone VNF allows Rick & Ben to control the drone and begins billing their account (step 4). The drone rental agreement is billed on a time basis, with Rick & Ben being charged £100 for every 15 minutes of flying time.

Rick & Ben uses the drone to assess the large tree, a task that takes three hours. After the job is completed, the drone is returned to Drones4You and the billing relationship ends. The drone VNF instance bills Rick & Ben's account before being deleted to free up resources for other VNFs in the shared environment (step 5).

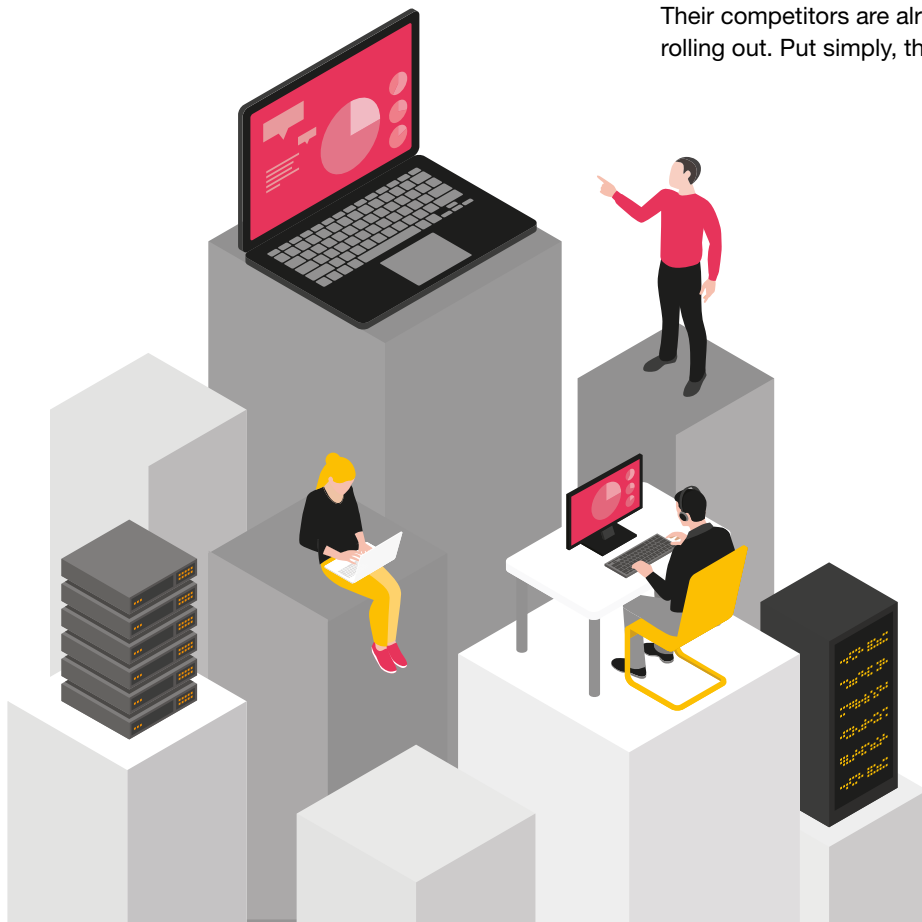
Exhibit 5: A revamped BSS/OSS platform supports a wider range of 5G services for customers



The imperative: Tackle BSS/OSS now to get ahead of the 5G game

The 5G world is here, ushering in a new wave of collaborative partnerships and B2B2X revenue models for operators worldwide. This momentum is unstoppable. The stark choice facing telecoms is whether to reinvent their BSS/OSS to be simpler and more flexible for 5G—or face being left out of the game.

In our view, this isn't really a choice at all. Companies that have yet to embark on the journey to extend SDN/NFV to the SD/SA stack must realise that now is the time to start. Their competitors are already doing this, and 5G networks are rolling out. Put simply, there's no time to lose.



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