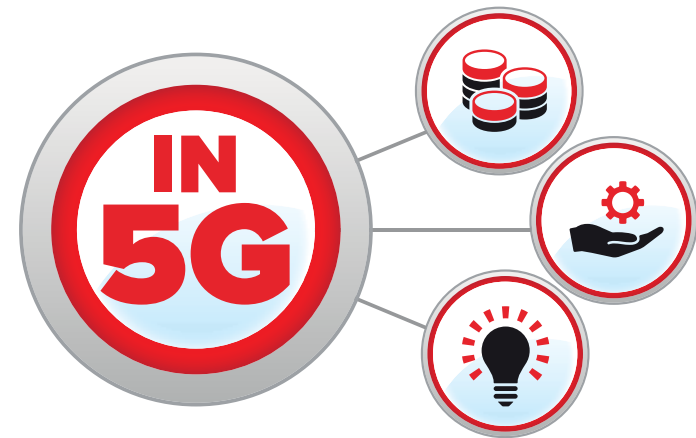tm**forum**

PRICING, SERVICE AND PARTNER INNOVATION

IN 5G

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amdocs

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Pricing, service and partner innovation in 5G

We hope you enjoy the report and, most importantly, will find ways to use the ideas, concepts and recommendations detailed within. You can send your feedback to the editorial team at TM Forum via editor@tmforum.org

The big picture

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5G and cloud computing offer communications service providers (CSPs) an opportunity to rethink services, pricing strategies and approaches to partnering. In doing so they can revolutionize telecommunications in the same way that public cloud providers have revolutionized computing.

Mobile operators are at the start of this journey. Even though 5G services have been available in some countries for two years, little service innovation has taken place. Is this because technology is holding operators back, or is it their culture and unwillingness to experiment and take risks?

The answer is all the above. Early 5G services are not very different from LTE. Operators have taken the path of least resistance in how they have deployed the new technology, connecting 5G radio access networks (RANs) to LTE core networks. These networks are closed, meaning equipment vendors have delivered access and core networks end to end.

Even so, there has been some innovation in 5G services and pricing. South Korean mobile operators, for example, have invested in new capabilities such as augmented and virtual reality (AR/VR) to give consumers new gaming and entertainment experiences. Globally operators have adopted 5G pricing structures similar to fixed broadband rather than mobile data pricing, and speed-based pricing has become commonplace in many markets.

What's next?
Now CSPs are starting to roll out standalone 5G networks, which involves deploying a new core network. T-Mobile USA announced the world's first standalone 5G network in August 2020, and many other operators have indicated they will begin deploying new core networks this year.

It will take time for operators to develop and deliver advanced 5G services based on these networks, however. Some operators plan to deploy edge computing to offer services that require extremely low latency, but most are still figuring out their edge strategies.

At the same time, CSPs are determining which network components and support systems should move to the cloud and which public cloud providers to partner with. Open RAN is generating a huge amount of interest because of promised CapEx and OpEx savings, but most telco CTOs realize that they must strike a balance between cost savings, network reliability, customer experience and ability to innovate.

Whatever capabilities mobile operators create in the network, they must have IT systems in place to ensure that they can deliver and monetize new services. Agility and flexibility in these systems are crucial.

CSPs can no longer take a "build it and they will come" approach. For example, they simply cannot afford to build edge networks across entire regions without first demonstrating demand for edge-enabled services. The ability to experiment and test monetization principles is a necessity.

Read these reports to learn more about CSPs' edge and cloud strategies:

CSPs need flexibility across their businesses as well. Most mobile operators are experimenting with 5G use cases in multiple verticals, but developing services and capabilities that can be monetized is a different matter altogether. They will have to partner with many other companies and potentially can play a leading role in orchestrating capabilities across partners if they choose to.

Read this report to understand:

- How 5G is different from LTE, and why different pricing strategies and business models are needed
- Why the ability to experiment is key

- Why operators need to build a new relationship between their technology and business departments to innovate successfully using 5G
- Why mobile private networks represent risk and opportunity
- How the role of connectivity is changing
- Which roles CSPs can play in partnerships to deliver 5G capabilities
- Why IoT is a special connectivity challenge
- How low-power wide area networks have impacted pricing for IoT connectivity
- How CSPs could use connectivity-as-a-service, network-as-a-service and network slicing to deliver 5G services

" Most mobile operators are experimenting with 5G use cases in multiple verticals, but developing services and capabilities that can be monetized is a different matter altogether. "

Section 1

Early 5G paves the way for innovation

Today, 5G is essentially turbo-charged LTE. It is available in large towns and cities, and most deployments are **non-standalone**, which means that 5G radio access networks are deployed as an overlay on the 4G LTE core network. **Standalone 5G**, which involves deploying new core networks, will start in earnest this year, but experimentation in consumer and enterprise markets, where mobile private networks (MPNs) are emerging, is already laying the groundwork for operators to deliver innovative services using new business models.

One of the first steps communications service providers (CSPs) must take is deciding whether to price 5G differently from 4G, meaning at a premium. Research firm Omdia **has been tracking** the 5G pricing strategies of 73 mobile operators. As of Q2 2020, most of them were sticking to LTE pricing models.

Make it simple

Most CSPs have been transitioning to simpler pricing plans. While established operators have rationalized the number of plans they offer, new operators typically launch with just two or three options.

In February Japanese newcomer Rakuten went one step further by introducing a single pricing plan with monthly charges ranging from ¥2,980 ($28) for customers using more than 20 gigabytes of data to ¥1,980 ($18) for customers using 3-20 gigabytes and ¥980 ($9) for 1-3 gigabytes. The service is free for anyone using less than 1 gigabyte in a single month.

By reducing the number of plans and moving to all-inclusive pricing, mobile operators are transitioning to software-as-a-service (SaaS) pricing models used by brands such as Netflix and Spotify. While this provides a simpler, more predictable monthly bill for consumers, it also risks "capping" the amount customers spend monthly.

Global 5G pricing models

24	5	16
operators were selling 5G data tiers based on the amount of data (similar to 4G but with higher data caps), while others were selling speed-based tiers with unlimited data (similar to fixed broadband services)	operators simply charged a one-off 5G activation fee	operators did not differentiate at all, meaning they sold 5G at the same price as LTE
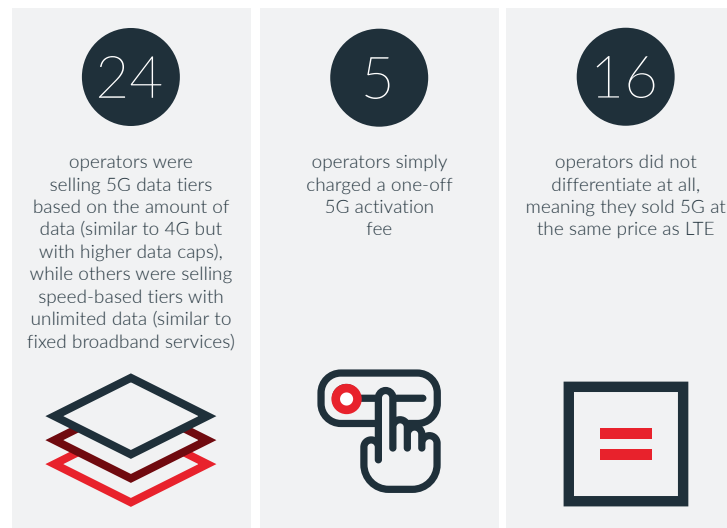
TM Forum, 2021 (source: Omdia)

By contrast, Netflix retains the ability to increase customers' spending on services by implementing price increases which are justified by the addition of new content and/or features, and by allowing for "spot" purchases of premium content such as movies or subscriptions to third-party services.

5G operators' success with this approach depends on whether they believe they, or potential partners, can offer services that will be valuable to customers and whether they have IT systems that can support the services – that is, support for real-time and contextually aware charging to enable and fulfill spontaneous purchases.

New partners & bundles
There is nothing new about content bundling. It became popular during the early days of LTE, with operators offering access to free or discounted third-party games, music and video services to help drive the migration from 3G.

The same strategy is playing out in 5G. According to Omdia, as of Q2 2020, 17 operators were bundling rich, 5G-optimized services into their package tiers. The focus this time is on services that require a fast connection such as enhanced audio and video, cloud gaming, augmented reality (AR) shopping and virtual reality (VR).

For example, Vodafone operating companies in Italy, Germany, Spain and the UK bundle cloud gaming into their 5G packages. O2 offers a 5G plan bundled with third-party VR services such as Oculus Go and Melody in the UK, which allows users to watch live concerts using VR headsets.

South Korean operator LG Uplus has gone further than any other operator in terms of investing in content that brings 5G to life. The company will invest ₩2.6 trillion ($2.1 billion) over the next five years in producing content for 5G networks. It is focusing on AR/VR content including entertainment, education, home training and games.

LG Uplus offers six 5G pricing plans, five of which offer unlimited data. Prices vary from ₩63,750 to ₩97,500 (about $55 to $85) based on how much data a user can share with friends or family. All plans offer bundles of mobile TV services, kids' content, music and movies, cloud gaming and AR and VR content.

Experiment first, strategize later
Telecoms operators have always taken a "build it and they will come" approach to their businesses. They have not tested next-generation mobile technology in smaller trial networks before committing to full national rollouts.

But 5G is different. Many operators believe that experimenting with potential customers and co-creating services is necessary to figure out which services enterprises need, whether they can deliver the services and whether the services will be profitable.

> " To increase customers' spending, mobile operators need IT systems that can support real-time and contextually aware charging. "

This process of experimentation is inevitably resulting in operators identifying many potential approaches that they will need to consider before settling on a way forward. They must evaluate the following:

Skills & capabilities – operators must consider their existing skills and capabilities to determine whether they will need to hire talent in a competitive market.

Which vertical sectors to target – CSPs likely will target verticals where they already have commercial relationships, even though other sectors may be a better match for the capabilities offered by 5G.

Which services customers want – for security and privacy reasons, some enterprises may want to control their own 5G networks, while others may want a dashboard that enables them to configure network requirements dynamically. In some cases, enterprises may favor a managed service relationship with a CSP.

Which services to offer – based on customers' needs, CSPs must decide which services to offer: basic connectivity, full end-to-end managed solutions or something in between.

Potential partners – CSPs will need to forge strong partnerships and participate in ecosystems, particularly for the delivery of IoT solutions where connectivity is only a small part of the overall value proposition.

Which commercial models customers prefer – SaaS approaches are gaining popularity, but for highly customized solutions they may represent a risky business model for CSPs because costs are unpredictable. Operators may also want to impose service level agreements.

Testing the waters with MPNs
Mobile private networks (MPNs) are gaining popularity. Most use LTE technology, but some enterprises are beginning to experiment with 5G because of promised features such as ultra-low latency and high availability. For mobile operators intent on expanding into the B2B market, MPNs represent both a risk and an opportunity.

The risk is that many enterprises will secure their own spectrum and work directly with systems integrators and network equipment suppliers to build their own access and core networks. The opportunity lies in understanding what enterprises want from MPNs and being able to craft service options for them.

Nokia describes four roles for CSPs in MPNs as shown in the graphic opposite. The CSP's involvement increases in each scenario, moving from left to right. These models are based on Nokia's own network deployments and engagements with enterprises.

The first phase of an MPN typically involves the enterprise implementing coverage where there is no macro cellular network coverage – either because a facility is in a remote area or the connectivity required is indoors where the signal is weak or non-existent. But as CSPs become proactive in targeting enterprises, more complex hybrid macro and private network scenarios are likely. For example:

- **Campus networks where the owner invites a mobile operator to colocate equipment on their premises** – this may extend to preparation of sites and providing power to the equipment. In return, the operator would provide macro network coverage throughout the campus.

- **Enterprises building their own MPNs with their own spectrum** – in this case, users need new devices and contracts to roam onto macro cellular networks. Assuming that devices capable of operating on MPNs and macro networks become available, operators could enable roaming between the two if they are providers of core network functionality.

- **Mobile operators provide MPN "as-a-service"** – enterprises could strike deals with operators for the CSP to build and operate the MPN and then provide services back to the enterprise.

We'll discuss business models and the changing role of connectivity more in the next section.

Private wireless architecture options and roles for CSPs
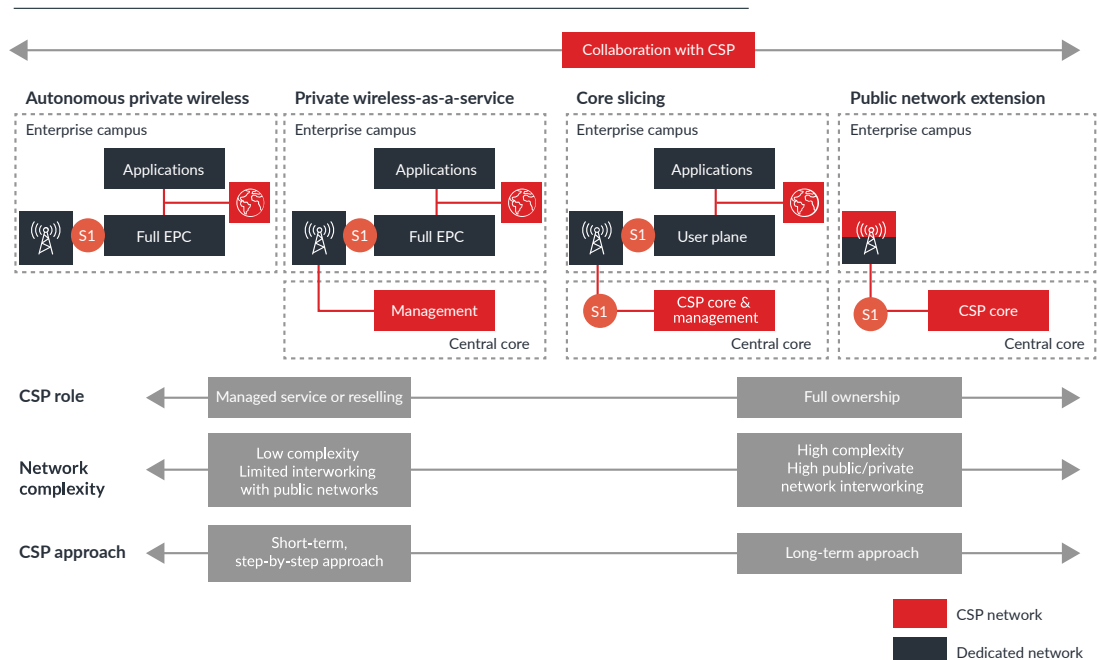
TM Forum, 2021 (source: Nokia)
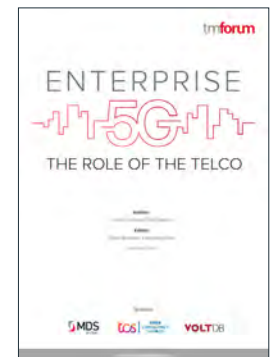
Learn more about how CSPs are targeting enterprises:

Section 2

The changing role of connectivity

Because of promising features such as ultra-low latency, high availability and vastly improved coverage, 5G is changing the way mobile operators think about their networks and the services they can offer businesses and consumers. Communications service providers (CSPs) around the world are re-evaluating their roles as providers of connectivity to determine whether and how to deliver services beyond connectivity.

Amazon Web Services (AWS) offers an interesting case study for CSPs. In the early 2000s Amazon was only an e-commerce company. It had developed IT capabilities to support its marketplace, but the process of exposing these capabilities to third parties and the resulting creation of AWS took several years.

When Amazon set out to build e-commerce capabilities for third-party retailers on top of its own infrastructure, the company quickly realized that the complexity of its internal IT systems, which had been built in a jumbled and haphazard way, would prevent this. Amazon untangled its IT mess using APIs and a company-wide API-governance program.

This set the stage for a more organized and disciplined way for internal developers to create new tools more generally. Amazon also developed a set of common infrastructure services so that internal development teams would not have to build their own compute, storage or database components every time they developed new applications. The hugely successful AWS infrastructure-as-a-service (IaaS) business was born when Amazon realized that there may be an external developer market interested in using a common infrastructure environment for their own applications.

The story of Amazon and AWS is relevant to CSPs because it can help them think about their own network and IT capabilities and future services in a new way, particularly as they roll out 5G. In short, it can inspire a change in focus, from being just a provider of connectivity services and solutions to becoming an enabler of other companies, developers and service providers.

Exploring business models
Most CSPs are exploring new business models, but are they truly ready for the "AWS-ization" of connectivity? Are they ready to embrace the idea of being enablers? And does copying the AWS business model fit with their stated strategies of targeting specific verticals and use cases as they deploy 5G?

Often in describing potential 5G use cases, the focus is on designing a solution to meet a specific challenge or opportunity, and the role of connectivity is hidden. While telecoms operators will, in most cases be the providers of the connectivity (except where they do not own the spectrum), they will not always deliver the solution. That role is more likely to be fulfilled by a vertical market specialist, systems integrator or operational technology vendor.

" The story of Amazon and AWS is relevant to CSPs because it can help them think about their own network and IT capabilities in a new way. "

The graphic opposite from our recent report *Enterprise 5G: The role of the telco* illustrates the roles that CSPs can play in the delivery of 5G services. This is mainly with the B2B market opportunity in mind, but it could also be applied to B2B2X or even B2C markets.

Making connectivity easier

Telecoms operators provide connectivity services to third-party providers of IoT services. A good example is medical devices. Increasingly, vendors of devices like automatic pill dispensers and blood glucose monitors are embedding cellular connectivity.

However, connectivity services have not been designed for the IoT because they require too many choices for the customer about technology and infrastructure. Enterprises, developers and third-party service providers do not want to have to choose between LTE-M, NB-IoT, 2G, 4G or 5G. They simply want the best connectivity at the best price for the relevant application.

Enterprises also want to retain control over connectivity so that they can adapt it based on their changing business requirements, without the need to request a change from the operator. In short, they want to buy connectivity the same way they buy computing services and resources in the public cloud.

This concept of easy-to-consume and easy-to-manage connectivity increasingly is referred to as connectivity-as-a-service (CaaS.). It relies on other technologies being in place such as network slicing, which is an important 5G capability, and network-as-a-service (NaaS).

Roles for CSPs in delivering 5G services
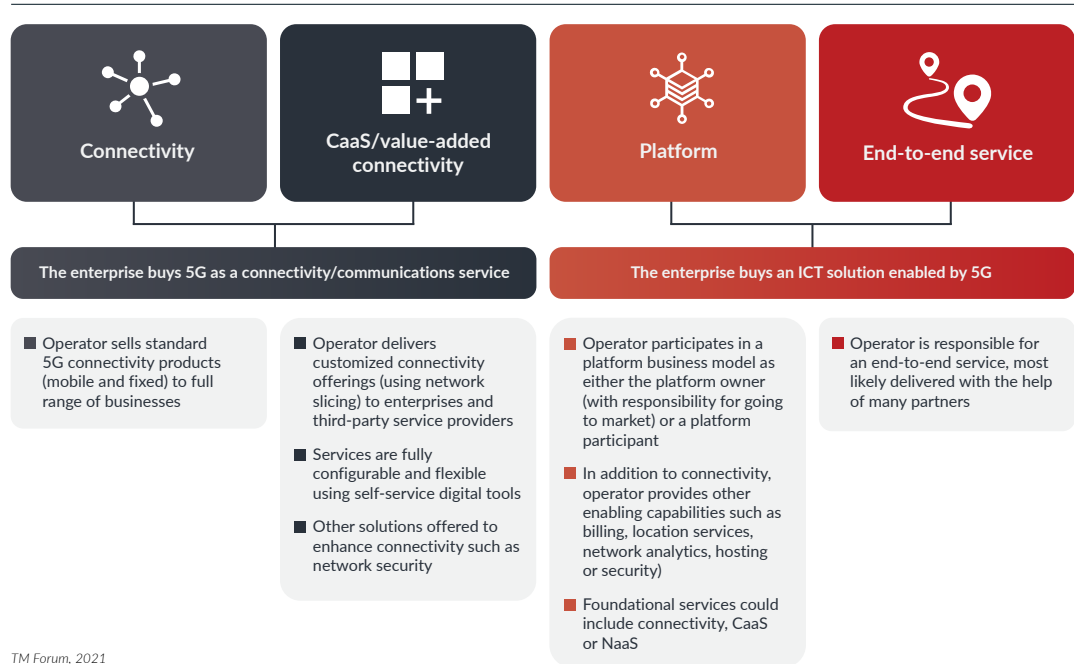
TM Forum, 2021

With NaaS, CSPs move network functionality into software and use catalogs and APIs, such as the TM Forum Open APIs, to expose network services so that different combinations of products and offers can be composed and delivered to customers (see **page 14**). CaaS could be one such service. We'll discuss CaaS and NaaS more in the next section.

TM Forum's Open APIs are powerful tools for exposing assets, especially when used in conjunction with a modern, component-based architecture like the **Open Digital Architecture (ODA),** which is part of the Open Digital Framework (see **page 30**). A component-based approach gives CSPs the ability to evolve incrementally to a fully automated, cloud native operations environment that relies on analytics and AI to deliver zero-touch services.

The ODA defines standardized, interoperable software components organized into loosely coupled domains. These components expose business services through the Open APIs, which are built on a common data model. Importantly, the ODA provides machine-readable assets and software code, including a reference implementation and test environment.

CSPs have led development of the architecture to reduce the time it takes to create new services from many months to just days or even hours. Today it typically takes about 18 months for CSPs to develop and monetize new services because of requirements to build connections many times over between customer management, service management, and ordering and billing systems across several lines of business. TM Forum members refer to these as systems of engagement, record and insight rather than OSS/BSS. The graphic opposite illustrates the functional architecture of the ODA.
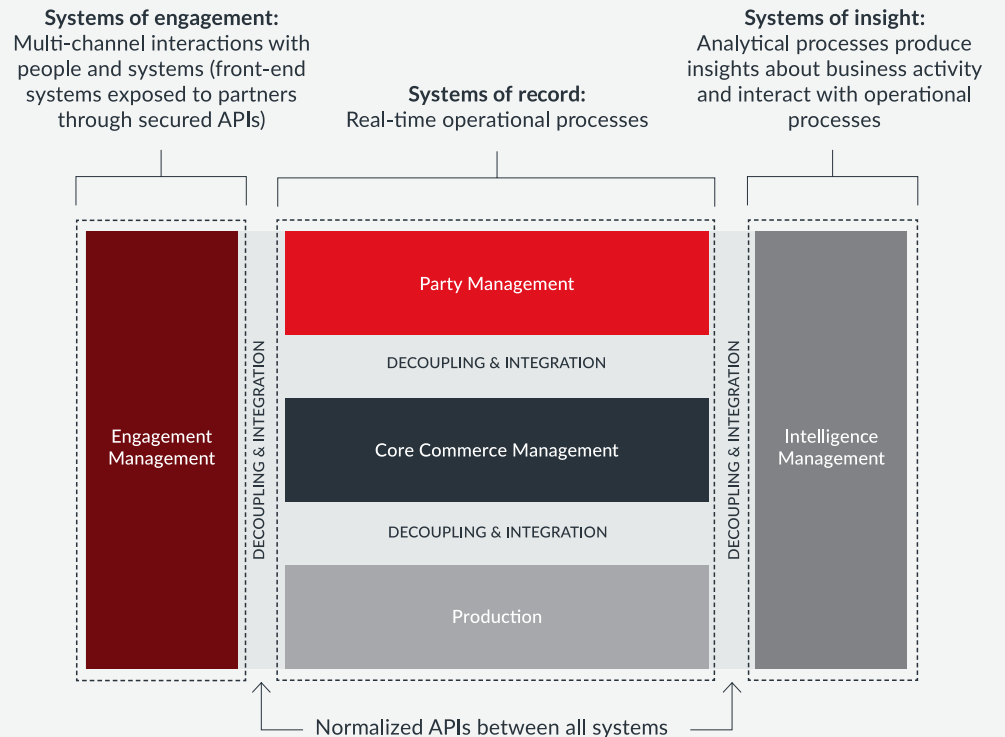
Read this report to learn more about ODA and Open APIs

ODA functional architecture

Systems of engagement:
Multi-channel interactions with people and systems (front-end systems exposed to partners through secured APIs)

Systems of record:
Real-time operational processes

Systems of insight:
Analytical processes produce insights about business activity and interact with operational processes

Engagement Management

DECOUPLING & INTEGRATION

Party Management

DECOUPLING & INTEGRATION

Core Commerce Management

DECOUPLING & INTEGRATION

Production

DECOUPLING & INTEGRATION

Intelligence Management

Normalized APIs between all systems

TM Forum, 2021

Section 3

Innovation using network slicing & NaaS

Mobile operators and their suppliers are exploring ways to turn 5G network slicing into a commercial proposition. Network slices need to be created across the entire network – from the backhaul portion, into the core and back out into the access network – but that will be possible only after operators have transitioned to fully virtualized networks.
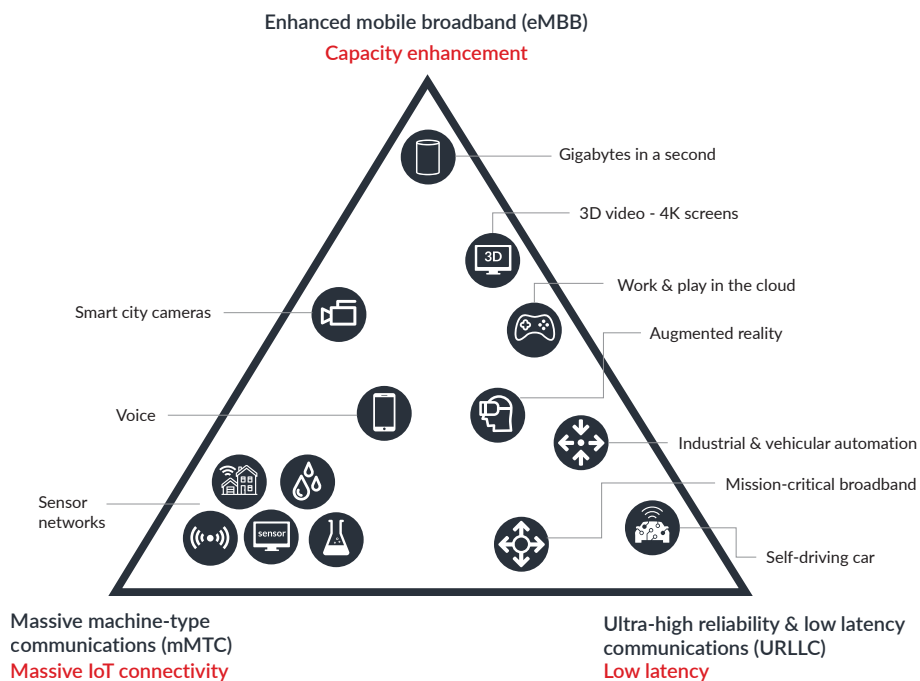
Communications service providers (CSPs) envision using network slicing to accommodate many types of 5G applications with different requirements for reliability and throughput. For example, an IoT sensor network requires relatively little bandwidth because sensors need to transmit only small amounts of data sporadically but frequently, whereas an application like remote surgery needs a lot of bandwidth, very low latency and guarantees of availability and reliability.

Network slicing is technically possible using LTE but needs a open, virtualized 5G core to realize the promises of ultra-low latency and high availability. The process of replacing the existing LTE core network with a standalone 5G core is just beginning. Furthermore, there is no single, agreed blueprint for how to build a virtualized and potentially cloud native core network which means CSPs have no timetable for when they may offer network slicing.

"There is no clear way of doing this," says Juan Carlos Garcia, Senior VP of Technology and Ecosystems, Telefónica Group. "We are trying to work out how to orchestrate slicing across different domains, but we are still three to five years away from having slicing as a commercial service."

What are the use cases for 5G?

Enhanced mobile broadband (eMBB)
Capacity enhancement

- Gigabytes in a second
- 3D video - 4K screens
- Work & play in the cloud
- Augmented reality
- Industrial & vehicular automation
- Mission-critical broadband
- Self-driving car

Smart city cameras

Voice

Sensor networks

Massive machine-type communications (mMTC)
Massive IoT connectivity

Ultra-high reliability & low latency communications (URLLC)
Low latency

TM Forum, 2021

Even as network virtualization makes slicing possible, CSPs' visions for how to develop commercial services and the number of slices to deploy vary. Ambitious operators envision customizing hundreds or thousands of slices for every large enterprise customer. Others are considering offering only three slices that map to the 5G uses cases laid out by the International Telecommunication Union: enhanced mobile broadband (eMBB), massive machine-type communications (mMTC) and ultra-reliable low-latency communications (URLLC).

The graphic on **page 18** shows three possible "tiers" of network slicing. The first tier is simplest, just three slices, one for each type of 5G use case: eMBB (enhanced broadband), mMTC (IoT) and URLLC (low latency). The next tier would offer 10-50 slices based on specific use cases or verticals. Finally, some CSPs envision supporting hundreds or thousands of slices based on a company's custom requirements, which could include their mobile private networks (MPNs).

While this approach is undeniably ambitious, the growth of MPNs and the possibility that many enterprises will bypass CSPs altogether, means it is a concept that some operators may decide they must pursue.

Innovative connectivity
Some people think of connectivity as a simple, unambitious business model when compared with delivering end-to-end services that require orchestration across partners' environments. Plus, there is a widely held perception that connectivity is not as profitable as end-to-end services.

This begs some important questions:

- Is there strong, pent-up demand for connectivity if it is delivered at the right price and with the right functionality?

- Is this kind of connectivity profitable for CSPs?

- Should the term "connectivity" be extended to include all the capabilities that sit within an operator's network, IT systems and business more broadly?

The future of connectivity is about connecting things rather than people, and 5G will inevitably displace other connectivity technologies. But incremental growth in connectivity that links people or buildings is possible. It will occur in environments where there is no connectivity today but where there almost certainly is demand. In most cases, this will be for high-speed connectivity that cannot be provided using LTE networks.

On example is connectivity for enterprises that do not have adequate coverage from a macro network, which is proving to be the main driver for MPNs. Others include providing indoor coverage where signals have problems entering the building and temporary locations or installations such as rented accommodations (for example, student dormitories and holiday rentals) or temporary or seasonal businesses (for example, cafes, building sites, and sports or music venues).

What about IoT?
Whether there is pent-up demand for IoT connectivity is less clear. New cellular IoT networks such as NB-IoT and LTE-M, along with dedicated IoT networks such as LoRA and Sigfox (collectively known as low-power wireless access networks – LPWA) have provided new capacity and much lower price points compared to SMS messaging, and these services are growing steadily. Indeed, the cost of connectivity has fallen considerably since the launch of LPWA services (see **page 19**).

Tiers of network slicing

Left tier — 3 slices based on ITU use cases:
- Enhanced mobile broadband
- Ultra-reliable low-latency
- Massive IoT

Middle tier — 10-50 slices by vertical or use case:
- Digital health
- Self-driving cars
- Shipping
- Retail
- Ports
- Airports
- Media
- Drones-as-a-service
- Agriculture
- Energy

Right tier — 100s or 1000s of slices based on customers' requirements (including in their mobile private networks):
- Speed/throughput
- Latency
- Capacity
- SLAs /QoS
- Location
- Time /date
- Security
- Federation/roaming
- Enterprise 1's MPN
- Enterprise 2's MPN
- Enterprise 3's MPN
- Enterprise 4's MPN

3 slices based on ITU use cases

10-50 slices by vertical or use case

100s or 1000s of slices based on customers' requirements (including in their mobile private networks)

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China Mobile's IoT revenue reveals LPWA's impact

China Mobile is perhaps the world's largest provider of IoT connectivity. Our analysis of the company's publicly available financial data from the 2019 calendar and fiscal years suggests that average monthly revenue per user (ARPU) for an IoT connection was just $0.15 per month in 2019.

When **GPRS** was the main connectivity option for machine-to-machine applications, average ARPU globally was about $2-$3 per month. While China Mobile's low IoT ARPU may be an extreme example, it illustrates the impact of LPWA services.

China Mobile's IoT business at a glance

IoT revenue = $1.32 billion

IoT connections = 718 million[*]

Monthly IoT ARPU = $0.15[*]

[*]Estimate based on the average between the number of IoT connections at the end 2018 (551 million connections) and the number at the end of 2019 (884 million connections)

5G will allow operators to scale IoT deployments in the long term, but more immediately its value lies in supporting emerging high-bandwidth applications that rely on devices such as drones or robots. If CSPs deploy edge computing capabilities along with 5G, they will be able to deliver low-latency IoT connectivity as well.

CaaS will make IoT connectivity easier to consume for enterprises and developers that want to embed connectivity into their applications. Dr. Lester Thomas, Chief Systems Architect at Vodafone Group, sees ease of use as the key driver for CaaS. By making connectivity easier to consume, Vodafone will be able to grow its IoT business.

Exposing assets as a strategy

As noted in **Section 2**, CSPs can learn a lot from cloud providers like AWS. According to an article published last year by TechRadar, the platform now offers 175 services ranging from computing, storage and networking to databases, analytics, application services, deployment, management, mobile, developer tools and IoT tools. This is a result of exposing its internal IT capabilities early on to third parties.

CSPs are already considering how to expose new assets such as edge computing, but what if they were to expose a wider range of assets that exist today only to serve their own retail, vertically integrated businesses? In addition to network slicing, they could sell access to IT systems such as billing or charging, security capabilities, location and hosting.

This represents a radical shift in how CSPs view their businesses, relationships with customers and new product development. Rather than thinking about how to develop products and services beyond connectivity, it means reinvesting in the connectivity business and reappraising its role and value.

This strategy may seem like acceptance of a role as a simple enabler or a wholesaler: Rather than the CSP owning the relationship with the customer, it becomes a bit pipe and fulfills a relatively low-value part of the overall solution for an enterprise. But the strategy could have the reverse effect.

If CSPs can make connectivity easier to consume for enterprises and developers, adoption of IoT services may accelerate significantly. CSPs could put themselves in prime position for orchestrating a partner ecosystem and building new revenue streams.

To be successful as an orchestrator of digital ecosystems, telecoms operators must radically change the relationship between the business and technology organizations within their companies. Today, the IT department is viewed as a cost rather than an enabler of value. But this is changing with CaaS and NaaS (see panel).

Telstra's NaaS transformation
Australian CSP Telstra is a NaaS pioneer. In 2018, the company worked closely with technology supplier Amdocs on a digital transformation that paved the way for softwarization of the network using the TM Forum Open Digital Architecture and Open APIs.

The digital transformation was a collaboration between Telstra's network and IT teams to build its 'Networks for the Future' architecture, which seeks to move away from traditional physical networks supported by silos of OSS/BSS to virtualized, software-defined networks supported and orchestrated by centralized IT.

This software-driven architecture dramatically enhances time to market through digitized and reusable capabilities, enabling Telstra to create simpler and more flexible products for customers. The NaaS approach supports near real-time activation and provisioning, end-to-end order tracking and dynamic service changes, which in some cases has reduced lead times from weeks to hours.

Ensuring flexibility
In addition to changing the relationship between network and IT, CSPs require support systems and monetization strategies that ensure maximum flexibility and agility, with a goal of being able to innovate and co-create with enterprise customers. They need to be able to test new features and services, launch them quickly and easily, and disable them down if they are not successful. The next section offers advice to help CSPs get started on this path.

Read the full case study:

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Section 4

Make it happen – Strategies for 5G innovation

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5G is changing the way mobile operators think about their businesses. They are re-examining their traditional roles as connectivity providers and learning how to become more innovative and co-create with enterprise customers. Following are considerations for communications service providers (CSPs) as they begin this journey:

Recognize the starting point

Some mobile operators view deployment of standalone 5G networks as the destination, but it really is just a starting point. With new core network capabilities like network slicing, connectivity becomes an enabler for specific applications rather than a service for connecting phones and buildings. CSPs recognize that a new approach to connectivity can unlock the potential of the IoT. Now they must figure out how and where they can profitably customize connectivity for enterprise applications by exploiting not only slicing, but also edge and cloud computing.

Evaluate IT systems

Many CSPs envision exposing their network, IT and other business assets to customers. This is a big step for service providers that historically have taken many months to develop a single new service. If mobile operators want to co-create successfully with enterprise customers and partners, they must deploy IT systems capable of delivering and monetizing new capabilities in weeks or days. Solutions developed using TM Forum's Open Digital Architecture and Open APIs provide the flexibility necessary to implement network- and connectivity-as-a-service. To learn more, contact TM Forum CTO George Glass.

Close gaps across the business

As networks become virtualized and software-defined, they can work more closely together with CSPs' IT systems. This synergy will be critical in the 5G era. Closing gaps between network, IT and product development teams is an important step toward being able toward being able to innovate and co-create with customers and partners.

Experiment with customers

Mobile operators must learn new ways of doing business to generate B2B revenues. Rather than building network and IT capabilities first, and then inviting customers to use them, operators should listen to customers to find out what they want. By experimenting and co-creating services with customers, CSPs can determine which services and capabilities may appeal to a wider audience.

Fail fast & learn from it

Innovations are not always successful. Indeed, many fail. It is important to plan for failure by developing the right systems and culture to ensure that it happens quickly, is not too costly and results in lessons learned. This approach will ensure that teams stay motivated to continue with innovation.

Make partnering a cornerstone of 5G strategy

As explained in **Section 2**, CSPs can play several different roles in a 5G ecosystem. But in every instance, the ability to partner with customers, third-party application developers and other service providers is a necessity. The most successful operators will be those that can onboard partners quickly.

Develop a strategy for connectivity-as-a-service

Enterprises want to be able to adapt connectivity capabilities based on their changing business requirements, and they want to do this easily, in the same way they buy cloud computing services and resources. They do not want to submit change requests that operators fulfill using largely manual and time-consuming processes. CSPs should consider a strategy to deliver connectivity-as-a-service. This means they will need to evaluate technologies such as network slicing and network-as-a-service, and support zero-touch partnering. TM Forum members are working to advance these concepts through their collaborative work on the Open Digital Architecture and Open APIs.

The 5G Value Plane - Monetize the power of the network

a· amdocs

5G has arrived. What now?

The active rollout of 5G networks across the world has shifted the discussion amongst communications service providers (CSPs) from "should we launch 5G?" to "now we've launched it, how can we monetize it more effectively?" Indeed, with the technology set to become a key driver of these players' post-COVID-19 strategies, the ability to identify the right answer to this question has become crucial.

The new reality brought by the pandemic emphasizes the challenge for CSPs to find ways to shift themselves upwards from their traditional position on the lower end of the value chain. Central to this is their ability to break the years-old paradigm of connectivity being perceived as a little more than a "dumb pipe" commodity, where differentiating from the competition often meant little more than competing on price.

The rollout of 4G was a prime example. Back then, while CSPs were making huge investments to upgrade their mobile network technology to enable faster network speeds, they failed to match them with significant upgrades to their business offerings, resulting in them having to compete with commoditized bundles of unlimited data, which kept ARPU down.

That's not to say 4G was a time of no innovation. Indeed, it was a time when multitudes of applications rushed (and are still rushing) to leverage the faster connectivity speeds available (practically) everywhere.

YouTube, Instagram, Netflix, Waze, Zoom, Fortnite, TikTok are just a few examples.

But the role played by CSPs was a passive one, since these players' services were able to perform adequately with best-effort 4G connectivity. As a result, they could be delivered in a manner similar to the OTT direct-to-customer model, with the bulk of the revenue ending up in the pockets of the app providers.

Given this precedent, there's little surprise CSPs are now approaching their investments in 5G with caution, while keeping their eyes peeled for the next "5G-killer" app.

Rise of network-embedded services (NES)

The vast majority of 5G rollouts to date have been based on a 4G upgrade path known as "non-standalone (NSA) 5G", whose main advantage over 4G is improved data speeds. While this is an important first step on the road to capturing the value 5G has to offer, CSPs need to do more to avoid repeating the mistakes of their past.

The real inflection point will be the adoption of 5G standalone (SA) technical architectures – where, a new 5G core makes available a rich array of dynamic and programmable network, edge and cloud assets.

These new capabilities can be combined and curated in a differentiated, tailored way – unveiling the true force of 5G and its ability to impact both our personal and professional lives. With these new 5G characteristics, CSPs can finally move away from the delivery infrastructure model and become an indispensable, integrated enabler of valuable, innovative offerings. This network evolution from "one size fits all" to a dynamic, tailored performance-per-use-case model becomes possible through the adoption and instantiation of network-embedded Services (NES).

NES's rely on the existence of specific resources and performance attributes. With 5G, CSPs can adopt the NES model and make available a wide range of programmable network resources to its partners, enterprise customers and end-users.

Monetizable 5G assets (partial list):

- Latency
- Speed
- Coverage area
- Capacity
- Density
- Reliability

- Slices
- Edge Resources
- Number of connected devices
- Variety of device types
- Frequencies
- CNFs/VNFs

- APIs
- Partners
- Data
- Monitoring apps

The 5G Value Plane - Monetize the power of the network

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This opens an exciting world of possibilities for partners to leverage the network in the precise manner and time their application requires, while dramatically strengthening the CSP's positioning in the value chain. In this new paradigm, rather than just a network, 5G effectively becomes a platform.
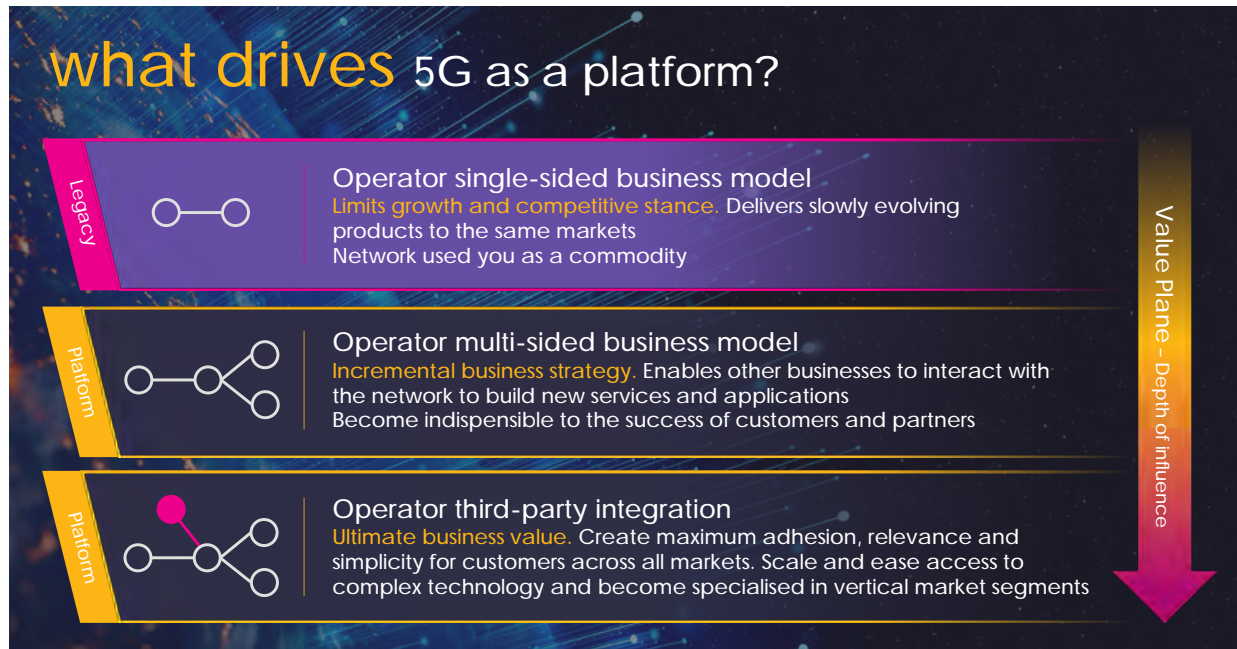
Driving new business models

With 5G as a platform, CSPs are now empowered to introduce new business models into their ecosystem, and at the same time, dramatically augment their existing business models. And by enabling enterprises to consume the network just as they consume the cloud, it also opens a world of monetization options.

Network as a service (NaaS) and Slice as a Service (SlaaS) offerings, for example, can be enhanced by a marketplace of partner solutions – all driven by the CSP. The B2B2X business model is yet another way to expose the network to partners, who can consume its capabilities as they require and reach new customers with innovative services.

Strategies such as these will allow CSPs to develop a much more important role in exposing and integrating network resources and delivering services, which in turn will be translated into additional revenue. This fundamental shift can be seen in figure 1.

what drives 5G as a platform?

Legacy

Operator single-sided business model
Limits growth and competitive stance. Delivers slowly evolving products to the same markets
Network used you as a commodity

Platform

Operator multi-sided business model
Incremental business strategy. Enables other businesses to interact with the network to build new services and applications
Become indispensible to the success of customers and partners

Platform

Operator third-party integration
Ultimate business value. Create maximum adhesion, relevance and simplicity for customers across all markets. Scale and ease access to complex technology and become specialised in vertical market segments

Value Plane – Depth of influence

Figure 1: 5G Platform Business Models

" Amdocs' packaging of policy, convergent charging, and real-time catalog solutions into an offering that serves the "5G value plane" represents a point of potential differentiation in a market that is now replete with a host of vendors calling out their 5G monetization credentials. "

John Byrne, Service Director, Telecom Technology & Software, Global Data

The 5G Value Plane - Monetize the power of the network

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The 5G Value Plane

The 5G Value Plane is a key enabler for driving network-embedded services and bringing cloud business models to 5G networks. It supports on-demand real-time curation and consumption of a wide range of resources and services, with innovative pricing and exposure.

While the 5G Stand Alone (SA) core contains many functions that "just power the network" – or just make 5G work – to tap into the wide revenue potential enabled by the new functionalities, business consideration will also become an integral part of the new core, thereby driving the need for the 5G Value Plane.

5G Value Plane comprises key 5G SA core network functions, which together, enable tight integration between the 5G network, the CSP's IT & business, partners, cloud players and enterprise customers. Such integration is key to enabling CSPs' evolution from traditional "network-powered" pipes to monetizers of the 5G network.

With 5G network-embedded services, the interactions between the business/IT side of a service provider and the 5G network become much more varied and dynamic, demanding a fresh outward-looking approach, whereby vertical integration is incorporated throughout every stage of the service lifecycle:

■ **Definition:** During the service definition, unique network capabilities, attributes and integration points are configured and priced as an integral part of the offering. These definitions become the 'Currencies of 5G'.

■ **Engagement:** Service ordering triggers the relevant charging, policy and network configurations needed for the specific characteristics, needs and duration of the service, while enterprise and partner portals expose real-time network performance and pricing relative to SLAs.

■ **Monetization:** Running 5G as a platform enables the CSP access to many more commercial models than was previously possible. Charging must occur in real time according to the specific service utilized, or other innovative chargeable triggers. The accurate "bill" is then exposed to customers in a clear manner adapted to their needs, reducing bill shock and enabling potential upsell packages.

■ **Analytics:** Such capabilities are crucial from an operational perspective – exposing serviceability and availability of appropriate network services to users, as well as from a monetization angle – determining which services and pricing models are optimal and able to be adjusted in real time.

Figure 2: The 5G Value Plane

The 5G Value Plane - Monetize the power of the network

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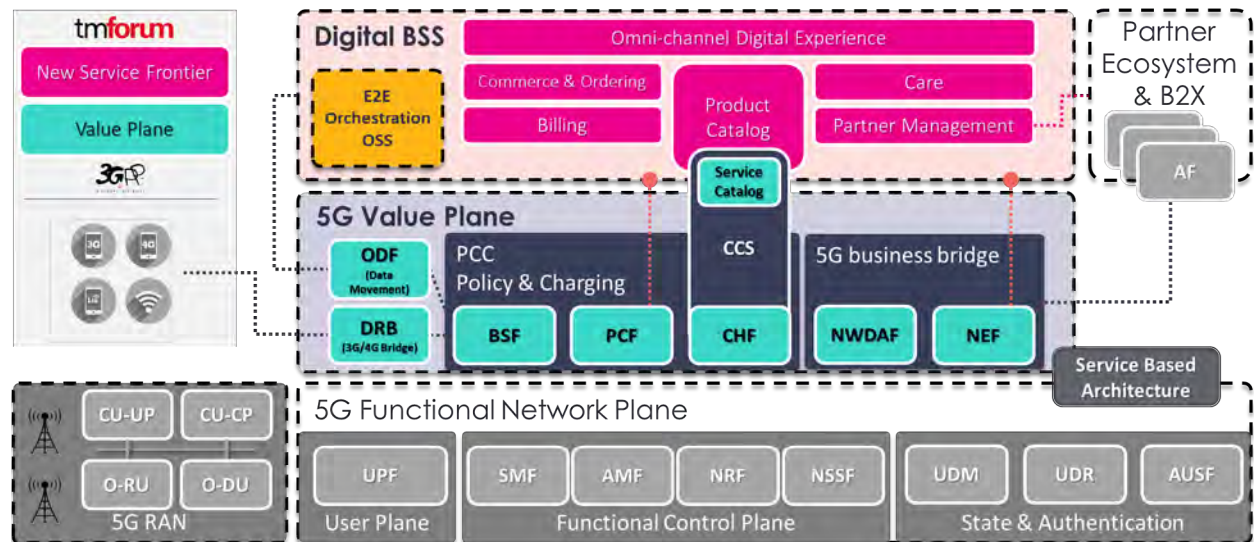
5G Value Plane components

CHF/CCS + PCF – Policy and charging have often been considered separately within the operator environment. With 5G, policy is no longer just a network control mechanism but a means to build and deliver 5G services. With its integration to more powerful 5G charging, it enables different offers with different network characteristics to have different pricing and charging rules, as well as appropriate SLAs. Amdocs and Openet's cloud-native Converged Policy & Charging Control (PCC) solution is tailored for optimal utilization and monetization of the 5G network.

NEF – The network exposure function is the key to exposing network APIs. It provides a CSP's enterprise customers and partners with direct access to interfaces that enable them to leverage the 5G network (e.g. Network slice as a service) as well as providing them with crucial visibility and real-time control of the status and performance of the network resources they are utilizing.

NWDAF – The network and data analytics function will be instrumental to collecting data across the 5G network domains. This "new world" of inputs can be leveraged by embedded AI/ML capabilities to provide in-depth analytics and reveal valuable operational and business insights. For example, a highly-loaded network element (slice, edge or other) could drive a required operational scale-up, in parallel to updating the pricing scheme for this now high-in-demand asset.

Service, commerce and charging catalog – Though not a core 5G function in itself, there is great importance that 5G Value Plane components be integrated to a unified, business-driven catalog, spanning across BSS, OSS and partners. With fully synchronized commercial and technical service definitions, it provides CSPs with the crucial agility they need to rapidly develop, launch, manage and monetize new offers, while empowering them to "try and fail fast" in order to take advantage of any emerging offers and partners.

Amdocs 5G Monetization solution is part of CES 21, Amdocs' modular cloud-native customer experience suite, and enables delivery of Value Plane components above through pre-integrated 5G-certified products within Amdocs Openet Policy and Charging, CatalogONE and NWDAF analytics.

" Effectively monetizing 5G requires operators to think differently about how the network can deliver a new value plane beyond connectivity. Instead of being a basic pipe, CSPs will deliver greater value to partners and consumers by delivering agile network embedded services that can provide different attributes to support the varying needs of applications. "

Maribel Lopez, Industry Analyst, Author, Technology Influencer, Lopez Research LLC

The 5G Value Plane - Monetize the power of the network

How Amdocs' CES21 serves the 5G Value Plane and the wider 5G experience

Beyond monetizing network resources, 5G is about enabling new experiences and introducing new business models. As part of an open, modular and AI-powered BSS/OSS suite, Amdocs CES21 delivers 5G Value Plane functions and also addresses a wide range of complementary aspects, including the below:

- **DigitalONE** enables a seamless omni-channel experience, for care, commerce and order management on every channel, driving business agility and accelerated time to market to meet the ever-evolving digital user's expectations.

- **RevenueONE** empowers new monetization models, with real-time billing to support on-demand interaction payments, and subscription billing for partner offerings, alongside complex partner lifecycle management to support marketplace-type engagements and B2B2X business models.

- **NEO network automation platform** manages design, orchestration, inventory and closed-loop operations for the 5G, hybrid and cloud networks.

Paving the path to a 5G mindset

For CSPs to fully leverage their 5G assets for innovative monetization, its paramount for them to adopt a clear 5G mindset upfront. This is true, even for today's 5G NSA offerings, as ultimately these will serve as the entry point towards the full 5G revolution.

The 5G Value Plane is the key first step towards achieving this mindset. With it, the potential range and number of possible use cases will be limited only by the imagination.

" It's not only about connecting people or things anymore. It's about the value of those connections. "

For more information on the 5G Value Plane and Amdocs' 5G monetization visit:
https://www.amdocs.com/5g-value-plane

Figure 3: Amdocs 5G Monetization

TM Forum Open Digital Framework

A blueprint for intelligent operations fit for the 5G era

The TM Forum Open Digital Framework provides a migration path from legacy IT systems and processes to modular, cloud native software orchestrated using AI. The framework comprises tools, code, knowledge and standards (machine-readable assets, not just documents). It is delivering business value for TM Forum members today, accelerating concept-to-cash, eliminating IT and network costs, and enhancing digital customer experience. Developed by TM Forum members through our Collaboration Community and Catalyst proofs of concept and building on TM Forum's established standards, the Open Digital Framework is being used by leading service providers and software companies worldwide.

Core elements of the Open Digital Framework
The framework comprises TM Forum's Open Digital Architecture (ODA), together with tools, models and data that guide the transformation to ODA from legacy IT systems and operations.
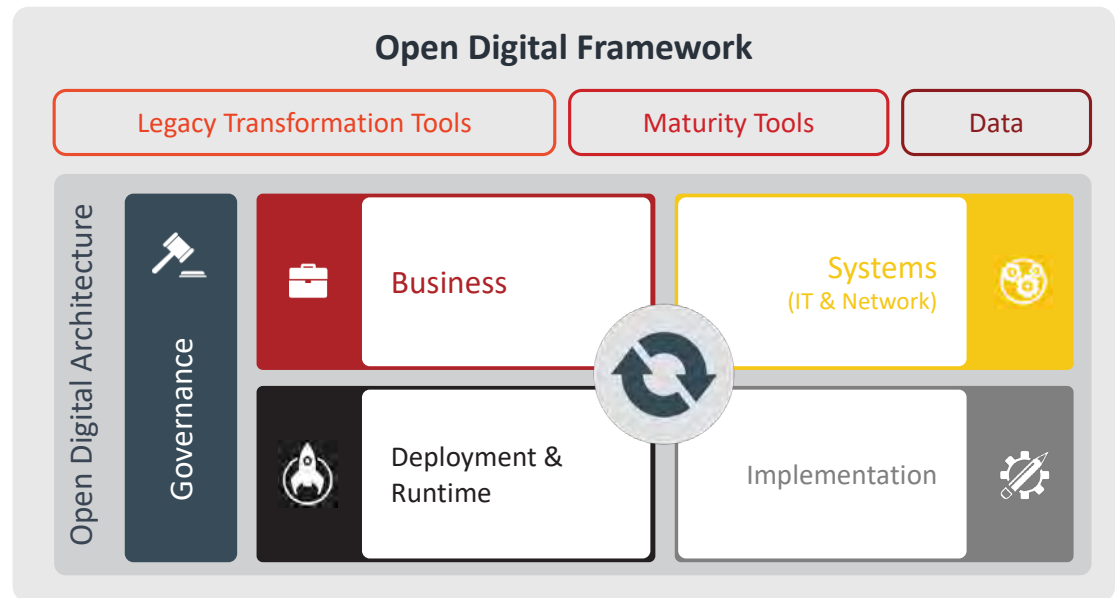
Open Digital Architecture
- Architecture framework, common language and design principles
- Open APIs exposing business services
- Standardized software components
- Reference implementation and test environment

Transformation tools
- Guides to navigate digital transformation
- Tools to support the migration from legacy architecture to ODA

Maturity tools & data
- Maturity models and readiness checks to baseline digital capabilities
- Data for benchmarking progress and training AI

Open Digital Framework

Legacy Transformation Tools	Maturity Tools	Data

Open Digital Architecture

Governance

Business | Systems (IT & Network)

Deployment & Runtime | Implementation

Goals of the Open Digital Framework
The Open Digital Framework aims to transform business agility (accelerating concept-to-cash from 18 months to 18 days), enable simpler IT solutions that are easier and cheaper to deploy, integrate and upgrade, and to establish a standardized software model and market which benefits all parties (service providers, vendors and systems integrators).

Learn more about collaboration
If you would like to learn more about the project or how to get involved in the TM Forum Collaboration Community, please contact George Glass.

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TM Forum Research Reports
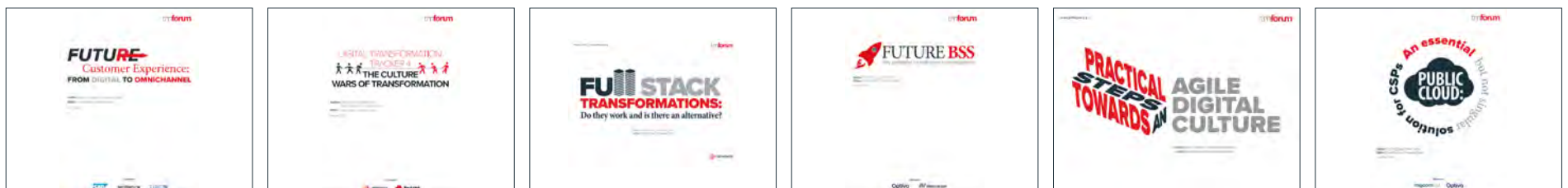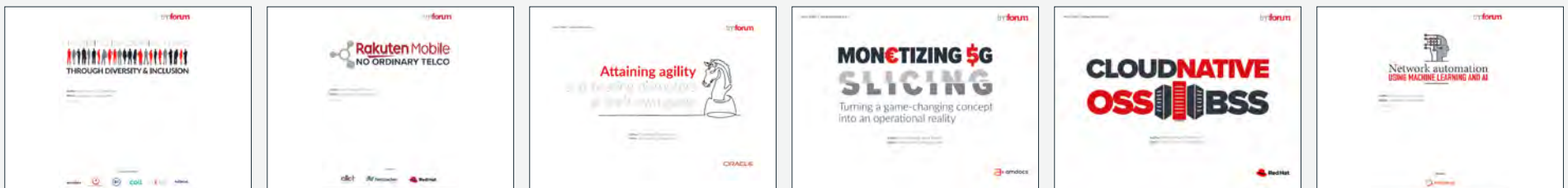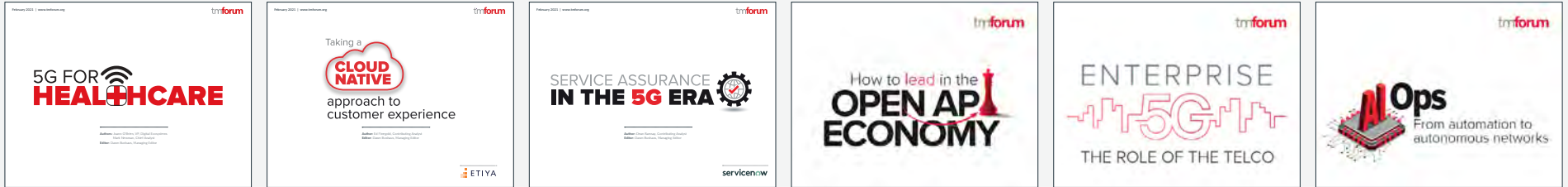
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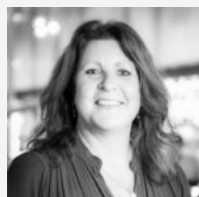
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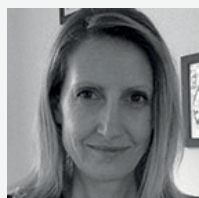
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