



WHITEPAPER

# The 5G marathon begins now



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# Executive summary

The sprint to be first with 5G services is over but now the real race begins and it will be a marathon. Many mobile carriers have chosen strategies that can help them win the race to market with the first 5G services but they risk underwhelming potential 5G customers, which could possibly undermine the value associated with the 5G brand. A strong 5G brand is important for industry-wide success. For 5G to be successful we need to build networks that address the real world demands from end device to the cloud, and everything in between. Indeed, a successful 5G will be revolutionary not only in the technology and capabilities, but also in the mindset.

The most lucrative 5G services will be those currently under development for enterprise verticals. It will take time to develop the right business models and associated products and services to deliver service these new customer segments. However, the fact that 5G will take a few years to reach its full potential does not mean that carriers can take their time in making 5G capabilities available.

The most progressive mobile service providers understand that the real competition of the future is not only other mobile service providers, but also more agile new entrants with cloud-service backgrounds.

Rakuten is a good example. Rakuten entered the mobile services market with no experience, but today has arguably the most advanced 5G network in Japan and is now acting as advisor to companies all over the world who wish to learn and repeat their success. Cloud-service giants like Google, Facebook and Microsoft are also building their capabilities.

The key to success is recognizing the need for an end-to-end telco cloud platform that can make the 5G network accessible as a service supporting the flexible delivery of modern API-driven services. Cisco has the experience and portfolio to provide the 5G telco cloud platform enabling mobile service providers to build their migration strategy for ultimate success in the 5G race.

# Don't win the 5G sprint but lose the 5G marathon

The race to deploy 5G services is thoroughly underway. 5G services are now available across the globe with mobile service providers taking a variety of routes to market. The routes have been dictated by available spectrum, but also choices on coverage and to what extent existing infrastructure is leveraged in the deployment of new 5G services.

However, in the rush to be first with 5G services, some mobile service providers might have done

themselves and their customers a disservice. The reaction to 5G service launches in the US is a case in point. Rather than being praised for being first with 5G services, mobile service providers have met criticism for either a lack of availability, coverage or download speeds. In hindsight, it is clear that expectations need to be managed with respect to what 5G can deliver today versus what is possible tomorrow, especially following the hype that has already been generated for several years.

What is more important to understand is that 5G is not a sprint, but a marathon. Winning the sprint can be important in establishing leadership, but that lead needs to be maintained throughout the race. Now that the sprint is over, its time to develop a strategy to win the marathon!

## The 5G sprint

To understand why 5G services have underwhelmed some consumers and critics, it is useful to examine what happened in the US market during 2020. Mobile service providers in the US chose different paths to market based on the 5G spectrum available. Due to the lack of mid-band spectrum (which has since been made available), AT&T and T-Mobile decided to leverage available lower-band spectrum in the 850MHz and 600MHz bands respectively. AT&T also deployed mmWave spectrum 5G services as did Verizon. Lower-band spectrum provides excellent reach and availability, but download speeds

are only marginally better than 4G services. 5G services based on mmWave provide impressive download speeds, which can be 10 times faster than 4G services, but with limited reach and availability. They also face difficulties penetrating solid objects, such as buildings.

These trade-offs have not gone unnoticed by 5G subscribers. Some have already judged the 5G revolution to be a “big fail so far”.<sup>1</sup> One of the issues for which consumers were not prepared is the fact that 5G is not just one service, but can be many different services.

Having bought into the marketing of mobile generation numbering and with 4G clearly better than 3G, consumers expected 5G to provide higher speeds as well as reach and availability. Having to compromise was not part of the deal!

This could damage the 5G message and the long-term success of 5G. According to the New York Times, “These 5G cellular networks will get better soon. I worry, though, that in the meantime Americans will grow cynical about the networks’ potential. And if they do, it will mostly be the phone companies’ fault”.<sup>2</sup>

<sup>1</sup>Source: <https://www.tomsguide.com/news/the-5g-revolution-has-been-a-big-fail-so-far>

<sup>2</sup>Source: <https://www.nytimes.com/2020/10/15/technology/ignore-phone-companies-5g.html>

# The 5G marathon

Ironically, in the sprint to be first with 5G consumer services, mobile service providers can have weakened a potential bastion in the future competition for 5G domination. Providing mobile services to consumers requires significant investment and experience, which acts as an effective barrier to new competitors. However, consumer services are just one of the potential 5G services that can be offered. If competitors gain a foothold in other 5G service areas,

then the barrier to competing for consumer services is suddenly much lower, especially if customers are already dissatisfied with current providers. This is especially the case in 5G, which is designed to be more open and disaggregated than previous mobile generations.

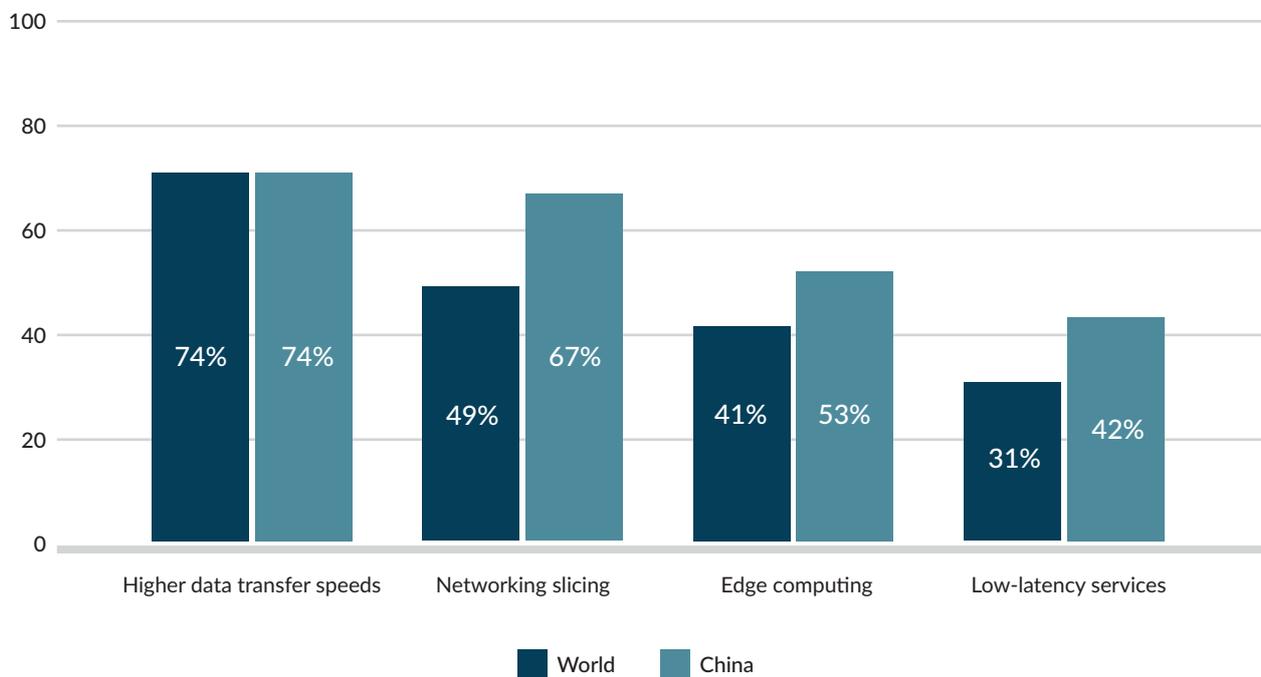
Global mobile revenues, driven mainly by enhanced Mobile Broadband (eMBB) services to consumers, are only expected to grow to \$1.14 trillion over the next

5 years. However, this represents a growth rate of 1% per year even as 5G accounts for 20% of connections in 2025<sup>3</sup>. This is a large market generating a lot of revenue, but 5G was designed to open new markets and opportunities that can prove to be just as large and potentially more lucrative.

According to the GSMA, the real opportunity for 5G lies in enterprise verticals,<sup>4</sup> as shown in the following survey results:

## Enterprise verticals are the real opportunity for 5G, with China racing ahead in this area

Which of the following 5G capabilities would make it compelling for your organisation to use 5G for future IoT deployments? (% of respondents, multiple answers possible)



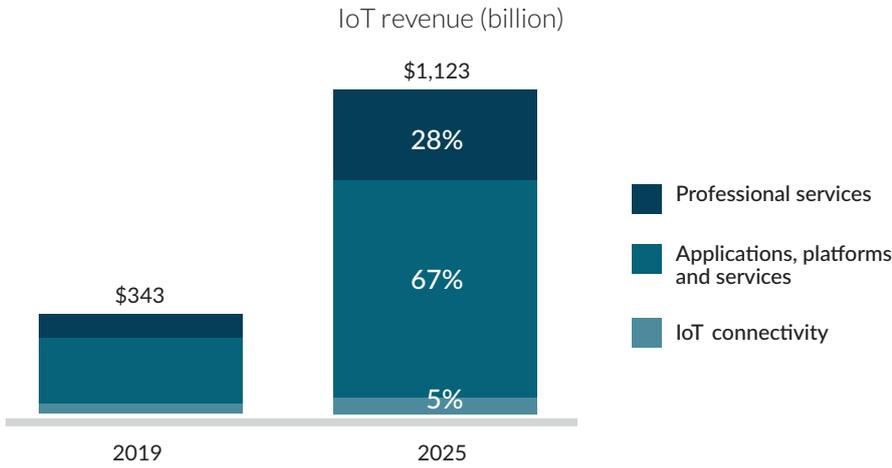
Source: GSMA Intelligence IoT Enterprise Survey Q4 2018

<sup>3</sup>Source: GSMA Mobile Economy 2020

<sup>4</sup>Source: GSMA Intelligence IoT Enterprise Survey Q4 2018

Higher data transfer speeds are available today, while the other 5G capabilities are still services under development. Nevertheless, significant new revenue can be generated from addressing enterprise vertical needs. A case in point is IoT connectivity, and the larger opportunity in IoT applications and services, which is expected to grow significantly over the next 5 years:

**\$1.1 trillion in IoT revenue by 2025, with value continuing to move up the stack to platforms**



Source: GSMA Intelligence

With automation comes the need for companies to implement sophisticated controls and analytics.

Therefore, most of the value gain for telcos and cloud firms supplying enterprise clients will be in the applications/platforms layer.

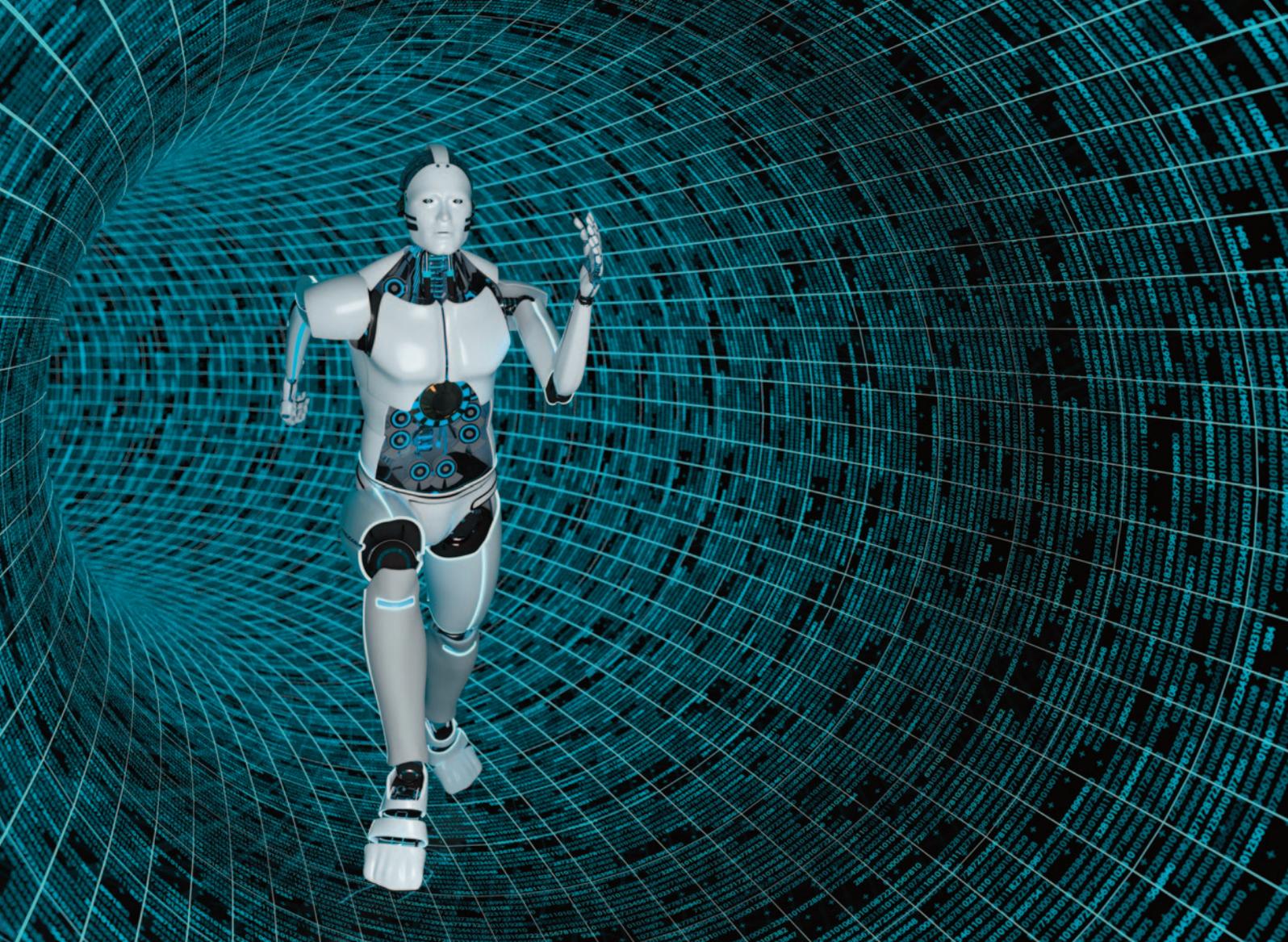
The deflationary nature of connectivity means it will shrink to half to 5% of total IoT revenue by 2025, meaning that connectivity will be unsustainable unless as part of a broader service package.



Note that IoT revenue of \$1.1 trillion in 2025 should be compared with current mobile service provider revenue of just over \$1 trillion in 2019. As can be seen, the real opportunity lies in providing the applications, platforms and services that leverage IoT connectivity.

This is just one example of future 5G revenue generating services. Others include smart factory automation and autonomous cars. These all provide additive opportunities to existing 5G revenue sources. However, to take advantage of these opportunities, as

we can see, it is not enough just to provide connectivity. It is important to consider the entire use case and customer need and position to deliver a more complete solution.



# Winning the marathon requires a focus on customer needs and value

Enterprise verticals are a key target customer for 5G mobile service providers. However, to truly take advantage of this opportunity, it is important that mobile service providers consider the entire use case and customer need. As can be seen by the IoT example, this includes applications and services that can enable mobile service providers to provide a more complete solution.

For example, manufacturing enterprises are currently in the midst of a digital transformation to smart factories, otherwise known as Industry 4.0. This is a major challenge requiring investments not only in IoT, but also intelligent robotics and automation solutions that will enable factories to operate autonomously. Enterprises need competent partners to help design and deliver the solutions required and take responsibility for supporting and servicing deployed solutions.

However, to do this, mobile service providers need to develop skills and competencies, or at the very least strong partnerships, that will position them as credible solution providers to enterprise customers. This also means that mobile service providers will begin to compete with formidable adversaries, who are ultimately their main competitors in the 5G marathon, namely cloud-service providers.

# Cloud service providers are the real competitors in the race

To date, mobile service providers have considered their competitors in the 5G race to be their compatriots from the mobile industry. The significant investment and knowledge required to offer mobile services have always been major barriers to entry for new competitors.

However, 5G has been inspired by the success that cloud-service providers have achieved in providing API-based services at scale using Software Defined Networks (SDN) and virtualization. 5G leans heavily on these concepts in its architecture and design. This

has introduced a steep learning curve for mobile service providers and their organizations as new paradigms and skills need to be understood and adapted to meet the needs of mobile service delivery. However, this is an area where cloud-service providers excel.

This is one of the reasons why many mobile service providers have chosen to focus on 5G New Radio (NR) capabilities first and introduce services using a Non-Stand Alone (NSA) deployment strategy leveraging existing 4G infrastructure. The radio network is

the one area of competence which is a unique competence that cloud-service providers do not possess and where they face a steep learning curve.

Nevertheless, if the real opportunity is in providing applications and services to enterprise verticals, mobile service providers need to develop a strategy that will enable them to exploit this opportunity and take on cloud-service providers in what will prove to be a crucial contest. It is probably this contest that will determine the ultimate winner of the 5G marathon.

## Sprinting to stand still

Thus far, it would appear that mobile service providers have chosen strategies on the premise that the main competition is other mobile service providers in the race to provide 5G consumer services. This would explain the sprint to deploy 5G services on whatever spectrum is available and later add mid-band spectrum.

In this strategy, choosing a 5G NSA architecture approach makes sense, as this is the fastest path to market and provides more time to figure out the challenges of implementing

virtualized RAN and 5G core networks. However, this only makes sense if the race is a sprint to 5G consumer service domination.

If, on the other hand, the 5G race is actually a marathon and the real opportunity is providing total solutions to enterprise verticals then the situation is dramatically different. Now, the competition is not just other mobile service providers, but also new entrants more familiar with cloud-services and the technologies on which they rely.

Cloud-services providers are entering the 5G and mobility space with enterprise directly in their focus. They have tools, services and reach that enterprises appreciate, and now they are building Telco Cloud Platforms to extend 5G connectivity. This requires a radically different strategy from mobile service providers if they want to compete.



# The 5G marathon roadmap

The good news is that a roadmap to success exists for mobile service providers that enables them to evolve their networks into Telco Cloud Platforms without disrupting existing network services. This 5G marathon roadmap provides the best basis for ultimate success.

In a 5G marathon scenario, a 5G NSA architecture strategy is not sufficient. The 5G marathon compels mobile service providers to

grasp the nettle and accelerate their learning with respect to 5G virtualization and telco cloud services. It requires mobile service providers to shift emphasis from 5G NSA architectures supporting consumer services to 5G Stand-Alone (SA) architectures supporting enterprise verticals.

This is the long road that requires stamina and perseverance, but ensures that having won the sprint,

mobile service providers do not end up standing still, watching new competitors ultimately win the 5G race. The good news is that the road to success might not be as long as first imagined as the tools, technology and solutions to successfully implement 5G SA networks capable of supporting advanced software and service solutions exist today.



## Pioneers are showing the way

Some mobile service providers are already showing the path forward with 5G SA networks. For example, T-Mobile has implemented a distributed 5G SA Core network using Cisco Ultra Cloud Core. New entrants are also emerging with 5G SA implementations such as cable companies like Comcast, Cox and DISH. These companies are all leveraging Cisco technology and solutions to accelerate their 5G SA implementations.

However, as if to underline the seriousness of the threat to mobile service providers, new entrants from cloud-based backgrounds have also leveraged available technology to enter the 5G race.

New entrants bring a different perspective based on their experience in offering cloud-based services. Rather than seeing the network as the core product, cloud-based companies view the network

as a platform on which to build services. The network is a resource to be leveraged through open APIs making the network a “platform-as-a-service”. With this mindset, it is only natural that the network supports end-to-end services through a single API using agile, software-defined principles. This enables the network to react autonomously to new circumstances and requirements in order to provide the required support to end-to-end services.

5G SA mobile service provider pioneers understand this mindset and also understand that the real competition comes from new entrants with cloud-based backgrounds. All of the major cloud-service providers are closely watching 5G developments and are building the capabilities to enter the race. Google announced their telco cloud strategy in March 2020 , Facebook has sponsored the

Telecom Infra Project (TIP) since 2016 including the OpenRAN project for virtualizing 5G RAN networks , while Microsoft recently invested in Metaswitch and Affirmed Networks .

Mobile service providers are actively partnering with cloud-service providers, such as AT&Ts alliance with Google for 5G edge computing as well as active participation in TIP projects and are thus taking the necessary steps to build competence and learn from these cloud-service pioneers. However, the next step is to accelerate their own 5G SA efforts and build the end-to-end telco cloud platforms required to enable agile and flexible response to new, emerging 5G opportunities, particularly for enterprise verticals. It is time to take the leap and begin the long 5G marathon race.

<sup>5</sup>Source: Google Cloud Announces Telco Strategy | Press Releases

<sup>6</sup>Source: Home - Telecom Infra Project

<sup>7</sup>Source: Microsoft announces definitive agreement to acquire Metaswitch Networks, expanding approach to empower operators and partner with network equipment providers to deliver on promise of 5G - The Official Microsoft Blog

<sup>8</sup>Source: Microsoft announces agreement to acquire Affirmed Networks to deliver new opportunities for a global 5G ecosystem - The Official Microsoft Blog

<sup>9</sup>Source: Google Cloud Announces Telco Strategy | Press Releases



# End-to-end orchestration on open, virtualized infrastructure key to success

5G networks are designed to be open and virtualized allowing individual services with different performance requirements to share the same infrastructure. 5G has introduced multiple new capabilities that allow demanding performance requirements to not only be met, but also delivered alongside other services with vastly different requirements.

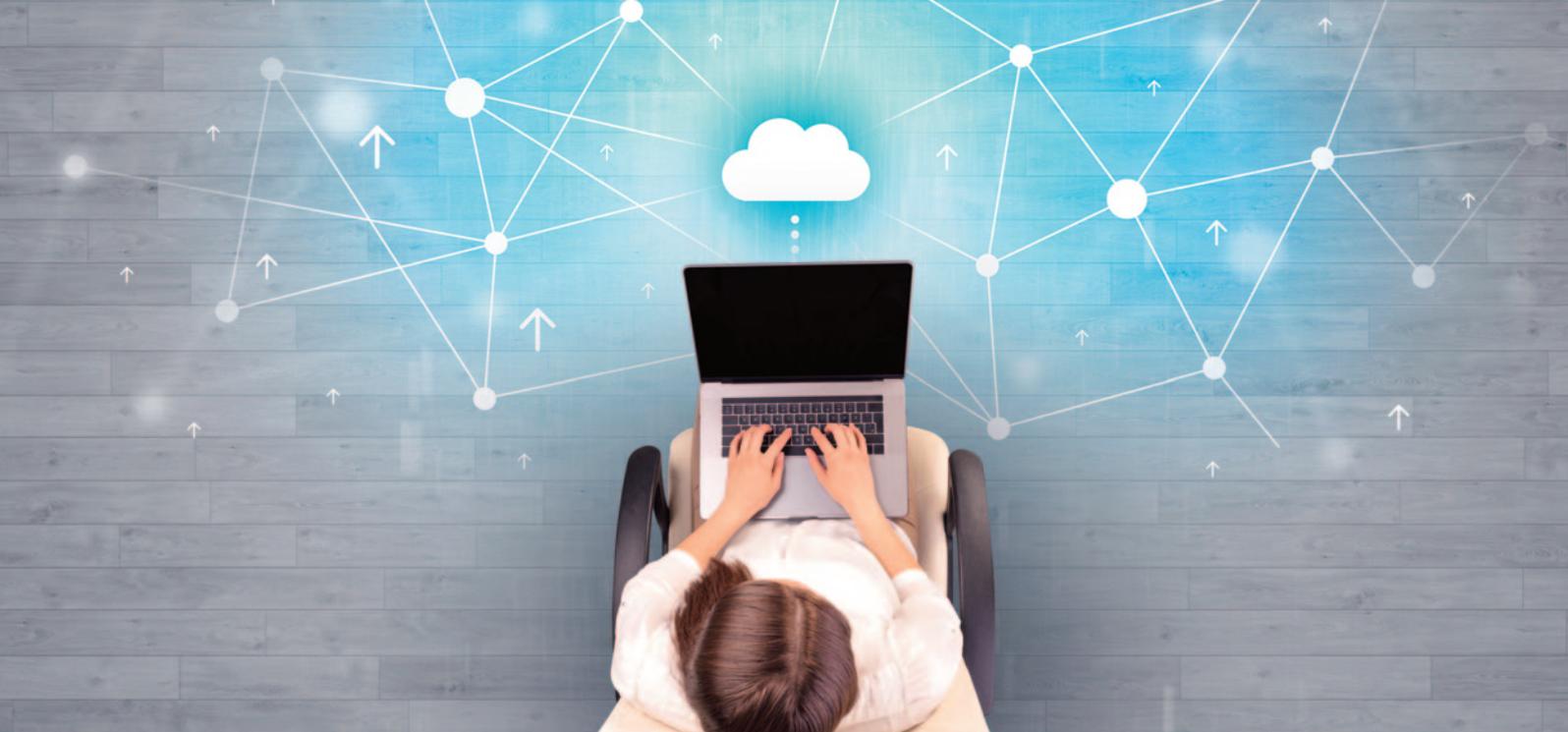
Virtualization of functions effectively separates software from hardware implementations and allows each individual function to be scaled independently and distributed optimally with respect to available bandwidth capacity and

latency requirements. This includes RAN functions as well as User Plane Functions (UPFs), which can be located at the edge of the network while control plane functions are more centrally located.

Traditionally, each part of the network would be managed separately with access, WAN, transport and core network management solutions. This made sense when the majority of traffic is traversing the core network making this the natural point of interaction with higher layer services, such as billing. However, with 5G, virtual network slices are established from

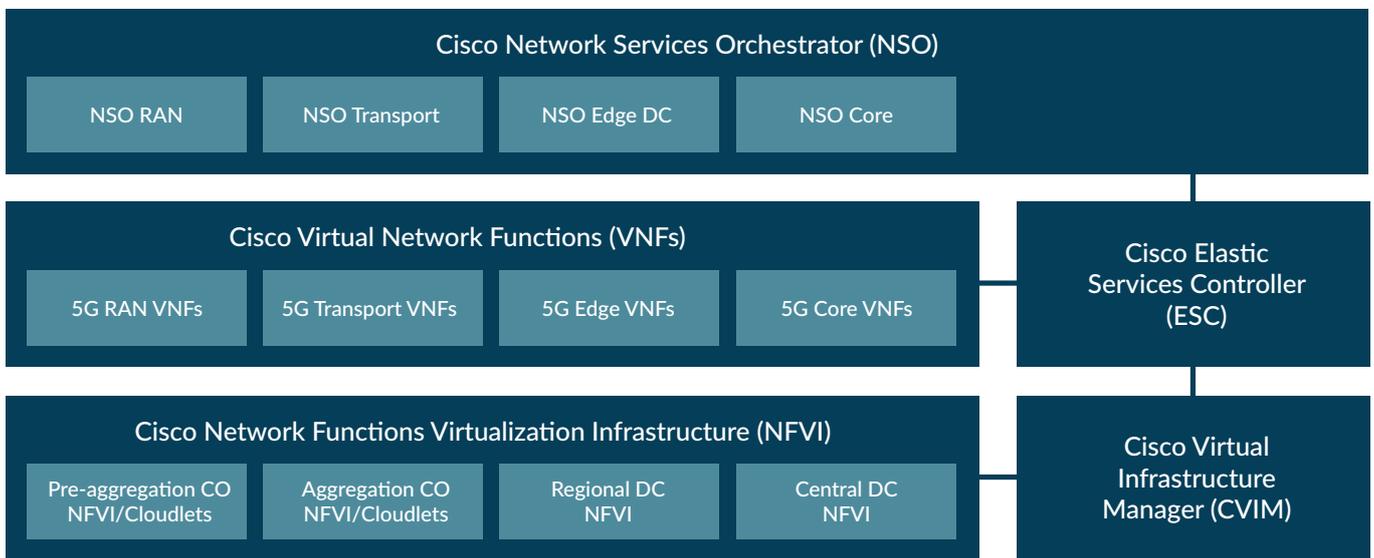
end-to-end where user plane traffic might never leave the edge network. The placement and scaling of individual functions needs to be dynamically adapted depending on end-user requirements and network load. It is therefore important to manage and monitor the 5G network from end-to-end.

One of the secrets to the success for early pioneers adopting 5G SA is not to focus just on the radio spectrum or RAN network, but to consider the entire network end-to-end and to implement an open, API-driven, software-defined telco cloud platform from day one.



# The Cisco Telco Cloud Platform

Cisco is one of the few vendors with the breadth of knowledge, experience and solutions to deliver all of the components necessary for success in 5G. Cisco offers a broad portfolio of proven 5G solutions based on decades of experience in delivering solutions to enterprise, cloud service providers as well as telecom service providers. Whether the starting point is 4G LTE or 5G NSA, Cisco has the migration path solutions you need to implement a service-oriented, software-defined, end-to-end 5G SA network.



5G SA pioneers have leveraged Cisco solutions to accelerate their 5G deployments. These pioneers did not just choose new technology approaches, but also adopted a different mindset with regards to the 5G network that is inspired by cloud-service paradigms. The 5G network is considered a service providing mobile connectivity that can be accessed via well-defined APIs. Once one adopts this mindset, it becomes clear that end-to-end orchestration

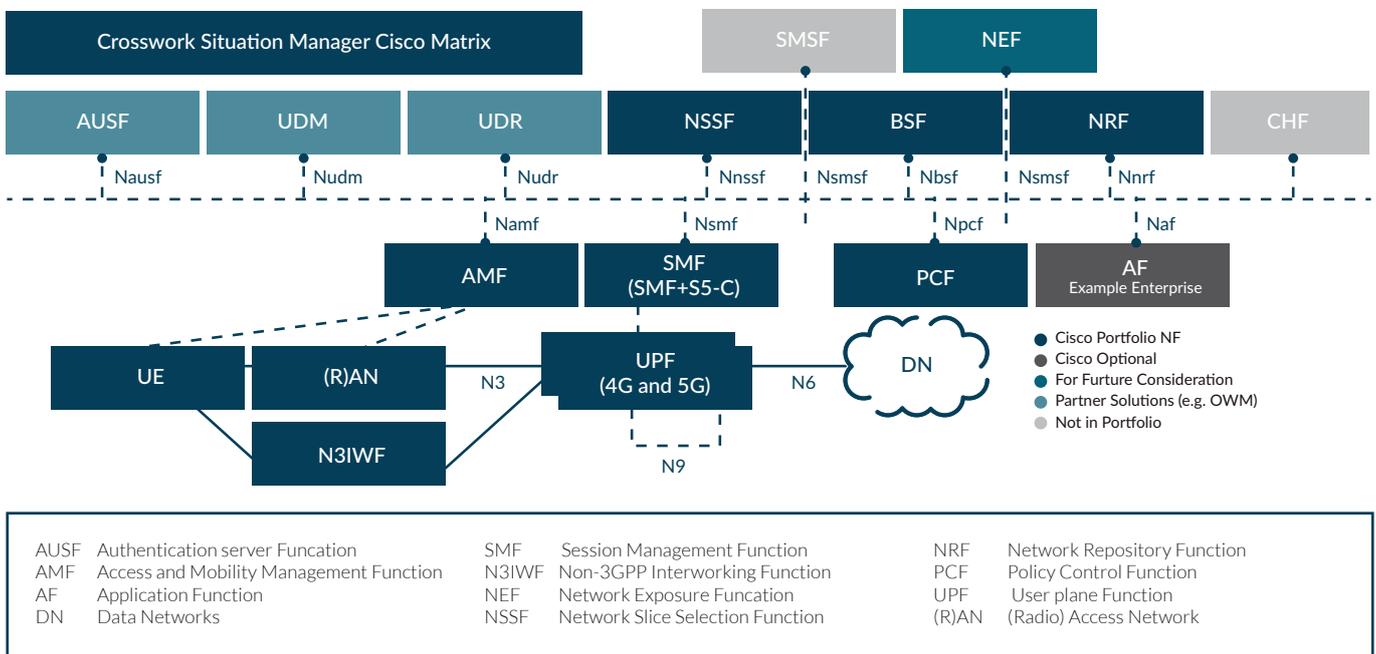
is necessary in order to provide 5G services based on virtualized network slices as a service through APIs. Cisco’s Telco Cloud Platform is designed with this mindset.

The Cisco Network Services Orchestrator (NSO) provides end-to-end NFV and SDN management and orchestration (MANO) across multiple network domains. It enables service providers to design and deliver services faster as well automate management of service

lifecycles. NSO uses intent-based networking based on YANG models to support validation, implementation and abstraction of network configuration and services.

Cisco provides a broad portfolio of physical equipment for RAN, transport and data centers, but also provides feature-rich virtual equivalents including a comprehensive portfolio of 5G Virtual Network Functions (VNFs), particularly for 5G SA:

### 5G Core Network Functions



These VNFs are managed by the Cisco Elastic Services Controller (ESC), which manages all aspects of the VNF lifecycle. Based on input from the Cisco NSO, Cisco ESC automatically instantiates required VNFs across the entire network and takes responsibility for monitoring and elastically scaling the VNFs as required.

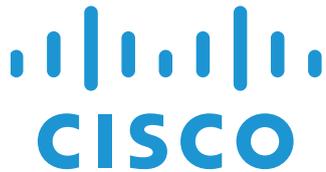
The VNFs can be instantiated in the physical locations that best meet bandwidth capacity, latency and

other network slice service requirements. For example, virtual RAN Centralized Unit (CU) VNFs can be instantiated in pre-aggregation central offices (COs) close to the consumers to reduce latency or be centrally located at aggregation central offices (COs). They can also be instantiated even closer to the consumer as cloudlets<sup>10</sup>. CO and data center infrastructure can be based on Cisco UCS servers.

The backhaul transport network supporting RAN backhaul to the 5G core is based on Cisco IOS-XR and Cisco IOS-XE IPv6 routers using a single control plane with traffic engineering based on segment routing. This allows consolidation of service-chaining in a seamless transport network from end-to-end supporting the establishment of 5G network slices.

**To learn more about Cisco and 5G please visit [www.cisco.com/go/mobile](http://www.cisco.com/go/mobile)**

<sup>10</sup>A cloudlet is a "mini-cloud" implementation comprising of a single high-performance server or small cluster of servers hosting VNFs as close to consumers as possible.



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