Voice over 5G: The enterprise opportunity for Communications Service Providers

How 5G for enterprises will change the game for CSPs

White paper

5G will be a game changer over the next ten years. Enterprises in every sector will undergo drastic changes with the arrival of 5G capabilities. Communications Service Providers (CSPs) will drive this disruption by helping enterprises to take advantage of innovative and exciting 5G services. Yet voice will continue to play a critical role in enterprise communications as a component within new service bundles enabled by 5G.

This fifth Nokia white paper on Voice over 5G (Vo5G) outlines the different approaches to voice for enterprise today and looks ahead to the arrival of 5G.

To regain enterprise business lost to IT and over-the-top (OTT) competitors, CSPs can offer cloud-based, customized virtual networks, managed private wireless 5G networks and many other types of service that leverage the new capabilities of 5G. With a converged cloud-native IP Multimedia Subsystem (IMS) solution, CSPs will be well placed to offer Vo5G services for enterprises.

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The enterprise opportunity for CSPs

5G will be a major disruptor in many industries for years to come. It will shape how individuals and connected objects communicate, as well as how enterprises operate. 5G will transform the networks from complex, rigid infrastructure into digital, automated and responsive tools that can adapt flexibly in line with each enterprise's requirements.

Moving to 5G will unlock a wealth of new services based on enhanced Mobile Broadband (eMBB), Augmented Reality (AR) and Virtual Reality (VR), massive IoT and Ultra-Reliable Low Latency Communications (URLLC). Whatever sector an enterprise inhabits, CSPs can design 5G services with the right performance characteristics to match each organization's priorities.

All this is possible because 5G allows CSPs to build networks to meet a wide range of different requirements using a modern cloud architecture.

5G combines Service Based Architecture (SBA) and cloud-native machines with open interfaces and network slicing. These key concepts come together to deliver the flexibility, granularity and scalability that allow CSPs to create highly customized virtual networks for individual enterprise needs. The open nature of 5G will also create new ecosystems and provide CSPs with robust sources of revenue once enterprises begin to adopt it at scale.

Voice will remain an important part of enterprise communications, complementing additional services that will emerge. When voice is included as one component among others that define a wider 5G-based service offer, Vo5G can allow CSPs to create compelling enterprise offers that replace legacy DECT and IP PBXs and link with other services in a single, cost-efficient communications package.

Vo5G presents an opportunity for CSPs that have lost much of the enterprise market as organizations increasingly opted for alternative voice solutions such as IP-PBXs or unified communications (UC) systems (either managed in-house or purchased from third party cloud providers). The emergence of 5G means CSPs can win back some of this business by offering new value as a provider of 5G services – with voice as a component of these broader offers.

The state of enterprise communications

Today's PBX and UC-based voice solutions

Most of today's enterprises use communication solutions based around a private branch exchange (PBX) voice system, which is usually supplemented by a unified communications (UC) suite.

A PBX creates a private telephony network within the enterprise, allowing employees to make free calls internally and communicate externally using channels such as Voice over IP and ISDN/TDM. It also provides features such as call transfer, voicemail, call recording, interactive voice menus (IVRs) and call queuing for contact centers.

A UC suite complements PBX/telephony features with additional capabilities for enhanced productivity. The UC integrates real time communication (messaging, voice, video) and asynchronous communication (email, fax) in a single interface, so the user has access to all the tools in one place, and increasingly on any device.

Telephony for both these systems can be provided on the premises, hosted by a VoIP vendor, or by a CSP hosting PBX/UC software logic in its network.

The shape of the market

Analysts often group PBX voice and UC features together under the UC banner when considering the market for enterprise communications, so we will do the same in this paper.

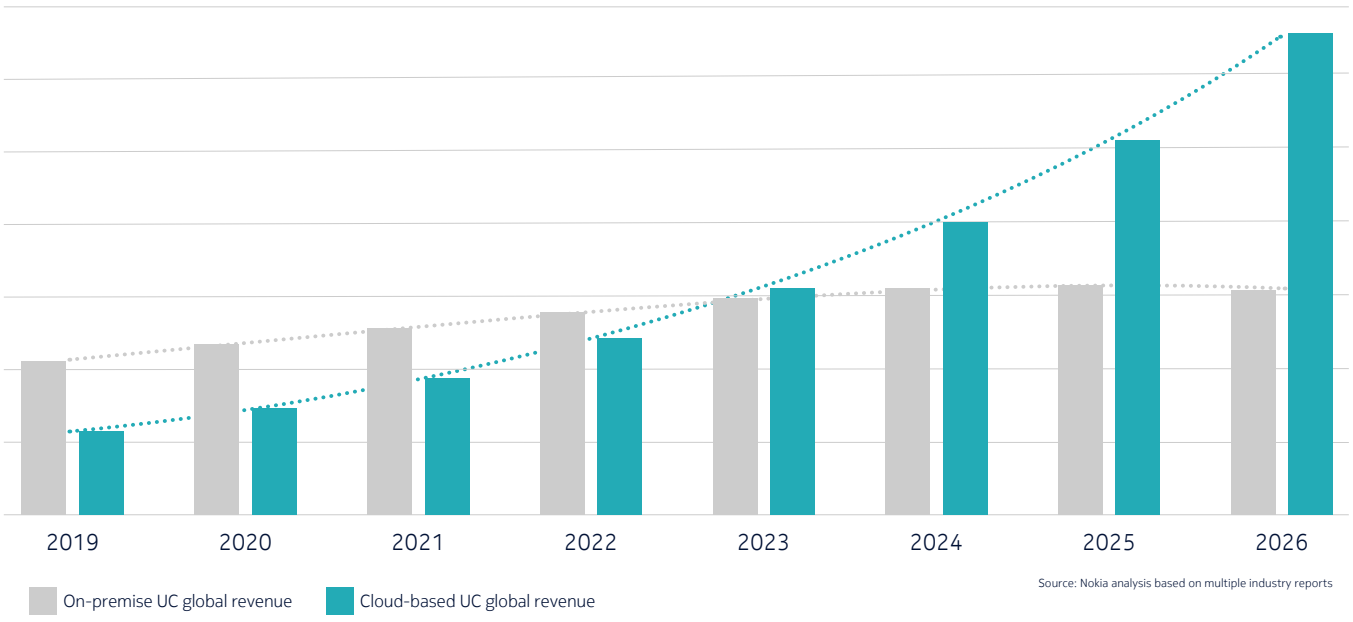
According to Grand View Research[1], the global UC market will reach $167.1 billion by 2025, based on a forecast 16.8% CAGR since 2018.

Grand View further notes that on-premise UC systems dominated the industry in 2018, but that cloud-based methods accounted for a revenue share of 45% in that year[2]. The analyst noted that this proportion is growing as demand for on-premise solutions reduces in favor of decreased costs, improved efficiency, and increased productivity offered by cloud-based UC.

Gartner says larger businesses (those with more than 1,000 employees) have traditionally preferred to maintain communications systems on premise for security, integration and customization benefits. Even so, Gartner still concludes that the shift to cloud-based unified communications is accelerating.

In its Unified Communications & Collaboration (UCC) Market Report 2020-2026 (Jan 2020), Global Market[3] also agrees that cloud-based solutions are growing. In its view, the cloud deployment model represented a market share of more than 25% in 2019 and is expected to register a growth rate of nearly 10% through 2026.

Figure 1. The Unified Communications & Collaboration market is shifting towards cloud deployment



1 https://www.grandviewresearch.com/industry-analysis/unified-communication-market
2 https://www.grandviewresearch.com/industry-analysis/unified-communication-marke
3 https://www.gminsights.com/industry-analysis/unified-communications-market-report

Although analysts may vary in their estimates of the exact market size, the trend is clear. The enterprise UC&C market is rapidly shifting away from on-premise solutions and toward a cloud-based hosted model as depicted in Figure 1. Enterprises will be looking for the right cloud-based communication provider to address their needs.

CSPs have a golden opportunity to reestablish themselves with their enterprise customers by taking advantage of this rapidly growing cloud-based unified communications as a service (UCaaS) market. They are well placed with existing infrastructure, expert in deploying and delivering networks, and have access to new 5G capabilities. As trusted providers of network services, they can offer advantages such as network reliability and available radio spectrum that many competitors cannot.

Who is leading the UcaaS market today?

Gartner's annual Magic Quadrant[4] shows that specialized vendors such as RingCentral, 8x8, Fuze, Dialpad and Microsoft are all showing leadership and vision in UC. In contrast, important CSPs selling UC to enterprises, such as BT, Orange, Verizon and AT&T were previously a regular part of this list but were dropped from the top tier in 2019, mainly because they are seen as insufficiently agile when addressing smaller companies at large scale.

Nokia believes the combination of a general shift toward cloud-based communication solutions coupled with new service capabilities offered by 5G technology could return CSPs as serious challengers to IT solution and VoIP vendors in the enterprise market.

How 5G changes everything

Voice: one among limitless 5G use cases for enterprises

Voice (and more recently video calls) has long been the mainstay of enterprise communications, regardless of the delivery mechanism. Voice is the original killer app and typically forms the base on which other subscriber features and real-time capabilities are layered.

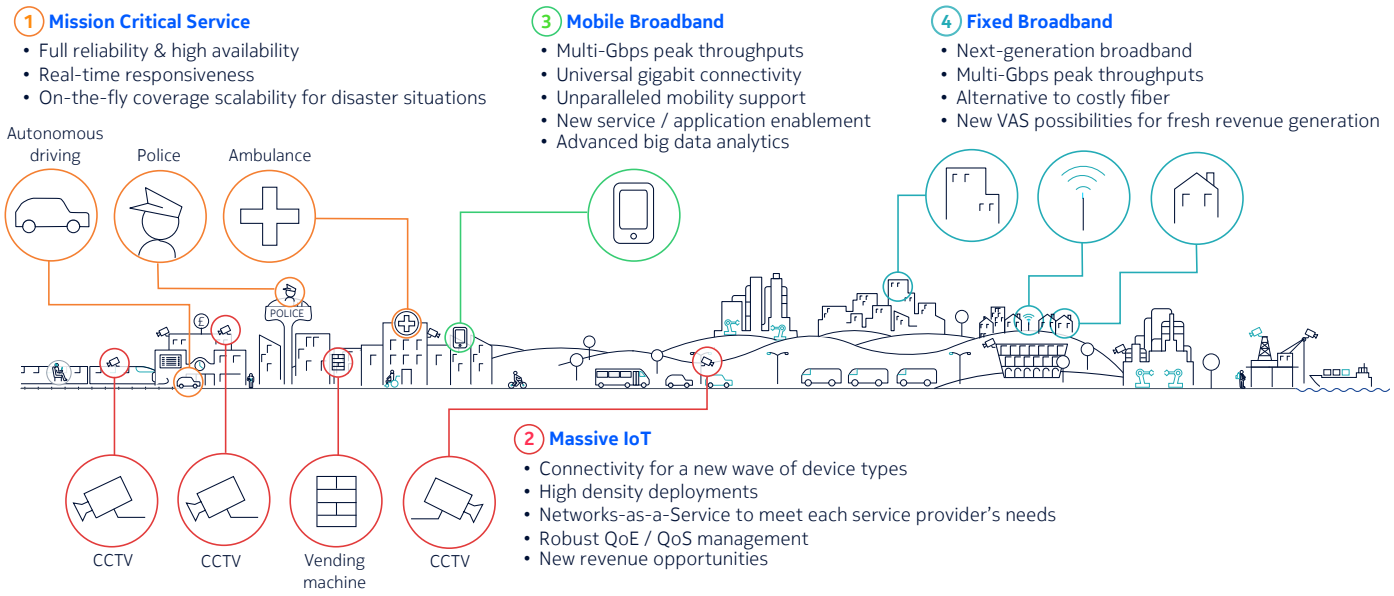
The introduction of 5G changes this service hierarchy. Unlike previous generational shifts, 5G isn't simply a new radio technology. Instead it includes a complete redesign of the core network to offer new network behaviors and capabilities. These include very low latency (of the order of 1ms end to end), drastically increased Internet of Things (IoT) connectivity, and ultra-high bandwidth for mobile subscribers (of the order of 1 Gbps).

5G supports anything-to-anything communication that, coupled with technology advances, enables a wide variety of new services. With these services, voice becomes a feature embedded into some service offerings. But voice alone will no longer provide the primary value of the service.

Consider, for example, AI assistant services such as Alexa and Siri. These applications provide internet-connected assistance services, using voice for the human-machine interface. Although voice is a critical component, it is not the focus of the application. Similarly, emerging 5G services will address larger use cases, and often include voice as a necessary, but minor component.

4 Magic Quadrant for Unified Communications 2019

Figure 2. The Key 5G use cases families, CSPs' business opportunities with 5G



This fundamentally changes the nature of voice in CSP service offers . These new 5G services will not need voice subscriber features such as call waiting or voice mail. What they will require is a simple, common voice service that can be easily embedded into a more comprehensive application. The infrastructure providing this voice component needs to be highly reliable, generic and access agnostic.

CSPs today have access to such capabilities in the form of the 3GPP IMS deployments that are already part of their 4G networks via VoLTE and VoWiFi. As 5G is deployed, they can re-use IMS to provide the Vo5G component for these services.

Vo5G for enterprises: different alternatives with operational benefits

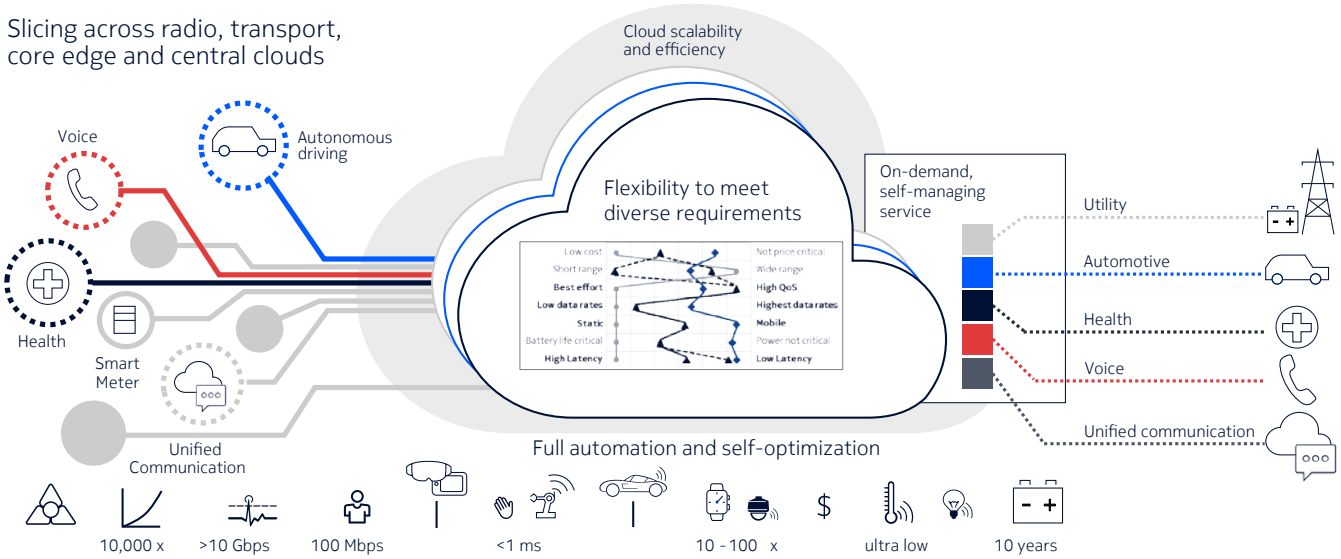
There are several paths for enterprises moving from PBX and UC systems. What makes the most sense for each enterprise depends greatly on the industry it serves and how it operates.

Most enterprises could take advantage of 5G applications by subscribing to a CSP offer that delivers the services they need. Examples include:

- A Fixed Wireless Access subscription that provides high bandwidth internet connectivity that can include a voice capability over that bandwidth in the form of a hosted service.
- A manufacturing enterprise may want a hosted IoT service to operate its factory floor.
- A package delivery enterprise may need to operate drones for delivery, hosting the drone control and intelligence in edge clouds owned by the CSP. The drone can save valuable weight by not carrying computer hardware, instead carrying only the radio receiver and control servos, with the drone's guidance and intelligence system hosted in the cloud – as long as the latency is very low and reliability of the connection very high between the drone and the cloud application – both of which are key capabilities of 5G.
- A taxi service may rely on 5G's mobile bandwidth for video and audio transmissions, recorded at a centralized host location for safety.

In all these cases, the enterprise could purchase those specific network services from the CSP, and consider adding a hosted unified communications offer from the CSP as well. Of course, the UC&C suite will likely have different Service Level Agreement (SLA) terms, but the CSP can use the concept of network slicing to create multiple virtual networks focused on their respective SLAs.

Figure 3. How CSPs can leverage Voice and UC suite to enterprises



*5G Novel Radio Multiservice adaptive network Architecture

For some enterprises such as mining companies, a private wireless network owned by the enterprise can make sense, using privately allocated 4G or 5G spectrum. In this case the enterprise can either implement and manage its own wireless core network, or it can rely on a CSP to provide and/or manage the network. The enterprise benefits from the same highly reliable and secure network communications, but with a high degree of operational control.

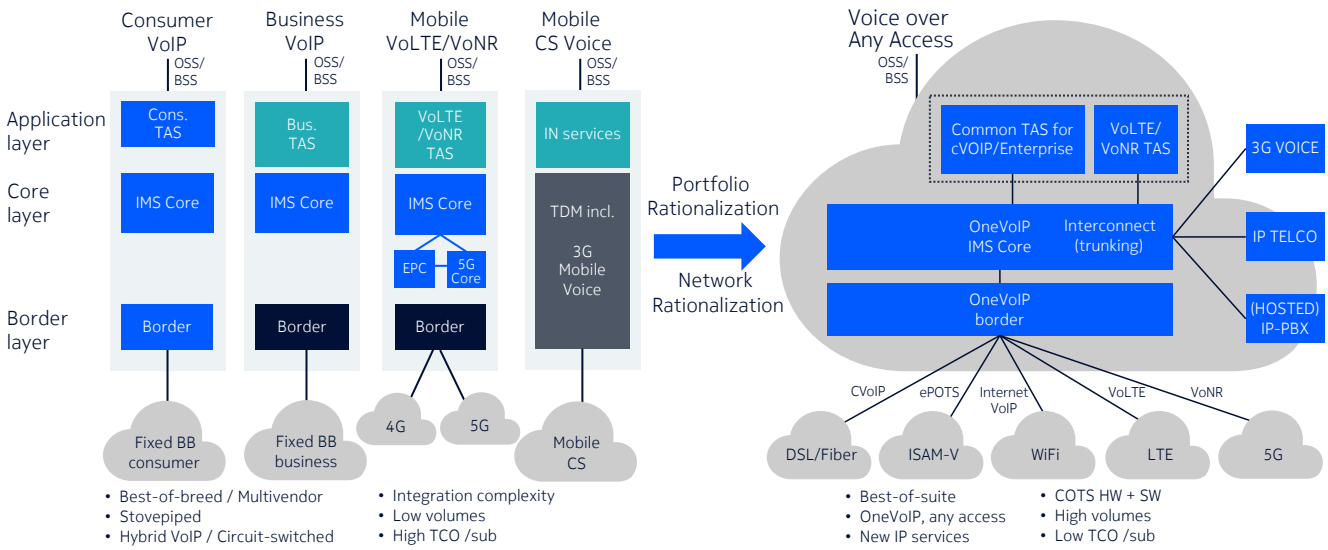
Each approach depends on nature of the enterprise's business and how important it views the benefits of customization and direct control, as well as the business case for its communication and wireless networking needs.

MS convergence:
Paving the way for enterprise business

CSPs typically run networks that overlap in function, resulting in operational inefficiencies. These came about as CSPs introduced new networks as technology evolved, or as they entered new markets. In the short term, establishing an overlay network allowed the CSP to quickly meet a market need, but each new overlay added complexity and operational cost. This accumulation of overlays is a major obstacle to business agility and limits the CSP's ability to create offers for enterprises.

With 5G, convergence becomes critically important. Voice and data connectivity are no longer compelling standalone offers that drive maximum Average Revenue Per User (ARPU). The new capabilities of 5G further dilute the value of simple voice and data, so using multiple networks dedicated to providing them in different contexts makes little sense. In a 5G world, voice must become a feature of a service package, efficiently delivered from a single, converged network asset which is IMS on cloud.

Figure 4. Simplifying and rationalizing voice around a convergent cloud IMS, an important step for CSPs to prepare 5G



What is convergence?

Convergence combines databases, Operations Support Systems (OSS) and Business Support Systems (BSS) in a single network for all types of service (voice and data) and all types of customer (enterprise and consumer). Economic benefits of convergence include reducing OPEX/CAPEX and the total cost of network ownership (TCO). Savings are made by eliminating the costs of maintaining multiple networks and large swathes of specialized or 'per vendor' hardware expertise. Achieving convergence is a challenge since it requires re-designing the network, but it paves the way for huge opportunities from 5G services, including Vo5G for enterprise customers and consumers.

The role of IMS and Vo5G in network convergence

IMS was originally designed as the subsystem that delivered IP multimedia services within 3G mobile networks, including voice and video calling. It was then extended to fixed networks, allowing convergence of fixed and mobile accesses. When 4G was introduced, IMS was further enhanced to supply voice and video services in a completely access agnostic fashion . In 5G, IMS has been chosen as the common core network for voice and video communications over 5G, regardless of whether delivery is over LTE or over New Radio (NR).

The importance of convergence is amplified by 5G network slicing and 5G packages for vertical enterprises, as well as new 5G services enabled by low latency, high burst mobile bandwidth and massive machine connectivity. Voice may only play a small role in these offers, making it uneconomic to overlay voice networks. The 5G voice core must be flexible, simple and available for every service – in other words, fully converged.

Furthermore, 5G architecture is designed around cloud-native principles, such as containerized network functions (CNFs), software decomposition and control / user plane separation (CUPS). Existing IMS deployments based on discrete physical components can provide the voice and video services for 5G but will be limited in capability. For maximum service agility, the IMS solution for 5G voice and video communications must also be cloud native, allowing the CSP to rapidly scale up or down the voice components of its network based on business needs, and incorporate voice into services in a variety of flexible ways.

Enterprise end user trends towards convergence

Previously, enterprise users typically relied on a single, dedicated voice communications device on their desk – a business phone. This behavior has evolved to a variety of enterprise services, including voice, consumed over multiple devices, anytime and anywhere, with a common user interface.

Looking ahead over the next five years, enterprise users will switch to 5G-capable devices and connect with a ballooning number of IoT-capable objects. Their environment will become increasingly intuitive and smart, with the growing use of wearables and connected displays, for example. Against this backdrop, voice will not be the revenue-driving ‘killer app’ it once was, but it will still be a critical, must-have part of enterprise services, both as a service in itself and as a component within other, data-based applications.

It is therefore critical that CSPs embrace convergence at scale in their Core network, OSS/BSS systems and databases, so they can create 5G service offers attractive to enterprises. The voice component must be efficient, universal and easy to integrate into the larger 5G service offers.

Answering CSP challenges

As the focus changes to cohesive 5G-based service offers, voice will become a small part of the CSP service bundle to generate more enterprise business and income. 5G makes bundling voice with other services for enterprises crucial, as enterprises buy into the promise of URLLx, eMBB or other new use cases.

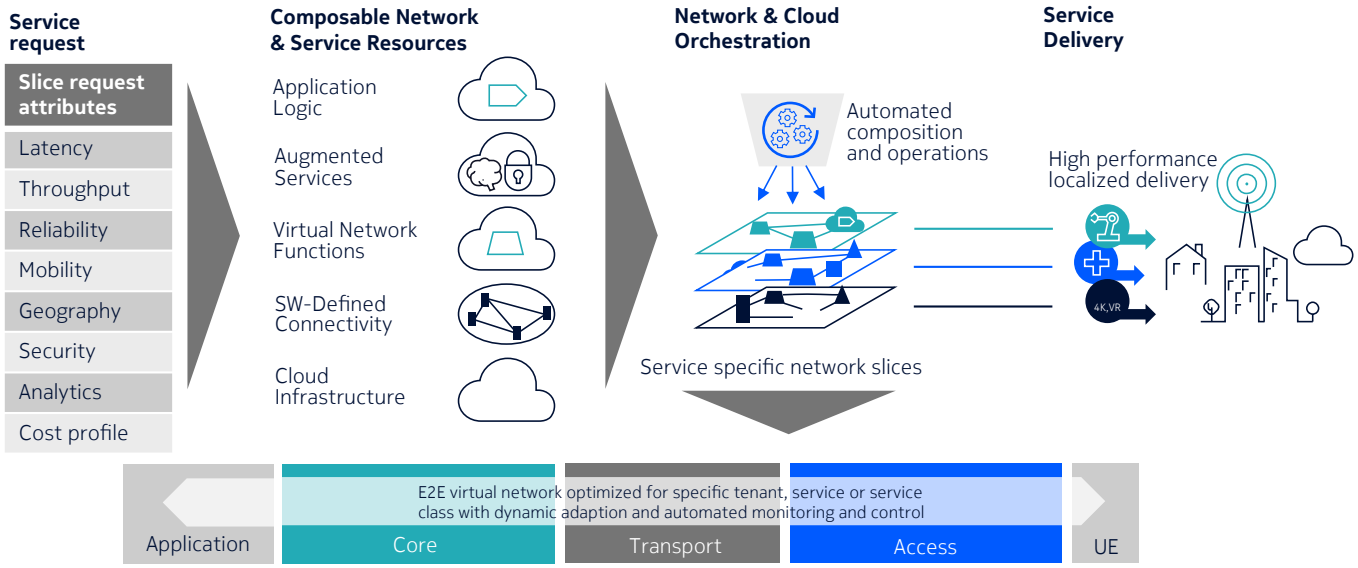
Delivering Vo5G to all users from a single, convergent location is most effectively achieved with a cloud-native IMS solution. This means convergence around a single voice core using a cloud-native IMS is extremely important to CSPs as they prepare for 5G.

Once they have a convergent cloud-native IMS core in place, CSPs can use it to offer voice services not only for their own fixed and mobile voice/data communication services, but also for every network slice and 5G service bundle they create for their enterprise customers.

Network slicing enables CSPs to offer customized enterprise networks

Network slicing dedicates a portion of the network – from radio, to core, to operations – to a virtual sub-network that serves a specific purpose with a given SLA. This virtual network acts as a dedicated resource to be used for a well-defined purpose. A network slice, for example, could be created for a package delivery enterprise, with latency, reliability and bandwidth requirements optimized to control many drones over a given area.

Figure 5. Network slicing comprising logical, dynamic, automated, monitored and controlled networks within the cloud



In this way, CSPs could offer customized network slices to enterprises across vertical industries, with SLAs customized to suit each organization. This creates a new way for enterprises to outsource a 5G network to the CSP, avoiding capital expenditure and yet using highly customized network implementations.

This creates an enormous set of new opportunities for the CSP. The technology to deploy 5G is complex, but the CSP can become the network technology expert partner for enterprises and mitigate some of the complexity with large scale automation and AI. The CSP provides the necessary network slices tuned to specific SLA requirements for each client. The enterprises benefit from dedicated network capabilities customized for their needs. Voice connectivity is provided when and where needed as a part of these offers.

Private wireless networks

Many enterprises will create their own private wireless solution rather than rely on CSP hosted services. Generally, an enterprise may choose to lease a network slice from a CSP which guarantees the SLA of the enterprise assets across a WAN area. But those enterprises that need a dedicated wireless network for their operational needs will instead deploy a private wireless network.

Figure 6 shows various types of industry mapped to their relative need to use a private wireless network rather than a network slice provided by a CSP.

Figure 6. Mapping private wireless and public network slicing to vertical industries

Critical connectivity need category	Industrial sites, campuses	Connected sites, FAN, regional	Nationwide
	Airports Factories	**Smart cities**	
Transport and logistics	Ports / ships	Warehouses	Delivery trucks
Energy	Power gen, Sub-stations Oil & Gas, Mines	Grid, pipelines	Field repair staff and assets
Rail	Urban rail	Mainline rail	
Public sector	GDBI, rural	PS deployable	Public safety Defence

There are two general approaches enterprises can take in a private wireless solution:

1) The enterprise deploys the solution in-house, as part of its IT infrastructure. The enterprise usually sources equipment, software and services from many vendors to create a solution tailored to its needs. Here, the CSP typically only provides public network access, much as today.
2) Alternatively, the enterprise may outsource some or all the private wireless network to a CSP which will manage the solution. It will still be located on premises, however.

It is this second, managed network opportunity that CSPs can pursue to gain additional enterprise customer business – especially when the enterprise has connected sites or a distributed, nationwide physical footprint. In these cases, the wide area nature of the CSP provides a significant value to the enterprise.

In some countries and/or regions, CSPs may have sole ownership of the radio spectrum the enterprise wishes to use – whether 4G or 5G. In these cases, the CSP has a strong differentiator in offering a managed network to the enterprise.

In all these cases, voice and video communication services can be added into the managed private network offer to the enterprise as an additional feature that helps reduce the enterprise's overall cost structure with a bundled (and predictable) communications solution. This may be by deploying IMS Virtual Network Functions (VNFs) in the private wireless network core, or by extending the CSP's IMS-based voice capabilities across the private wireless network.

Conclusion

A big chunk of the 5G opportunity for CSPs lies in enterprise services. Voice is no longer the revenue driver it once was and 5G will relegate it still further to one service among many as new and exciting possibilities emerge in data-driven applications. Even so, voice remains an essential component for enterprise offers.

The 5G-related window of opportunity provides CSPs with the chance to challenge non-CSPs and OTT/VoIP vendors, and win back a share of the cloud-based enterprise communications market. But it also presents CSPs with the mandate to rationalize their networks and realize operational savings to reduce their total cost of network ownership.

The key will be to provide voice services as part of their 5G settlements for enterprises, where it can operate within a network slice that fulfils the enterprise voice SLA. Voice services may be included as part of a 5G network slice with custom SLAs or may be part of a private wireless network solution managed by the CSP. In addition, CSPs need to look for opportunities to provide essential management services for private wireless networks where it makes more sense for the enterprise as compared to a network slice approach.

A challenge remains for most CSPs. IMS convergence is itself a critical transformation that CSPs must undergo to pave the way for enterprise business. This requires deployment of a cloud-native version of IMS if the existing IMS implementation is based on dedicated physical servers, or deploying VoLTE using this technology if the CSP has not yet done so. Cloud-native IMS is an essential component to achieve the full potential of Vo5G.

Abbreviations

3GPP	3rd Generation Partnership Project
4G	4th Generation [mobile radio]
5G	5th Generation [mobile radio]
5G Core	5G Core
AI	Artificial Intelligence
AR	Augmented Reality
ARPU	Average Revenue Per User
BSS	Business Support System
CAGR	Compound Annual Growth Rate
CAPEX	Capital Expenditure
CNF	Containerized Network Function
COTS	Commercial off-the-Shelf
CS	Circuit Switched
CSP	Communications Service Provider
CUPS	Control / User Plane Separation
DECT	Digital Enhanced Cordless Telecommunications
DSL	Digital Subscriber Line
eMBB	enhanced Mobile Broadband
EPC	Evolved Packet Core [4G]
IMS	IP Multimedia Subsystem
IoT	Internet of Things
IP	Internet Protocol
ISAM	Integrated Services Access Manager
ISDN	Integrated Services Digital Network
IT	Information Technology
IVR	Interactive Voice Menu
LTE	Long Term Evolution
mIoT	massive Internet of Things
NR	New Radio
NSA	Non-Standalone
OPEX	Operating Expense
OSS	Operations Support System
OTT	Over the Top
PBX	Private Branch Exchange
QoE	Quality of Experience
QoS	Quality of Service
SA	Standalone
SBA	Service Based Architecture
SBC	Session Border Controller
SIP	Session Initiation Protocol
SLA	Service Level Agreement
TAS	Telephony Application Server
TCO	Total Cost of Ownership
TDM	Time Division Multiplexing
UC	Unified Communications
UCC	Unified Communications and Collaboration
UCaaS	Unified Communication as a Service
URLLC	Ultra-Reliable Low Latency Communications
VAS	Value Added Services
VNF	Virtual Network Function
Vo5G	Voice over 5th Generation [mobile radio]
VoIP	Voice over Internet Protocol
VoLTE	Voice over LTE
VoNR	Voice over New Radio
VoWiFi	Voice over WiFi
VR	Virtual Reality
WAN	Wide Area Network
WiFi	Wireless Fidelity

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