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VIEWPOINT

THE INEVITABLE SHIFT TO STANDALONE 5G CORE NETWORKS

By 2030, 5G is expected to add $1.3 trillion to the global GDP, and a standalone 5G core network infrastructure is the way to realize that economic potential. It is imperative for telcos to build their standalone 5G core networks — with infrastructure and talent — to tap into the multitude of low-latency industrial monetization opportunities.

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5G is scaling faster than any of the previous generations of mobile networks — it is expected to surpass one billion subscriptions worldwide by the end of 2022. According to Ericsson, global 5G subscriptions are expected to reach 4.4 billion by 2027, accounting for a 48% share of all mobile connections.

However, mobile applications that simply demand higher data transfer speeds do not reflect 5G's true potential. The real economic power of 5G lies in industrial automation, internet of things (IoT) use cases, multiplayer augmented reality gaming, remote healthcare delivery, and other such applications that require extremely low-latency communications.

> CSPs should shift to a standalone 5G core network built on a cloud-native service-based architecture equipped with network functions virtualization, network slicing, and edge computing capabilities.

These applications can't be delivered via the non-standalone (NSA) network that most communication service providers (CSPs) have created using existing 4G infrastructure and 5G new radio (antenna). CSPs need to move to a standalone (SA) 5G core (5GC) network, that's built on a cloud-native service-based architecture (SBA) and is equipped with network functions virtualization (NFV), network slicing, and edge computing capabilities, to enable those low-latency applications.

> 22% of the world's telecom operators are currently investing in building standalone 5G core networks, including the talent and skills required for it.

Currently, about 22% of the telecom operators worldwide are investing in public SA 5GC networks — in trials and planned or actual deployments. In addition, several companies are also testing, piloting, or deploying SA 5GC technologies for private networks. As economic benefits (particularly via industrial applications) start to appear for the early movers, more companies are expected to invest in SA core to cope up. And these investments wouldn't just be into the infrastructure, but also the new skills and talent needed to build and maintain the SA 5G core networks.

SA 5GC is imperative to extract the true potential of 5G

The NSA 5G design uses the existing 4G infrastructure with 5G antennas, which increases data transfer speed but does not reduce the latency in the network which is key to enabling the real 5G use cases including autonomous cars, remote surgeries, and massive IoT networks. Moreover, the NSA architecture only allows for uniform service levels, while the SA 5GC enables network slicing, which allows CSPs to create customized network conditions as desired for various applications and users — opening up multiple monetization models. The SA 5GC also helps simplify architectures, improve security, and reduce network maintenance costs.

The previous generations of networks were highly centralized with the entire suite of network management services delivered primarily by a single provider. However, with the advent of data services and the need to scale rapidly, the core networks are increasingly virtualized and moving to the cloud-native architecture. This, in turn, is driving the shift to decentralization of networks, creating space for numerous individual service providers with specific, value-adding capabilities. These include distributed cloud storage services (prevents data loss, and allows load sharing and easier storage expansion), microservice decoupling (service modules are independently deployed or with other modules with flexibility), and containerization (modules that make an application are hosted in virtualized containers).

The SA 5GC has a service-based architecture (SBA), which means that it is future-proof in terms of supporting a wide range of services that probably aren't even conceptualized yet. In this architecture, network function services (NFSs) such as calling, routing, and signaling are decoupled from one another but integrated through software applications. This allows for customization of each module through new microservices, better scalability through application programming interfaces (APIs) that can be introduced flexibly, and easy upgrading of NFSs owing to independent deployment and testing of microservices.

> The SA 5GC has a service-based architecture capable of supporting services that aren't even conceptualized yet.

As briefly mentioned earlier, a key feature of SA 5GC is that it enables multiple network slices per device (as against one slice per device with NSA), which allows for varying levels of service depending on the use case for optimum use of network resources. For instance, AR services require an ultra-high data transfer speed of 1,600 Mbit/s and autonomous driving requires millisecond-level end-to-end (E2E) low latency and reliability of 99.999% or higher. Network slicing enables CSPs to slice a network into multiple virtual E2E networks on the same hardware infrastructure to flexibly combine capabilities and allocate resources as needed.

Lastly, the SA 5GC networks are primarily software-based and feature heavy levels of automation. The telecom industry's digital value chain will be premised on the 'continuous integration' and 'continuous deployment' (CI CD) concepts that ensure automated development, delivery, and deployment of software for ongoing operations and maintenance. The transformation of operations support systems (OSS) and business support systems (BSS) is also key to the development of SA 5GC. These systems need to be open and flexible to support applications that are virtualized and run as containerized microservices so that they can be scaled rapidly.

Featuring the aforementioned capabilities, the SA 5GC can deliver effectively on the key potential applications of 5G:

- **Enhanced mobile broadband (eMBB):** Extremely fast streaming and browsing experiences on handheld as well as immersive AR/VR devices.
- **Ultra-reliable low latency communications (URLLC):** Lag-free communications for applications such as autonomous cars and remote surgeries.
- **Massive machine type communications (mMTC):** Connectivity solutions for a large number of sensors and devices across buildings and production facilities.

Leading players are investing heavily on SA 5GC

According to a pre-pandemic estimate by GSMA, global mobile operators were collectively expected to invest $1.1 trillion in capital expenditure (capex) between 2020 and 2025 — over 75% of which would be attributed to 5G.

CSPs across the world have moved towards the cloud-native SA 5GC to gain first movers' advantages. In August 2020, T-Mobile US launched one of the world's first commercial SA 5GC networks, working in collaboration with Cisco, Nokia, Ericsson, MediaTek, OnePlus, and Qualcomm. In October 2022, Verizon also moved its commercial traffic on to its SA 5GC based on the Verizon Cloud Platform (VCP), which is cloud-native and supports NFV, private cloud services, and edge and compute services. It also enables Verizon to automatically and dynamically allocate network resources appropriately (viz. network slicing). Several other CSPs including Reliance Jio, Telefonica, and Telstra are also making the move to SA 5GC, and others will have to follow suit in order to compete effectively.

These investments in SA 5GC will have to be recouped via meaningful monetizable services for consumers and enterprises. PwC estimates that by 2030, 5G applications in smart utilities management will add $330 billion to the global GDP. Similarly, 5G is expected to contribute $15 billion to the US economy just through industrial manufacturing applications.

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To compete effectively, shift to SA 5GC now

Early movers have already formed critical partnerships, demonstrated their capabilities, and have had more time to experiment and learn how to navigate the challenges SA 5GC brings forth. While it may have proven to be more expensive for them to be novel, the late movers might have to deal with the challenge of breaking through the trust and confidence established by older providers in the market. Therefore, the sooner operators make the shift, the better chances they will have of establishing that trust and confidence in their capabilities — especially with enterprise customers.

Infosys has worked with several telcos globally, assisting their transition to SA 5GC. This includes activities such as network design, planning, deployment, integration, testing, and root-cause analysis — in addition to OSS and BSS transformation expertise.

For instance, an Asian CSP appointed Infosys to support with its core network operations support, project execution activities, and network improvement initiatives. These tasks include deployment of 5G core network functions (such as access and mobility management function, and session management function), core network integration and testing, analyzing network traces and troubleshooting, network optimization and monitoring of KPIs, and device testing with Samsung and Apple.

Infosys also supported a North American telecom operator's 5G core network initiatives such as BSS integration, which involves 3GPP standards aligned solution design, integrations, go live strategy, and network optimization. Similarly, multiple other operators have sought Infosys' help with specific technical project management activities for its 5G core network, including the shift from 4G core virtualized network functions to containerized network functions (CNFs) for 5G.

> Infosys has been assisting several global telcos in transition to SA 5GC through network design, planning, deployment, integration, testing, and root-cause analysis.

The move to SA 5GC is inevitable. It is happening now, and the operators need to manage their budgets carefully, as the magnitude of spending is huge and the little efficiencies will make a big difference. Additionally, they need to manage talent requirements well. The skills required to build and use 5G networks to their maximum potential will need to be acquired as well as developed internally. Those that navigate the technical as well as the softer aspects of this transition well could benefit greatly by establishing a strong foundation for the upcoming decade of immersive experiences.

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