

VENDOR INTEROPERABILITY WITH SERVICE-BASED ARCHITECTURE

WHITE PAPER

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A Service-Based Architecture (SBA) allows Communication Service Providers (CSPs) to source the best independent vendors to support different network service types based on their expertise. This flexibility enables new business opportunities and avoids the lock-in of a single vendor's roadmap. A [2021 TM Forum study](#) shows:

“Many operators report spending about 80% of their IT budgets on integration and customization, which leaves only 20% for innovation. They are turning to Open APIs and open architectures to flip this ratio.”

It's time to replace longstanding and significant investments that resist change and openness. The traditional use of a single vendor for mobile network software drives inevitable high investments and costs for integration, maintenance, and licenses. Without change, CSPs, enterprises, and other industry players have no easy way out.

Many CSPs have used traditional telco architectures and built point-to-point integrations and connections for communication between network elements (NEs) and OSS/BSS systems. With little competition and proprietary software, CSPs were constrained to a single vendor, and it took several months or more to bring a new concept to market. To this day, CSPs are challenged with vendor lock-in, slow time-to-market, and high cost of innovation. CSPs find that the vendor's promise of minimum and seamless integration efforts doesn't materialize.

Service-Based Architectures with open APIs present a gilded opportunity for CSPs to monetize innovative 5G standalone (SA) services because open APIs allow easy communication between different network and system components without the need for costly and time-consuming integrations.

What does a Service-Based Architecture mean for CSPs?

Some of the best ways for CSPs to increase revenue require the ability to collaborate in a multi-vendor environment. Bringing new choices for customers requires building a more flexible ecosystem that can use partner products or services to help capture new markets. An SBA also allows CSPs to experiment more quickly and deliver new 5G services to enterprises and consumers in shorter launch cycles. These two significant areas bring the most cost-effective and revenue-producing benefits:

1. Build a multi-vendor ecosystem

- > A **multi-vendor environment** can allow CSPs to pick the best vendors. They can choose the best vendor to provide specific network functions (NF) for 5G SA, reduce integration costs, and build a resilient network. Together with multiple vendors, the collaboration stimulates innovation, opens new avenues for revenue generation, and truly accelerates the development of an open 5G ecosystem.

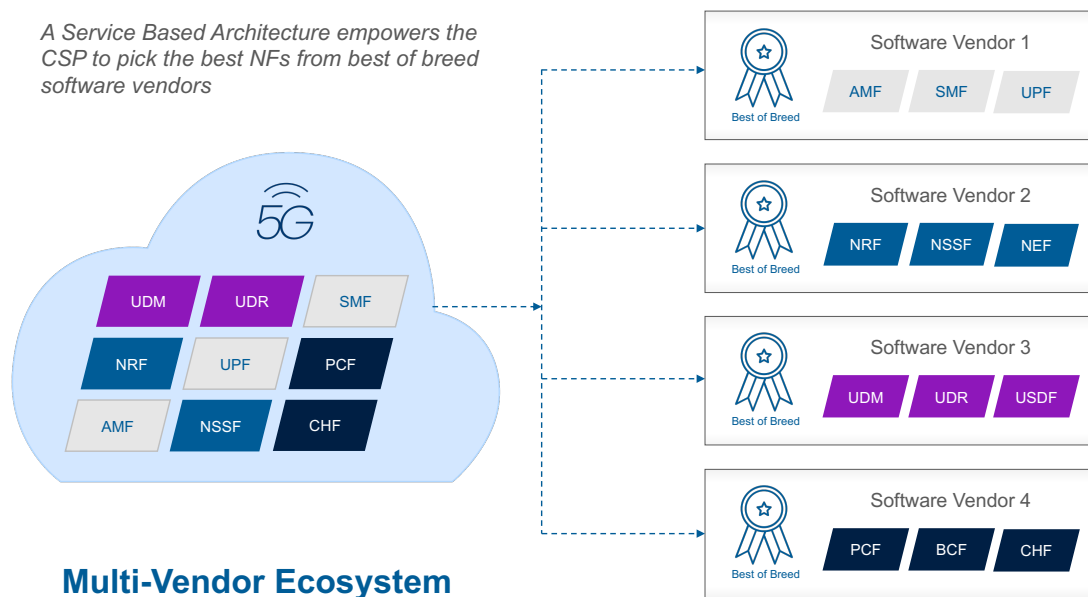


Figure 1: Multi-Vendor Ecosystem



Source the best-of-breed vendors: Leverage the opportunity to pick the best offering for NFs from different vendors, each focusing on a separate functional area.

- > For example, a CSP can choose an Access and Mobility Function (AMF), Session Management Function (SMF), and User Plane Function (UPF) from a software vendor that specializes in this area. Separately, they can pick a superior grade Unified Data Management (UDM) or Unified Data Repository (UDR) from another vendor. This way, the CSPs can discover more competent products and benefit from best-of-breed expertise.

Integrate faster: Common communication standards speed up and streamline NF integrations from different vendors. Without an SBA, an incumbent software vendor can take several months or longer to integrate with a new vendor.

Build a resilient network with vendor diversity: A highly available network is a priority for CSPs, and for 5G, it is even more important since it will be used for critical services. A multi-vendor 5G core provides the operational capability to adapt and react to changes. Having a single vendor own the most critical part of the network can actually be a risk.

Create new 5G SA services: Using an SBA and the best independent vendors for each service type brings unique expertise and flexibility to create new services. CSPs can deliver new features for NFs quickly instead of relying on a single vendor's roadmap. Vendors who provide a cloud-native solution with broader support for open APIs can integrate better and faster with third-party cloud applications steering the way for easy service creation.

Reduce costs: CSPs can leverage price competition when choosing the best partner and align to the CSPs' specific technology and business needs. Additionally, service-based NFs can be directly deployed on bare metal hardware, reducing costs by using non-proprietary COTS infrastructure.

Figure 2 shows a quick look at the reasons CSPs are adopting open APIs also cites “Reduce the cost of integration” as the top driver. (source: [TM Forum](#))

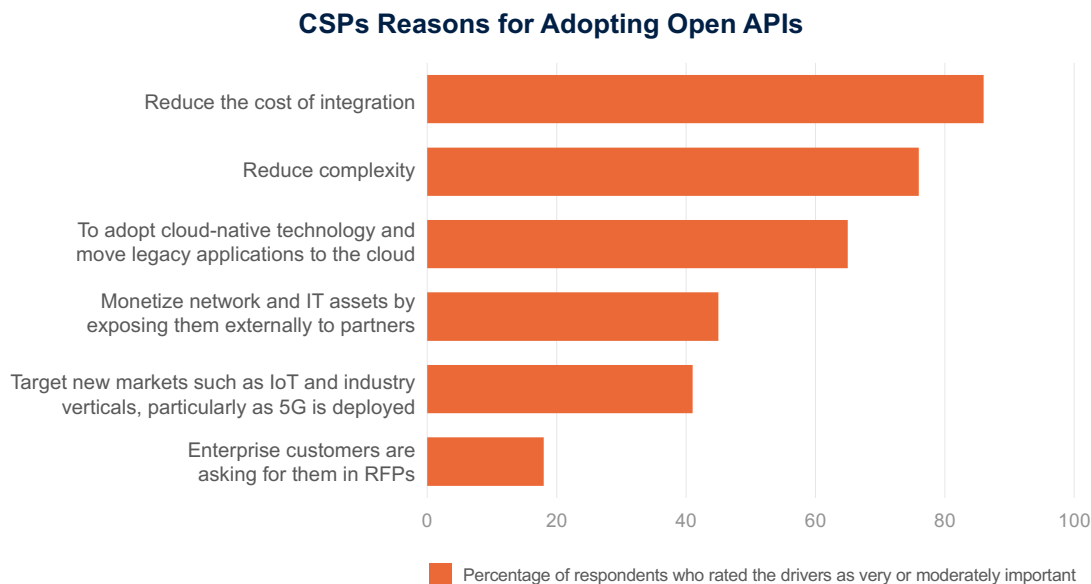


Figure 2: CSPs reasons for adopting open APIs

2. Capture new markets and shorten launch cycles

Open APIs: Enabling plug-and-play interoperability of components within IT systems and networks shortens development time. Using open interfaces greatly reduces the cost of integration and allows CSPs to expose network and IT capabilities to partners using platform-enabled business models. Not only can CSPs use partner products or services to capture new markets, but they can also more quickly experiment and deliver new 5G services to enterprises and consumers.

Collaboration: The 5G community is continuously building new technologies. Open cooperation provides CSPs the leverage to pursue differentiation and low cost for creating new business categories making the competition irrelevant.

New 5G business scenarios: The features of a 5G SA network eventually translate into network capabilities that can be exposed by the architecture as key enablers for 5G ecosystems. The partner environment can now use these new capabilities of programmability, reliability, scalability, and cost-effective resource consumption via standardized open APIs to define variable SLAs (using network slicing) for new business scenarios.

Step-by-step approach: Modular architectures can be refactored or replaced in smaller pieces over time as the business grows - instead of replacing or refactoring an entire application using a big-bang approach. This paves the way for futuristic networks and new markets.

How Service-Based Architecture addresses CSPs' challenges

3GPP has defined the 5G SA architecture as service-based utilizing cloud virtualization. All 5G network functions and procedures, including authentication and security, offer specific services by interfacing with a common framework to any NFs that are permitted to do so. The SBA represents a move towards a cloud implementation of the core network.

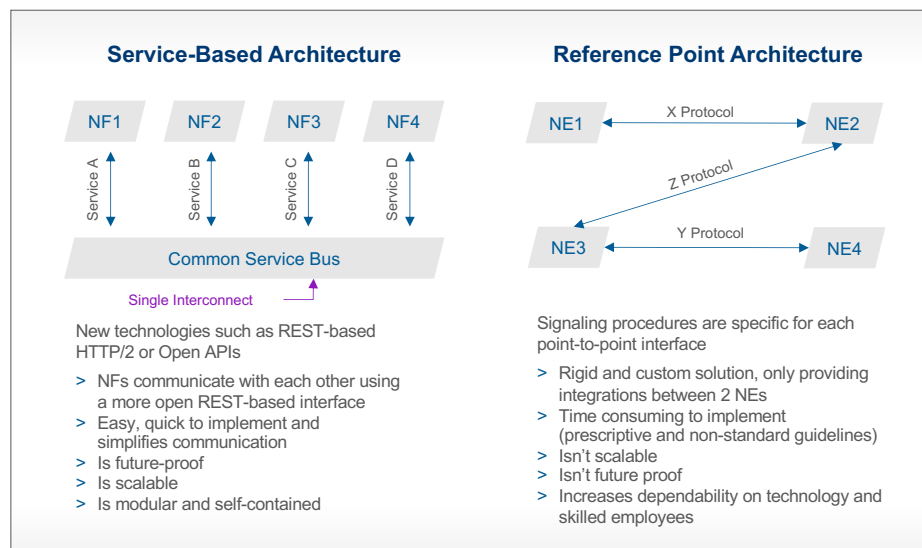


Figure 3

Unlike the Reference Point Architecture, in which the network elements use point-to-point interfaces to communicate with each other, a Service-Based Architecture replaces NEs with NFs. Figure 3 shows how legacy point-to-point interfaces are replaced by a common bus that acts as a single interconnect for all NFs. A point-to-point interface has specific signaling protocols that are restricted to the legacy telecom sector with prescribed guidelines for communication. However, service-based interfaces are standard, open, and lend themselves to more loosely coupled and modular applications.

Technical Benefits of a Service-Based Architecture

While the business benefits of an SBA outweigh the technical ones, the technical advancements simplify operations and interoperability, thus further facilitating the business benefits.

- An SBA is modular, with applications encapsulated into self-contained services that are individually designed, developed, tested, and deployed with little or no dependency on other components or services in the application. They are re-usable, allowing deployments to take advantage of the latest software technologies.
- An SBA enables vendor interoperability with the help of a Service Communication Proxy (SCP). SCP delivers the crucial function of synchronizing message parameters between NFs to ease multi-vendor integration.

- The NFs are de-coupled and self-contained. REST-based interfaces allow them to communicate with each other rather than traditional and specific telco protocols like Diameter, GPRS Tunnelling protocol (GTPv2), etc. NFs can be deployed as containers that run on non-proprietary infrastructure.
- SBA leverages widely adopted standard protocols such as HTTP/2 and its well-developed security mechanisms that facilitate seamless integration of third-party applications with the 5G core network. Open APIs allow exposure of network services that the partner ecosystem can deploy.
- With SBA, CSPs can build a telco-grade web-scale framework that enables open, modular, and services-based software that is scalable, resourceful, and handles rapid growth efficiently.

Vendor interoperability with Service Communication Proxy (SCP)

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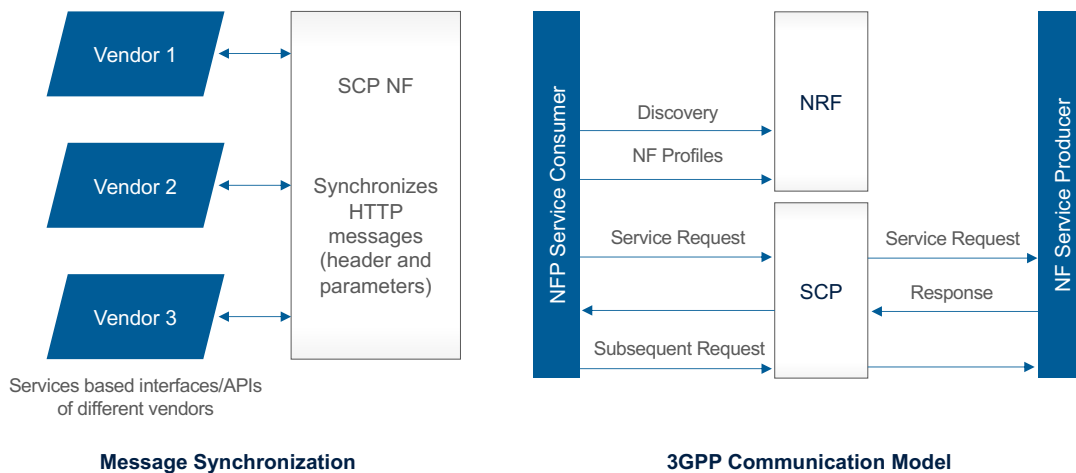


Figure 4

Figure 4 shows how SCP provides the end-to-end integrity protection of HTTP/2 messages between the communication path of an NF service consumer and an NF service producer. 3GPP defines SCP as an optional node in a 5GC network, but its benefits are indeed worth considering for CSPs.

- SCP, as an NF placed between an NF consumer service and an NF producer service, can solve interoperability issues
- It simplifies IP networking by making the NF aware of only the SCP
- It implements operator-specific load-balancing, congestion handling, failover using application-level parameters

- It uses message mediation to solve incompatibility in messages (applicable to NFs of different 3GPP releases too)
- An SBA empowered by SCP makes a multi-vendor environment easy and fast to implement

Before selecting a vendor, CSPs should consider long-term business objectives, growth, competition, and new revenue generation. Selecting a vendor that provides the SCP NF will enable the CSP to make vendor interoperability easier. This new ecosystem enriches a mobile network by bringing specific vendor expertise, more competitive NF features, diverse service types, and reduced costs.

Since SBA is service-driven, it enables new and diverse service types with different technical requirements. 5G provides the Service-Based Interfaces (SBI) for different NFs (for example, via SBI HTTP/2 Restful APIs). Besides varied service types, SBI provides demanding performance requirements efficiently. It is an enabler for short time-to-market and cloud-native web-scale technologies.

Conclusion

For many years, a great deal of financial and emotional investment has been made to resist change and openness. Mobile network technology was unrelated to web-scale technology. Change is needed.

- To fulfill the promise of 5G and future networks, the mobile network must evolve to be more open, programmable, and have a service-oriented architecture.
- Though SBA and cloud-native infrastructure help alleviate challenges such as integration costs, interoperability testing, vendor management, etc., CSPs need to identify the optimal number of vendors, each providing a cluster of related NFs.
- Previous generations of 2G, 3G, and 4G were mostly about connecting smartphones for human communication, but 5G has diverse use cases for healthcare, robotics, different IoT devices, cars, and different types of network traffic. So, a 5G network needs more flexibility and the ability to interoperate and integrate using various interfaces and standard communication methods.

This new ecosystem enriches a mobile network by bringing specific vendor expertise, more competitive NF features, diverse service types, and reduced costs. SBA brings the opportunity to enable a converged digital future by re-architecting mobile networks to become more open, cloud-native, and shift to a software paradigm that makes it easier to integrate, re-use, and re-configure networks.

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