TELCOMA
CERTIFICATIONS SINCE 2009

TELCOMA Global Whitepaper

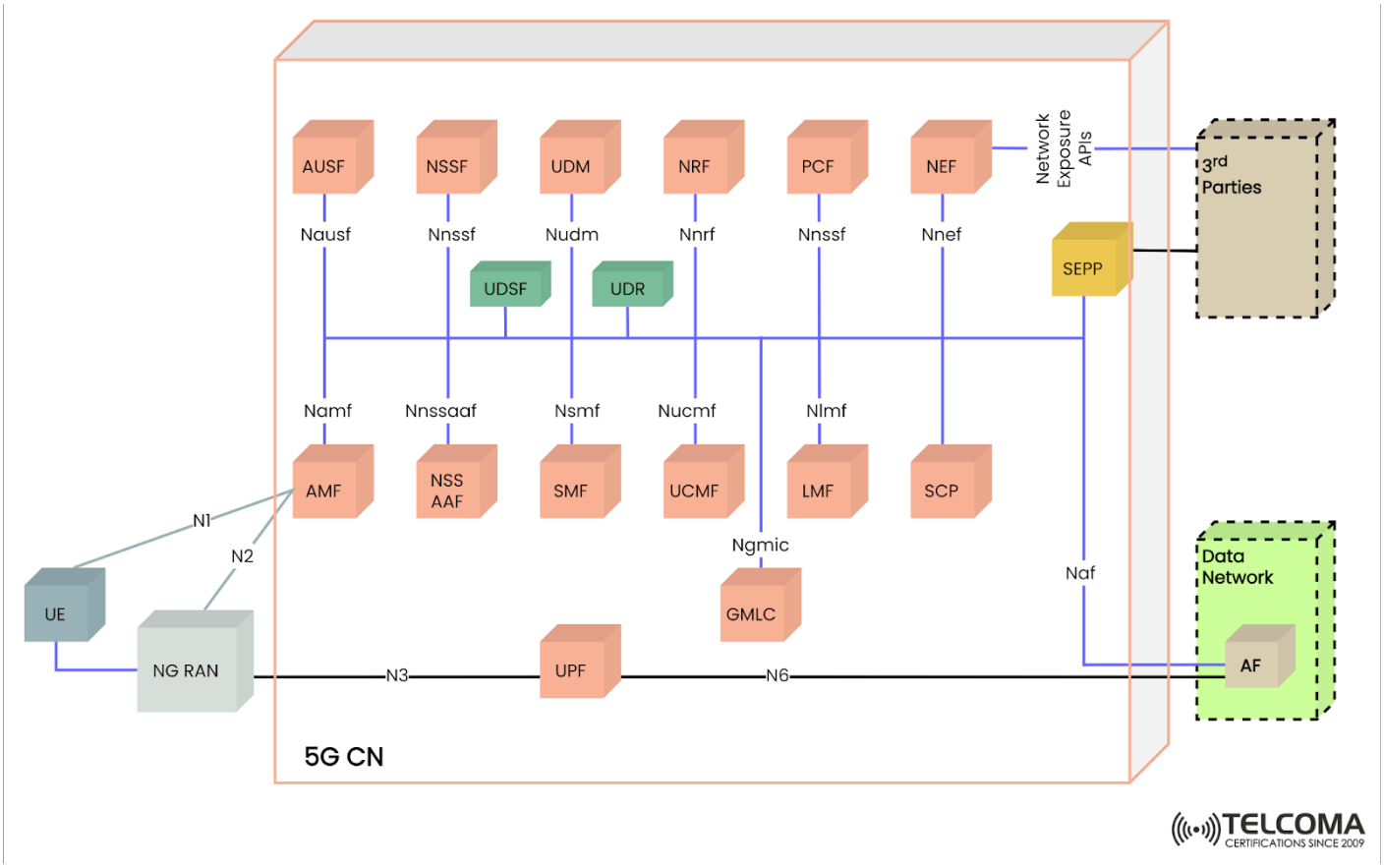
5G Core Network

5G Core Network

Introduction

It is the heart of a 5G mobile network. It establishes reliable, secure connectivity to the network for end-users and provides access to the services. It handles a wide variety of network functions in the mobile network core. Various functions performed by the core network include Mobility management, Authentication, Security, connectivity management, Authorization, subscriber data management, managing policies, etc. 5G core is completely software-based and designed as a cloud-native core network. 5G core is virtualized in nature with many network functions, these network functions are cloud-based for higher flexibility.

The new 5G core is based on a Service-based Architecture that implements the IT network principles and cloud-native design approaches. In 5GC, there are network functions where each NF is formed by a combination of small pieces of software code called microservices. Each NF offers one or more services to other NFs via API (Application Programming Interfaces). 5GC allows it automatically. upgrades and the addition of new functionalities with no impact on already running services.

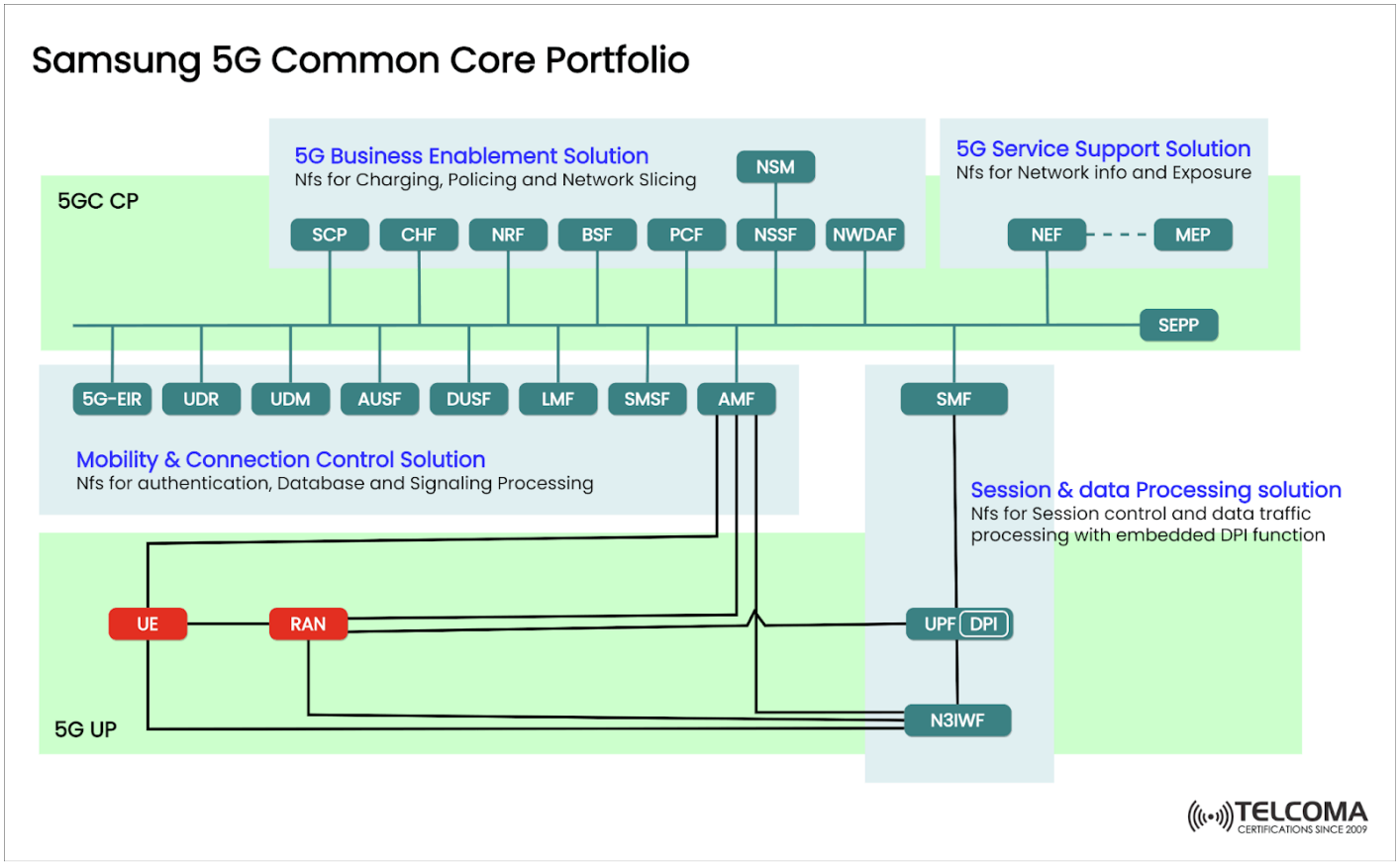


Why a new core?

Advanced 5G use cases like ultra-low latency, very high throughputs, and massive devices connected will change businesses and the lives of consumers. Along with 5G NR (New Radio), the 5G core is also required to change with advanced technologies that can support applications of 5G technology. The commercial 5G deployments are based on NR non-Standalone technology that uses existing LTE radio access for signaling between the devices and the network, and EPC (Evolved Packet Core) networks enhanced to support the 5G NSA (Non-Standalone). 5G NSA deployment allows 5G services to be added quickly and reusing the existing 4G networks. For fully 5G deployment, SA (Standalone) deployment is there which requires an independent 5G network and the 5G core. This new approach is required for further advancements in telecom technology and future 6G technologies. The new 5GC addresses the needs of the future as well. The New 5G core should be able to support enhanced end-user experience, it should be able to

simplify network operations, increase service creation agility, and can improve network capabilities.

Enhanced user experience includes faster access, lower latency, higher bit rates, reduced signaling. Simplified operations and service agility include less complex orchestration, service-based architecture, cloud-native deployments, extensibility, and openness. A future proof network architecture includes target architecture for industry innovation, addresses multiple verticals, enables an ecosystem service innovation, addresses new consumer services. Improved network capabilities include an end-to-end network slicing model, enhanced QoS model, improved end-to-end security, and edge computing.

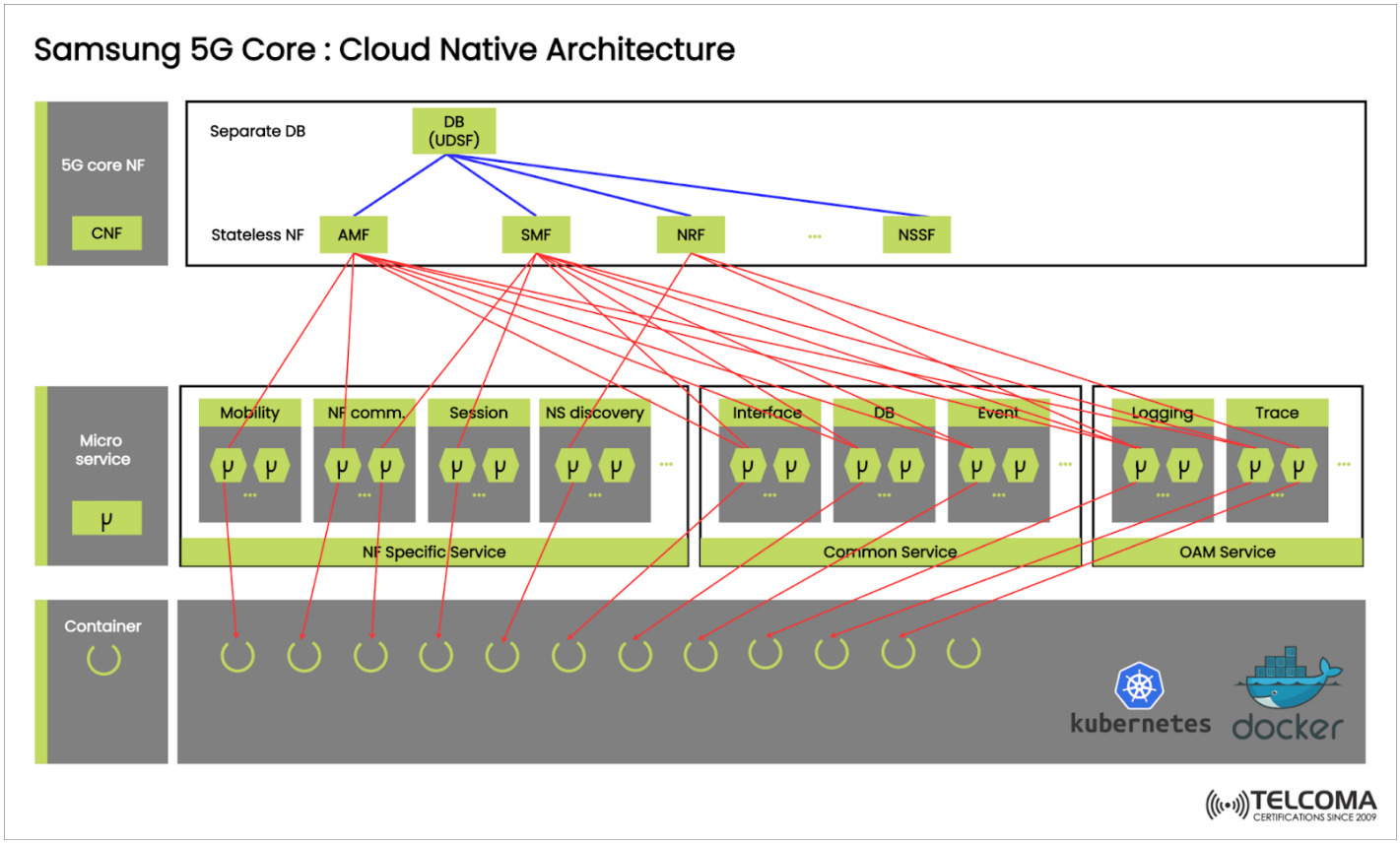


Multi-Access Core (5G dual Core)

Dual-mode 5G Core is built on a cloud-native, microservices-based technology. It combines EPC (Evolved Packet Core) and 5GC (5G Core) functions into a common multi-access and cloud-native platform that supports 5G as well as

previous generations. The core is virtualized in nature and designed for cloud deployment. The core consists of Cloud Packet Core, Cloud Unified Data Management (UDM), and Policy and Signalling Controller products. Multi-access core or 5G dual-core consists of built-in software that enables full end-to-end monitoring and troubleshooting tools for improved user experience and security reasons like firewalls. It enables service providers to introduce 5G quickly and efficiently while protecting existing services, has a controlled and smooth migration to 5G aligned to business needs, addresses new segments with flexibility and agility, it can reduce cost and increase performance with cloud-native design and quickly introduce new functionalities and reduce the functional costs.

Cloud-native new Core Architecture



- **Separation of Control plane and user plane:** separation of CP and UP simplifies the new core architecture. Gateway control and user plane separation divide the very complex logic functions into the control plane which reduces the costs of the gateway deployments and several alternative

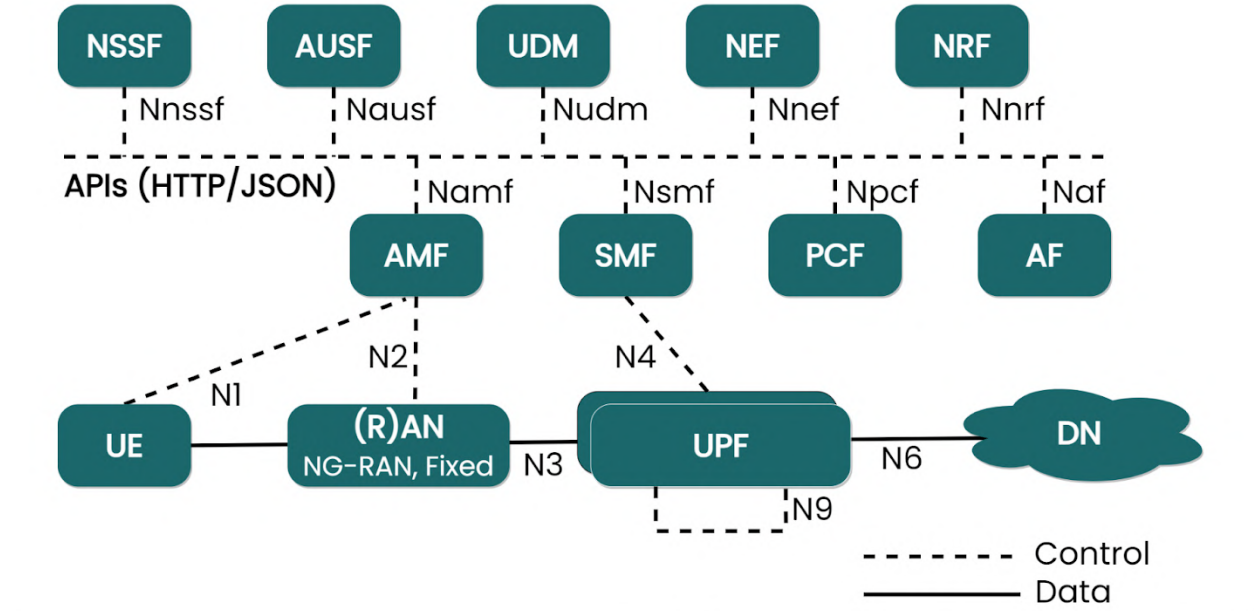
signaling routes. CP and UP separation supports scaling of the forwarding and control planes to improve network architecture flexibility.

- **Flexible Network Components:** Mobile networks will provide diversified services. eMBB, URLLC, and mMTC demand different requirements for network control functions. In the service-oriented 5G network architecture, logical control functions can be abstracted as independent functional components, which can be flexibly combined according to service requirements. Compared to tightly coupled network control functions, the control plane component architecture significantly simplifies the development and deployment of new services.
- **Unified Database Management:** with separated data and control logic, network status information can be centralized in a unified database. All network functions can access metadata models through all the standard interfaces and they can locally store dynamic user data. With the help of a service management framework, the unified database simplifies the procedure for the network information retrieval function which is introduced to reduce the signaling load.

In existing networks, operators have gradually used SDN (Software-defined networking) and NFV (Network Functions virtualization) in their networks. 5G networks continuously require innovation with cloud adoption to customize various network functions.

5G SA 5GC (Standalone 5G Core)

It is a cloud-native Architecture in the 5GC. In this, the network functions are deployed as microservices. The 5G core network functions can be moved to the edge of the network, which can satisfy the low latency demands of mission-critical control services. 5G services such as smart cities, smart factories, etc, stand-alone architecture will play an important role. 5G SA core is a fully virtualized, cloud-native architecture that introduces a new way to develop, deploy and manage various services. It includes concepts of microservices and service-based interfaces that reduce the total cost of deployment.



AUSF	Authentication Server Function
AMF	Access and Mobility Management Function
AF	Application Function
DN	Data Networks
SMF	Session Management Function

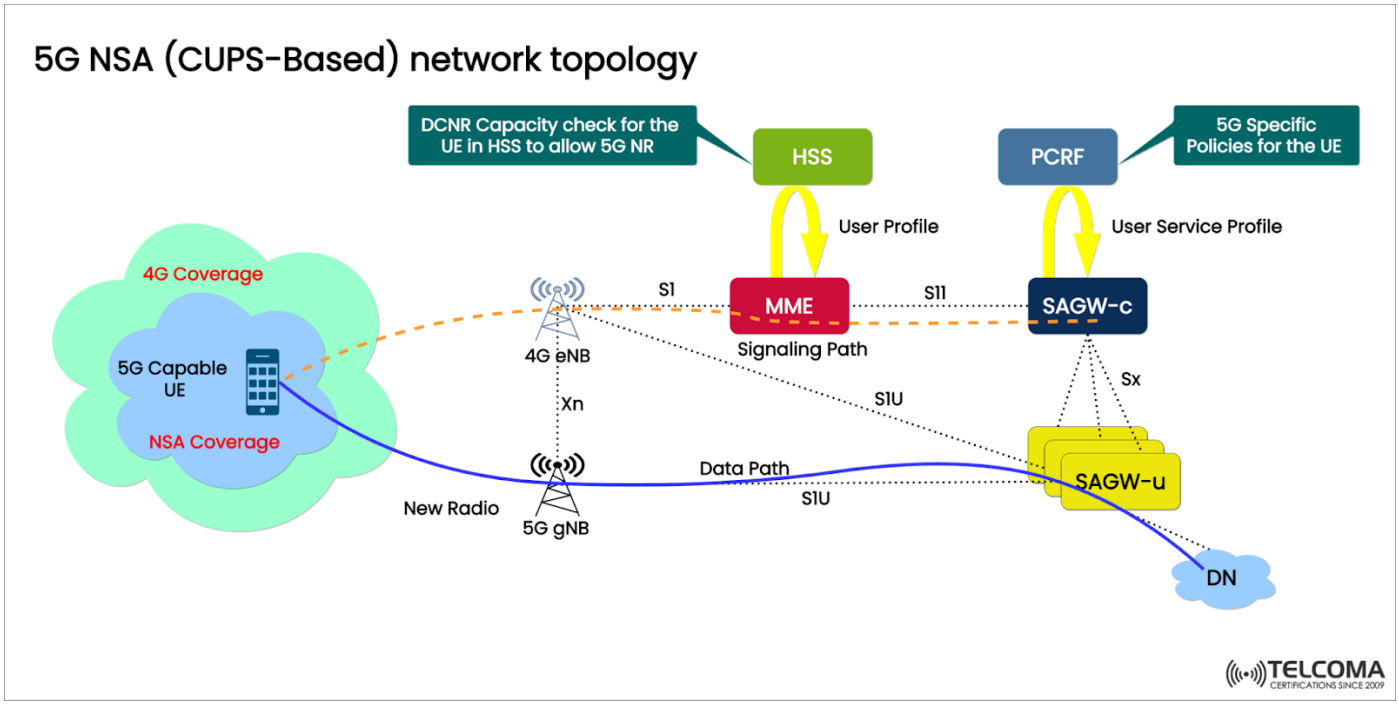
NEF	Network Exposure Function
NSSF	Network Slice Selection Function
NRF	Network Repository Function
PCF	Policy Control Function
UPF	User Plane Function
(R)AN	(Radio) Access Network

Benefits:

- Network operators can launch new services such as smart cities etc
- Fully Virtualized and Cloud-native
- The architecture enables end-to-end slicing to logically separate services.
- The use of Automation can reduce the cost of deployment
- It can give a variety of deployment models

5G NSA 5GC (Non-Standalone 5G Core)

It is a 5G Core deployment option that can re-use the existing 4G EPC (Evolved Packet Core). It enables to use of the existing core for network operations. This can be combined with efforts to reduce network operating costs by using virtualization and CUPS (control and user plane separation) using software-defined networking concepts.



Benefits:

- It can deliver high-speed connectivity to consumers with 5G-enabled devices.
- Leverage existing network investments in transport and mobile core.

The 5G Core uses a cloud-aligned service-based Architecture (SBA) to support Authentication, Security, Session management, and aggregation of traffic from connected devices, all of which requires the complex interconnection of network functions,