Nokia Cloud Packet Core

Profit from opportunity, evolve with confidence
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Networks will be required to support an increasingly diverse set of requirements such as massive scale, immense speed, low latency and distributed architectures.

Mobile gaming and multimedia applications, cloud-based productivity collaboration tools, and tele-operation of drones and connected cars will push network capabilities into a new dimension – and drive completely new network architectures.

These diverse services will be delivered on their own network slice, allowing service providers to offer dedicated and tailored levels of service for specific use cases.

To achieve all of this, innovation within the core network is vital. A cloud-native core is necessary to create increased productivity, service agility and diversity – and to deliver on the promise of 5G.
A number of cloud-native attributes are necessary for service providers to fully exploit what cloud technology has to offer. Nokia’s cloud-native packet core has been designed using a common software foundation with many of these attributes inherent within its software:

- A software disaggregated architecture that includes cloud concepts such as microservices, providing increased software design modularity plus flexibility

- Open-core architecture that uses open APIs to securely expose information and capabilities, generating new revenues

- The ability to support flexible deployment options both physical and virtual, including a range of network function virtualization infrastructures (NFVIs)

- DevOps to quickly and continuously deliver new features and software improvements that ultimately improve time-to-market for new services.
The Nokia Cloud Packet Core architecture provides high levels of automation and measurability, allowing service providers to quickly and easily monetize their core investment and achieve fast service enablement.

- Stateless network functions with state-efficient processing that separate subscriber and session state data from the underlying business logic.

- A common data layer stores all functional state information.

- Deployment flexibility provides a range of virtualized network function (VNF) and physical network function (PNF) deployment options under common management.

- End-to-end network slicing delivers predictive service performance per tenant or per service.

- Distributed edge computing moves core resources out of a centralized cloud into regional or edge clouds that are closer to the end user, improving service quality and network efficiency.

- Programmability and analytics enabled with streaming telemetry give service providers the ability to measure their core network and can be used to dynamically adjust network resources in real time to changes in service demands.

- The Nokia Cloud Packet Core delivers services across a range of wireless and fixed access technologies.
The core network continues to evolve to support diverse services and applications. Software disaggregation enables independent scaling and allows for a more distributed, flexible and efficient core function placement.

Sizing of the core needs to cater to very small deployments at the far edge of the network and also much larger deployments in regional and centralized data centers.

The Nokia Cloud Packet Core solution has an optimized cloud-native software design. Solution components can be deployed using pre-integrated appliances that do not require an NFVI, which is still a complex undertaking for some service providers. Virtualized or physical network functions can also be used, with high-performance network processor-based solutions offering multi-terabit user planes.

All deployment options offer network growth, deliver additional functionality, and mitigate end-of-product-life challenges.
The 5G core network has a service-based architecture. Network functions provide services via standard APIs and the HTTP 2.0/TCP protocol. A network function registers its capabilities with the Network function Repository Function (NRF) to facilitate service discovery.

The 5G core consists of numerous network functions. The Nokia Cloud Packet Core provides:

- Network Slice Selection Function (NSSF): Assigns network slice instances to devices.
- User Plane Function (UPF): Equivalent to the user plane of the Evolved Packet Core’s Serving Gateway (SGW) and Packet Data Network Gateway (PGW).
- Network function Repository Function (NRF): Provides registration and discovery functionality; maintains the network function profile and supported services.
- Non-3GPP Interworking Function (N3IWF): Handles the integration of the untrusted non-3GPP access.
- Access and mobility Management function (AMF): Terminates the interface from the various access networks.
- Session Management Function (SMF): Establishes and manages sessions for all access types.

Introducing standard API and HTTP 2.0/TCP over a common control bus

Existing core architecture with many rigid and inflexible reference points

CPC-provided 5G core network functions

Nokia 2019
Software disaggregated architecture can include cloud-native concepts such as the use of microservices and containers where developers break down software functions into discreet services. These services are independent from each other and can be updated with minimal impact on other disaggregated functions.

Software disaggregation provides numerous benefits: applications are easier to deploy or update, they are more resilient, have less impact on other services and are highly scalable. Faster service introduction is also possible because applications can be integrated into a live network system using digital and automated delivery.

Microservice design can impose challenges, so it’s important to consider appropriate usage. The smaller modules become, the more difficult it is to maintain orthogonality – which is vital to ensure that each module has its own life cycle. In addition, communication overhead can increase with finer granularity. Development effort can also intensify as the number of interfaces between the modules grows.

The Nokia Cloud Packet Core disaggregated software can be deployed on a range of NFVIs, including environments with virtual machines or containers, which is a developing virtualization technology within the industry.
Fixed-mobile convergence

The Broadband Network Gateway (BNG) is an essential component in delivering fixed broadband services. Today, the BNG runs as an integrated system that incorporates both the subscriber-management control plane and the user plane.

It’s beneficial to distribute and locate the BNG close to subscribers, to reduce backhaul costs and latency. However, this increases the number of subscriber management control points, resulting in greater network complexity.

Software disaggregation with BNG control and user plane separation (CUPS) can help address these issues, simplifying operations and also providing independent location, scaling and life-cycle management capabilities. With this architectural evolution, a common or unified control plane for both wireless and fixed access can be deployed. This unified control plane function can manage multiple wireless and fixed user plane functions, which can also be distributed from the unified control plane function. This functional separation allows delivery of any service over any access technology: fixed, fixed-wireless, mobile broadband or massive IoT/machine-type communication.

CUPS supports the evolution to a digital service infrastructure by converging and consolidating fixed wireline and wireless control plane functions. Nokia's Cloud Packet Core architecture with its software disaggregation capabilities can provide these common control plane functions for a dynamic and personalized experience for mobile, enterprise/verticals and residential users.
Nokia Cloud Mobile Gateway

The Nokia Cloud Mobile Gateway (CMG) supports diverse service requirements for multiple market segments:

- Consumers
- Enterprises
- Transportation
- Logistics and smart city IoT
- Industrial uRLLC communications.

The Nokia CMG has an optimized cloud-native software design that ensures high performance and scalability. CUPS enables independent scaling, more flexible and distributed architectures and more efficient use of network resources.

The CMG can be deployed on a range of NFVIs to meet varying service provider requirements and has a clear evolution path towards containers, which is a developing virtualization technology within the industry. The CMG supports multi-access connectivity, including licensed, unlicensed and shared wireless access as well as fixed access.

The CMG can be deployed as a number of 2/3/4/5G network functions:

- User Plane Function (UPF)
- Non-3GPP Interworking Function (N3IWF)
- Session Management Function (SMF)
- Network Slice Selection Function (NSSF)
- Network function Repository Function (NRF)
- Serving Gateway (SGW)
- Packet Data Network Gateway (PGW)
- Gateway GPRS Support Node (GGSN)
- Subscriber Services Gateway (SSG)
- Hybrid Access Gateway (HAG)
- Enhanced Packet Data Network Gateway (ePDG)
- Trusted Wireless Access Gateway (TWAG).

Read the Cloud Mobile Gateway solution sheet.
The Nokia Cloud Mobility Manager (CMM) provides exceptional message processing performance to meet the increasing signaling loads of converged subscribers, IoT devices and applications.

Similar to the Nokia CMG, the Nokia CMM has an optimized cloud-native software design that is ready for the evolution to 5G. The CMM supports multi-access connectivity and offers multiple configuration options plus deployment flexibility. Subscriber and bandwidth capacity can be scaled quickly and flexibly as service demands change.

The CMM captures numerous call and transaction statistics as well as network element event data to enable advanced network analytics and diagnostics. Per-device event details correlated with the associated access and core network nodal statistics go beyond the typical service measurements and RF analysis provided by other tools.

The CMM can be deployed as a:
- Access and Mobility Management Function (AMF)
- Mobility Management Entity (MME)
- Combined AMF/MME
- Serving GPRS Support Node (SGSN)
- Combined MME/SGN.

Read the Cloud Mobility Manager solution sheet.
Service providers are eager to extend their service offerings and expand their market reach. To do this they need the right core network infrastructure to profitably and efficiently deliver a range of services. This requires an extremely scalable, flexible, intelligent, programmable and high-performing cloud-native core network solution.

Nokia’s cloud-native Cloud Packet Core has a variety of cloud-native attributes built in to its architecture to meet the more stringent latency, performance and reliability requirements of this diverse set of services. Our Cloud Packet Core leverages open architecture and the associated ecosystem. Open APIs hide the network complexity and enable flexible and fast creation and modification of services by third parties.

The core network must have the ability to be deployed in a number of different ways, to meet service providers’ operational and business requirements. Nokia’s cloud-native Cloud Packet Core supports multi-access connectivity that enables service providers to converge their fixed and wireless services over a common core.

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Visit the Cloud Packet Core web page

**Performance and scalability:** Through use of virtualized and physical network functions to fit your needs.

**Faster time-to-market:** Cloud programmability and automation for fast service enablement.

**Service diversification for growth:** Transform society and fuel the next industrial revolution.

**Lower TCO:** Leverage cloud-native attributes for improved resource utilization and reduced OPEX (through automation).

**Any access:** Utilize a high-performance, access-agnostic nexus point.
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Product code: SR1906035718EN  (July)  CID: 206491

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