The Nokia CMM supports the broad range of network requirements for consumer and enterprise mobile services and for Internet of Things/Machine Type Communications (IoT/MTC). It also provides exceptional message processing performance and webscale capacity to meet the increasing signaling loads of mobile subscribers, IoT devices/sensors and applications. The CMM reduces network TCO through a cloud-native architecture and by maximizing the use and efficiency of the network functions virtualization (NFV) infrastructure.

Overview

The Nokia CMM is built with a cloud-native design that is optimized for the evolution to 5G and next-generation mobile voice, video and data services. It delivers the high performance and subscriber scalability to address the growth in users, devices and applications with their associated signaling and lower latency demands. The CMM supports multi-access connectivity, converging the 5G, 4G and 2G/3G mobile core control planes onto a single, functional instance. The CMM runs on a general-purpose computing platform, offering multiple configuration options and deployment flexibility.

The CMM can be deployed as a:

- Access Mobility and Management Function (AMF)
- Mobility Management Entity (MME)
- Combined AMF/MME
- Combined MME/Serving GPRS Support Node (SGSN)
- Cellular Serving Gateway Node (C-SGN)

The CMM is a key element of the Nokia Cloud Packet Core solution (see Figure 1). The Cloud Packet Core is a flexible, scalable, high-performance packet and next-generation core built with a cloud-native design. The design meets the varied service requirements for enhanced mobile broadband, IoT/MTC, and critical and ultra-reliable machine communications. The design also leverages integrated network intelligence and service agility to generate new revenues.

The CMM software is built with the field experience and knowledge gained from large-scale mobile network deployments. Its robust and advanced design supports the demanding control plane requirements of the packet core.
When deployed together with the Nokia mobile networks radio portfolio, the CMM delivers a highly scalable core control plane function that supports any macro, metro or small cell network architecture.

**Multi-access**

The Nokia CMM provides multi-access (2G/3G/4G/5G) radio connectivity by converging the signaling control plane for the packet core. This convergence simplifies core network architecture and operations and facilitates its deployment in existing packet core call processing pools, enabling the rapid expansion of mobile services.

**5G Core evolution**

The Nokia CMM provides seamless evolution to a 5G Core by adding AMF to support the 5G standalone (SA) options as defined in 3GPP Release 15. Both AMF and MME can be supported on the same CMM.

**Cloud-native design**

The Nokia CMM is built with a cloud-native design that delivers the webscale, deployment flexibility and performance required in a packet core control plane function. It operates in any OpenStack and VMware NFV operating environment and can run on any NFV infrastructure hardware platform. In addition, it can be life-cycle managed with any NFV Management and Orchestration (MANO) system.

**State-efficient VNF processing**

The Nokia CMM state-efficient call processing unpins or decouples the subscriber's session state information from the compute resources of the underlying NFV infrastructure. It does this by intelligently capturing the session state as a data transaction that can be moved and re-instantiated on the same or a different call processing virtual machine (VM) when required. As a result, network resource utilization increases, which lowers the cost to operate the network.

**Common data layer**

The Nokia CMM design uses new cloud core functionality defined in 3GPP as a Common Data Layer (CDL). This functionality provides a database that synchronizes and stores subscriber session state data from the CMM VMs. The CDL used in the CMM design is an open-source, NoSQL, in-memory data structure store that is highly resilient and fault tolerant, supporting built-in replication.
By maintaining session state on the CDL and NFV design enhancements that age-out VM message processing VM caches, the CMM can provide the massive subscriber and device scalability that is needed for mobile broadband and IoT/MTC services.

**Signaling and IoT optimization**

Network signaling is increasing at a tremendous rate due to the popularity of smartphones and applications that alternate frequently between connected and idle states. With IoT, potentially millions of additional smart devices and sensors will add to the signaling traffic.

The Nokia CMM enhanced paging capabilities identify the device type, service request type and location information to intelligently define different paging policies that reduce the overall control plane signaling volume. The CMM can also detect patterns in device mobility and use sophisticated algorithms to reduce tracking area updates.

In cellular IoT networks, the CMM supports the Cellular-Serving Gateway Node (C-SGN) function (see Figure 2) by combining the functions of the Nokia Cloud Mobile Gateway (CMG) together with the CMM into a single managed function through the Nokia Network Services Platform (NSP). This simplifies configuration, monitoring and management of the C-SGN function.

The CMM as the C-SGN supports non-IP data delivery (NIDD) by interfacing with the Subscriber Control Enforcement Function (SCEF) over the T6a interface or through the CMG via the S11-U to the IoT server over the SGi interface.

The CMM supports 3GPP IoT R12, R13 and R14 features that significantly reduce device and network signaling, extending device battery life. This includes highly efficient handling of frequent and infrequent data transmissions; device power savings mode (PSM); idle mode extended Discontinuous Reception (eDRX); paging optimization to reduce signaling; and a cache age-out feature to improve call processing resource efficiency and device scalability.

**Figure 2. CMM as C-SGN to support cellular IoT services**
Mobile voice and broadband

With the ability to support millions of subscribers and tens of thousands of macro and small cells, the Nokia CMM provides the control plane scalability and message processing performance needed for mobile service connectivity. The CMM supports a comprehensive feature set to interoperate with any IMS core network to deliver Voice over LTE (VoLTE) and multimedia services.

Field-proven software

Nokia is recognized as an industry leader in wireless networks and technology. Our field-proven CMM software is deployed in many of the world's largest wireless networks. This knowledge and expertise are designed into the Nokia CMM software.

High availability

The Nokia CMM software architecture is built to meet the requirements of a carrier-grade control plane while taking advantage of NFV and cloud-optimized redundancy models. It supports advanced VNF and VM-level protection schemes that, together with the CDL, are highly resource efficient. Coupled with in-service software upgrades and advanced overload control protection capabilities, these functions enable the CMM to deliver reliability and availability levels not easily achieved in NFV general-purpose computing operating environments.

Appliances

For private LTE networks or for smaller scale overlay networks that are managed and maintained in a traditional telecom operating environment, the Nokia CMM is also offered as an appliance that pre-integrates CMM software together on a Nokia AirFrame hardware server.

Advanced network analytic and diagnostic tools

The Nokia CMM captures Per-Call Measurement Data (PCMD) and Traffic per device as well as network element event data across the Nokia packet core and eNodeB that provides advanced network analytics and diagnostics. This per-device event detail correlated with the associated cellular and core network nodal details goes beyond typical service measurements and RF analysis provided with other tools. It assists in trouble call resolution, cell RF optimization and planning, and significantly reduces network drive testing.

System management

Operations, administration and maintenance (OAM) of the Nokia CMM can be performed in both an NFV environment and a traditional Telco operating environment. For NFV dynamic life-cycle operations, the CMM can be managed with any ETSI MANO system, including the Nokia CloudBand software suite. The Nokia NSP provides NFV service assurance and performance monitoring of the CMM, delivering health status and key metrics to the NFV manager.

The NSP and Nokia NetAct provide integrated element and network management across the entire Nokia mobile network.

NetAct performs network management across the Nokia LTE macro and small cell network while the NSP supports management of the packet core, IP/MPLS transport, and microwave backhaul networks. The NSP also supports element and network management integration of third-party components, delivering single-screen view and sign-on capability that simplify operations and maintenance.
Learn more

The Nokia Cloud Mobility Manager (CMM) is the key control plane element of the Nokia Cloud Packet Core solution—a cloud-based packet core architecture that is built to support the growth of mobile and enterprise services, the scalability requirements and varied service requirements of the IoT, as well as the evolution to 5G.

To learn more about the Nokia Cloud Mobility Manager, visit the Nokia Cloud Mobility Manager web page.

To learn more about the Nokia Cloud Packet Core solution, visit the Nokia Cloud Packet Core web page.
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