Functional Testing of Containerized database application for VNF for Nokia SDM

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Abstract:

The Shared Data Layer is the cornerstone to consolidate subscriber and session data within a highly reliable and scalable repository. Separating data from processing boosts business agility, making it easier to explore new services and revenue opportunities, many based on third-party cloud applications. Subscriber Data Management (SDM) sits at the heart of the core network, storing valuable data used by diverse telecoms services. With the arrival of 5G and the evolution to cloud architectures, SDM must fulfil new 3GPP-defined requirements as well as the operational needs of legacy network elements. SDM has been deployed for 4G used by billions of subscribers globally in some of the world's largest networks, but now faces new challenges raised by 5G. The Nokia cloud native Shared Data Layer (SDL) offers unparalleled network scalability and reliability to help manage telco Network Functions (NFs) and is now a contribution to standardization.

1. Introduction

Subscriber Data Management (SDM) consolidates the profile data in a single virtual data store across mobile and fixed networks and Subscriber Data Management (SDM) is one of the most critical functions in telecommunication networks. With the evolution to cloud architectures and the arrival of 5G , handling all subscribers' data and services should be managed efficiently . Shared Data Layer also simplifies the network architecture, thereby reducing TCO(Total Cost of Ownership). Implementing the Shared Data Layer should be achieved with minimal user disruption.

2. Preliminaries

Subscriber Data Management is a concept that takes an interest in the telecoms industry, where service providers seek to integrate their customer data into a single database so that they can incorporate predictive analytics, use Artificial Intelligence, and have the potential to learn more about their customers. Exposure to subscriber data is however still a problem for network operators. This is primarily due to subscriber data being stored in a nonunified distributed architecture comprising several different, often vendor-specific network elements and services, which makes it costly to integrate the data. Subscriber Data Management approaches address this problem through the consolidation of subscriber data into a single repository.

2.1 Need of Subscriber data management

Data is floating everywhere — in applications, in billing information for subscribers, in multiple networks and in their profiles. The problem is that the data is segmented across many locations and is therefore duplicated, disorganized and difficult to manage. This also leads to higher costs related to the management of this data, since it must be offered in multiple systems requiring different interfaces and in a hastily fashion. Operators are unable to view all subscriber data in one place, so they are incapacitated when it comes to making comprehensive decisions about their subscribers.

2.2 Nokia's Approach for Subscriber Data Management

Nokia is the leading in market for advanced SDM solutions in emerging and developed markets, suitable for mobile operators, hybrid, fixed, and mobile virtual network operators. Nokia's SDM helps operators to build creative ,agile,

services. Nokia's approach to virtualization of the telco cloud infrastructure is based on flexibility and a multi-stack strategy.
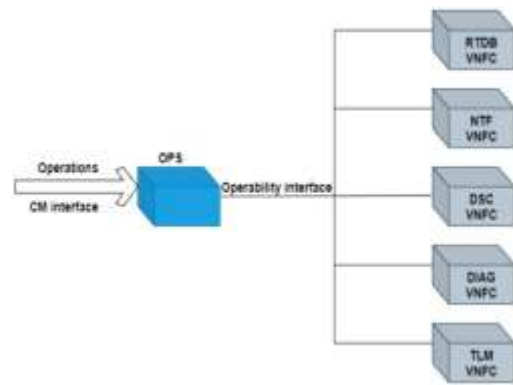
2.3 Shared Data Layer Components

The logical deployment of SDL is composed of multiple instances of SDL VNF. The group of instances forms a logical feature of the SDL network. Deployment of SDLs is done through the Cloud Band Application Manager (CBAM). Components of Shared Data Layer are as follows —

I. Operations
II. Real Time Database
III. Notifications
IV. Telemetry
V. Diagnostics
VI. Discovery

The evolution of Nokia One- NDS to Shared Data Layer is one of the main building blocks of the Nokia cloud-native core. Nokia Shared Data Layer is a common repository where the applications can store all their data. The data stored in the Shared Data Layer is accessible by Front End applications (HLR, HSS, PCF). Cloud-native core offers the adaptability and flexibility needed to deliver the ultra-reliability, high performance and low latency demanded by 5G and IoT.

2.3.1 Operations

SDL operation is managed by OPS. Here OPS VNFC instance defines the relevant SDL services in an order to orchestrate the process in an SDL VNF instance, and invokes the necessary functions on the VNFC instances service via an internal operability interfaces as shown in the figure 1.1

Figure 1.1 OPS role in SDL

2.3.2 Real Time Database

RTDB service is the key component of SDL. The RTDB service provides storage and quick data access to any front-end application and core Virtual Network Function. RTDB service is responsible for distributing, storing, and replicating database content. This involves secure storage of the data of the applications, indexing the data of the applications in order to access data quickly and supporting protocols that allow applications to provide and access their data. The three main functional areas in the RTDB service as shown in Figure 1.2 are-

- **Access** — This provides RTDB access through the LDAP protocol.
- **Indexing** — This route access requests to the node holding the relevant document.
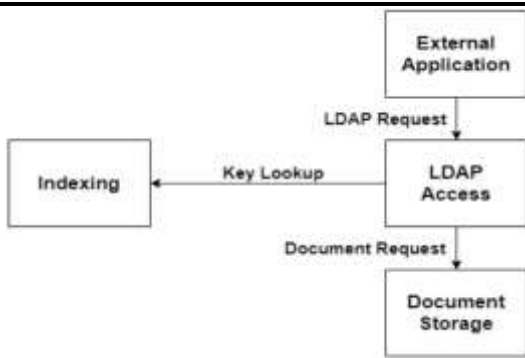- **Storage** — This store, replicates documents, and updates the index.

Figure 1.2 RTDB role in SDL

2.3.3 Notifications

Notification Service (NTF) is a highly scalable and secure SDL message delivery network. Notifications may be requested from the applications when changes are made to the data stored in SDL. NTF will forward the notifications as needed.

2.3.4 Telemetry

Telemetry Service offers a realistic view of SDL VNF instances to network operators and supports SDL VNF and SDL service VNFC instances fault and performance management. Telemetry Service track sensors and collect recorded sensor data. The Telemetry Service performs the following features, using the data collected:

- Fault management (FM): Telemetry service detects a fault if the sensor data measured is abnormal.
- Performance Management (PM): Telemetry service uses measured data from a given set of sensors to produce PM counters and KPIs.

2.3.5 Diagnostics

In Shared Data Layer (SDL), the logs provide information about the Virtual Network Function Component (VNFC) the status and functions. The SDL generates logs, and it is the responsibility of the Logging Service (LS) to gather and store this information. It is a time-consuming to view, maintain, and scan logs with log files on each of the VNFCs in the SDL VNF. To solve this, centralized logging system is set up so that several logs can be aggregated and stored in a single location on a continuous basis.

2.3.6 Discovery

Discovery Service provides external clients with the features and interface required to discover endpoints for data access. Discovery Service is an operation to find a service provider for the service you are seeking. Discovery service is extracting the service provider's address. This location is further accessed and used for the requested service. Discovery Service offers smart, interactive, and real-time discovery capabilities for endpoints.

3. Conclusion

Subscriber data management is the most important tool for centralized storage of subscriber data. In addition to this, when we are starting in the age of the 5G and IoT, the very concept of a subscriber shifts and connected devices themselves become "subscribers". By using items from SDM, Apps that involve continuous data access — which is especially useful when a third-party cloud service providers store data off- site. The benefit of all of this is clear by allowing operators to centralize the subscriber data gives them the capacity to understand their subscriber activity better. Understanding the actions of subscribers will allow operators to deliver creative, highly individualized services such as mobile roaming alerts & geolocation driven deals. Essentially, operators can monetize the data of their customers more efficiently by using SDM. It is necessary to deploy SDM because we are entering the IoT age quickly. Nearly all will become a connected device refrigerator, coffee making machine, shoes, watches, clothes, electronic appliances, etc and there will come a massive wave of additional subscriber information with all these new links.

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