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Cloud SPR

SUBSCRIPTION PROFILE REPOSITORY

Introduction

This document describes the Cloud SPR product developed by Globberry as part of its Policy Management Suite. Besides this product, the Cloud SPR Globberry Policy Management Suite consists of Cloud PCRF for the management of subscribers' PCC policies in the data access network and Cloud DRA for dispatching and managing diameter messages across the network.

The Subscription Profile Repository (SPR) is a 3GPP-compliant database for holding subscriber data relevant to operation of the Policy & Charging Control (PCC) framework by a telecommunications operator.

The product is based on micro-service architecture and can be deployed on an arbitrary configuration of physical or virtual servers, including servers in the cloud.

Cloud SPR is a pre-integrated component of the Globberry Policy Management Suite, although it can be used as a standalone product.

Table Of Contents

Cloud SPR Key Features

- **Static Profile Storage:** Holding static subscriber data relevant to the Policy & Charging Control operation, such as the subscriber category, allowed services and preferred QoS
- **Dynamic Profile Maintenance:** Holding and updating dynamic subscriber profile data such as traffic consumption levels, spending limits and current service conditions
- **PCRF Sp Interface:** Providing PCRF with a consistent ACID interface for creating, reading, modifying and deleting subscriber data stored in the Cloud SPR, with clear distinction between static and dynamic data
- **PCRF Notification:** Interactively informing PCRF about all subscriber profile changes requiring immediate review of the applicable PCC rules
- **Profile Provisioning:** Supporting provisioning interfaces for loading and maintaining the static subscriber profile data from the operator's OSS/BSS systems.

Cloud SPR can be used as a standalone product, or work in close integration with Globberry's Cloud PCRF for compete management of the network's PCC policies

Cloud SPR Benefits

- Compatibility with 2G/3G/4G and non-3GPP access networks
- Support for subscriber profile attributes specific for newer applications, such as VoLTE, LTE Broadcast, Car Connectivity and Internet of Things / M2M
- Unrivalled performance with extremely fast dynamic profile database, maintaining read/write latencies in single milliseconds
- Virtually unlimited capacity and throughput due to easy horizontal scalability, database decentralization and built-in replication features
- High reliability and reservation, including geo-redundancy and automatic failover/ system recovery
- OPEX savings due to virtualization, modular structure, single point of provisioning and simplified network architecture.

Cloud SPR: Architecture

The figure below shows the Cloud SPR's component architecture:

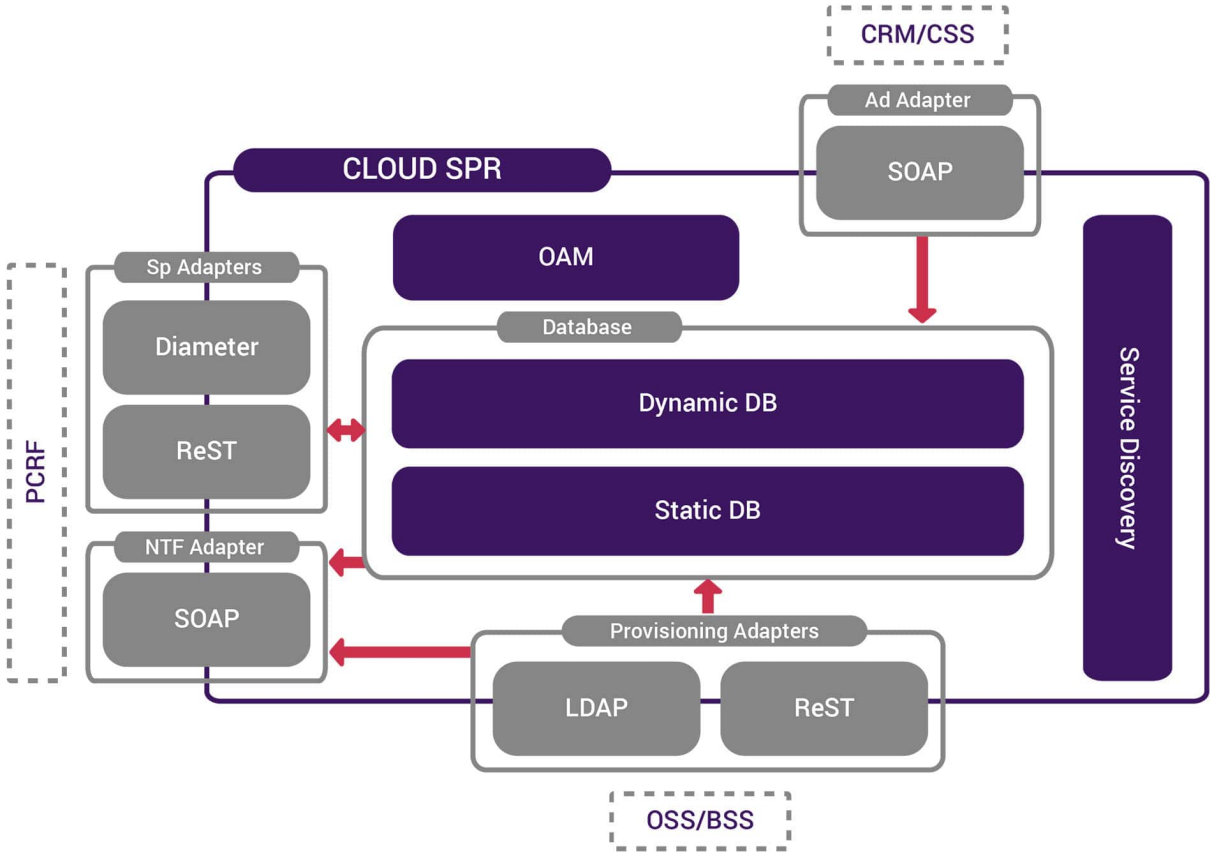

Figure 1. Cloud SPR Architecture

Cloud SPR contains following components:

- Database, with separate segments for static and dynamic subscriber profile data
- Diameter and ReST-based adapters implementing the Sp interface between the database and PCRF for reading and writing the subscriber profile data
- SOAP adapters for NTF notification interface informing PCRF of real-time changes to subscriber profiles
- LDAP and ReST provisioning adapters for receiving the subscriber profiles and profile upgrades from the operator's OSS/BSS systems
- SOAP-based Ad adapters implementing the Actual Data interface providing the real-time profile information to the external customer service and self-service platforms

- Service Discovery clients and servers, automating the integration and interaction of all the modules above

- GUI and CLI operation, administration and management (OAM) components for performing configuration, administration and monitoring tasks.

Cloud SPR is an enterprise-level system based on microservices architecture. Cloud SPR's modules exist as autonomous components, interacting with other Cloud SPR modules via ReST/http. The system uses a Service Discovery mechanism to detect running modules and build links between the components in real time. Such architecture offers a great flexibility for horizontal scaling of the internal Cloud SPR components, as additional modules can be started up in the Cloud SPR environment in real time, automatically taking over some of the load. The architecture also ensures high reliability and accessibility, as separate modules are executed in separate containers, and failure of a single module simply leads to redistribution of its load among other remaining modules, through the automatic rebalancing algorithms implemented in Cloud SPR via Service Discovery.

At the operator's discretion, all aforementioned Cloud SPR modules can be deployed to either physical or virtual servers, including servers in the cloud. When selecting a deployment option, the main concern is the operator's ability to guarantee reliable physical http-connectivity between all Cloud SPR modules. With fast and reliable http connections, Cloud SPR modules can be easily deployed on multiple physical or virtual servers, increasing the overall reliability of the system. The reliability and availability can be further enhanced with geographical reservation, by deploying Cloud SPR modules on servers at different locations or even in different regions. The replication features, built in at the database level, ensure consistency of the data at all locations and sufficient redundancy in case of database instance failures.

The Cloud SPR's dynamic database segment is based on a fast NoSQL database providing read/write latencies in single milliseconds and seamless read/write concurrency.

Cloud SPR: Functionality

Static Profile Storage

The Cloud SPR's static database segment can store the following elements of the subscriber profile:

- Subscriber class and category
- Charging-related information and options
- Subscriber services and their parameters
- Advanced Multimedia Priority Service (MPS) settings
- Allowed/preferred QoS.

The static segment data is usually created and updated via provisioning from the operator's OSS/BSS systems. Through LDAP and ReST adapter modules, Cloud SPR supports LDAP and ReST provisioning interfaces. The Cloud SPR provisioning interfaces are consistent in the sense that even when the same subscriber profile changes are applied repeatedly several times, the eventual subscriber profile state remains correct.

Dynamic Profile Maintenance

The Cloud SPR's dynamic database segment can store the following subscriber profile elements:

- Usage monitoring information reported by PCRF based on either PCEF or OCS data
- The current QoS applicable at the session or application/data flow level
- PCC policies currently applied to the subscriber IP CAN-sessions
- The full history of SMS and web notifications send to the subscriber
- Temporary backup data on the full state of the subscriber's sessions, used to recover from partial PCRF failures.

The dynamic segment data is usually created and accessed by the operator's PCRF in real-time. Cloud SPR provides PCRF with an extremely fast and consistent ACID interface for creating, reading, modifying and deleting the dynamic subscriber profile data.
To accommodate PCRFs from different vendors, Cloud SPR provides a universal underlying database structure, enabling the installations to account for all interface specifics in the Sp adapter modules. The replication features are built in at the database level and are fully transparent to the PCRF client.

Notification (NTF) Interface

Cloud SPR will notify PCRF of all subscriber profile changes requiring immediate review of the PCC rules applicable to the subscriber. The notifications are triggered by provisioning adapters when the subscriber profile is updated; the changes made to the Cloud SPR database are then propagated to PCRF via SOAP using the NTF adapter component. The NTF interface is unidirectional; the PCRF is only expected to return the confirmation that the SOAP message has been received.

Actual Data (Ad) Interface

Cloud SPR provides external systems with an Actual Data (Ad) SOAP interface/web service for accessing the subscriber data accumulated in its dynamic database segment. The interface may be used by various customer service and self-service systems to display/report on the subscriber data usage, the current QoS and PCC policies. The static subscriber profile data can also be accessed via the Ad interface, but usually are of much less interest.

Integration with Cloud PCRF

While Cloud SPR can be used as a standalone product with any vendor's PCRF, it is pre-integrated with Cloud PCRF, another Globberry product providing universal PCC policy management in data access networks. Cloud PCRF and Cloud SPR have fully compatible interfaces for exchanging the data, with no need to adjust the Sp and NTF-adapters to account for data structures specific to a particular vendor. In addition to that, Cloud PCRF and Cloud SPR modules can be managed together by a shared set of Service Discovery components and common OAM modules can be used for SPR/PCRF configuration, administration and monitoring.

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