

Nokia Cloud Signaling Director

Release 24

Secure, simplify, scale and analyze your core network. Nokia Cloud Signaling Director (CSD) creates an efficient signaling control plane for both 4G and 5G core networks, reducing maintenance and operations costs. CSD supports all standard signaling models today, and many non-standard ones.

Nokia Cloud Signaling Director (CSD) offers a complete set of capabilities to insert an intelligent routing entity into the control plane, resulting in a simpler, more scalable and more secure control plane. We combine innovative rules engine technology with our deep signaling and cloud expertise to give you an effective toolkit for addressing rapid signaling traffic growth. CSD provides complete control plane signaling facilitation as the Service Communication proxy (SCP) in a 5G core and as the Diameter Routing Agent (DRA) in a 4G core.

Features

- High-speed message inspection and manipulation based on patented Agile Rules Technology (ART)
- Flexible cloud native deployment options
- Service Communication Proxy (SCP) with support for 3GPP Models - A, B, C and D deployments
- Security Edge Protection Proxy (SEPP)
- Binding Support Function (BSF)
- Cloud native deployment of DRA (CN-DRA) co-located with 5G NFs
- Scalability, so networks can meet specific performance requirements, and elasticity
- Ease of integration with third-party systems

- DEA/Diameter firewall (4G) and SEPP (5G) for interconnect security
- Analytics platform for network monitoring and advanced troubleshooting.
- Interworking between 4G IMS and 5G EPC for Rx-BSF use case

Benefits

- Security built in for internal and external threats
- Lower OPEX through improved efficiency, scalability and performance plus simplified creation, testing and deployment of routing policies
- Lower CAPEX through support for deployment of vendor-agnostic hardware
- Improved customer experience through fewer outages, overloads and service interruptions
- Simplified provisioning of network maintenance and administration functions
- Ease of interoperability with third-party vendors and disparate networks
- Assurance that all signaling messages are relayed, proxied or redirected according to the requirements of various applications
- Cloud deployment enables increased flexibility in rollout, maintenance, healing and growth

Overview

Based on Agile Rules Technology (ART), Nokia CSD enables service providers to quickly and easily develop customized routing policies to simplify and operate their control plane, resulting in improved efficiency, scalability and performance.

Designed for cloud environments, CSD offers the deployment flexibility and scalability that service providers need as well as superior elasticity and fault tolerance. For deployment as a CNF, CSD is compatible with Kubernetes based cloud infrastructures, including Amazon AWS, Google Cloud, Microsoft Azure, and others. For deployment as an NFV, CSD is fully integrated with Nokia CloudBand's NFVI/VIM and VNFM, VMware's vCloud Director® (NFVI/VIM), and it can also be used with other vendors' cloud management systems.

With CSD, service providers can address emerging signaling control plane issues to improve the subscriber experience, reduce outages and maximize the effectiveness of their control plane while lowering operations and maintenance costs.

Key use cases

Simplifies the control topology

In core networks, adding the CSD's SCP or DRA in front of Network Elements/Functions removes the complicated peer-to-peer mesh. Instead, it creates a hub-and-spoke topology while preparing the network for a simplified routing overlay network.

Mediates between control elements

CSD ensures interoperability and compatibility among different control elements. This capability dramatically reduces OPEX when new elements are deployed and new software loads are installed. Additionally, the CSD provides interoperability and security between signaling networks.

Defines the control plane behavior

CSD improves performance by defining more efficient, predictable and high performing control behavior.

Defining and controlling the server selection involves partitioning the servers into pools and performing load balancing in each pool. For example, the Subscriber Location Function provides an information lookup so subscribers can be mapped to the correct Home Subscriber Server.

This mapping allows for specific subscriber data and destination values in a database.

Secures the roaming infrastructure

CSD protects the exchange of signaling information across disparate and partner networks as well as home and visited networks in a roaming infrastructure. The signaling software leverages firewall and proxy capabilities to:

- Protect signaling messages' validity
- Act as a single point of entry for visited network traffic
- Control complex roaming agreements
- Ensure security by hiding network topology
- Fix key message content and filter out unknown and unwanted data

Detailed features and benefits

The following sections describe Nokia CSD features and benefits in detail.

Control plane message monitoring

Control plane message monitoring is complicated in 5G due to heavy emphasis on use of TLS for HTTP2/JSON messages. Nokia SCP provides convenient flow observation, message mirroring, and message tracing:

- Multiple supported monitoring methods (vTAP, Mirroring, EDR's, Tracing) and formats to satisfy different requirements e.g. HEP3, JSON, CSV, XML
- Observability of flows concerning message rates, success, failure, latency, etc.
- Ability to mirror or trace traffic depending on defined criteria

Agile Rules Technology (ART)

The Agile Rules Technology (ART) rules engine incorporates over 150 patents and offers a range of benefits unique to this solution:

- An easy-to-use rules visualization GUI: Operators can configure, test and deploy a new set of rules without the need for coding or professional services involvement.
- Flexibility: Support for a wide range of existing or emerging routing use cases that can be tailored for specific scenarios.
- High performance and scalability: Very low latency and high transaction rates for complex routing scenarios.
- Maintainability: Reduced time and costs to operate, install, upgrade, troubleshoot and debug the system and associated rules.

Flexible deployment options

CSD was designed as cloud-native software and is not based on proprietary hardware. It can be deployed in three ways:

- Commercial, off-the-shelf (COTS)-based deployment: Allows service providers to use cost-effective HP Blade or rack-mount servers.
- CNF cloud deployment on Kubernetes: provides the advantages of hyperscaler hosting on public clouds such as Amazon AWS, Google Cloud,, etc. Also supports public-private hybrid cloud deployments.
- NFV cloud deployment: Offers all the benefits of network functions virtualization (NFV) and full integration with Nokia CloudBand, OpenStack® and VMware vCloud NFV™.

Scalability and elasticity

CSD can be flexibly scaled to support a wide range of network sizes and the associated volumes of control plane traffic. To meet specific performance requirements, application capacity can be added or removed easily. Deployments can be scaled independently in three ways:

- Load Balancer scalability: This matches the site's scale requirements. The resources allocated

to load balancers provide a wide range of performance.

- Application scalability: This depends on the number of nodes deployed in the application layer, and it can be scaled independently of the load balancer or persistence layers. The per-application node capacity may vary based on the message processing's complexity.
- Persistence scalability: Independent linear scaling for the amount of information that may be persisted. Persistent node capability is guided by the read and write data mixture. New nodes can be added seamlessly without affecting the ongoing operations.

Elasticity is the ability to grow or reduce the system scale. Implementation of elasticity requires limiting of state information to the persistence layer, a high-performance, stateless single point of contact, and stateless application nodes.

Fault tolerance

CSD provides fault tolerance in all layers of its architecture:

- Point-of-contact nodes: CSD deploys point-of-contact nodes in hot active/standby pairs. CSD monitors the availability of the active point-of-contact nodes. Lack of active node availability triggers activation of the standby system, providing minimal disruption to ongoing operations.
- Application and database nodes: Application and database nodes are deployed in N+K active-active mode. This allows for K failures to occur without any loss of service capacity.

Centralized operations

- A single provisioning service enables simplified service deployment for functions such as maintenance and administration.
- Network monitoring includes a statistics dashboard and peer dashboard.
- Subscriber tracing is supported.
- Interface to Nokia NetAct for Fault Monitoring and Performance Monitoring.

Ease of integration with third-party systems

CSD is built for multivendor deployments. Its architecture enables simple and fast customization to accommodate protocol differences in implementation. This allows for easy integration across a multitude of network environments, reducing time to deployment and operational deployment costs.

Technical specifications

Deployment options

Nokia CSD, release 23 supports SCP, SEPP, BSF and CN-DRA to be deployed on top of Kubernetes cluster as containerized microservices integrated with Nokia Cloud Operations Manager.

Cloud options

Cloud-native Network Functions (CNF)

- Nokia Container Services (NCS)
- RedHat OCP
- Amazon AWSAmazon EKS
- VMWare TCP
- Microsoft Azure

Network Functions Virtualization (NFV)

- Nokia CloudBand Infrastructure Software
- Nokia CloudBand Application Manager
- OpenStack Rocky
- VMware vCloud NFV
- Virtualized Network Function Manager integration (OpenStack and VMware vCloud)

Table 1. Nokia CSD Features and Benefits Summary

Feature	Benefit
5G and 4G signaling	Service Communication Proxy (SCP) for http2 signaling facilitation Security Edge protection proxy (SEPP) for roaming scenarios Binding Support Function (BSF) Diameter Routing Agent and Edge Agent (DRA, DEA)
Support for all Diameter and SBI interfaces	Enables flexible deployment into any 4G/5G signaling environment with the needed applications made available by adding application descriptors
Stateful and stateless message routing	Controls the Diameter behavior in the network for efficient operation, scalability and performance
Mediation and data manipulation	Assures interoperability and compatibility between existing and new elements
Server load partitioning and load balancing	Extends processing responsibilities within a pool of assigned or unassigned servers and precisely defines routing behavior
Message stream mirroring	Supports uninterrupted system migration or message inspection use cases
Session binding and correlation	Ensures that all messages from a given session follow the same path in scenarios of same as well as related flows
Diameter firewall	Secure 4G signaling in accordance with GSMA FS.19 (Diameter Interconnect Security)
Edge Agent for roaming	Enables rapid internetworking between home and visited networks including firewall-based security through DEA (4G) and SEPP (5G)
Overload protection	Protects downstream and upstream elements from too many or overly frequent signaling messages
Throttling	Limits traffic to engineered levels of throughput with exception handling
Fraud monitoring and white lists	Improves control plane security
Signaling suppression	Reduces control plane traffic
Interworking function (IWF)	Mediates and secures signaling messages between different networks composed of 5G http2, 4G Diameter, and 2G/3G SS7



Learn more

For more information about the Nokia Cloud Signaling Director, please visit:
<https://www.nokia.com/networks/products/cloud-signaling-director/>

About Nokia

At Nokia, we create technology that helps the world act together.

As a B2B technology innovation leader, we are pioneering networks that sense, think and act by leveraging our work across mobile, fixed and cloud networks. In addition, we create value with intellectual property and long-term research, led by the award-winning Nokia Bell Labs.

Service providers, enterprises and partners worldwide trust Nokia to deliver secure, reliable and sustainable networks today – and work with us to create the digital services and applications of the future.

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