Nokia Cloud Signaling Director
Secure, simplify and scale core signaling
Release 18.8

As usage of mobile networks continues to grow rapidly, managing control traffic is becoming a major challenge. With ubiquitous access to personal multimedia devices, subscribers are driving the next generation of network capabilities, resulting in a huge rise in control traffic.

Deploying a 4G or 5G core network without a signaling solution creates a complicated control topology and an inefficient signaling control plane, which increases maintenance and operations costs and can cause service degradation and outages.

Nokia Cloud Signaling Director (CSD)\(^1\) 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. The CSD will provide complete control plane signaling facilitation for 5G.

**Key features**

- High-speed message inspection and manipulation based on patented Agile Rules Technology (ART)
- Flexible cloud deployment options
- Scalability, so networks can meet specific performance requirements, and elasticity
- Fault tolerance
- Centralized provisioning functions
- Ease of integration with third-party systems
- Diameter firewall for interconnect security

**Key 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

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\(^1\) Previously known as Nokia Dynamic Diameter Engine (DDE), the CSD is Nokia’s software for 4G Diameter signaling and 5G HTTP/2 signaling
• 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. 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 4G networks, adding the CSD’s Diameter routing agent (DRA) in front of Diameter entities or groups of like Diameter entities removes the complicated peer-to-peer Diameter 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.

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 for virtualization and is not based on proprietary hardware. It can be deployed in two ways:

- Commercial, off-the-shelf (COTS)-based deployment: Allows service providers to use cost-effective HP Blade or rack-mount servers.
- 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, in which a total of N+K nodes are deployed to handle the capacity of N nodes. 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.

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

Deployment options
Nokia CSD, release 18.8, is certified by Nokia for operation on the following hardware platforms:

• HP BladeSystem c7000: HP Proliant BL460c Gen9 Server Blade
• HP ProLiant servers (for rack-mount server configurations): HP ProLiant DL 380p Gen9 Server

NFV cloud options
• OpenStack Newton
• VMware vCloud NFV 2.x
• CloudBand Infrastructure Software, release 18.0
• CloudBand Application Manager, release 18.0
• Life cycle management support: Instantiation, scaling and healing
• Virtualized Network Function Manager integration (OpenStack and VMware vCloud)