Oracle® Communications Converged Charging System

Network Bridge User Guide

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Oracle Communications Converged Charging System Network Bridge User Guide, Release 2.0

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Preface

This guide provides an overview of Oracle Communications Network Bridge.

Audience

This guide is intended for anyone who installs and uses Oracle Communications Network Bridge.

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1
Network Bridge Overview

Oracle Communications Network Bridge is a cloud native solution based on a microservices architecture. It enables 5G Core Network Functions (NFs) to communicate with Evolved Packet Core (EPC) network elements.

Topics in this document:

- About Network Bridge
- About the Supported Nchf Service Operations
- About the Supported Npcf Service Operations

About Network Bridge

Network Bridge is a transformation application for 5G-enabled communication services. It allows two network applications with different protocols and formats to communicate with each other. For example, it enables an online charging system (OCS) from one vendor to interface with an OCS from another vendor.

Network Bridge receives REST API messages from a source network application, converts the messages into the appropriate format, and then sends the messages to a destination network application. Likewise, Network Bridge performs the reverse when the destination needs to send messages back to the source. To view the supported REST API message types, see "About the Supported Nchf Service Operations" and "About the Supported Npcf Service Operations".

Network Bridge can perform the following types of conversion:

- **Protocol transformation**: Converts REST API messages between the HTTP and Diameter protocols, allowing communication between 5G network applications and 4G LTE OCSs or PCRFs. By default, Network Bridge supports protocol transformation between:
  - N40 interfaces and Gy interfaces
  - N7 interfaces and Gx interfaces
- **Event translation**: Modifies data included in REST API messages and their payloads to meet the needs of downstream network applications. For example, it can add, modify, and delete fields from message payloads.

Network Bridge converts incoming and outgoing messages using the rules you specify. The rules define a message's criteria to qualify for conversion and how to convert the message. For protocol transformation, the Network Bridge package includes protocol rule files for N40-to-Gy conversion and N7-to-Gx conversion that are ready for immediate use. You do not need to perform any modifications on these files.

To configure Network Bridge for event translation, such as from one 5G network application to another, you must manually create a rule file that specifies the criteria and the fields and values to change. See "About the Mutation Rule File".

About the Supported Nchf Service Operations

Table 1-1 shows the types of Nchf operations that Network Bridge supports. To create, update, or end a converged charging session, the NF submits an HTTP POST request to the URI shown in the table.

Table 1-1 Supported CHF Service Operation Types

Nchf Operation	Request Originator	URI	Description
Nchf_ConvergedCharging_Create	NF	*apiRoot***/nchf-convergedcharging/v3/chargingdata**	Creates an initial quota reservation for a converged charging session. For example, initially reserving 500 MB for a data session.
Nchf_ConvergedCharging_Update	NF	*apiRoot***/nchf-convergedcharging/v3/chargingdata/***ChargingDataRef***/update**	Updates the quota reservation and reports the current service usage. For example, reserving an additional 100 MB and reporting that the customer has used 499 MB from the initial quota reservation.
Nchf_ConvergedCharging_Delete	NF	*apiRoot***/nchf-convergedcharging/v3/chargingdata/***ChargingDataRef***/release**	Ends a converged charging session by releasing the subscriber's reservation and then providing a last report of service usage.
Nchf_ConvergedCharging_UpdateNotify	CHF	*notificationUri***/update** *notificationUri***/terminate**	Notifies the NF that one of the following is required: • Reauthorization of the session • Ending the session

where:

- *apiRoot* is the URL for accessing the Network Bridge server, which is either **http://***hostname***:***httpPort* or **https://***hostname***:***httpsPort*.
- *chargingDataRef* is the unique identifier for a charging data resource in a Public Land Mobile Network (PLMN).
- *notificationURI* is the recipient of notifications sent by the CHF, such as http://test-notification-url.

For more information about the Nchf service operations, see ETSI TS 132 290 V15.1.0 Technical Specification.

About the Supported Npcf Service Operations

Table 1-2 shows the types of Npcf operations that Network Bridge supports. To create, update, or end a policy-controlled session, the NF submits an HTTP POST request to the URI shown in the table.

Table 1-2 Supported PCRF Service Operation Types

Npcf Operation	Request Originator	URI	Description
Npcf_SMPolicyControl_Create	NF	*apiRoot***/npcf-smpolicycontrol/v1/sm-policies**	Creates a PDU session with a specified QoS flow.
Npcf_SMPolicyControl_Update	NF	*apiRoot***/npcf-smpolicycontrol/v1/sm-policies/***smPolicyId***/update**	Updates the PDU session when a policy control request trigger condition is met. For example, changing the QoS flow when a user's location changes.
Npcf_SMPolicyControl_Delete	NF	*apiRoot***/npcf-smpolicycontrol/v1/sm-policies/***smPolicyId***/delete**	Deletes the SM Policy Association and the associated resources.
Npcf_SMPolicyControl_UpdateNotify	PCF	*notificationUri***/update** *notificationUri***/terminate**	Updates or deletes the PDU session-related policy context at the SMF and the policy control request trigger information.

where:

- *apiRoot* is the URL for accessing the Network Bridge server, which is either **http://***hostname***:***httpPort* or **https://***hostname***:***httpsPort*.
- *smPolicyId* is the unique identifier for an individual SM Policy resource.
- *notificationURI* is the recipient of notifications sent by the CHF, such as http://test-notification-url.

For more information about the Pcrf service operations, see ETSI TS 129 512 V15.0.0 Technical Specification.

2 Using Network Bridge for 5G-to-4G Payload Conversion

You can use Oracle Communications Network Bridge to convert HTTP message payloads from 5G networks into the Diameter protocol, so they can be processed by 4G LTE online charging systems (OCSs) as well as policy and charging rules functions (PCRFs).

Topics in this document:

About 5G-to-4G Payload Conversion

Network Bridge can convert REST API messages from 5G network applications into a format for 4G network applications. This functionality prevents your company from needing to switch to a complete 5G core architecture all at once. You can launch a 5G services architecture while using an existing 4G LTE online charging system (OCS) and a 4G policy and charging rules function (PCRF). That is, you can continue using a 4G LTE OCS, such as Oracle Communication Network Charging and Control, to rate 5G service usage from your customers.

When configured for 5G-to-4G payload conversion, the Network Bridge architecture does the following:

- Processes incoming HTTP messages
- Prepares messages for processing by a 4G protocol conversion service
- Converts message payloads between the HTTP protocol and the Diameter protocol

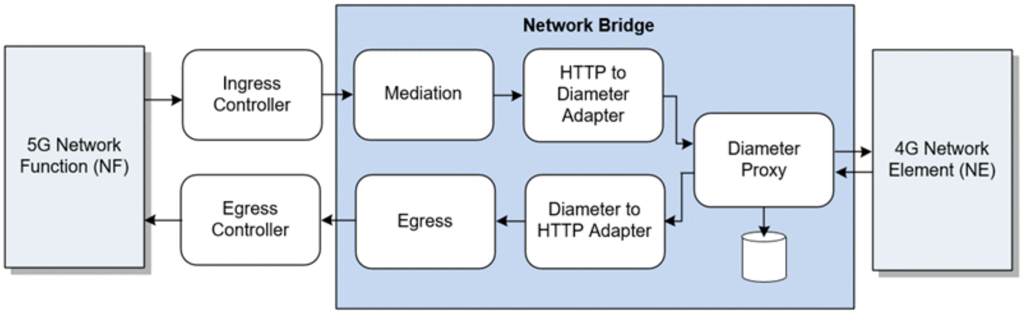
The Network Bridge package includes built-in support for the following:

- Interworking between 5GC SMF and EPC OCS – N40 to Gy
- Interworking between 5GC SMF and EPC PCRF – N7 to Gx

5G-to-4G Network Bridge Architecture

Figure 2-1 shows the Network Bridge architecture for performing 5G-to-4G payload conversion.

Figure 2-1 5G-to-4G Network Bridge Architecture



For information about configuring Network Bridge for 5G-to-4G payload conversion, see "Configuring Network Bridge for 5G to 4G Payload Transformation" in *Network Bridge Cloud Native Installation and Administration Guide*.

Processing Messages from 5G NFs to 4G NEs

Network Bridge processes messages from 5G NFs to 4G NEs as follows:

1. The 5G NF sends a credit-control request (CCR) message to the external ingress controller.
2. The external ingress controller directs the incoming message to the Network Bridge Mediation component.

> **Note:**
>
> You must configure the ingress controller to route N40 and N7 requests to the Mediation component. See "Installing an Ingress Controller" in *Network Bridge Cloud Native Installation and Administration Guide*.

3. The Mediation component prepares the message for protocol transformation and optionally adds custom metadata before sending the message to the HTTP to Diameter Adapter component.
4. The HTTP to Diameter Adapter component:
   - Converts the message payload from the HTTP protocol to the Diameter protocol according to rules in the Network Bridge protocol rule file.
   - Sends the message to the Diameter Proxy component.
5. The Diameter Proxy component adds AVPs, such as origin and destination, and then sends the message to the 4G NE.
6. The 4G LTE OCS or PCRF starts, updates, closes, or rates the converged charging session or policy-controlled charging session.
7. The 4G LTE OCS or PCRF responds to the CCR by sending a credit-control answer (CCA) message to the Diameter Proxy component.
8. The Diameter Proxy component stores information about the session in the MySQL NDB and then sends the message to the HTTP to Diameter Adapter component.

9. The HTTP to Diameter Adapter component:
    - Converts the message payload from the Diameter protocol to the HTTP protocol according to rules in the Network Bridge protocol rule file.
    - Sends the message to the Mediation component.
10. The Mediation component sends the message to the external ingress component, which in turn forwards it to the 5G NF.

Processing Messages from 4G NEs to 5G NFs

Network Bridge processes messages from 4G NEs to 5G NFs as follows:

1. The 4G LTE OCS or PCRF sends an RAR message to the Diameter Proxy component.
2. The Diameter Proxy component retrieves session information from the MySQL NDB before sending the message to the Diameter to HTTP Adapter component.
3. The Diameter to HTTP Adapter component:
    - Converts the message payload from the Diameter protocol to the HTTP protocol according to the rules in the Network Bridge protocol rule file.
    - Sends the message to the Egress component.
4. The Egress component optionally adds AVPs, such as Explicit-Route-Record, to the message before sending it to the external egress controller.
5. The external egress controller forwards the message to the 5G NF.
6. The 5G NF responds by sending a reauthorization answer (RAA) message to the external egress controller.
7. The external egress controller forwards the message to the Network Bridge Egress component.
8. The Egress component forwards the message to the Diameter to HTTP Adapter component.
9. The Diameter to HTTP Adapter component:
    - Converts the message payload from the HTTP protocol to the Diameter protocol according to the rules in the Network Bridge protocol rule file.
    - Sends the message to the Diameter Proxy component.
10. The Diameter Proxy component forwards the message to the 4G NE.

3

Using Network Bridge for 5G-to-5G Payload Conversion

Oracle Communications Network Bridge can be used to convert HTTP message payloads between different 5G network functions (NFs).

Topics in this document:

- About Using Network Bridge as an N40 Proxy
- Process Flow for N40 Proxy
- About the Mutation Rule File

About Using Network Bridge as an N40 Proxy

You can use Network Bridge to interconnect multiple 5G NFs that support different formats, such as between a 5G network application and several 5G online charging systems (OCS) from various vendors. In this case, Network Bridge acts as an N40 proxy, dynamically transforming REST API messages into the appropriate format for each OCS vendor.

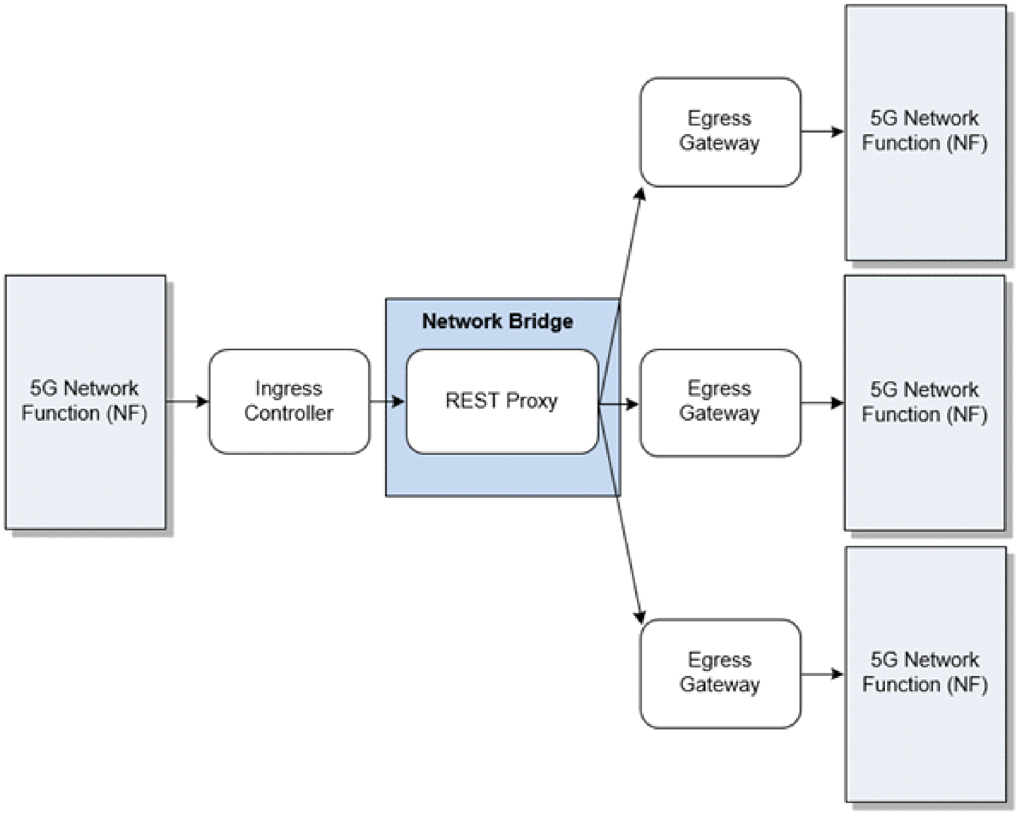
When configured as an N40 proxy, the Network Bridge architecture does the following:

- Translates HTTP/2 signaling API messages between vendor-specific implementations
- Resolves interoperability issues between 5G NFs
- Dynamically transforms messages based on rules you specify
- Appends value-added services based on rules you specify

Process Flow for N40 Proxy

Figure 3-1 shows the Network Bridge architecture for functioning as an N40 proxy.

Figure 3-1 Network Bridge REST Proxy Architecture



Network Bridge converts REST API message payloads between different 5G NFs by using the following process:

1. The ingress controller, which is external to Network Bridge, directs incoming messages to the Network Bridge REST Proxy component.

   > **Note:**
   >
   > You must configure the ingress controller to route N40 and N7 requests to the REST Proxy component. See "Installing an Ingress Controller" in *Network Bridge Cloud Native Installation and Administration Guide*.

2. The REST Proxy component transforms message payloads according to your mutation rule file and then sends messages to the appropriate external egress gateway.
3. The external egress gateway forwards messages to the destination 5G NF.

For information about configuring Network Bridge for 5G-to-5G payload conversion, see "Configuring Network Bridge for 5G to 5G Payload Conversion" in *Network Bridge Cloud Native Installation and Administration Guide*.

About the Mutation Rule File

Network Bridge can transform incoming and outgoing REST API messages according to the rules you define in a mutation rule file. The file specifies the following:

- The criteria that a REST API message must meet, such as it contains a specific header value. If multiple conditions are included, a message must meet all the criteria to qualify for transformation.
- How to transform the REST API message, such as by adding a header field and changing a field's value in the JSON body.

For the criteria, you can require that a single field, a required key-value pair for a parameter, or a JSON string does one of the following:

- Equals a value (you can specify whether it is case sensitive or not)
- Does not equal a value (you can specify whether it is case sensitive or not)
- The value is not null
- The value is null
- The value matches a regular expression
- The JSON string contains a set JSON path

You can configure Network Bridge to transform the following if a message meets all of the criteria:

- **Headers**: Add, modify, or remove header fields from the REST API message.
- **Request Bodies**: Modify the HTTP message body by adding, replacing, or removing fields.
- **Method or Status Code**: Update the method name or the status code.
- **URLs**: Modify the URLs to which REST API messages are sent.
- **Payloads**: Convert request payloads between JSON format and XML format.
- **Message Actions**: Forward, reject, drop, or copy messages based on configured rules.

For information about creating a mutation rule file, see "Defining Mutation Rules for Payload Conversion" in *Network Bridge Cloud Native Installation and Administration Guide*.