EPG Software Configuration Overview

OPERATION DIRECTIONS

16/1543-AXB 250 12-V3 Uen DS

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Contents

1 Introduction

This document gives an overview of the basic and optional software configuration tasks on the Evolved Packet Gateway (EPG) as well as configuration guidelines, and includes references to configuration instructions.

1.1 Scope

This document covers the following issues:

- Information on the default root password
- An overview of configuration guidelines
- An overview of basic EPG software configuration tasks
- An overview of optional EPG software configuration tasks
- Examples of an EPG software configuration

Note: It is not allowed to issue a commit command when the EPG application is stopped unless specifically instructed to. The validation of the configuration cannot be performed on a stopped node. For information on how to stop and start the EPG application, see Section 3 on page 1.

Note: In this document, the term physical interface refers to the interface configured in Network Functions Virtualization Infrastructure (NFVI).

1.2 Target Groups

This document is intended for personnel performing configuration of the EPG.

2 Default Root Password

At initial installation of the EPG, use the default root password `root` to access the node.

The root password is reset to the default value after an upgrade or update. Therefore, change the default root password immediately after an initial installation, software upgrade, or update. For more information, refer to *Security Management*.

3 Configuration Guidelines

This section lists some necessary guidelines for consideration when performing EPG configuration.

3.1 Using the CLI

The primary user interface to the EPG is the CLI. For more information about using CLI commands, refer to *Using the CLI* and for information about specific commands, refer to *Commands.*

3.1.1 Command Modes and Prompts

There are five command modes and associated prompts available to the user, as shown in Table 1.

Table 1 Command Modes and Prompts

Mode	Access	Prompt	Example
IPOS exec	Connect to the node using either Telnet or Secure Shell (SSH).	`[local]host#`(1)	**`ssh user@10.0.0.2`** `[local]host#`(1)
IPOS global configuration	Enter the IPOS global configuration mode by using the following command from the IPOS exec mode: `[local]host#`**`configure`**	`[local]host(config)#`	`[local]host#`**`configure`** `[local]host(config)#`
Ericsson exec	Enter the Ericsson exec mode by using the following command from the IPOS exec mode: `[local]host#`**`start oam-cli`**	`(exec) user@hostname>`	`[local]host#`**`start oam-cli`** `(exec) user@hostname>`

Mode	Access	Prompt	Example
Ericsson configuration[2]	Enter the Ericsson configuration mode by using the following command from the Ericsson exec mode: `(exec) user@hostname>`**`configure`**	`(config) user@hostname>`	`(exec) user@hostname>` **`configure`** `(config) user@hostname>`**`ManagedElement=1,Epg=1`** `(config) ManagedElement=1,Epg=1 user@hostname>`
Shell[3]	Enter the shell mode by using the following command from the IPOS exec mode: `[local]host#` **`start shell`**	`bash-3.2$`	`[local]host#`**`start shell`** `bash-3.2$`

(1) If the privilege start level for the login user is 7 or higher, the prompt is #. For privilege start levels below 7, the prompt is >.
(2) CLI commands must be executed from the level of the configuration hierarchy the user wants to work with or modify. The limitation implies that fullpath commands only work if used for hierarchy levels previously created.
(3) The shell mode is only to be used according to Ericsson directions and in strict accordance to the procedures described in the CPI.

EPG application-level action commands can be executed in the Ericsson exec and Ericsson configuration CLI modes by an account with the **EPG Operator** user role.

For information on administrative privilege levels and user roles required for accessing the different CLI modes, refer to *Security Management*.

The Ericsson exec and Ericsson CLI modes also support the following:

- Autocomplete, using the **Tab** key
- Help text and support, using the **?** key

3.1.2 Command Mode Hierarchy

Command modes exist in a hierarchy. The user must access the higher-level command mode before the user can access a lower-level command mode in the same chain. As an example, Figure 1 shows the hierarchy of the command modes used to configure some basic service features.

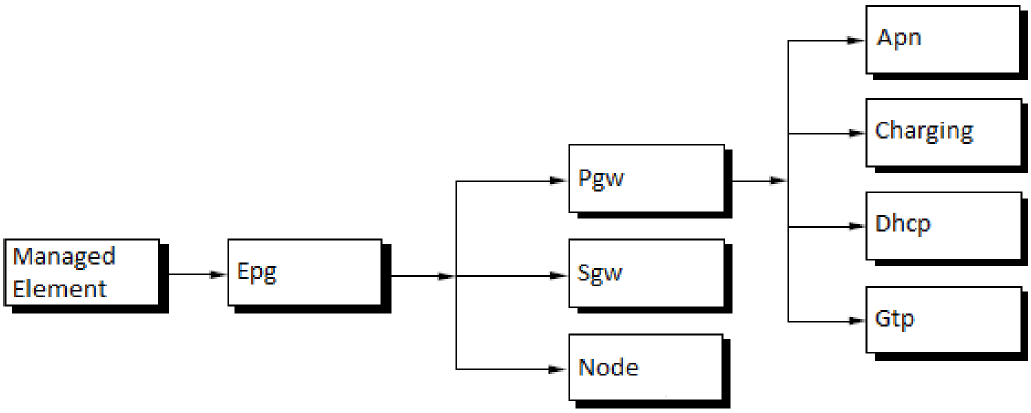

Figure 1 Example of Command Mode Hierarchy for Basic System Commands

Similarly, each level of the hierarchy of the EPG software configuration has to be manually created before it can be navigated to or before CLIs can be executed on the level in question.

CLI commands must be executed from the level of the configuration hierarchy the user wants to work with or modify. The limitation implies that full path commands only work if used for hierarchy levels previously created and only if entered as seen in the following example:

```
(config) ManagedElement=1
user@hostname>Epg=1,Pgw=1,Apn=apn1,giAddressRange=addressRange
```

Example 1 Using Full Path Commands

The following examples show how to navigate the CLI on the EPG:

```
exec
user@hostname>configure
(config)
user@hostname>ManagedElement=1
(config) ManagedElement=1
user@hostname>Epg=1
(config) ManagedElement=1,Epg=1
user@hostname>Pgw=1
(config) ManagedElement=1,Epg=1,Pgw=1
user@hostname>statistics ppb
```

Example 2 Navigating the Configuration Hierarchy to Execute Commands.

```
ManagedElement=1,Epg=1
user@hostname>Apn=?
<cr>
<new>
(config) ManagedElement=1,Epg=1,Pgw=1
user@hostname>Apn=apn1.com
(config) ManagedElement=1,Epg=1,Pgw=1.Apn=apn1.com
user@hostname>
```

Example 3   Creating a New Hierarchy Level.

```
(config) ManagedElement=1,Epg=1,Pgw=1.Apn=apn1.com
user@hostname>up
(config) ManagedElement=1,Epg=1,Pgw=1
user@hostname>up
(config) ManagedElement=1,Epg=1
user@hostname>Sgw=1
(config) ManagedElement=1,Epg=1,Sgw=1
user@hostname>statistics
sgw-statistics:
```

Example 4   Changing Location in the Hierarchy in Order to Execute a Command.

3.1.3 Configuration Files

An EPG configuration can be loaded in two ways. Either the configuration is loaded from a file by using the `configure` *<url>* command, or the content of a configuration file can be copied and pasted directly in the CLI.

Note: When loading a configuration from a configuration file that contains objects with list attributes, the existing node configuration must be empty.

The following shows an example of the configuration file format:

```
ManagedElement=1
   Epg=1
      Node=1
         BoardAllocation=gc-0/15/1
            up
         BoardAllocation=gc-0/6/1
            up
         BoardAllocation=gu-0/16/1
            up
         BoardAllocation=gu-0/17/1
            up
         BoardAllocation=gu-0/5/1
            up
         Ebm=1
```

```
    enabled
    logicalInterface="ebm-if"
    Server=1
       address="16.10.0.1"
       port=6600
       up
    up
Interface=1
    GomC=1
       logicalInterface="gom-c-if"
       up
    up
LogicalInterface=ebm-if
    address="5.18.0.1"
    routingInstance="ctx-ebm"
    up
LogicalInterface=gom-c-if
    address="5.16.0.1/27"
    routingInstance="ctx-gom"
    up
LogicalInterface=s1s4s12-u-if
    address="5.24.0.1"
    ipv6Address="2A02:5:18::1"
    routingInstance="ctx-s1s4s12-u"
    up
LogicalInterface=s4s11-c-if
    address="5.2.0.1"
    ipv6Address="2A02:5:2::1"
    routingInstance="ctx-s4s11-c"
    up
LogicalInterface=s5s8-c-if
    address="5.4.0.1"
    ipv6Address="2A02:5:4::1"
    routingInstance="ctx-s5s8"
    up
LogicalInterface=s5s8-u-if
    address="5.5.0.1"
    ipv6Address="2A02:5:5::1"
    routingInstance="ctx-s5s8"
    up
LogicalInterface=gn-s5s8-c-if
    address="5.0.0.1/27"
    ipv6Address="2A02:5::1/123"
    routingInstance="ctx-s5s8"
    up
LogicalInterface=gn-s5s8-u-if
    address="5.1.0.1"
    ipv6Address="2A02:5:1::1"
    routingInstance="ctx-s5s8"
    up
up
```

```
Pgw=1
   node="epg6-1-pgw"
   BoardAllocation=1
      numberOfCpb=2
      up
   Apn=apn1.com
      giAddressRange="5.40.12.192/27"
      pgwEnabled
      routingInstance="gi1"
      PdpContext=1
         addressAllocation=shared-ip-pool
         creation=unblocked
         sharedIpPool="IPv4_pool"
      up
   PdpContext=1
      allowSecondary
   Interface=1
      GnC=1
         logicalInterface="gn-s5s8-c-if"
         n3Requests=1
         noPathManagement
         noPeerRestart
         up
      GnU=1
         logicalInterface="gn-sns8-u-if"
         up
      S5s8C=1
         logicalInterface="gn-s5s8-c-if"
         up
      S5s8U=1
         logicalInterface="gn-s5s8-u-if"
         up
      up
   up
Sgw=1
   node="epg6-1-sgw"
   Interface=1
      S1s4s12U=1
         logicalInterface="s1s4s12-u-if"
         up
      S4s11C=1
         logicalInterface="s4s11-c-if"
         n3Requests=1
         noPathManagement
         noPeerRestart
         up
      S5s8C=1
         logicalInterface="s5s8-c-if"
         up
      S5s8U=1
         logicalInterface="s5s8-u-if"
```

```
                    up
                 up
              up
           up
        up
```

Example 5   Configuration Example

3.2 Stop and Start the EPG

Some configuration changes require that the GGSN, PGW, or SGW applications be stopped before making such changes. The GGSN, PGW, or SGW applications can also be stopped before or after the initial start of a new software application.

Mandatory GGSN-, PGW-, or SGW-specific configuration needs to be made before start of the specific application is possible. This configuration is performed during an upgrade or update of installations already running a specific application or during an initial software installation. The procedures for software upgrade are described in *Software Upgrade for Virtual EPG from 16A* and *Software Upgrade for Virtual EPG*. The procedure for initial software installation, is described in *Deploying Virtual EPG*.

Note: Activation of PGW-specific functionality by configuration is not a prerequisite for start of the GGSN application. The procedure for activation of the PGW and SGW functionality is described in *EPG Migration for Deployment in EPS*.

Table 2 shows the supported procedures for stopping and starting EPG deployments on node level and board level.

Table 2   Supported Procedures for Stopping and Starting EPG Deployments

EPG Deployment	**Supported Procedures**	
	Node Level	**Board Level**
Standalone SGW	Stopping and starting the SGW	N/A (1)
Standalone GGSN/PGW	Stopping and starting the GGSN or PGW	Stopping and starting CPBs on board level
Combined SGW and PGW	Stopping and starting the combined SGW and PGW	N/A (1)

(1) Stopping and starting CPBs and PPBs on board level is not supported.

3.2.1 Terminate User Sessions

User sessions can be terminated using two commands, `terminateIdleSessionStart` and `terminate`.

The termination of idle user sessions is an optional feature controlled by the action command `terminateIdleSessionStart`. The command is used to terminate idle user sessions on the SGW, PGW, or GGSN nodes. It is used to empty a node partially or fully without impacting active user sessions.

To terminate both active and idle user sessions use the `terminate` command. The termination of user sessions is limited by the configured throttling rates. Using the `terminate` command results in active user sessions being interrupted.

See *Session Management* for more information on `terminateIdleSessionStart` and throttling rates.

3.2.2 Stop and Start the Standalone SGW on Node Level

The following sections describe the stop and start procedures for the standalone SGW on node level.

3.2.2.1 Stop the Standalone SGW

The standalone SGW can be stopped on node level according to the following procedure.

Warning!

The following procedure is service-affecting and causes EPG downtime. Depending on the traffic load, this procedure can take a long time to execute, possibly several hours.

---

1. Block the creation of new user sessions on the SGW:

```
(config) ManagedElement=1,Epg=1,Sgw=1,ControlPlane=1,Session=1,E
user@hostname>node
user@hostname>commit
```

2. Terminate idle user sessions on the SGW, or user sessions that become idle while the command is running:

```
(exec)
user@hostname>ManagedElement=1,Epg=1,Sgw=1,ControlPlane=1,Sessic
```

3. Verify the number of users sessions that are remaining on the SGW to determine when is appropriate to run the `terminate` command:

```
(exec)
user@hostname>ManagedElement=1,Epg=1,Sgw=1,statistics
```

The `sgw-nbr-ues` field shows the total number of UE devices on the SGW.

The following command displays the number of user sessions remaining on the SGW with a QCI value of 1:

```
(exec)
user@hostname>ManagedElement=1,Epg=1,Sgw=1,statisticsQci 1 all bri
```

The following command displays the number of bearers per ARP priority level:

```
(exec)
user@hostname>ManagedElement=1,Epg=1,Sgw=1,statisticsArp
```

4. Terminate all remaining user sessions on the SGW:

```
(exec)
user@hostname>ManagedElement=1,Epg=1,Sgw=1,ControlPlane=1,Session=
```

Note: The `terminate` command is only required if there are user sessions remaining on the SGW.

5. Verify that the termination has been finalized. All user sessions must be terminated before the application can be stopped:

```
(exec)
user@hostname>ManagedElement=1,Epg=1,Sgw=1,statistics
```

6. Verify that SGW Charging Data Records (CDRs) or Rf Accounting-Requests (ACRs) are not being generated any more:

```
(exec)
user@hostname>ManagedElement=1,Epg=1,Sgw=1,statistic
sCharging
```

Ensure that the `rf-acct-req-pending-to-be-written-to-disk` and `bp-cdrs-pending-to-be-written-to-disk` fields are equal to zero.

7. Stop the node function by setting a stop configuration:

```
(config) ManagedElement=1,Epg=1,Sgw=1,Stop=1
user@hostname>node
user@hostname>commit
```

If the EPG application is stopped, the Redundant File Manager (RFM) process rebuilds the file system after 5 minutes. Stop the RFM process to prevent it from removing a custom file directory structure.

8. Stop the RFM process, using the following command:

```
[local]host#process stop rfm
```

9. Verify that the RFM process is stopped:
`[local]hostname#show process rfm`Ensure that the `STATE` of the RFM process is `stop`.

3.2.2.2 Start the Standalone SGW

The standalone SGW can be started on node level by using the following procedure.

1. Start the node by deleting the stop setting on node level:

```
(config) ManagedElement=1,Epg=1,Sgw=1
user@hostname>no Stop=1
user@hostname>commit
```

2. Unblock the user sessions by deleting the block setting on node level:

```
(config) ManagedElement=1,Epg=1,Sgw=1,ControlPlane=1,Session=1,B
user@hostname>no node
user@hostname>commit
```

Note: After an upgrade or node reload, the RFM process starts automatically. If no upgrade or node reload has been performed, the RFM process needs to be started manually. To start the RFM process, use the following command:

```
[local]hostname#process start rfm
```

3. Verify that the RFM process is running:

```
[local]hostname#show process rfm
```

3.2.3 Stop and Start the Standalone GGSN or PGW on Node Level

The following sections describe the stop and start procedures for the standalone GGSN or PGW on node level.

3.2.3.1 Stop the Standalone GGSN or PGW

The standalone GGSN or PGW can be stopped on node level according to the following procedure.

Warning!

The following procedure is service-affecting and causes EPG downtime. Depending on the traffic load, this procedure can take a long time to execute, possibly several hours.

1. Block the creation of new user sessions on the GGSN or PGW:

   ```
   (config) ManagedElement=1,Epg=1,Pgw=1,ControlPlane=1,Session=1,Blo
   user@hostname>node
   user@hostname>commit
   ```

   Blocking the GGSN or PGW causes all incoming bearer creation requests to be rejected.

2. Terminate idle user sessions on the GGSN or PGW or user sessions that become idle while the command is running:

   ```
   (exec)
   user@hostname>ManagedElement=1,Epg=1,Pgw=1,ControlPlane=1,Session=
   ```

   The value of `idleMonitorTimer` indicates the maximum time in seconds for which a session is allowed to be kept with no uplink payload. The range of `idleMonitorTimer` is 1–65535 seconds.

   Note: The user sessions that have dedicated bearers with QCI values that have been configured to prevent idle termination are kept.

   To display QCI values for bearers, enter the following command:

   ```
   (exec)
   user@hostname>ManagedElement=1,Epg=1,Pgw=1,statistics qci
   ```

3. Verify the number of user sessions that are remaining on the PGW to determine when is appropriate to run the `terminate` command:

   ```
   (exec)
   user@hostname>ManagedElement=1,Epg=1,Pgw=1,statistics brief
   ```

   The following field displays the number of active PDP contexts:

   `pdp-active`

   The following field displays the number of active IPv4 and IPv6 EPS bearers:

```
eps-active-bearer
```

4. Terminate all remaining user sessions on the GGSN or PGW:

   ```
   (exec)
   user@hostname>ManagedElement=1,Epg=1,Pgw=1,ControlPlane=1,Sessic
   ```

   Note: The `terminate` command is only required if there are user sessions remaining on the GGSN or PGW.

5. Verify that the termination has been finalized. All user sessions must be terminated before the application can be stopped:

   ```
   (exec)
   user@hostname>ManagedElement=1,Epg=1,Pgw=1,statistics brief
   ```

6. Verify that GGSN/PGW CDRs or Rf ACRs are not being generated any more:

   ```
   (exec)
   user@hostname>ManagedElement=1,Epg=1,Pgw=1,statistics
   charging
   ```
   Ensure that the `ftp-cdrs-to-be-written-to-disk` and `gtpp-cdrs-to-be-written-to-disk` fields are equal to zero.

7. Stop the node function by setting a stop configuration:

   ```
   (config) ManagedElement=1,Epg=1,Pgw=1,Stop=1
   user@hostname>node
   user@hostname>commit
   ```

If the EPG application is stopped, the RFM process rebuilds the file system after 5 minutes. Stop the RFM process to prevent it from removing a custom file directory structure.

8. Stop the RFM process, using the following command:

   ```
   [local]host#process stop rfm
   ```

9. Verify that the RFM process is stopped:
   ```
   [local]hostname#show process rfm
   ```
   Ensure that the `STATE` of the RFM process is `stop`.

3.2.3.2 Start the Standalone GGSN or PGW

The standalone GGSN or PGW can be started on node level by using the following procedure.

1. Start the node by deleting the stop setting on node level:

   ```
   (config) ManagedElement=1,Epg=1,Pgw=1
   ```

```
user@hostname>no Stop=1
user@hostname>commit
```

2. Unblock the user sessions by deleting the block setting on node level:

```
(config) ManagedElement=1,Epg=1,Pgw=1,ControlPlane=1,Session=1,Blo
user@hostname>no node
user@hostname>commit
```

Note: After an upgrade or node reload, the RFM process starts automatically. If no upgrade or node reload has been performed, the RFM process needs to be started manually. To start the RFM process, use the following command:

```
[local]hostname#process start rfm
```

3. Verify that the RFM process is running:

```
[local]hostname#show process rfm
```

3.2.4 Stop and Start the Combined SGW and PGW on Node Level

The following sections describe the stop and start procedures for the combined SGW and PGW on node level.

3.2.4.1 Stop the Combined SGW and PGW

The combined SGW and PGW can be stopped on node level according to the following procedure.

Warning!

The following procedure is service-affecting and causes EPG downtime. Depending on the traffic load, this procedure can take a long time to execute, possibly several hours.

---

1. Block the creation of new SGW and PGW user sessions:

```
(config) ManagedElement=1,Epg=1,Sgw=1,ControlPlane=1,Session=1,Blo
user@hostname>node
(config) ManagedElement=1,Epg=1,Pgw=1,ControlPlane=1,Session=1,Blo
user@hostname>node

user@hostname>commit
```

2. Terminate idle user sessions on the SGW or user sessions that become idle while the command is running:

```
(exec)
user@hostname>ManagedElement=1,Epg=1,Sgw=1,ControlPlane=1,Sessic
```

3. Verify the number of user sessions that are remaining on the SGW to determine when is appropriate to run the `terminate` command:

```
(exec)
user@hostname>ManagedElement=1,Epg=1,Sgw=1,statistics
```

   The `sgw-nbr-ues` field shows the total number of UE devices on the SGW.

   The following command displays the number of user sessions remaining on the SGW with a QCI value of 1:

```
(exec)
user@hostname>ManagedElement=1,Epg=1,Sgw=1,statisticsQci 1 all b
```

   The following command displays the number of bearers per ARP priority level:

```
(exec)
user@hostname>ManagedElement=1,Epg=1,Sgw=1,statisticsArp
```

4. Terminate all remaining user sessions on the SGW:

```
(exec)
user@hostname>ManagedElement=1,Epg=1,Sgw=1,ControlPlane=1,Sessic
```

   Note: The `terminate` command is only required if there are user sessions remaining on the SGW or PGW.

5. Terminate idle user sessions on the PGW or user sessions that become idle while the command is running:

```
(exec)
user@hostname>ManagedElement=1,Epg=1,Pgw=1,ControlPlane=1,Sessic
```

   The value of `idleMonitorTimer` indicates the maximum time in seconds for which a session is allowed to be kept with no uplink payload. The range of `idleMonitorTimer` is 1–65535 seconds.

   Note: The user sessions that have dedicated bearers with QCI values that have been configured to prevent idle termination are kept.

   To display QCI values for bearers, enter the following command:

```
(exec)
user@hostname>ManagedElement=1,Epg=1,Pgw=1,statistics qci
```

6. Verify the number of user sessions that are remaining on the PGW to determine when is appropriate to run the `terminate` command:

```
(exec)
user@hostname>ManagedElement=1,Epg=1,Pgw=1,statistics brief
```

The following field displays the number of active PDP contexts:

`pdp-active`

The following field displays the number of active IPv4 and IPv6 EPS bearers:

`eps-active-bearer`

7. Terminate all remaining user sessions on the PGW:

```
(exec)
user@hostname>ManagedElement=1,Epg=1,Pgw=1,ControlPlane=1,Session=
```

Note: The `terminate` command is only required if there are user sessions remaining on the SGW or PGW.

8. Verify that the termination has been finalized. All user sessions must be terminated before the applications can be stopped:

```
(exec)
user@hostname>ManagedElement=1,Epg=1,Sgw=1,statistics
(exec)
user@hostname>ManagedElement=1,Epg=1,Pgw=1,statistics brief
```

9. Verify that CDRs or Rf ACRs are no longer being generated.

If SGW charging is enabled, verify that CDRs or Rf ACRs are no longer being generated:

```
(exec)
user@hostname>ManagedElement=1,Epg=1,Sgw=1,statisticsCharging
```

If PGW charging is enabled, verify that CDRs or Rf ACRs are no longer being generated:

```
(exec)
user@hostname>ManagedElement=1,Epg=1,Pgw=1,statistics
charging
```

Ensure that the following fields are equal to zero:

- `ftp-cdrs-to-be-written-to-disk`
- `gtpp-cdrs-to-be-written-to-disk`

- `rf-acct-req-pending-to-be-written-to-disk`
- `bp-cdrs-pending-to-be-written-to-disk`

10. Stop the SGW and PGW node functions simultaneously by setting a stop configuration:

    Note: Stopping either the SGW or PGW only is not supported.

    ```
    (config) ManagedElement=1,Epg=1,Sgw=1,Stop=1
    user@hostname>node
    (config) ManagedElement=1,Epg=1,Pgw=1,Stop=1
    user@hostname>node
    user@hostname>commit
    ```

If the EPG application is stopped, the RFM process rebuilds the file system after 5 minutes. Stop the RFM process to prevent it from removing a custom file directory structure.

11. Stop the RFM process, using the following command:

    ```
    [local]host#process stop rfm
    ```

12. Verify that the RFM process is stopped: `[local]hostname#show process rfm`Ensure that the `STATE` of the RFM process is `stop`.

3.2.4.2 Start the Combined SGW and PGW

The combined SGW and PGW can be started on node level by using the following procedure.

Note: The SGW and PGW must be started together for the start to be effective. Start does not take place until after a commit is performed.

1. Start the SGW and PGW node functions simultaneously by deleting the stop settings on node level:

    ```
    (config) ManagedElement=1,Epg=1,Sgw=1
    user@hostname>no Stop=1
    (config) ManagedElement=1,Epg=1,Pgw=1
    user@hostname>no Stop=1
    user@hostname>commit
    ```

2. Unblock the SGW and PGW sessions, by deleting the block setting on node level:

    ```
    (config) ManagedElement=1,Epg=1,Pgw=1,ControlPlane=1,Session=1,B
    user@hostname>no node
    (config) ManagedElement=1,Epg=1,Sgw=1,ControlPlane=1,Session=1,B
    user@hostname>no node
    ```

```
user@hostname>commit
```

Note: After an upgrade or node reload, the RFM process starts automatically. If no upgrade or node reload has been performed, the RFM process needs to be started manually. To start the RFM process, use the following command:

```
[local]hostname#process start rfm
```

3. Verify that the RFM process is running:

```
[local]hostname#show process rfm
```

3.2.5 Stop and Start the GGSN or PGW on Board Level

The following sections describe the stop and start procedures for the GGSN or PGW CPBs on board level.

Note: Blocking, terminating, stopping, and starting GGSN/PGW PPBs are not supported.

3.2.5.1 Stop the GGSN or PGW CPBs on Board Level

The GGSN or PGW application can be stopped on Control Processing Board (CPB) level according to the following procedure:

1. Block the creation of all new sessions on the CPB:

```
(config) ManagedElement=1,Epg=1,Pgw=1,ControlPlane=1,Session=1,Blo
user@hostname>Board=boardName
user@hostname>commit
```

2. Terminate all active sessions on the CPB, if any active sessions exist:

```
(config) ManagedElement=1,Epg=1,Pgw=1,ControlPlane=1,Session=1
user@hostname>terminateBoard boardName
```

3. Verify that the termination has been finalized. All sessions on the CPB must be terminated before the GGSN or PGW application on the CPB can be stopped:

```
(config) ManagedElement=1,Epg=1,Node=1,Board
Allocation=boardName
user@hostname>statistics pgw
```

The number of active bearers on the CPB must be equal to zero, as shown in the example below:

```
(config) ManagedElement=1,Epg=1,Node=1,BoardAllocation=gc-0/15/1
```

```
username@hostname>statistics pgw
pgw-statistics:
    pgw-nbr-of-active-bearers: 0
```

4. Stop the CPB by setting a stop configuration:

```
(config) ManagedElement=1,Epg=1,Pgw=1,Stop=1
user@hostname>Board=boardName
user@hostname>commit
```

3.2.5.2 Start the GGSN or PGW CPBs on Board Level

The GGSN or PGW application can be started on CPB level by using the following procedure:

Note: If an application has been stopped on CPB level, it must also be started on CPB level for start to be effective.

Start does not take place until after a commit is performed.

1. If there is only one CPB specified under the `ManagedElement=1,Epg=1,Pgw=1,Stop=1` hierarchy, configure the application to start on board level by deleting the stop setting:

```
(config) ManagedElement=1,Epg=1,Pgw=1
user@hostname>no Stop=1
user@hostname>commit
```

If there are two or more boards specified under the `ManagedElement=1,Epg=1,Pgw=1,Stop=1` hierarchy, configure the application to start on board level by deleting the stop setting for a specific previously stopped CPB:

```
(config) ManagedElement=1,Epg=1,Pgw=1,Stop=1
user@hostname>no Board=boardName
user@hostname>commit
```

2. Unblock the sessions on the CPB, by deleting the block setting on board level:

```
(config) ManagedElement=1,Epg=1,Pgw=1,ControlPlane=1,Session=1,B
user@hostname>no Board=boardName
user@hostname>commit
```

4 Basic Configuration

This section lists the configuration tasks required to establish basic functionality.

4.1 Configure an EPG Node Identifier

An EPG identifier is included in Fault Management (FM) alarms and alerts, and Event-Based Monitoring (EBM) stream header records. The EPG identifier is also included in the PM statistic data of all node levels (that is all xml files of the node) as localDn even if a PGW/SGW identifier is set.

To configure an EPG identifier, include the following statement:

```
(config) ManagedElement=1,Epg=1,Node=1
   nodeName=epgIdentifier
```

Note: The `epgIdentifier` can consist of 1–20 characters. If only one character is used for `epgIdentifier`, this character must not be equal to 1.

If an EPG identifier is not configured, the default EPG identifier is the host name of the router. Changes to the host name during runtime will not update the EPG Identifier. This requires a restart.

To update the EPG identifier during runtime use the `nodeName` attribute.

4.1.1 Configure an SGW Identifier

An SGW identifier is included in generated SGW charging data files and SGW-specific alarms and alerts.

To configure an SGW identifier, include the following statement:

```
(config) ManagedElement=1,Epg=1,Sgw=1
   node=sgwIdentifier
```

Note: To run the SGW application, it is mandatory to configure the SGW identifier.

The `sgwIdentifier` can consist of 1–20 characters. If only one character is used for `sgwIdentifier`, this character must not be equal to 1.

The node identifier is included in the PM statistic data of all SGW levels (that is all xml files of the SGW) as localDn even if an SGW identifier is set.

4.1.2 Configure a GGSN/PGW Identifier

A GGSN/PGW identifier is included in generated GGSN/PGW CDRs and GGSN/PGW-specific alarms and alerts, and as NAS-Identifier in RADIUS messages.

To configure a GGSN/PGW identifier, include the following statement:

```
(config) ManagedElement=1,Epg=1,Pgw=1
   node=pgwIdentifier
```

Note: The `pgwIdentifier` can consist of 1–20 characters. If only one character is used for `pgwIdentifier`, this character must not be equal to 1.

The node identifier is included in the PM statistic data of all PGW levels (that is all xml files of the PGW) as localDn even if a PGW identifier is set.

4.2 Configure Physical Interfaces

For information on configuring the physical interfaces and Internet Protocol (IP) addresses, refer to *Contexts and Interfaces*.

4.3 Configure Logical Interfaces

Logical interfaces can be configured for the following interfaces:

- For the SGW: S4-C/S11, S5/S8-C, S5/S8-U, S1-U/S4-U/S12, Rf, and Gom
- For the GGSN/PGW: Gn/Gp, S5/S8, S2a, S2b, Gx+, Gx+ PCC, Gy+, S6b, S6b Auth, Rf, and Gom

For information on configuring logical interfaces with IP addresses and routing instances, refer to *GTP Interface Configuration* and *EPG Board Configuration*.

For information on configuring other relevant interfaces such as the EBM logical interface, see the corresponding interface configuration documents.

For information on selecting the master routing instance or virtual routing instances for the logical interfaces, refer to *Routing*.

4.4 Configure IP Address Ranges and Routing Instances

For information on configuring IP address ranges and routing instances for GGSN/PGW conceptual interfaces, such as Gn/Gp, S5/S8, GTP-based S2a, S2b, Gi/SGi, and Gom interfaces, refer to *GTP Interface Configuration*, *EPG Board Configuration*, and *APN Configuration*.

For information on selecting the master routing instance or virtual routing instances for the conceptual interfaces, refer to *Routing*.

4.5 Configure Offline Charging

For information on configuring CDR-based charging and Rf charging, refer to *Offline Charging Configuration*.

4.6 Configure APNs

For information on configuring Access Point Names (APNs), refer to *APN Configuration*.

4.7 Migrate the EPG for Deployment in EPS

For information on migrating the EPG for deployment in the Evolved Packet System (EPS) network, refer to *EPG Migration for Deployment in EPS*

4.8 Configure System Syslog for ISP Logging

Logging of ISP-related information is performed using system logging interface, configured to write specific events to the ISP log file. For more information about default system syslog configuration, refer to *EPG Logs*.

Note: The time stamp format for the ISP log is configurable. This format with Universal Time Coordinated (UTC) offset is recommended due to its compatibility with the ISPTool. Refer to *Logging* for how to configure the time stamp format.

5 Optional Configuration

This section lists further configuration options available in the EPG.

5.1 Connectivity and Routing

This section lists configuration options related to EPG connectivity and routing.

5.1.1 PDP Context and EPS Bearer Properties

For information on configuring Packet Data Protocol (PDP) context and EPS bearer properties, refer to *APN Configuration*.

5.1.2 GTP Properties

For information on configuring GPRS Tunneling Protocol (GTP) properties, refer to *GTP Properties Configuration*.

5.1.3 PMIPv6 Properties

For information on configuring the PMIPv6 PDN connection properties, refer to *APN Configuration*.

5.1.4 L2TP

For information on configuring Layer Two Tunneling Protocol (L2TP), refer to *L2TP Configuration*.

5.1.5 DHCP

For information on configuring Dynamic Host Configuration Protocol (DHCP), refer to *APN Configuration*.

5.1.6 RADIUS

For information on configuring Remote Authentication Dial-In User Service (RADIUS), refer to *RADIUS Configuration*.

5.2 Event-Based Monitoring

For information on configuring EBM, refer to *Event-Based Monitoring Configuration*.

5.3 Quality of Service

For information on configuring Quality of Service (QoS), refer to *Quality of Service Configuration*.

5.4 Resilience

For information on configuring resilience, refer to *EPG Board Configuration*.

For information on performing scale out procedures, refer to *Scaling the EPG*.

5.5 SACC

The following sections list resources for information on configuring Service Aware Charging and Control (SACC).

5.5.1 Content Filtering

For information on configuring content filtering, refer to *Content Filtering Configuration*.

5.5.2 PISC

For information on configuring Packet Inspection and Service Classification (PISC), refer to *PISC Configuration*.

5.5.3 Charging Methods

For information on configuring charging methods, refer to *Charging Methods Configuration*.

5.5.4 Credit Control

For information on configuring credit control, refer to *Credit Control Configuration*.

5.5.5 Policy and Charging Control

For information on configuring policy and charging control, refer to *Gx+ Policy and Charging Control Configuration*.

5.5.6 Aware Policy-Based Routing

For information on configuring Aware Policy-Based Routing, refer to *Aware Policy-Based Routing Configuration*.

5.5.7 Static Access Control

For information on configuring static access control, refer to *Gx+ Static Access Control Configuration*.

5.6 PGW Pause Charging

For more information on PGW pause charging, refer to *Session Management*.

For more information on configuring PGW pause charging, refer to *PGW Pause Charging Configuration*.

5.7 Operation and Maintenance

For information on performing Operation and Maintenance (O&M) procedures, refer to *Operation and Maintenance Configuration*.

5.8 Traffic Redirection

For information on configuring traffic redirection, refer to *Traffic Redirection Configuration*.

5.9 Shared IP Pool

For more information on configuring shared IP pools, refer to *Shared IP Pool Configuration*.

5.10 IMS Emergency Session

For more information on configuring IMS emergency session, refer to *IMS Emergency Session Configuration*.

5.11 Inter-Chassis Redundancy

For more information on configuring Inter-Chassis Redundancy (ICR), refer to *Inter-Chassis Redundancy Configuration*.

6 EPG Configuration Examples

This chapter provides examples of EPG configuration. These examples show configuration of all EPG-related interfaces, addresses, services, APNs, and several other EPG features and capabilities. These examples do not change QoS parameters from the defaults, show routing protocols, nor show configuration of Label-Switched Paths (LSPs) used by Multi-Protocol Label Switching (MPLS).

Note: The examples in this section only show, partially, ways that an EPG can be configured. There are other configurations for the Gn, Gi, and additional interfaces for different physical and logical network architectures.

6.1 Determine the Network Environment

Before configuring an EPG, first determine the network environment, including all of the physical interfaces on the EPG and the board types.

In this configuration example, the EPG is at the center of a group of conceptual interfaces. The interfaces concerned are listed as below and those not mentioned below are not covered in this document.

- The Gn interface to the SGSN
- The Gi and SGi interfaces to one or more APNs
- The S4 interface to the SGSN
- The S5/S8 interface to an external SGW
- The S5/S8 interface to an external PGW
- The GTP-based S2a interface to a trusted WLAN Access Network (TWAN)
- The PMIPv6-based S2a interface to a Mobile Access Gateway (MAG)
- The S2b interface to an Evolved Packet Data Gateway (ePDG)
- The S11 interface to the MME
- The S1-U interface to the eNodeB
- The S12 interface to the Radio Network Controller (RNC)
- The Ga interface for the charging and billing gateway server
- Gom logical interfaces for O&M

All of these conceptual interface types are shown in Figure 2.

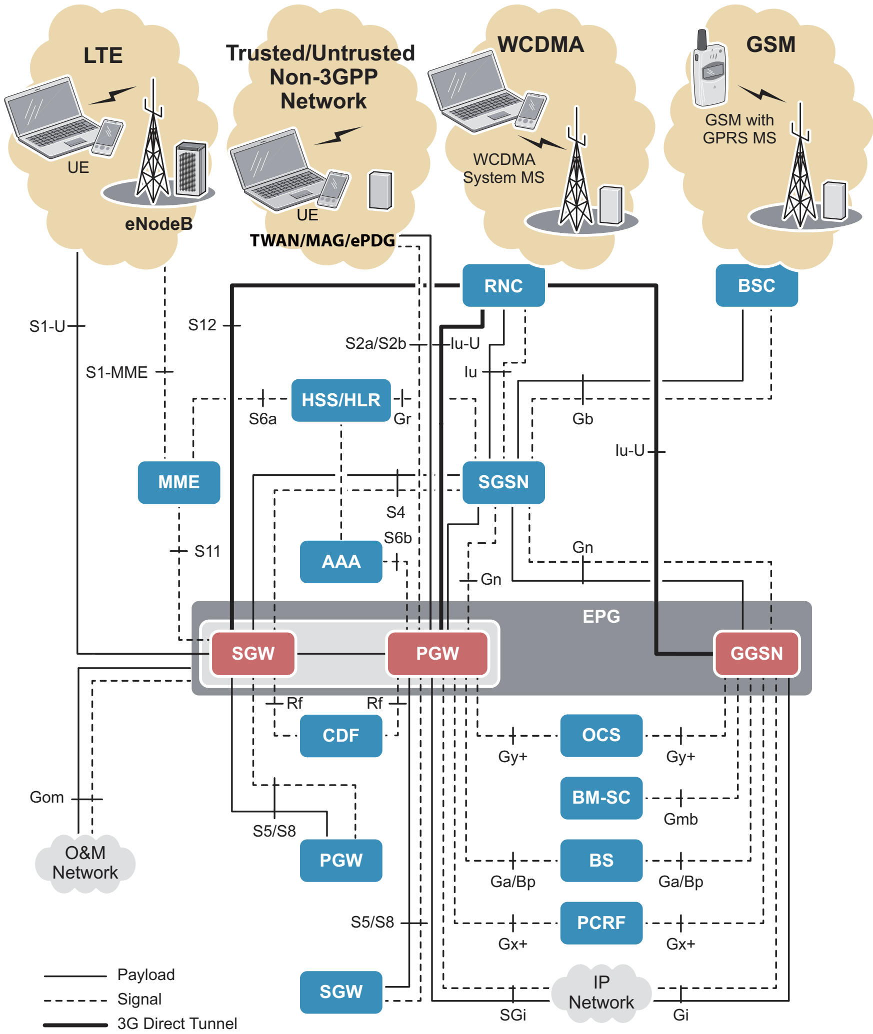

Figure 2 Conceptual EPG Interfaces

Conceptual interfaces are different from logical interfaces, and are not necessarily separate physical interfaces, although they might be in some configurations. More than one conceptual interface can share a single physical interface. However, multiple conceptual interfaces configured on the same physical interface can negatively impact performance. For clarity, this example uses a separate physical interface for each conceptual interface. These physical interfaces are assigned IP addresses in the configuration example.

In addition to the conceptual interfaces and related physical interfaces, this example EPG also configures separate physical interfaces for shared RADIUS and DHCP servers for use by certain APNs.

6.2 Determine the IP Addresses

The first task is to configure the correct IP addresses used on the interfaces. This requires coordination between the EPG network administrator and the network administrators of the other network devices and the various APNs. This example uses private IP addresses and is somewhat limited in choice of addresses for different parts of the network. In reality, the IP addresses employed by the EPG would likely be very diverse instead of being drawn from only the `10.0.0.0/8`, `172.16.0.0/12` and `192.168.0.0/16` address spaces.

For end-to-end user data transfer between the UE and an APN through the EPG, six IP addresses are important in a GPRS context. Different IP addresses are required in an EPS context and are indicated as such in the list following Figure 3. Control functions also use these IP addresses, but the packet flows are somewhat different and are not illustrated. Figure 3 shows the use of these six IP addresses for data transfer along with the structure of the arriving and departing protocol data units in which the addresses appear for a GPRS example. In an EPS context, the GGSN is replaced by the PGW and the SGSN by the SGW.

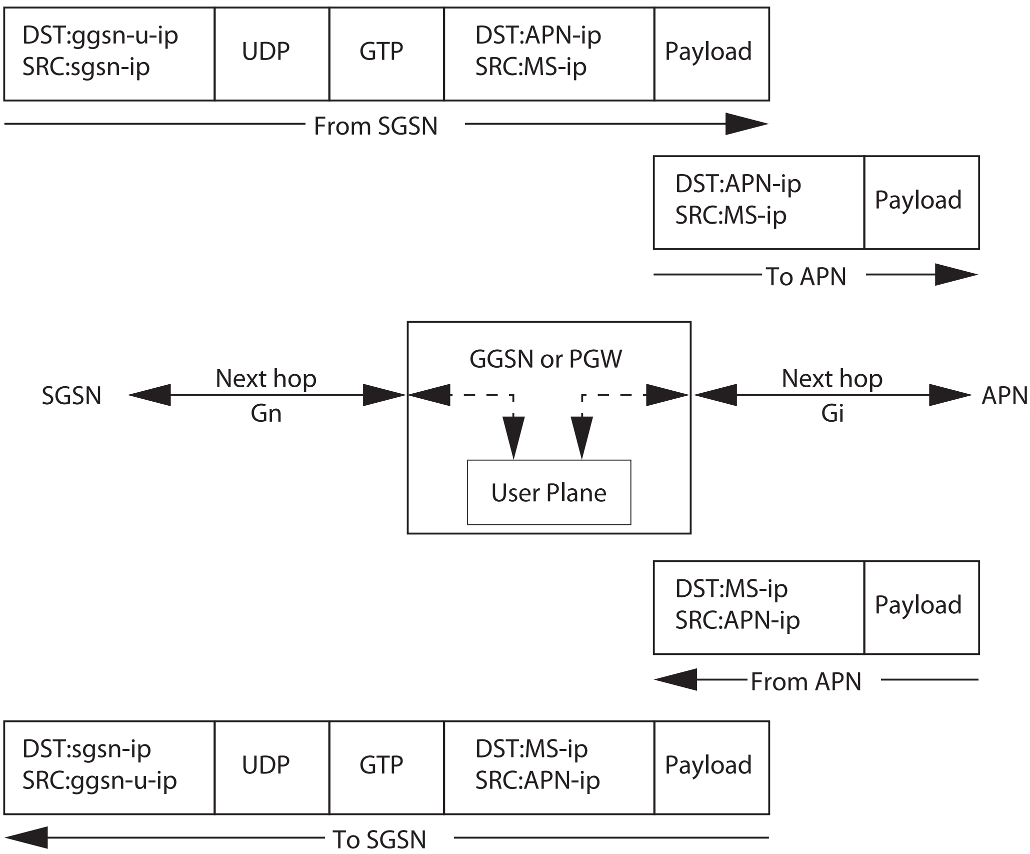

Figure 3 IP Addresses Used for Data Transfer in a GPRS Context

The figure shows the uplink flow of packets from UE through the SGSN and GGSN to the APN and the downlink flow from the APN to the UE. The outer IP header on packets that flow between SGSN and GGSN has the SGSN IP address and the user plane IP addresses. Packets flow between the SGSN and Packet Processing Boards (PPBs), based on these IP addresses. The inner IP header on packets that flow between the EPG and the APN has the UE IP and APN IP addresses. Packets flow between the UE and the APN device (such as a server) based on these IP addresses. The IP addresses on the physical interfaces on the EPG are used to resolve next-hop addresses for these packets.

The EPG receives or discovers the IP addresses in the following ways:

- Gn interface

  The physical Gn interface IP address used for next-hop resolution is configured directly on the physical Gn interface. For more information on configuring interfaces and IP addresses, refer to *GTP Interface Configuration*.

- S5, GTP-based S2a, and S2b interface - EPS interface

  The physical S5, GTP-based S2a, and S2b interface IP address used for next-hop resolution is configured directly on the physical S5, GTP-based S2a, and S2b interface. For more information on configuring physical interfaces and IP addresses, refer to *GTP Interface Configuration*.

- S4-C and S11 - EPS interface

  The physical S4-C and S11 interface IP address used for next-hop resolution is configured directly on the physical S4-C and S11 interface. For more information on configuring physical interfaces and IP addresses, refer to *GTP Interface Configuration*.

- SGW S5/S8 interface - EPS interface

  The physical S5/S8 interface IP address used for next-hop resolution are configured directly on the physical S5/S8 interface. For more information on configuring physical interfaces and IP addresses, refer to *GTP Interface Configuration*.

- S1-U, S4-U, and S12 interface - EPS interface

  The physical S1-U, S4-U, and S12 interface IP address used for next-hop resolution is configured directly on the physical S1-U, S4-U, and S12 interface. For more information on configuring physical interfaces and IP addresses, refer to *GTP Interface Configuration*.

- Gi and SGi interface

  The physical Gi and SGi interface IP address used for next-hop resolution for each APN is configured directly on the particular physical Gi and SGi interface. For more information on configuring interfaces and IP addresses, refer to *Contexts and Interfaces*.

The SGi interface is used in the EPS and fulfills the same role as Gi. It is used for PGW-enabled APNs.

- SGSN IP

  The IP address of the SGSN is learned by the GGSN when a PDP context is created by the SGSN and GGSN. Because it is part of a control function, no explicit configuration of the SGSN IP address is needed, except when special configuration is required for a particular SGSN.

  In an EPS context, the GGSN is replaced by the PGW, SGSN is replaced by the SGW and PDP contexts are replaced by EPS bearers.

- GGSN/PGW Control Plane

  A set of IP addresses, one for each CPB, is dynamically assigned from a configured address range for the cluster of all CPBs when the EPG starts up. Addresses or address ranges are configured in the example. To configure the address or address range for the GGSN/PGW control plane, include the `address` or `ipv6Address` statement.

- GGSN/PGW User Plane

  A set of IP addresses, one for each PPB, is dynamically assigned from a configured address range for the cluster of all PPBs when the EPG starts up. Address ranges are configured in the example. To configure the address range for the GGSN/PGW user plane, include the `address` or `ipv6Address` statement.

- APN IP

  This IP address space is either learned through a routing protocol, statically configured in the default routing table (`inet.0`), or statically configured as part of the routing instance on that Gi or SGi interface. This example uses static configuration in the routing instances for each Gi or SGi interface. To configure the APN address space, include the **`static`** statement. For more information on configuring routing instances, refer to *APN Configuration*.

- UE IP

  These IP addresses, one for each PDP context or EPS bearer, are configured as a range for each APN and can be assigned a static address, or a dynamic address from a shared IP pool, a RADIUS server, or a DHCP server. All of these methods are used in the various APNs configured in this example network. To configure the UE address space, include the **`address`** statement or link the shared IP pool to APN.

In this example, the following interfaces are configured:

- Gn, PGW S5/S8, and GTP-based S2a interface

- SGW S5/S8 interface
- S4-C and S11 interface
- S1-U, S4-U, S12 interface
- Gom logical interfaces
- A number of Gi and SGi interfaces

The addresses on the physical Gi and SGi interfaces to the APNs are all drawn from the `20.255.0.0/16` IP address space and the IP addresses assigned to the UE are all in the `172.16.0.0/12` private IP address space. Because overlapping IP address spaces are used by the UE in this configuration example, each Gi or SGi interface uses a virtual routing instance table in a Virtual Private Network (VPN) to hold routing information. Seven APNs are configured in this example. For simplicity, the APNs are called `APN1.com` through `APN7.com`. The major characteristics of each of the seven APNs are as follows:

- `APN1.com` is on a Gi interface associated to the `vlan-id` 1, using IPv4 address `20.255.59.0/28` and IPv6 address `2001:f040:2::9/62;` the UE use IP address range `172.16.1.0/24`. The IP addresses for the UE using this APN are assigned a static address by the GGSN, and no RADIUS server is used for authentication and accounting.
- `APN2.com` is on an SGi interface associated to the `vlan-id` 2, using IP address `20.255.60.0/28` and IPv6 address `2001:f040:3::9/62;` the UE use IP address range `172.16.2.0/24`. The IP addresses for the UE using this APN are assigned from a shared IP pool by the GGSN, and no RADIUS server is used for authentication and accounting. SACC is enabled and configured for the APN.
- `APN3.com` is on a Gi interface associated to the `vlan-id` 3, using IP address `20.255.61.0/28` and the UE use IP address range `172.16.3.0/24`. This APN uses an inband RADIUS server for authentication and accounting and to assign IP addresses to its UE.
- `APN4.com` is on a Gi interface associated to the `vlan-id` 4, using IP address `20.255.62.0/28` and the UE use IP address range `172.16.4.0/24`. This APN uses an inband DHCP server to assign IP addresses to its UE.
- `APN5.com` is on a Gi interface associated to the `vlan-id` 5, using IP address `20.255.63.0/28` and the UE use IP address range `172.16.5.0/24`. This APN shares a routing instance with `APN6.com`. This APN uses a shared RADIUS server for authentication and accounting. The UE are assigned a static IP address by the GGSN.
- `APN6.com` is on a Gi interface associated to the `vlan-id` 6, using IP address `20.255.64.0/28` and the UE use IP address range `172.16.6.0/24`. This APN shares a routing instance with `APN5.com`, so the IP address ranges can no longer overlap. This APN uses a shared

RADIUS server for authentication and accounting. The IP addresses are statically assigned to the UE by the EPG.

- `APN7.com` is on a Gi interface associated to the `vlan-id` 7, using IP address `20.255.65.0/28` and the UE use IP address range `172.16.7.0/24` to show that UE address ranges do not have to overlap. This APN uses a shared DHCP server to assign IP addresses to its UE.

In addition to the Gn, S4-C, S4-U, S5/S8, GTP-based S2a, S2b, S11, S1-U, S12, and Gi or SGi interfaces, the EPG uses addresses from the `192.168/16` private address space for the Gom, shared RADIUS, and DHCP interfaces.

The IP addresses used in the example are configured in different sections of the EPG configuration file. This configuration example also establishes addresses in the `192.168/16` range for the node to use as source addresses on packets sent on the Gn, S4-C, S4-U, S5/S8, GTP-based S2a, S2b, S11, S1-U, S12, and Gom interfaces.

6.3 Configure Physical Interfaces

The physical interfaces configured in this section are not necessarily EPG-specific. For more information on configuring physical interfaces and IP addresses, refer to *Contexts and Interfaces*.

Create Contexts and Configuring Physical Interfaces

```
service multiple-contexts
!
context ctx-s5s8-c
!
 no ip domain-lookup
!
 interface if-s5s8-c
  ip address 11.0.1.254/24
  ipv6 address 2a00:11:0:1::254/64
 no logging console
!
 ip route 1.1.1.101/32 11.0.1.101
!
 ipv6 route 1111:1:1:101::/64 2a00:11:0:1::101
!
!context ctx-s5s8-u
!
 no ip domain-lookup
!
 interface if-s5s8-u
  ip address 11.0.5.254/24
  ipv6 address 2a00:11:0:5::254/64
 no logging console
!
```

```
 ip route 1.1.5.101/32 11.0.5.101
!
 ipv6 route 1111:1:5:101::/64 2a00:11:0:5::101
!
context ctx-s4s11-c
!
 no ip domain-lookup
!
 interface if-s4s11-c
  ip address 11.0.2.254/24
 no logging console
!
 ip route 1.1.2.101/32 11.0.2.101
!
context ctx-s1s4s12-u
!
 no ip domain-lookup
!
 interface if-s1s4s12-u
  ip address 11.0.4.254/24
  ipv6 address 2a00:11:0:4::254/64
 no logging console
!
 ip route 1.1.4.101/32 11.0.4.101
!
 ipv6 route 1111:1:4:101::/64 2a00:11:0:4::101
!
context ctx-gom-c
!
 no ip domain-lookup
!
 interface if-gom-c
  ip address 11.0.3.254/24
  ipv6 address 2a00:11:0:3::254/64
 no logging console
!
context ctx-ebm
!
 no ip domain-lookup
!
 interface if-ebm
  ip address 11.0.6.254/24
  ipv6 address 2a00:11:0:6::254/64
 no logging console
!
 ip route 1.1.6.101/32 11.0.6.101
!
 ipv6 route 1111:1:6:101::/64 2a00:11:0:6::101
!
context ctx-rf
!
```

```
 no ip domain-lookup
!
 interface if-rf
  ip address 11.0.7.254/24
  ipv6 address 2a00:11:0:7::254/64
 no logging console
!
 ip route 1.1.7.101/32 11.0.7.101
!
 ipv6 route 1111:1:7:101::/64 2a00:11:0:7::101
!
!
```

6.4 Configure EPG Logical Interfaces

This section contains an example of configuration for some EPG logical interfaces.

Configure SGW Logical Interfaces for S1-U, S4, S11, S5/S8, S12, and Gom Interfaces

```
ManagedElement=1
   Epg=1
      Node=1
         Interface=1
            GomC=1
               logicalInterface="Gom-C-if"
               up
            up
         LogicalInterface=S1S4S12-U-if
            ipv6Address="2001:1b70:4294:ffa0::2601/128"
            routingInstance="ctx-s1s4s12-u"
            up
         LogicalInterface=S4S11-if
            ipv6Address="2001:1b70:4294:ffa0::2603/128"
            routingInstance="ctx-s4s11-c"
            up
         LogicalInterface=S5S8-C-if
            address="192.168.50.7/32"
            ipv6Address="2001:1b70:4294:ffa0::2605/128"
            routingInstance="ctx-s5s8"
            up
         LogicalInterface=S5S8-U-if
            address="192.168.50.8/32"
            ipv6Address="2001:1b70:4294:ffa0::2606/128"
            routingInstance="ctx-s5s8"
            up
         LogicalInterface=Gom-C-if
            address="192.168.50.9/32"
            ipv6Address="2001:1b70:4294:ff90::2520/128"
            routingInstance="ctx-gom-c"
```

```
            up
        Sgw=1
            Interface=1
                S1s4s12U=1
                    logicalInterface="S1S4S12-U-if"
                    up
                S4s11C=1
                    diffserv=cs4
                    logicalInterface="S4S11-if"
                    n3Requests=2
                    t3ResponseTime=3
                    up
                S5s8C=1
                    diffserv=cs4
                    logicalInterface="S5S8-C-if"
                    n3Requests=2
                    t3ResponseTime=3
                    up
                S5s8U=1
                    logicalInterface="S5S8-U-if"
                    up
                up
```

Configure N3/T3 Per SGW Message Type on S4, S11, and S5/S8 Interfaces

```
ManagedElement=1
    Epg=1
        Sgw=1
            Interface=1
                S4s11C=1
                    CreateBearerRequest=1
                        n3Requests=5
                        t3ResponseTime=0.3
                        up
                    up
                S5s8C=1
                    EchoRequest=1
                        n3Requests=2
                        t3ResponseTime=20
                        up
                    up
                up
            up
        up
    up
```

Configure GGSN/PGW Logical Interfaces for the Gn/Gp, S5/S8, S2a, and S2b Interfaces

```
ManagedElement=1
```

```
Epg=1
   Node=1
      LogicalInterface=gn-s5s8-c-if
         address="192.168.10.17/29"
         routingInstance="ri-gngps5s8s2a"
         up
      LogicalInterface=gn-s5s8-u-if
         address="192.168.10.25/32"
         routingInstance="ri-gngps5s8s2a"
         up
      up
   Pgw=1
      Interface=1
         GnC=1
            logicalInterface="gn-s5s8-c-if"
            up
         GnU=1
            logicalInterface="gn-s5s8-u-if"
            up
         S5s8C=1
            logicalInterface="gn-s5s8-c-if"
            up
         S5s8U=1
            logicalInterface="gn-s5s8-u-if"
            up
         up
      up
   up
```

6.5 Configure Other EPG Services

Other EPG services, such as EPG board allocation, EPG node, GGSN/PGW, and SGW identifiers, offline charging, and the APNs can also be configured. EPG boards determine the addresses or address ranges to use for IP packets sent through EPG interfaces towards external nodes. In GGSN APNs and PGW APNs, UE address ranges, allocation methods, and inband and shared RADIUS and DHCP servers for each APN are configured along with other characteristics. When an APN uses a RADIUS server for authentication and accounting but not address allocation, and there is no DHCP server, the PDP context and EPS bearer must be configured for static or shared-IP-pool address allocation.

The Gi or SGi address range, which is used to assign IP addresses to be used by the control plane for control messages on the Gi or SGi interfaces to and from the APNs uses, for example, a /29 suffix provides a pool of six usable addresses for the control plane. The addresses this example uses are drawn from the `10.200.200.8/29` address space.

Billing information sent to the charging gateway server uses GTP' and establishes tariff times based on day (8:00 AM to 5:00 PM) and night usage.

Configure Board Allocation for User Plane, Control Plane, and L2TP

```
ManagedElement=1
   Epg=1
      Node=1
         BoardAllocation=gc-0/16/1
            up
         BoardAllocation=gu-0/15/1
            up
         BoardAllocation=gc-0/5/1
            up
         BoardAllocation=gu-0/6/1
            up
         BoardAllocation=gc-0/17/1
            up
```

Configure the EPG Node Identifier

```
ManagedElement=1
   Epg=1
      Node=1
         nodeName=epg1-1
      up
   up
```

Configure GGSN/PGW and SGW Identifiers

```
ManagedElement=1
   Epg=1
      Pgw=1
         node=pgw-1
      Sgw=1
         node=sgw-1
```

Configure CDR-Based Charging

```
ManagedElement=1
   Epg=1
      Pgw=1
         Charging=1
            GtpPrime=1
               pathManagement
               up
            chargingFormat="7"
            ChargingDataFile=1
               GtpPrimeDataFile=1
                  activateOnFailure
                  up
               up
               Characteristics=1
```

```
                default="profile0"
                Profile0=1
                   timeLimit="15"
                   transferType="ftp-pull"
                   volumeLimit="8000"
                   up
                Profile2=1
                   timeLimit="15"
                   transferType="gtp-prime"
                   volumeLimit=9000
                   GtpPrime=1
                      gateway="8.18.0.1"
                      up
                   up
                Profile3=1
                   timeLimit="15"
                   transferType="gtpp-ftp"
                   volumeLimit="10000"
                   GtpPrime=1
                      gateway="8.18.0.1"
                      up
                   up
                up
             up
          up
       up
    Sgw=1
       Charging=1
          chargingFormat=9
          Characteristics=1
             defaultProfile=0
             ignoreProfileFromServingNode
             roamingBasedProfile=0
             Profile=0
                changeLimit=5
                timeLimit=15
                volumeLimit=800
                up
             up
          ChargingDataFile=1
             no compression
             maximumAge=20
             maximumSize=102400
             LocalDataFile=1
                forceEmptyFiles
                up
             up
          up
       up
    up
 up
```

Configure Rf Charging (SGW)

```
ManagedElement=1
   Epg=1
      Sgw=1
         Charging=1
            chargingFormat=9
            Characteristics=1
               defaultProfile=0
               ignoreProfileFromServingNode
               roamingBasedProfile=0
               Profile=0
                  changeLimit=5
                  timeLimit=15
                  volumeLimit=800
                  up
               up
            ChargingDataFile=1
               no compression
               maximumAge=20
               maximumSize=102400
               LocalDataFile=1
                  forceEmptyFiles
                  up
               up
            Rf=1
               acrRetries=3
               diameterApplicationSystem="das-1"
               serviceContextId="5.115.310.10.32251@3gpp.org"
               AcrAttribute=1
                  chargingGatewayFunctionHost
                  chargingGroupId
                  connectedInfo
                  up
               up
```

Configure Rf Charging (PGW)

```
ManagedElement=1
   Epg=1
      Pgw=1
         FeatureActivation=1
            chargingRf
            up
         Charging=1
            Characteristics=1
               transferType="rf"
               default=0
               ignoreProfileFromServingNode
               Profile=0
                  changeLimit=5
                  timeLimit=15
                  volumeLimit=800
```

```
                transferType="rf"
                up
            up
        Rf=1
            acrRetries=3
            serviceContextId="5.115.310.10.32251@3gpp.org"
            up
```

Configure Tariffs Change

```
ManagedElement=1,Epg=1,Pgw=1,Charging=1
    TariffActivation=1
        starts="01:45"
        up
    TariffActivation=2
        starts="07:45"
        up
    TariffActivation=3
        starts="13:45"
        up
    TariffActivation=4
        starts="19:45"
        up
    up
```

Configure APN1

`APN1.com` is on a Gi interface using IPv4 address `20.255.59.0/28` and IPv6 address `2001:f040:2::9/62;` the UE use IP address range `172.16.1.0/24`. The IP addresses for the UE using this APN are assigned a static address by the GGSN, and no RADIUS server is used for authentication and accounting.

```
ManagedElement=1,Epg=1,Pgw=1
    Apn=dls-apn3-0104
        AccessRestrictions=1
            radiusAssistedApnSelection
            giAddressRange="20.255.59.0/28"
            routingInstance="sgi3"
            PdpContext=1
                addressAllocation=radius
                creation=unblocked
                enableDedicatedBearer
                Address=172.16.1.0/24
                    up
                PolicyControl=1
                    noPolicy
                up
            up
        up
    up
```

Configure APN2 for the PGW

`APN2.com` is on an SGi interface using IP address `20.255.60.0/28` and IPv6 address `2001:f040:3::9/62;` the UE use IP address range `172.16.2.0/24`. The IP addresses for the UE using this APN are assigned from a shared IP pool by the GGSN, and no RADIUS server is used for authentication and accounting. SACC is enabled and configured for the APN.

```
ManagedElement=1,Epg=1,Pgw=1
   Apn=dls-apn3-0102
      allowRuleSpace="A"
      giAddressRange="20.255.60.0/28"
      pgwEnabled
      routingInstance="sgi3"
      PdpContext=1
          addressAllocation=radius
         creation=unblocked
         enableDedicatedBearer
         Address=172.16.2.0/24
            up
         LoadDistribution=1
            granularity=16
            up
         up
          ServiceBasedCharging=1
            controlContext=3gpp
            CreditControl=1
               RoProfile=ocs-gy-1
                  diameterApplicationSystem="ocs-1"
                  noPreemptiveReservation
                  serviceContextId="8.32251@3gpp.org"
                  Failure=1
                     failureAction=terminate
                     up
                  up
               RoProfile=ocs-gy-2
                  diameterApplicationSystem="ocs-2"
                  noPreemptiveReservation
                  serviceContextId="8.32251@3gpp.org"
                  Failure=1
                     failureAction=terminate
                     up
                  up
               up
            PolicyControl=1
               Dynamic=1
                  GxProfile=pcd-pcc-gx-1
                     diameterApplicationSystem="pcc-gx-1"
                     ruleSpaceNegotiation
                     up
                  up
               up
            up
```

```
         up
      up
   up
```

Configure APN3 with Inband RADIUS Address Allocation

`APN3.com` is on a Gi interface using IP address `20.255.61.0/28` and the UE use IP address range `172.16.3.0/24`. This APN uses an inband RADIUS server for authentication and accounting and to assign IP addresses to its UE.

```
ManagedElement=1,Epg=1,Pgw=1
   Apn=dls-apn1-0105
      routingInstance="sgi1"
      giAddressRange="20.255.61.0/28"
      pgwEnabled
      PdpContext=1
         addressAllocation="radius"
         creation=unblocked
         Address=172.16.3.0/24
            up
         up
      Radius=1
         Authentication=1
            Server=1
               name=10.10.10.10
               port=1812
               secret=secret cleartext
               serverdownTimeout=30
               up
            Server=2
               name=10.10.10.11
               port=1812
               secret=secret cleartext
               serverdownTimeout=30
               up
            up
         Accounting=1
            Server=1
               name=10.10.10.10
               port=1813
               secret=secret cleartext
               serverdownTimeout=30
               up
            Server=2
               name=10.10.10.11
               port=1813
               secret=secret cleartext
               serverdownTimeout=30
               up
            up
         up
```

```
        up
    up
```

Configure APN4 with Inband DHCP Address Allocation

`APN4.com` is on a Gi interface using IP address `20.255.62.0/28` and the UE use IP address range `172.16.4.0/24`. This APN uses an inband DHCP server to assign IP addresses to its UE.

```
ManagedElement=1,Epg=1,Pgw=1
    Apn=dls-apn1-0106
        routingInstance="sgi1"
        giAddressRange="20.255.62.0/28"
        pgwEnabled
        PdpContext=1
            addressAllocation="dhcp-client"
            creation="unblocked"
            Address=172.16.4.0/24
                up
            up
        Dhcp=1
            Server=10.20.20.20
            up
        up
    up
```

Configure APN6 with Shared RADIUS Address Allocation

`APN6.com` is on a Gi interface using IP address `20.255.64.0/28` and the UE use IP address range `172.16.6.0/24`. This APN shares a routing instance with `APN5.com`, so the IP address ranges can no longer overlap. This APN uses a shared RADIUS server for authentication and accounting. The IP addresses are assigned to the UE by the RADIUS server.

```
ManagedElement=1,Epg=1,Pgw=1
    Apn=dls-apn1-0107
        routingInstance="sgi1"
        giAddressRange="20.255.64.0/28"
        pgwEnabled
        PdpContext=1
            addressAllocation="radius"
            creation="unblocked"
            Address=172.16.6.0/24
                up
            up
        Radius=1
            Authentication=1
                sharedServer="radauthout-om_cn1"
                up
            Accounting=1
                sharedServer="radaccout-om_cn1"
```

```
            up
         up
      up
   up
```

Configure APN7 with Shared DHCP Address Allocation

`APN7.com` is on a Gi interface using IP address `20.255.65.0/28` and the UE use IP address range `172.16.7.0/24` to show that UE address ranges do not have to overlap. This APN uses a shared DHCP server to assign IP addresses to its UE.

```
ManagedElement=1,Epg=1,Pgw=1
   Apn=dls-apn1-0108
      routingInstance="sgi1"
      giAddressRange="20.255.65.0/28"
      pgwEnabled
      PdpContext=1
         addressAllocation="dhcp-client"
         creation="unblocked"
         Address=172.16.7.0/24
            up
         up
      Dhcp=1
         sharedServer="dhcpout-om_cn1"
      up
   up
```

Configure Shared DHCP Server for APN7

```
ManagedElement=1,Epg=1,Pgw=1
   Dhcp=1
      Server=dhcpout-om_cn1
         address="192.168.10.10"
         address="192.168.10.11"
         routingInstance="om_cn"
         giAddressRange="20.255.70.0/28"
         up
      Server=dhcpout-om_cn2
         address="192.168.11.10"
         address="192.168.11.11"
         routingInstance="om_cn"
         giAddressRange="20.255.70.32/28"
      up
   up
```

Configure Shared RADIUS Server for APN5

```
ManagedElement=1,Epg=1,Pgw=1
   Radius=1
```

```
        Server=radauthout-om_cn1
            address="192.168.20.20"
            routingInstance="om_cn"
            giAddressRange="20.255.71.0/28"
            secret=secret cleartext
            up
        Server=radaccout-om_cn1
            address="192.168.20.21"
            routingInstance="om_cn"
            giAddressRange="20.255.71.32/28"
            secret=secret cleartext
        up
    up
```

Reference List

Standards

[1] *Internet Engineering Task Force: Request for Comments 1918: Address Allocation for Private Internets*, RFC 1918