



## SGSN Service Configuration Procedures

---

- [SGSN Service Configuration Procedures](#), on page 2
- [2.5G SGSN Service Configuration](#), on page 2
- [3G SGSN Service Configuration](#), on page 3
- [Dual Access SGSN Service Configuration](#), on page 4
- [Configuring the S4-SGSN](#), on page 5
- [Configuring an SS7 Routing Domain](#), on page 7
- [Configuring GTT](#), on page 9
- [Configuring an SCCP Network](#), on page 10
- [Configuring a MAP Service](#), on page 11
- [Configuring an IuPS Service \(3G only\)](#), on page 12
- [Configuring an SGTP Service](#), on page 13
- [Configuring a Gs Service](#), on page 13
- [Configuring an SGSN Service \(3G only\)](#), on page 14
- [Configuring a GPRS Service \(2.5G only\)](#), on page 16
- [Configuring a Network Service Entity](#), on page 16
- [Configuring DNS Client](#), on page 17
- [Configuring GTPP Accounting Support](#), on page 18
- [Configuring and Associating the EGTP Service \(S4 Only\)](#), on page 20
- [Configuring and Associating the GTPU Service \(S4 Only\)](#), on page 22
- [Configuring the DNS Client Context for APN and SGW Resolution \(Optional\)](#), on page 23
- [Configuring the S6d Diameter Interface \(S4 Only\)](#), on page 24
- [Configuring the S13' Interface \(S4 Only, Optional\)](#), on page 27
- [Configuring QoS Mapping for EPC-Capable UEs using the S4 Interface \(S4 Only, Optional\)](#), on page 31
- [Configuring the Peer SGSN Interface Type \(S4 Only, Optional\)](#), on page 32
- [Configuring Gn Interface Selection Based on an Operator Policy \(S4 Only, Optional\)](#), on page 33
- [Configuring a Custom MME Group ID \(S4 Only, Optional\)](#), on page 33
- [Configuring and Associating the Selection of an SGW for RAI \(S4 Only, Optional\)](#), on page 34
- [Configuring a Local PGW Address \(S4 Only, Optional\)](#), on page 36
- [Configuring the Peer MME Address \(S4 Only, Optional\)](#), on page 36
- [Configuring the ISR Feature \(S4 Only, Optional\)](#), on page 37
- [Configuring IDFT for Connected Mode Handover \(S4 Only, Optional\)](#), on page 38
- [Creating and Configuring ATM Interfaces and Ports \(3G only\)](#), on page 39

- [Creating and Configuring Frame Relay Ports \(2.5G only\), on page 39](#)
- [Configuring APS/MSP Redundancy, on page 39](#)

## SGSN Service Configuration Procedures

This chapter provides configuration instructions to enable the SGSN to function in GPRS (2.5G), UMTS (3G), or LTE (4G) networks. The *System Administration Guide* provides interface and system-level configuration details and the *Command Line Interface Reference* provides additional command information.




---

**Important** Please note that LTE (4G) support is only available in releases 14.0 and higher.

---




---

**Important** At least one packet processing card must be activated prior to configuring the first service. Procedures for configuring the packet processing card can be found in the *System Administration Guide*.

---

High level step-by-step service configuration procedures are provided for the following:

### 2.5G SGSN Service Configuration

The following configuration steps must be completed to allow the system to operate in a 2.5G GPRS network.

The service handling the GPRS or 2.5G functions in the SGSN is called the "gprs-service".

- 
- Step 1** Create all the contexts you will use in your configuration. Refer to the "System Element Configuration Procedures" chapter in the *System Administration Guide*.
- Step 2** Create and configure the Frame Relay interface(s) and Ethernet interface(s). Refer to the "System Element Configuration Procedures" chapter in the *System Administration Guide*.
- Step 3** Configure SS7 routing domains. Use the procedure in [Configuring an SS7 Routing Domain, on page 7](#). The concept of an SS7 routing domain is not a standard SS7 concept. It is a concept specific to this platform which groups a set of SS7 feature configuration together to facilitate the management of the SS7 connectivity resources for an SGSN service.
- Step 4** Configure GTT. The GTT configuration is used to set rules for GTT and define the GTT databases. Follow the procedure in [Configuring GTT, on page 9](#)
- Step 5** Configure SCCP-Networks. The purpose of an SCCP network is to isolate the higher protocol layers above SCCP and the application itself from SS7 connectivity issues, as well as, to provide a place for global SCCP configuration specific to SGSN services. Use the procedure in [Configuring an SCCP Network, on page 10](#)
- Step 6** Configure MAP services. The MAP service configuration is used by the SGSN service to communicate with many of the nodes on the narrow band-SS7 network part of the network such as HLR, EIR, GSM-SCF, GMLC and SMS-GMSC/SMS-IW MSC. The purpose of having an isolated map configuration is to enable different application services to use the map service to communicate with other map entities in the network. Use the procedure in [Configuring a MAP Service, on page 11](#)
- Step 7** Configure SGTP. The SGTP service configures the parameters used for GTP Tunneling. At the minimum, interfaces for GTP-C and GTP-U must be configured. Use the procedure in [Configuring an SGTP Service, on page 13](#)

- Step 8** Configure the SGSN service. All the parameters specific to the operation of an SGSN are configured in the SGSN service configuration mode. SGSN services use other configurations like MAP and IuPS to communicate with other elements in the network. The system can support multiple gprs-services.
- Step 9** Configure the GPRS service. All of the parameters needed for the system to perform as a SGSN in a GPRS network are configured in the GPRS service. The GPRS service uses other configurations such as SGTP and MAP to communicate with other network entities and setup communications between the BSS and the GGSN. Use the procedure in [Configuring a GPRS Service \(2.5G only\)](#), on page 16
- Step 10** Configure the Network Service Entity Instance. This identifies the NSEI to use and associates it with a Network Service Virtual Connection Identifier. Use the procedure in [Configure a Network Service Entity for IP](#), on page 16
- Step 11** Configure DNS. This configuration enables domain name resolution and specifies the DNSs to use for lookup. Use the procedure in [Configuring DNS Client](#), on page 17
- Step 12** Configure GTP Accounting. This configures GTP-based accounting for subscriber PDP contexts. Use the procedure in [Configuring GTP Accounting Support](#), on page 18
- Step 13** Configure Frame Relay DLCI paths and bind them to NSEI links as needed. Refer to *Creating and Configuring Frame Relay Interfaces and Ports* in the *System Administration Guide*.
- Step 14** Save your configuration to flash memory, an external memory device, and/or a network location using the Exec mode command **save configuration**. For additional information on how to verify and save configuration files, refer to the *System Administration Guide* and the *Command Line Interface Reference*.
- 

## 3G SGSN Service Configuration

The following configuration steps must be completed to allow the system to operate in a 3G network.

---

- Step 1** Create the contexts needed. Refer to the *System Element Configuration Procedures* chapter in the *System Administration Guide*.
- Step 2** Create any interfaces needed in the appropriate context. Refer to the *System Element Configuration Procedures* chapter in the *System Administration Guide* for IP (broadcast Ethernet) interfaces and for ATM interfaces.
- Step 3** Configure SS7 routing domains. The SS7 routing domain is proprietary concept to provide a combined configuration for the SS7 links, linksets, and related parameters. SS7 routing domain configurations are common to both SIGTRAN and MTP3-B networks. Use the procedure in [Configuring an SS7 Routing Domain](#), on page 7
- Step 4** Configure global title translations (GTT). The GTT configuration is used to set rules for GTT and to define the GTT databases. Follow the procedure in [Configuring GTT](#), on page 9
- Step 5** Configure SCCP networks. The SCCP network (layer) provides services to protocol layers higher in the SS7 protocol stack, for example RANAP and TCAP. The SCCP layer is also responsible for GTT. As well, all the SS7 routing domains (created in step 3) will be associated with an SCCP network. Use the procedure in [Configuring an SCCP Network](#), on page 10
- Step 6** Configure MAP services. The MAP service configuration is used by the SGSN service to communicate with many of the nodes in the SS7 network, such as the HLR, EIR, GSM-SCF, GMLC and SMS-GMSC/SMS-IW MSC. Having an isolated MAP configuration enables different application services to use the MAP service to communicate with other MAP entities in the network. Use the procedure in [Configuring a MAP Service](#), on page 11
- Step 7** Configure IuPS services. A set of parameters define the communication path between the SGSN service and radio network controllers (RNCs) in a UMTS IuPS service. Use the procedure in [Configuring an IuPS Service \(3G only\)](#), on page 12

- Step 8** Configure SGTP services. The SGTP service configures the parameters used for GTP Tunneling. At a minimum, interfaces for GTP-C and GTP-U must be configured. Use the procedure in [Configuring an SGTP Service, on page 13](#)
- Step 9** Configure the SGSN service. All the parameters specific to the operation of an SGSN are configured in the SGSN service configuration mode. SGSN services use other service configurations like MAP (map-service) and IuPS (iups-service) to communicate with other elements in the network.
- Step 10** Configure DNS clients. This configuration enables domain name resolution and specifies the DNSs to use for lookup. Use the procedure in [Configuring DNS Client, on page 17](#)
- Step 11** *Optional:* Configure operator policies. Operator policies are not required for SGSN operation, however, they provide the operator with a powerful method for determining call handling. SGSN operator policies specify rules governing the services, facilities and privileges available to a single subscriber or groups of subscribers. Use the procedure in [Configuring SGSN Operator Policies](#).
- Step 12** Configure GTP Accounting. This configures GTP-based accounting for subscriber PDP contexts. Use the procedure in [Configuring GTP Accounting Support, on page 18](#)
- Step 13** Configure ATM PVCs and bind them to interfaces or SS7 links as needed. Refer to *Creating and Configuring ATM Interfaces and Ports* in the *System Administration Guide*.
- Step 14** Save your configuration to flash memory, an external memory device, and/or a network location using the Exec mode command **save configuration**. For additional information on how to verify and save configuration files, refer to the *System Administration Guide* and the *Command Line Interface Reference*.
- 

## Dual Access SGSN Service Configuration

The following configuration steps must be completed to allow the SGSN to operate in both GPRS (2.5G) and UMTS (3G) networks. This type of co-location is referred to as dual access.

To configure dual access requires a combination of steps from both the 2.5G and 3G configuration procedures:

- 
- Step 1** Create the contexts needed. Refer to the *System Element Configuration Procedures* chapter in the *System Administration Guide*.
- Step 2** Create any interfaces needed in the appropriate context refer to the *System Element Configuration Procedures* chapter in the *System Administration Guide*.
- For IP (broadcast Ethernet) interfaces, refer to *Creating and Configuring Ethernet Interfaces and Ports* in the *System Administration Guide*.
  - For ATM interfaces (3G) refer to *Creating and Configuring ATM Interfaces and Ports* in the *System Administration Guide*.
  - For Frame Relay interfaces (2.5G) refer to *Creating and Configuring Frame Relay Interfaces and Ports* in the *System Administration Guide*.
- Step 3** Configure SS7 routing domains. The SS7 routing domain is a non-standard, proprietary SS7 concept specific to this platform. SS7 routing domains provide a combined configuration for the SS7 links, linksets, and related parameters for SS7 connectivity resources for an SGSN service. SS7 routing domain configurations are common to both SIGTRAN and MTP3-B networks. Use the procedure in [Configuring an SS7 Routing Domain, on page 7](#)
- Step 4** Configure global title translations (GTT). The GTT configuration is used to set rules for GTT and to define the GTT databases. Follow the procedure in [Configuring GTT, on page 9](#)

- Step 5** Configure SCCP networks. The SCCP network (layer) provides services to protocol layers higher in the SS7 protocol stack, for example RANAP and TCAP. The SCCP layer is also responsible for GTT (step 4) and every SS7 routing domain (step 3) will be associated with an SCCP network. Use the procedure in [Configuring an SCCP Network, on page 10](#)
- Step 6** Configure MAP services. The MAP service configuration is used by the SGSN service to communicate with many of the nodes in the SS7 network, such as the HLR, EIR, GSM-SCF, GMLC and SMS-GMSC/SMS-IWMSC. Having an isolated MAP configuration enables different application services to use the MAP service to communicate with other MAP entities in the network. Use the procedure in [Configuring a MAP Service, on page 11](#)
- Step 7** Configure IuPS services. A set of parameters define the communication path between the SGSN service and radio network controllers (RNCs) in a UMTS IuPS service. Use the procedure in [Configuring an IuPS Service \(3G only\), on page 12](#)
- Step 8** Configure SGTP services. The SGTP service configures the parameters used for GTP Tunneling. At a minimum, interfaces for GTP-C and GTP-U must be configured. Use the procedure in [Configuring an SGTP Service, on page 13](#)
- Step 9** Configure the GPRS service. All of the parameters needed for the system to perform as an SGSN in a GPRS network are configured in the GPRS service. The GPRS service uses other service configurations, such as SGTP (sgtp-service) and MAP (map-service) to communicate with other network entities and setup communications between the BSS and the GGSN. Use the procedure in [Configuring a GPRS Service \(2.5G only\), on page 16](#)
- Step 10** Configure the Network Service Entity Instance. This identifies the NSEI to use and associates it with a Network Service Virtual Connection Identifier. Use the procedure in [Configuring a Network Service Entity, on page 16](#)
- Step 11** Configure DNS. This configuration enables domain name resolution and specifies the DNSs to use for lookup. Use the procedure in [Configuring DNS Client, on page 17](#)
- Step 12** Configure GTP Accounting. This configures GTP-based accounting for subscriber PDP contexts. Use the procedure in [Configuring GTP Accounting Support, on page 18](#)
- Step 13** Configure ATM PVCs and bind them to interfaces or SS7 links as needed. Refer to *Creating and Configuring ATM Interfaces and Ports* in the *System Administration Guide*.
- Step 14** Configure Frame Relay DLCI paths and bind them to NSEI links as needed. Refer to *Creating and Configuring Frame Relay Interfaces and Ports* in the *System Administration Guide*.
- Step 15** Save your configuration to flash memory, an external memory device, and/or a network location using the Exec mode command **save configuration**. For additional information on how to verify and save configuration files, refer to the *System Administration Guide* and the *Command Line Interface Reference*.
- 

## Configuring the S4-SGSN

The following configuration steps comprise the required and optional tasks for configuring the S4-SGSN to provide an interface between GPRS (2.5G) / UMTS (3G) networks and EPC (4G) networks via the EPC S4 interface. This is referred to as an S4-SGSN.



### Important

The S4-SGSN cannot operate until after 2G, 3G, or dual access SGSN service is configured. Do not begin S4-SGSN configuration until one of those services is configured and operational. Refer to the [2.5G SGSN Service Configuration, on page 2](#), [Configuring an SGSN Service \(3G only\), on page 14](#), or [Dual Access SGSN Service Configuration, on page 4](#) sections in this chapter for details on configuring those services.

Before you begin the configuration procedure, note the following:

- Configuration steps 1 through 5 are **mandatory** for the S4-SGSN to operate properly.
- Configuration steps 6 through 15 are **optional**. They can be used to configure or enable various optional functionality and features, including:
  - Bypass DNS resolution for various network elements
  - Configure GUTI-to-RAI mapping
  - Configure operator-specific QoS mapping values
  - Configure the S13' interface for the Mobile Equipment Identity (MEI) check
  - Configure the license-enabled Idle Mode Signaling Reduction feature
  - Configure the Indirect Data Forwarding Tunnel feature

- 
- Step 1** Configure, 2G, 3G or Dual Access SGSN service support. Refer to the [Configuring a GPRS Service \(2.5G only\)](#), on page 16, [3G SGSN Service Configuration](#), on page 3, or [Dual Access SGSN Service Configuration](#), on page 4 sections in this chapter for the configuration
- Step 2** Configure and associate the EGTP service. The EGTP service is required to support communication between the SGSN and the EPC SGW over the S4 interface using the GTPv2 protocol. Refer to the [Configuring and Associating the EGTP Service \(S4 Only\)](#), on page 20 procedure.
- Step 3** Configure and associate the GTPU service. The GTPU service supports the configured EGTP service by enabling the sending and receiving of GTP bearer packets from the EPC SGW over the S4 interface. Refer to the [Configuring and Associating the GTPU Service \(S4 Only\)](#), on page 22 procedure.
- Step 4** Configure DNS for APN resolution. Configurables must be set to enable the default DNS client on the SGSN to resolve EPC PGW and SGW addresses. Refer to the [Configuring the DNS Client Context for APN and SGW Resolution \(Optional\)](#), on page 23 procedure.
- Step 5** Configure the S6d Diameter Interface. The S6d interface is used by the SGSN to communicate with the HSS. The HSS is a master user database that contains all subscription related information, Refer to the [Configuring the S6d Diameter Interface \(S4 Only\)](#), on page 24 procedure.
- Step 6** *Optional.* Configure the S13' (S13 prime) interface. This interface is used to perform Mobile Equipment (ME) identity check procedure between the SGSN and Equipment Identity Registry. Refer to the [Configuring the S13' Interface \(S4 Only, Optional\)](#), on page 27 procedure.
- Step 7** *Optional.* Configure operator-specific QoS mapping between EPC elements and the SGSN. The S4-SGSN communicates QoS parameters towards the SGW/ PGW and EPC UEs in different formats. Operators must configure the SGSN quality of service (QoS) parameters as a call-control-profile that will ensure proper QoS mapping between the S4-SGSN, SGW/PGW and UEs. Refer to the [Configuring QoS Mapping for EPC-Capable UEs using the S4 Interface \(S4 Only, Optional\)](#), on page 31 procedure.
- Step 8** *Optional.* Configure the interface type used by the S4-SGSN to communicate with the peer SGSN. Refer to the [Configuring the Peer SGSN Interface Type \(S4 Only, Optional\)](#), on page 32 procedure.
- Step 9** *Optional.* Configure Gn interface selection for EPC-capable UEs based on an operator policy. When the EGTP service is configured, the SGSN, by default, selects the S4 interface for 1) EPC capable UEs and 2) non-EPC capable UEs that have an EPS subscription only. However, operators have the option to forcefully select the Gn interface for both types of UEs. Refer to the [Configuring Gn Interface Selection Based on an Operator Policy \(S4 Only, Optional\)](#), on page 33 procedure.
- Step 10** *Optional.* Configure a custom MME group ID. For operators who are using LAC ranges between 32768 and 65535 in UMTS/GPRS deployments, rather than for MMEs in LTE deployments, the SGSN provides a workaround to ensure backward compatibility. Refer to the [Configuring a Custom MME Group ID \(S4 Only, Optional\)](#), on page 33 procedure.
- Step 11** *Optional.* Configure the S-GW for a RAI. If operators wish to bypass DNS resolution for obtaining the EPC S-GW address, the S4-SGSN can select a locally configured S-GW by performing a local look-up for the current RAI. Refer to the [Configuring and Associating the Selection of an SGW for RAI \(S4 Only, Optional\)](#), on page 34 procedure.

- Step 12** *Optional.* Configure a Local PGW Address. For operators who wish to bypass DNS resolving an EPC P-GW address, the SGSN can be configured with a local P-GW address as part of an APN profile. Refer to the [Configuring a Local PGW Address \(S4 Only, Optional\), on page 36](#) procedure.
- Step 13** *Optional.* Configure the peer MME address. If operators wish to bypass DNS to resolve the peer MME address, the SGSN supports the local configuration of a peer MME address for a given MME group (LAC) and MME code (RAC). Refer to [Configuring the Peer MME Address \(S4 Only, Optional\), on page 36](#) procedure.
- Step 14** *Optional.* Configure the Idle Mode Signaling Reduction (ISR) feature. The ISR is a license-enabled feature allows the UE to roam between LTE and 2G/3G networks while reducing the frequency of TAU and RAU procedures due to the UE selecting E-UTRAN or UTRAN networks. Refer to the [Configuring the ISR Feature \(S4 Only, Optional\), on page 37](#) procedure.
- Step 15** *Optional.* Enable the setup of indirect data forwarding tunnels (IDFT) between the eNodeB and the RNC via the SGW during connected mode handovers. This allows for connected mode handovers between the UTRAN and E-UTRAN networks across the S3 (S4-SGSN-to-MME) interface. Refer to [Configuring IDFT for Connected Mode Handover \(S4 Only, Optional\), on page 38](#).

---

## Configuring an SS7 Routing Domain

The SGSN supports both SS7- and IP-based routing. IP-based routing is provided through the use of contexts. SS7 routing is facilitated through the configuration and use of SS7 routing domains. SS7 routing domains group SS7-related configuration parameters. Depending on the SS7 signaling method, an SS7 routing domain may be configured with one of the following:

- **Linksets:** Used for broadband SS7 signaling, linksets are comprised of link ids that specify point codes for SCCP endpoints. It is important to note that SCCP endpoints are further defined through the configuration of SCCP Networks (refer to *Configuring an SCCP Network*) which are associated with the SS7 routing domain in which the linkset is configured.
- **Application Server Processes (ASPs) / Peer Server Processes (PSPs):** Used for IP (SIGTRAN), M3UA ASPs and PSPs dictate the IP address and port information used to facilitate communication between network endpoints. ASPs refer to the local endpoints.

---

## Configuring an SS7 Routing Domain to Support Broadband SS7 Signaling

- Step 1** In global configuration mode, create a new SS7 routing domain, give it a unique ID and specify the network variant that SS7 communications through this routing domain use.
- Step 2** In SS7 routing domain configuration mode, configure the MTP-3 sub-service field (SSF).
- Step 3** Create an SS7 linkset with a unique ID.
- Step 4** In linkset configuration mode, specify the self point code - this is the point code of the SGSN.
- Step 5** Specify the adjacent point code to communicate with another SS7 node, e.g., an RNC.
- Step 6** Configure individual links, identified with link IDs.
- Step 7** In link configuration mode, specify the MTP3 link priority.
- Step 8** Specify the Signaling Link Code (SLC) for this link. This must be unique to this link within the current linkset. Note that SLCs must match, one-to-one, with those defined for the peer nodes.
- Step 9** Configure this link to use either passive or active arbitration.

- Step 10** In SS7 routing domain configuration mode, configure SS7 routes by specifying destination point codes and associated linkset IDs.

## Example Configuration

```

configure
  ss7-routing-domain id variant variant
  ssf subsvc
  linkset id id
  self-point-code ###
  adjacent-point-code ###
  link id id
  priority pri
  signaling-link-code code
  arbitration arbitration
  exit
exit
route destination-point-code dpc linkset-id id
end

```

## Configuring an SS7 Routing Domain to Support IP Signaling for SIGTRAN

To configure IP, the SS7 routing domain must be configured in a specific way as described below:

- Step 1** In Global configuration mode, create a new SS7 routing domain, give it a unique ID and specify the network variant that SS7 communications through this routing domain use.
- Step 2** In SS7 Routing Domain configuration mode, configure the MTP-3 subservice field.
- Step 3** Create an ASP (Application Service Part) instance for M3UA ASP configuration and give it a unique ID.
- Step 4** Specify the local SCTP (Stream Control Transmission Protocol) end-point IP address and the name of the context where the IP interface associated with the address is configured.
- Important** At least one address needs to be configured before the end-point can be activated.
- Step 5** Specify the end-point SCTP port address to be used. Default port address is 2905.
- Step 6** Bind the end-point to the application server process (ASP) instance to activate it.
- Step 7** In SS7 routing domain configuration mode, create a peer server configuration with a unique ID.
- Step 8** Name the peer server configuration. Usually this is the name of the SS7 network entity that this instance is configured to communicate with, for example an HLR, an STP, or an RNC.
- Step 9** Specify the M3UA routing context ID.
- Step 10** Create a PSP instance and give it a unique ID.
- Step 11** In PSP configuration mode, specify the PSP mode in which this PSP instance should operate.
- Step 12** Specify the communication mode this PSP instance should use as client or server.
- Step 13** Configure the exchange mode this PSP instance should use. Generally this is not configured for IPSP-SG configuration, e.g., SGSN and STP.



- Step 14** Configure the IP address of the peer node SCTP end-point for this PSP instance. At least one address needs to be configured before the end-point can be activated. Up to two addresses can be configured.
- Step 15** Specify the ID of the ASP instance with which to associate this PSP instance.
- Step 16** Configure SS7 routes, in SS7 routing domain configuration mode, by specifying destination point codes and peer server IDs. Routes are configured if the destination point code (DPC) is at least a hop away from the SGSN or when the DPC is not the same as the peer server. For example, the route is configured between the SGSN and the HLR which communicates through STPs or signaling gateways. In this case, the signaling gateways are configured as the peer server on the SGSN.

## Example Configuration

```

configure
  ss7-routing-domain id variant variant
    ssf subsvc
      asp instance instance_id
        end-point address address context ctxt_name
        end-point bind
      exit
    peer-server id id
      name name
      routing-context ctxt_id
      psp instance id
        psp-mode mode
        exchange-mode mode
        end-point address address
        associate asp instance id
      exit
    exit
  route destination-point-code dpc peer-server-id id
end

```

## Configuring GTT

Global Title Translation (GTT) configuration consists of defining GTT associations, defining GTT address maps, and referring to these in an SCCP network configuration. The GTT Associations define GTT rules applicable to a specific GT format. The GTT Address Maps define a global title address to be routed to using a specific routing indicator. These are configured in the global configuration mode and are available to all SCCP networks configured in the system.

- Step 1** In global configuration mode, create a GTT association with a unique name.
- Step 2** In GTT association configuration mode, define the type of digit analysis to be used; "fixed" is the generally used digit analysis and if specified, also define the length of the digits to be analyzed. This is represented using action IDs.
- Step 3** In GTT association configuration mode, define the GT format (1 to 4) for which the analysis needs to be applied.
- Step 4** In the GT format configuration mode, specify the numbering plan and the nature of address to be used. Note that a separate GTT association needs to be created for a combination of numbering plan, nature of address, and GT format.

**Important** There are many different ways to configure a GTT association and the needs of every network are different. Please refer to the *Global Title Translation Association Configuration Mode* chapter in the Command Line Interface Reference for the commands available.

**Step 5** In global configuration mode, create a GTT address map, with a unique name, for a specific global title address.

**Step 6** In GTT address map configuration mode, associate a specific GTT association and the action ID.

**Step 7** In GTT address map configuration mode, define the routing indicator to be included in the Called-party Address in the out-going SCCP message along with the destination of the message using the option out-address.

**Important** There are many different ways to configure a GTT Address Map and the needs of every network are different. Please refer to the *GTT Address Map Configuration Mode* chapter in the Command Line Interface Reference for the commands available.

## Example Configuration

```
configure
  global-title-translation association instance <inst#>
    action id <id> type <action_type> start-digit <num> end-digit <num>
    gt-format <format_num>
  exit
  global-title-translation address-map instance <inst#>
    associate gtt-association <assoc#> action id <id>
    gt-address <gt_addr_prefix>
    out-address <name>
      ssf <sub_svc_fld>
      routing-indicator <route_ind>
      ni-indicator <addr_ind>
      ssn <sub_sys_num>
      point-code <pt_code>
    end
```

## Configuring an SCCP Network

SCCP (Signaling Connection Control Part) networks are a concept specific to this platform. The SCCP network provides services to protocol layers higher in the SS7 protocol stack, e.g., RANAP and TCAP. This layer is also responsible for GTT. Every SS7 routing domain will be associated with an SCCP network. Use the following example configuration to specify a global SCCP configuration specific to SGSN services.



**Important** A total of 12 SCCP networks can be configured.

To configure an SCCP network:

**Step 1** In global configuration mode, specify an identification number for this SCCP network configuration and the signaling variant.

- Step 2** Specify the self point code of the SGSN.
- Step 3** Specify the SS7 routing domain with which to associate this SCCP network configuration.
- Step 4** If using GTT (Global Title Translation), specify the name of a GTT address map to use.
- Step 5** Configure a destination point code and give it a name.
- Step 6** Configure the destination point code version.
- Step 7** Configure the destination point code subsystem number.

---

## Example Configuration

```
configure
  sccp-network <id_number> variant <v_type>
    self-pointcode <sp_code>
    associate ss7-routing-domain <rd_id>
    global-title-translation address-map <map_name>
    destination dpc <dp_code> name <name>
    destination dpc <dp_code> version <ver_type>
    destination dpc <dp_code> ssn <ss_number>
  end
```

## Configuring a MAP Service

The Mobile Application Part (MAP) is an SS7 protocol which provides an application layer for the various nodes in GSM and UMTS mobile core networks and GPRS core networks to communicate with each other in order to provide services to mobile phone users. MAP is the application-layer protocol used to access the Home Location Register (HLR), Visitor Location Register (VLR), Mobile Switching Center (MSC), Equipment Identity Register (EIR), Authentication Center (AUC), Short Message Service Center (SMSC) and Serving GPRS Support Node (SGSN).

The primary facilities provided by MAP are:

- Mobility Services: location management (when subscribers move within or between networks), authentication, managing service subscription information, fault recovery.
- Operation and Maintenance: subscriber tracing, retrieving a subscriber's IMSI.
- Call Handling: routing, managing calls while roaming, checking that a subscriber is available to receive calls.
- Supplementary Services.
- Short Message Service (SMS)
- Packet Data Protocol (PDP) services for GPRS: providing routing information for GPRS connections.
- Location Service Management Services: obtaining the location of subscribers.



---

**Important** A maximum of 12 MAP services can be configured on the system.

---

To configure MAP services:

- 
- Step 1** In the context config mode, create a MAP service and give it a name.
  - Step 2** In MAP Service configuration mode, configure the SCCP network that defines SS7 connectivity for SCCP applications.
  - Step 3** Configure the parameters to contact the HLR.
  - Step 4** In HLR configuration mode, specify the HLR pointcodes that should be associated with specific IMSI prefixes.
  - Step 5** Configure the HLR pointcode to use as the default.
  - Step 6** *Optional:* Enable the Short Message Service functionality.
  - Step 7** *Optional:* Configure the SMS routing.
- 

## Example Configuration

```

configure
  context context_name
    map-service map_name
      access-protocol sccp-network sccp_network_id
      equipment-identity-register point-code pnt_code
    hlr
      imsi any point-code
      default policy routing
    exit
  short-message-service
    smsc-routing imsi-starts-with prefix point-code sms_pc
  end

```

## Configuring an IuPS Service (3G only)

A set of parameters, in the IuPS service configuration mode, define the communication path between the SGSN service and the RNC. These configured parameters pertain to the RANAP layer of the protocol stack. IuPS services must be configured in the same context as the SGSN service that will use them.

To configure an IuPS service:

- 
- Step 1** In context configuration mode for the SGSN service, create an IuPS service and give it a unique name.
  - Step 2** In IuPS service configuration mode, specify the ID of the SCCP network to use for access protocol parameters.
  - Step 3** Bind an address of an IP interface defined in the current context to use for GTP-U connections to the RNC.
  - Step 4** Specify an RNC to configure with a unique ID and the MCC and MNC associated with the RNC.
  - Step 5** In RNC configuration mode, specify the RNC's point code.
  - Step 6** Specify the LAC ID and RAC ID associated with the RNC.
- Important** Appropriate interfaces (i.e., physical, loopback, secondary) must be defined prior to configuring the IuPS service or the GTP-U IP address will decline to bind to the service.
-

## Example Configuration

```

configure
  context context_name
    iups-service iups_name
      access-protocol sccp-network sccp_network_id
      gtpu bind address ip_address
      rnc id rnc_id mcc mcc_num mnc mnc_num
      pointcode rnc_pc
      lac lac_id rac rac_id
  end

```

## Configuring an SGTP Service

This section provides instructions for configuring GPRS Tunneling Protocol (GTP) settings for the SGSN. At a bare minimum, an address to use for GTP-C (Control signaling) and an address for GTP-U (User data) must be configured.

To configure the SGTP service:

- 
- Step 1** Create an SGTP service and give it a unique name, in context configuration mode.
  - Step 2** Specify the IP address of an interface in the current context to use for GTP-C.
  - Step 3** Specify the IP address of an interface in the current context to use for GTP-U.

**Important** Appropriate interfaces (i.e., physical, loopback, secondary) must be defined prior to configuring the SGTP service or the GTP-U IP address will decline to bind to the service.

---

## Example Configuration

```

configure
  context name
    sgtp-service name
      gtpc bind address address
      gtpu bind address address
  end

```

## Configuring a Gs Service

This section provides instructions for creating and configuring a Gs interface used by the SGSN to communication with an MSC or VLR. The Gs interface is defined as a Gs service which handles the configuration for the MSC/VLR.

The Gs interface parameters are configured within a Gs service in a context. Then the Gs service is referred to in a GPRS service, an SGSN service, or an Call-Control Profile. The Gs service does not need to be in the same context as the SGSN service, GPRS service, or a Call-Control Profile.

To configure the Gs service:

- 
- Step 1** In context configuration mode, create a Gs service and give it a unique name. Usually Gs service is defined in the same context in which MAP service is defined because the MSC/VLR, HLR, EIR, and SMS-C are reachable via the STP or SGW connected to the SGSN.
  - Step 2** Specify the name of the SCCP network that identifies the SS7 access protocols.
  - Step 3** Specify the target SS7 sub-system number (SSN), of the Base Station System Application Part (BSSAP), for communication. Without this bit of configuration, the Gs service can not start.
  - Step 4** Identify a location area code, in either a pooled or non-pooled configuration, relevant to the MSC/VLR. This step can be repeated as needed.
  - Step 5** Define the MSC/VLR by identifying its ISDN number, its SS7 point code, and the BSSAP SSN used to communicate with it. Repeat this step to define multiple MSC/VLRs. (Note: SSN only needs to be defined if the routing defined is to the MSC/VLR is PC+SSN.)
- 

## Example Configuration

```

configure
  context name
    gs-service name
      associate-sccp-network id
      bssap+ ssn ssn
      non-pool-area id use-vlr vlr_id lac lac_id
      vlr vlr_id isdn-number isdn_number bssap+ ssn ssn point-code vlr_pt_code
    end
  
```

## Configuring an SGSN Service (3G only)

All the parameters specific to the operation of an SGSN in a UMTS network are configured in an SGSN service configuration. SGSN services use other service configurations like MAP (map-service) and IuPS (iups-service) to communicate with other elements in the network.

To configure an SGSN service:

- 
- Step 1** In Context configuration mode, create an SGSN service and give it a unique name.
  - Step 2** Specify the Core Network (CN) ID that will identify this SGSN service on the CN.
  - Step 3** Specify the E.164 number to identify this SGSN service.
  - Step 4** Configure the maximum number of PDP contexts that a UE can establish.
  - Step 5** Specify the MAP service and the context in which it is configured that this SGSN service should use.
  - Step 6** Specify the IuPS service name and the context in which it is configured for the SGSN service to use for RAN protocol settings.

**Important** If a direct tunnel is to be established, GTP-U direct tunneling must be enabled in both the IuPs service and in the call-control-profile. For the IuPS service, the DT must be enabled per RNC; DT is enabled by default on RNCs.

- Step 7** Specify the SGTP service and the context in which it is configured for this SGSN service to use for GTP configuration.
- Step 8** Specify the CDR types that the SGSN service should generate.
- Step 9** Specify the context in which GTP accounting is configured. If the accounting context is not specified the current context is assumed.
- Step 10** Configure the charging characteristics profile. (Number of buckets for the max change condition, volume limit, time limit, and tariff time switch values should be defined individually according to requirements for each of the charging characteristics profiles.)
- Step 11** *Optional:* Specify the Gs service name and the context in which it is configured.
- Important** Session Management (SM) and GPRS Mobility Management (GMM) settings can be configured as needed using the SGSN configuration mode commands; `sm <keyword>` and `gmm <keyword>`. Refer to the *SGSN Service Configuration Mode* chapter in the *GPRS/UMTS Command Line Interface Reference*.

## Example Configuration

```

configure
  context context_name
    sgsn-service svc_name
      core-network id cn_id
      sgsn-number sgsn_number
      max-pdp-contexts per-ms max_number
      { mobile-application-part-service | associate map-service } map_name
  context map_context
    ran-protocol iups-service iups_svc_name context iups_context
    { sgtp-service | associate sgtp-service } svc_name context name
    accounting cdr-types [ mcdr | scdr ]
    accounting context acct_context
    cc profile profile_number interval seconds
    { gs-service context | associate gs-service } ctxt service
gs_service_name
end

```

Notes:

- For releases 12.2 and earlier, use `mobile-application-part-service map_name context map_context` command. For releases 14.0 and later, use the `associate map-service map_name context map_context` command.
- For releases 12.2 and earlier, use the `sgtp-service svc_name context name` command. For releases 14.0 and later, use `associate sgtp-service svc_name context name` command.
- For releases 12.2 and earlier, use the `gs-service context ctxt service gs_service_name` command. For releases 14.0 and later, use the `associate gs-service context ctxt service gs_service_name` command.

## Configuring a GPRS Service (2.5G only)

All the parameters specific to the operation of an SGSN in a GPRS network are configured in a GPRS service configuration. GPRS services use other configurations like MAP and SGTP to communicate with other elements in the network. The system can support multiple GPRS services.

To configure a GPRS service:

- 
- Step 1** In Context configuration mode, create a GPRS service instance and give it a unique name.
  - Step 2** Specify the context in which the accounting parameters have been configured.
  - Step 3** Create a PLMN definition for the GPRS service to include the identity of the mobile country code (MCC) and the mobile network code (MNC).
  - Step 4** Associate other services (such as a MAP or Gs or SGTP service) and their configurations with this GPRS service. This command should be repeated to associate multiple service types and/or multiple instances.
  - Step 5** Define the network service entity identifier (NSEI) of one or more remote SGSNs with their location area code (LAC) and routing area code (RAC). This step can be repeated to associate multiple peer-NSEIs.
  - Step 6** Specify the E.164 number to identify this SGSN.
  - Step 7** Configure the charging characteristic(s).
  - Step 8** Specify the types of CDRs to generate.
- 

### Example Configuration

```

configure
  context context_name
    gprs-service gprs_service_name
      accounting ctxt
      plmn id mcc mcc_num mnc mnc_num
      { service | associate service | }service_type service_name context
service_ctxt
  peer-nsei peer_nsei_id lac lac_id rac rac_id
  sgsn-number sgsn_isdn_number
  cc profile id buckets value
  cc profile id interval value
  accounting cdr-types cdr_type
end

```

## Configuring a Network Service Entity

### Configure a Network Service Entity for IP

Prior to implementing this configuration, the IP interfaces should have been defined in the same context as the GPRS service.



- 
- Step 1** In Global configuration mode, create a network service entity (NSE) for IP. The resulting prompt will appear as:
- ```
[local]<hostname>(nse-ip-local)#
```
- Step 2** In the Network Service Entity - IP local configuration mode, create up to four virtual links (NSVLs) for this entity - each with a unique NSVL Id. The resulting prompt will appear as:
- ```
[local]<hostname>(nse-ip-local-nsvl-<id>)#
```
- Step 3** Configure the link access information: IP address, context name, and port number.
- Step 4** Configure the links signaling characteristics.
- 

## Example Configuration for a Network Service Entity for IP

```
config
network-service-entity ip-local -n
nsvl instance id
nsvl-address ip-address ip_addr context ctxt port num
signaling-weight num data-weight num
end
```

## Configure a Network Service Entity for Frame Relay

- 
- Step 1** In Global configuration mode, create a network service entity (NSE) for Frame Relay. The resulting prompt will appear as:
- ```
[local]<hostname>(nse-fr-peer-nsei-id)#
```
- Step 2** In the Peer NSEI configuration mode, create a virtual connection instance for this entity. The resulting prompt will appear as:
- ```
[local]<hostname>(nse-fr-peer-nsei-<id>-nsvci-<id>)#
```
- 

## Example Configuration for a Network Service Entity for IP

```
config
network-service-entity peer-nsei id frame-relay
ns-vc id id -n
end
```

## Configuring DNS Client

DNS client services can be configured for a context.

---

- Step 1** In context configuration mode, enable DNS lookup.

- Step 2** Specify the DNS to use for lookups; maximum of two DNS addresses can be used.
- Step 3** Create a DNS client with a unique name.
- Step 4** In DNS Client configuration mode, bind the DNS client to the IP address of an interface in the current context.

## Example Configuration

```
configure
  context context_name
  ip domain-lookup
  ip name-servers ip_address
  dns-client name
    bind address ip_address
  end
```

## Configuring GTPP Accounting Support

This section provides instructions for configuring GTPP-based accounting which allows the SGSN to send M-CDR and/or S-CDR accounting data to the Charging Gateways (CGs) over the Ga interface.

The Ga interface and GTPP functionality are typically configured within a separate charging context.

The SGSN begins to generate M-CDR data upon GPRS/IMSI attach. S-CDR data generation begins upon PDP context activation.

Accounting servers can be configured individually or as GTPP accounting server groups. GTPP accounting server groups can each have completely different GTPP settings configured. Although a GTPP server can be included in multiple GTPP groups.

Any GTPP accounting servers configured at the context level that are not specifically configured as part of a GTPP group, are automatically assigned to be part of the GTPP server group called default that is part of every context.

A maximum of 8 GTPP named server groups can be configured across all contexts. A maximum of 4 CGFs can be configured in each GTPP server group. A total of total 32 CGFs can be configured across all server groups, including the server group called default, in one context. Each GTPP group must have unique GTPP charging agents (CGFs) configured.



### Important

The system supports the specification of the UDP port number for the charging agent function on the system and for the CG. The default charging agent port is 49999. The default CG Server port is (3386). If an SGSN service and a GGSN service are both configured on this system be sure that the UDP ports are unique for each type of service. Refer to the Command Line Interface Reference for information on changing the ports used.

To configure the GTPP accounting support for a SGSN service:

- Step 1** Create the GTPP group in accounting context by applying the example configuration in the *Creating GTPP Group* section.
- Step 2** Configure the charging agent and GTPP server (CGF) related parameters for the GTPP accounting support by applying the example configuration in the *Configuring GTPP Group* section.

- Step 3** Verify your GTPP group and accounting configuration by following the steps in the *Verifying GTPP Group Configuration* section.
- Step 4** Save your configuration to flash memory, an external memory device, and/or a network location using the Exec mode command **save configuration**. For additional information on how to verify and save configuration files, refer to the *System Administration Guide* and the *Command Line Interface Reference*.

## Creating GTPP Group

Use the following example to create the GTPP group to support GTPP accounting:

```
configure
context <vpn_ctxt_name>
gtp group <gtp_group_name> -noconfirm
end
```

Notes:

- In addition to one default GTPP group "default" a maximum of 8 GTPP groups can be configured with this command in a context.
- In case no GTPP group is configured in this context, system creates a default GTPP group named "default" and all the CGF servers and their parameters configured in this context are applicable to this "default" GTPP group.

## Configuring GTPP Group

Use the following example to configure the GTPP server parameters, GTPP dictionary, and optionally CGF to support GTPP accounting:

```
configure
context <vpn_ctxt_name>
gtp group <gtp_group_name>
gtp charging-agent address <ip_address> [ port <port> ]
gtp server <ip_address> [ max <msgs > ] [ priority <priority> ]
gtp dictionary <dictionaries>
gtp max-cdrs <number_cdrs> [ wait-time <dur_sec> ]
gtp transport-layer { tcp | udp }
end
```

Notes:

- In addition to one default GTPP group "default" a maximum of 8 GTPP groups can be configured with this command in a context.
- In case no GTPP group is configured in this context, system creates a default GTPP group named "default" and all the CGF servers and their parameters configured in this context are applicable to this "default" GTPP group.
- Command for CGF **gtp charging-agent** is optional and configuring gtp charging-agent on port 3386 may interfere with ggsn-service configured with the same ip address. Multiple interfaces can be configured within a single context if needed.
- For more information on GTPP dictionary encoding, if you are using StarOS 12.3 or an earlier release, refer to the *AAA and GTPP Interface Administration and Reference*. If you are using StarOS 14.0 or a later release, refer to the *GTPP Interface Administration and Reference*.

- For better performance, it is recommended to configure maximum number of CDRs as 255 with **gtp max-cdrs** command.
- You can select transport layer protocol as TCP or UDP for Ga interface with **gtp transport-layer** command. By default it is UDP.
- Multiple GTPP server can be configured using multiple instances of this command subject to following limits:
  - Total 4 GTPP server in one GTPP group
  - Total 32 GTPP server in one context
  - Total 9 GTPP groups (1 default and 8 user defined GTPP groups) can be configured in one context. Number of CGFs in 1 GTPP group is limited to 4 and a total of 32 CGF servers across all GTPP groups in one context are configurable.

## Verifying GTPP Group Configuration

Verify that your CGFs were configured properly by entering the following command in *Exec Mode*:

```
show gtp accounting servers
```

This command produces an output similar to that displayed below:

```
context: source
Preference      IP                Port      Priority      State
  Group
-----
Primary        192.168.32.135    3386      1             Active
default
Primary        192.168.89.9      3386     100           Active
default
```

## Configuring and Associating the EGTP Service (S4 Only)

This section describes how to configure and associate the EGTP service to support S4-SGSN functionality.

The SGSN communicates with the EPC network SGW via the GTPv2 protocol over the S4 interface. GTPv2 is configured on the chassis as part of an EGTP service. Once configured, the EGTP service then must be associated with the configured UMTS (3G) and/or GPRS (2G) service configured on the system to provide access to the EPC network.

Once the EGTP service is associated with the UTRAN and/or GERAN service, then the S4-SGSN will be chosen for PDP context activation in the following cases:

- If the last known capability of the UE indicates that it is EPC-capable.
- If the last known capability of the UE indicates it is non-EPC capable but has an EPS subscription only.
- If a PDP context is already activated for the UE, and the S4 interface is already selected for the UE.



### Important

The S4 feature license must be enabled on the S4-SGSN to configure the EGTP service.



**Important** S4 support for the SGSN requires the presence of an SGTP service, even though S4 support is being configured for the SGSN to use the S4 interface. The SGTP service is required to interface with non-EPC capable roaming partners via the Gn interface. SGTP is also required for subscribers using mobile phones that are not EPC-capable in an EPC network.



**Important** Currently, the S4-SGSN does not support the transfer of PDP contexts from the S4 interface to the Gn interface within the same S4-SGSN.

Use the following procedure to configure and associate the EGTP service to for S4 functionality on the SGSN:

- Step 1** Access *Context Configuration Mode*.
- Step 2** Create and configure the EGTP service in the desired context.
- Step 3** Configure the interface type for the EGTP service.
- Step 4** Configure the validation mode for the EGTP service. The default and recommended setting is **standard**.
- Step 5** Associate the EGTP service with the configured 2.5G service (if configured).
- Step 6** Associate the EGTP service with the configured 3G service (if configured).

## Example Configuration

```

config
  context context_name
    egtp-service service_name
      gtpc bind ipv4-address ipv4_address
      interface-type interface-sgsn
      validation-mode standard
    end
config
  context context_name
    gprs-service gprs_service_name
      associate egtp-service egtp_service_name context context_name
    end
config
  context context_name
    sgsn-service sgsn_service_name
      associate egtp-service egtp_service_name context context_name
    end

```



**Important** It is recommended to execute the S4 SGSN configuration commands during the maintenance window. After configuring the node, re-start the node to activate the configuration commands. This will ensure that the node is in a consistent state and S4 SGSN service instability scenarios are avoided.

**Important**

If you modify the **interface-type** command, the parent service (service within which the eGTP/GTP-U service is configured) will automatically restart. Service restart results in dropping of active calls associated with the parent service.

## Configuring and Associating the GTPU Service (S4 Only)

This section describes how to configure and associate the GTPU service on the S4-SGSN.

The GTPU service is required to support the EGTP service for the sending and receiving of GTP bearer packets to and from the EPC SGW.

Use the following procedure to configure and associate the GTPU service:

- 
- Step 1** Access *Context Configuration Mode*.
  - Step 2** Create the GTPU service in the same context where the **egtp-service** is configured.
  - Step 3** Bind the GTPU service to the IP address to be used for GTP-U (the S4-SGSN side IP address for GTP-U packets).
  - Step 4** Associate the GTPU service with the configured **egtp-service**.
- 

## Example Configuration

```

config
  context context_name
    gtpu-service service_name
      bind ipv4-address ipv4_address
    end
  context
config
  context egtp-service_context_name
    egtp-service egtp-service_name
      associate gtpu-service egtp_service_name
    end

```

**Important**

It is recommended to execute the S4 SGSN configuration commands during the maintenance window. After configuring the node, re-start the node to activate the configuration commands. This will ensure that the node is in a consistent state and S4 SGSN service instability scenarios are avoided.

# Configuring the DNS Client Context for APN and SGW Resolution (Optional)

This section describes how to configure the context from which DNS client has to be selected for performing an APN FQDN query for resolving a PGW address (S4-SGSN) or a co-located PGW / GGSN address (Gn SGSN), and the context from which DNS client has to be selected for performing an RAI FQDN query for resolving an SGW address (S4-SGSN).

By default, the S4-SGSN supports the initiation of a DNS query after APN selection using a S-NAPTR query for EPC-capable subscribers. The S4-SGSN resolves a PGW/GGSN by sending an APN-FQDN query to the DNS client. Similarly, the S4-SGSN resolves the SGW by sending a RAI-FQDN query to the DNS client. The DNS Client then sends a query to the DNS server to retrieve NAPTR/SRV/A records and return the SGW or PGW IP address to the SGSN.



## Important

For non-EPC capable subscribers, the S4-SGSN initiates only a DNS A query.

The Gn SGSN supports selecting a co-located PGW/GGSN node for EPC capable UEs by performing a DNS SNAPTR lookup for APN FQDN for the service parameter "**x-3gpp-pgw:x-gn**" / "**x-3gpp-pgw:x-gp**". Note that in addition to these parameters, the service parameters In addition to these interfaces "**x-3gpp-ggsn:x-gn**" & "**x-3gpp-ggsn:x-gp**" are used for selecting standalone GGSNs.

For performing a DNS SNAPTR query, the SGSN requires an additional, optional, configuration that identifies the context where DNS lookup for EPC-capable UEs must occur. This is accomplished by creating a call-control-profile that specifies the context from which the DNS client should be used for resolving a co-located PGW/GGSN address on a Gn SGSN as well.

Use the following procedure to configure and associate the configure DNS for APN resolution to support S4 functionality:

- Step 1** Access *Call Control Profile Configuration Mode* and create a call control profile.
- Step 2** Configure the DNS client context to resolve PGW UEs via the context the DNS client is configured.
- Step 3** Configure the DNS client context to resolve SGW UEs via the context where the DNS client is configured.

## Example Configuration

```
config
  call-control-profile name
    dns-pgw context dns_client_context_name
    dns-sgw context dns_client_context_name
  end
```

Notes:

- **dns-pgw context** is valid for selecting a PGW (in an S4-SGSN) as well as a co-located PGW/GGSN (in a Gn/GP- SGSN). If the interface selected for a UE is S4 and if there is no **dns-pgw context** configured under the Call Control Profile, then by default it will look for the DNS client in the context where the

EGTP service is defined. If the interface selected for a UE is Gn/Gp, and if there is no **dns-pgw context** configured under the Call Control Profile, then by default the system will look for the DNS client in the context where the SGTP service is configured for selecting co-located PGW/GGSNs if:

- The UE is EPC capable and,
- **apn-resolve-dns-query snaptr** is configured under an APN Profile.
- **dns-sgw context** specifies the name of the context where the DNS client is configured and that will be used for DNS resolution of SGWs. If **dns-sgw** is not configured, the S4-SGSN uses the DNS client configured in the context where EGTP service is configured to query the SGW DNS address.



#### Important

It is recommended to execute the S4 SGSN configuration commands during the maintenance window. After configuring the node, re-start the node to activate the configuration commands. This will ensure that the node is in a consistent state and S4 SGSN service instability scenarios are avoided.

## Configuring the S6d Diameter Interface (S4 Only)

This section describes how to configure the S6d Diameter interface to support S4 functionality.

The S6d interface is a Diameter-based interface used to support S4 functionality by enabling the S4-SGSN to communicate with the HSS. The HSS is a master user database that contains all subscription related information, and performs the following functions:

- Authentication and authorization of the user
- Provides the subscribers location information
- Provides the subscribers IP information

To support the S6d interface, an HSS Peer Service must be configured and associated with a Diameter endpoint. This HSS Peer Service is then associated with the configured SGSN and/or GPRS services to enable communication with the HSS via the S6d interface. Optionally, operators can configure an operator policy-based interface selection.

Configuring the S6d interface consists of the following procedures:

1. Configuring a Diameter Endpoint for the S6d interface
2. Configuring the HSS Peer Service and Interface Association for the S6d interface
3. Associating the HSS Peer Service with the SGSN and GPRS Services for the S6d interface.
4. Optional. Configuring operator policy-based interface selection for the S6d interface.

## Configuring the Diameter Endpoint for the S6d Interface

Use the following procedure to configure the Diameter endpoint for the S6d interface:

- Step 1** Configure a port that will be bound to an interface (at step 3) to be used as the S6d interface.
- Step 2** Configure an Ethernet interface to be used as a diameter endpoint.
- Step 3** Configure a Diameter endpoint to be used as the S6d interface.
- Step 4** Specify the origin host address and the IP address of the Ethernet interface to be used as the S6d interface.



- Step 5** Specify the origin realm. The realm is the Diameter identity. The originator's realm is present in all Diameter messages and is typically the company or service provider's name.
- Step 6** Specify the peer name, peer realm name, peer IP address and port number. The peer IP address and port number are the IP address and port number of the HSS.
- Step 7** Specify the route entry peer. This parameter is optional. The route entry peer parameter is required if multiple HSS peers are configured under a Diameter point and operators want to associate a routing weight to each HSS peer so that the S4-SGSN contacts each HSS based on the weight distribution.
- Step 8** Optional. Enable or disable the **watchdog-timeout** parameter.
- Step 9** The **use-proxy** keyword can be specified in the **diameter-endpoint** command to enable the proxy mode. The usage of proxy mode depends on the operator's HSS capabilities.

## Example Configuration

```

config
  port ethernet slot number/port number
  no shutdown
  bind interface s6d_interface_name context_name
end
config
  context context_name
  interface s6d_interface_name
    ip address s6d_interface_ip_address subnet_mask
  exit
  diameter endpoint endpoint_name
    origin host host_name address s6d_interface_ip_address
    origin realm realm_name
    peer peer_name realm realm_name address hss_ip_address
    route-entry peer route_entry_name
  use-proxy
  no watchdog-timeout
end

```

## Configuring the HSS Peer Service and Interface Association for the S6d Interface

Use the following procedure to configure the HSS Peer Service and interface association for the S6d interface:

- Step 1** Configure a Diameter endpoint. If not already configured, refer to the [Configuring the Diameter Endpoint for the S6d Interface, on page 24](#) Then specify the IP address of the Ethernet interface configured in Step 1 as the Diameter endpoint address.
- Step 2** Associate the Diameter endpoint with an HSS peer service.
- Step 3** Specify the Diameter dictionary to be used for the HSS Peer Service. The **standard-r9** dictionary must be used for the S6d interface.

## Example Configuration

```

config
  context sgsn_context_name
    hss-peer-service hss_peer_service_name
      diameter hss-endpoint hss_endpoint_name
      diameter hss-dictionary standard_r9
    end

```

## Associating the HSS Peer Service with the SGSN and GPRS Services for the S6d Interface

Use this procedure to association the HSS Peer Service with the SGSN and GPRS Services:

- 
- Step 1** Access *Context Configuration Mode* and create an SGSN service.
- Step 2** Associate the HSS peer service name with the SGSN service.
- Step 3** Access *Context Configuration Mode* and create a GPRS service.
- Step 4** Associate the HSS peer service name with the GPRS service.
- 

## Example Configuration

```

config
  context context_name
    sgsn-service sgsn-service-name
      associate hss-peer-service hss-peer-service-name
    end
  context context_name
    gprs-service gprs-service-name
      associate hss-peer-service hss-peer-service-name
    end

```

## Configuring Operator Policy-Based S6d Interface Selection (Optional)

It is mandatory for the SGSN and GPRS services to have either a MAP service association or an HSS-Peer-Service association.

- If no MAP service is associated with the SGSN or GPRS services, and only the HSS service is associated with the SGSN or GPRS services, then the S6d interface is selected.
- If both the MAP service and the HSS-Peer-Service are associated with the SGSN or GPRS service, by default the Gr interface is selected. To override the default use of the Gr interface, configure the operator policy to select the **s6d-interface**.
- Once the interface selection is configured, the call-control-profile is first checked to determine whether to select the MAP-interface or HSS-interface. If neither the MAP nor HSS is configured under the call control profile, then the system checks the configured SGSN or GPRS-services.

- 
- Step 1** Access *Call Control Profile Configuration Mode* and create a call-control-profile.
- Step 2** Associate the configured HSS peer service with the S6d interface. The **s6d-interface** option must be selected.
- 

### Example Configuration

```

config
  call-control-profile name
    associate hss-peer-service name s6d-interface
  end

```

## Configuring the Subscription Interface Preference for the S6d Interface (Optional)

The S4-SGSN provides a mechanism to associate a MAP service with call-control-profile. In some situations, it is possible that both the MAP service and the HSS peer service are associated with the Call Control Profile. In these cases, operators can configure the preferred subscription interface.

- 
- Step 1** Access *Call Control Profile Configuration Mode* and create a call-control-profile.
- Step 2** Specify the preference of the subscription-interface. Selecting the **hlr** option will cause the MAP protocol to be used to exchange messages with the HLR. The **hss** option causes the Diameter-protocol to be used to exchange messages with the HSS.
- 

### Example Configuration

```

config
  call-control-profile name
    prefer subscription-interface { hlr | hss }
  end

```

## Configuring the S13' Interface (S4 Only, Optional)

The S13' (S13 prime) interface is a Diameter-based interface that is used to perform the Mobile Equipment (ME) identity check procedure between the SGSN and EIR. Configuring the S13' interface is optional.

The SGSN performs ME identity check to verify the Mobile Equipment's identity status.

The S13' interface uses the Diameter protocol. An HSS Peer Service must be configured and associated with a Diameter endpoint. It is not mandatory to configure the HSS Peer Service under the SGSN or the GPRS service. By configuring the HSS Peer Service in *Call Control Profile Configuration Mode*, the S13' interface can be used.

In the absence of an operator policy, the HSS Peer Service must be associated with the configured SGSN or GPRS service to be able to utilize the S13' interface. In the presence of an operator policy, the operator policy configured overrides the service configured in the SGSN or GPRS service.



**Important** The S13' interface can only be configured after the S6d interface has been configured. Refer to [Configuring the S6d Diameter Interface \(S4 Only\), on page 24](#) procedure for information on configuring the S6d interface.

Configuring the S13' interface consists of the following procedures;

- Step 1** Configure a Diameter Endpoint for the S13' interface.
- Step 2** Configure the HSS Peer Service and Interface association for the S13' interface.
- Step 3** Associate the HSS Peer Service with the SGSN and GPRS services for the S13' interface.
- Step 4** Optional. Configure an operator policy S13-based interface selection call control profile for the S13' interface.

## Configuring a Diameter Endpoint for the S13' Interface

Use this procedure to configure a Diameter endpoint for the S13' interface:

- Step 1** Access *Context Configuration Mode* and create a Diameter endpoint.
- Step 2** Specify the origin host address and the IP address of the S13' interface.
- Step 3** Specify the origin realm. The realm is the Diameter identity. The originator's realm is present in all Diameter messages and is typically the company or service name.
- Step 4** Specify the peer name, peer realm name, peer IP address and port number. The peer IP address and port number are the IP address and port number of the HSS.
- Step 5** Specify the route entry peer (optional). The route entry peer parameter is required if multiple HSS or EIR peers are configured under a Diameter point and operators wish to associate a routing weight to each HSS or EIR peer so that SGSN contacts each HSS or EIR based on the weight distribution.
- Step 6** The user can optionally enable or disable the parameter watchdog-timeout.
- Step 7** The **use-proxy** keyword can be specified in the diameter-endpoint command to enable the proxy mode. The usage of proxy mode depends on the operator's EIR capabilities.

## Example Configuration

```

config
  port ethernet s13'_interface_name
    no shutdown
    bind interface s13'_interface_name sgsn_context_name
  end
config
  context context_name
    interface s13'_interface_ip subnet_mask
  exit
  diameter endpoint s13'_endpoint_name
    origin host host_name address host_address
    origin realm realm_address

```

```

peer peer_name realm realm_name address hss_ip_address
route-entry peer route_entry_name
use-proxy
no watchdog-timeout
exit
hss-peer-service hss_peer_service_name
diameter hss-endpoint s6d_endpoint_name eir-endpoint s13'_endpoint_name
end

```

## Configuring the HSS Peer Service and Interface Association for the S13' Interface

Use the following procedure to configure the HSS Peer Service and Interface association:

- 
- Step 1** Configure an Ethernet interface to be used as a Diameter endpoint.
  - Step 2** Configure a Diameter endpoint and specify the IP address of the Ethernet interface configured in Step 1 as the Diameter endpoint address.
  - Step 3** Configure an HSS peer service and associate it with the Diameter endpoint configured for the S6d and S13' interfaces.
  - Step 4** Specify the Diameter dictionary to be used for the HSS-Peer-Service. The **standard-r9** option must be selected for the SGSN.
- 

### Example Configuration

```

config
port ethernet slot_number/port_number
no shutdown
bind interface s6d_interface_name sgsn_context_name
end
config
context sgsn_context_name
interface s6d_interface_name
ip address s6d_interface_ip_address subnetmask
exit
diameter endpoint s6d-endpoint_name
origin realm realm_name
origin host name address s6d_interface_address
peer peer_name realm realm_name address hss_ip_address
exit
diameter endpoint s13'_endpoint_name
origin realm realm_name
origin host name address s13'_interface_address
peer peer_name realm realm_name address eir_ip_address
exit
hss-peer-service hss_peer_service_name
diameter hss-endpoint hss_endpoint_name eir-endpoint eir_endpoint_name
diameter hss-dictionary standard-r9
end

```

## Associating the HSS Peer Service with the SGSN and GPRS Services for the S13' Interface

Use this procedure to associate the HSS Peer Service with the SGSN and GPRS services.

- 
- Step 1** In *Context Configuration Mode* create a SGSN service.
- Step 2** Associate the HSS peer service with SGSN service, if configured, and provide the HSS peer service name and context name.
- Step 3** Associate the HSS peer service with GPRS service, if configured, and provide the HSS peer service name and context name.
- 

### Example Configuration

```

config
  context context_name
    sgsn-service sgsn_service_name
      associate hss-peer-service hss-peer-service-name
    end
config
  context context_name
    gprs-service gprs_service_name
      associate hss-peer-service hss-peer-service-name
    end

```

## Configuring S13' Interface Selection Based on an Operator Policy

It is mandatory for the SGSN and GPRS service to have either a MAP service association or an HSS Peer Service association.

- In the absence of a MAP service association with SGSN or GPRS service, and if the HSS service is associated with the SGSN or GPRS service then the S13' interface is selected.
- If both the MAP service and the HSS-Peer-Service are associated with the SGSN or GPRS service, by default the Gf interface is selected. To override this default, operators can configure an operator policy to configure behavior for the S13' interface selection.
- Once configured, the behavior is as follows:
  - First, the call control profile is checked to determine on whether a MAP or HSS interface is configured.
  - If neither A MAP or HSS is configured under the call control profile, then the system uses the configuration in the SGSN or GPRS service.

Use this procedure to configure an operator policy used for S13' interface selection.

- 
- Step 1** Access *Call Control Configuration Mode* and configure a call-control-profile.
- Step 2** Associate the HSS Peer Service with the **s13-prime-interface**.
-

## Example Configuration

```

config
  call-control-profile name
    associate hss-peer-service name s13-prime-interface
  end

```

# Configuring QoS Mapping for EPC-Capable UEs using the S4 Interface (S4 Only, Optional)

An S4-SGSN communicates QoS parameters towards the SGW and PGW in EPC QoS. However, it sends QoS towards the UE in the QoS format defined in the GMM/SM specification (TS 24.008). 3GPP defines a mapping for EPS QoS to pre-release 8 QoS in TS 23.401, Annex E. On the S4-SGSN, operators can configure the quality of service (QoS) parameters as Call Control Profiles that will ensure proper QoS mapping between the S4-SGSN and the EPC gateways (PGW and SGW) and UEs. However, such configurations are optional. If no mapping is configured, then the S4-SGSN uses the default mapping.

The configured Call Control Profiles also will be used if the S4 interface is chosen for PDP activation, but the subscription does not have an EPS subscription. Therefore, GPRS subscription data (which uses QoS in pre-release 8 format), will be mapped to EPS QoS behavior. The allocation and retention policy will be mapped to EPS ARP using the configured Call Control Profiles. Specifically, the configuration provided in this section enables the S4-SGSN to:

- Map EPC ARP (allocation and retention priority) parameters to pre-release 8 ARP (Gn/Gp ARP) parameters during S4-SGSN to Gn SGSN call handovers.
- Map ARP parameters received in a GPRS subscription from the HLR to EPC ARP parameters if the S4 interface is selected for an EPC capable UE that has only a GPRS subscription (but no EPS subscription) in the HLR / HSS.

If the QoS mapping configuration is not used, the following default mappings are used:

- Default ARP **high-priority** value = 5
- Default ARP **medium-priority** value = 10
- Default **pre-emption capability** = **shall-not-trigger-pre-emption**
- Default **pre-emption vulnerability** = **pre-emptable**

Use this procedure to configure QoS mapping for EPC Gateways and UEs:

- 
- Step 1** Access *Call Control Profile Configuration Mode* and create a call-control-profile.
  - Step 2** Configure the QoS ARP settings.
  - Step 3** Exit back to the Local prompt.
  - Step 4** Access the call-control profile you just configured.
  - Step 5** Configure the QoS pre-emption or vulnerability capabilities.
-

## Example Configuration

```

config
  call-control-profile cc_profile_name
    qos gn-gp arp high-priority hi_prior_value medium-priority med_prior_value
  end
config
  call-control-profile cc-profile-name
    qos gn-gp pre-emption { capability { may-trigger-pre-emption |
shall-not-trigger-pre-emption } | vulnerability { not-pre-emptable |
pre-emptable } }
  end

```

## Configuring the Peer SGSN Interface Type (S4 Only, Optional)

Operators can specify the type of interface the S4-SGSN will use to communicate with the peer SGSN in a call control profile.

Use the following procedure to configure the peer SGSN interface type:

- 
- Step 1** Access the Call Control Profile configuration for the peer SGSN.
- Step 2** Configure the interface type to be used for communication between the S4-SGSN and the peer SGSN. **s16** must be specified if the peer SGSN is an S4-SGSN.
- 

## Example Configuration

```

config
  call-control-profile cc_profile_name
    sgsn-address { rac rac value lac lac value | rnc_id rnc_id } prefer {
local | fallback-for-dns } address ipv4 ipv4 address interface { gn | s16
}
  end

```

Notes:

- The **rnc\_id** parameter can be used instead of the **rac** and **lac** values if operators wish to configure the target RNC ID that maps to the address of the peer SGSN via the S16 interface. The RNC ID is used by the S4-SGSN for inter-SGSN SRNS relocation. Configuration of the **rnc\_id** is optional, and valid only if SRNS relocation first has been configured in *Call Control Profile Configuration Mode* using the **srns-inter** and/or **srns-intra** commands.
- The **fallback-for-dns option** is under development for future use, and is not currently supported on the S4-SGSN.
- NRI-based validation is not supported on the S4-SGSN.



**Important**

It is recommended to execute the S4 SGSN configuration commands during the maintenance window. After configuring the node, re-start the node to activate the configuration commands. This will ensure that the node is in a consistent state and S4 SGSN service instability scenarios are avoided.

## Configuring Gn Interface Selection Based on an Operator Policy (S4 Only, Optional)

The S4-SGSN uses the S4 interface to communicate with EPC-capable UEs. However, operators have the option to create a call-control-profile that enables the S4-SGSN to forcefully select the Gn interface for EPC-capable UEs.

Use this procedure to forcefully select the Gn interface for EPC-capable UEs:

- Step 1** Access *Call Control Profile Configuration Mode*.
- Step 2** Create a call-control-profile.
- Step 3** Configure the SGSN to forcefully select the Gn interface.

### Example Configuration

```
config
  call-control-profile cc_profile_name
    sgsn-core-nw-interface { gn | s4 }
  end
```

Notes:

- **sgsn-core-nw-interface** specifies the interface that EPC-capable UEs will use to communicate with the packet core gateways (GGSN/SGW). The default setting for EPC-capable UEs is **s4**.

**Important**

It is recommended to execute the S4 SGSN configuration commands during the maintenance window. After configuring the node, re-start the node to activate the configuration commands. This will ensure that the node is in a consistent state and S4 SGSN service instability scenarios are avoided.

## Configuring a Custom MME Group ID (S4 Only, Optional)

3GPP specifications define how a GUTI allocated by an MME is translated into an old P-TMSI and old RAI when a UE hands over to an SGSN. 3GPP specifications state that when a GUTI is mapped to an old RAI, the MME group ID portion of the GUTI will be mapped to a Location Area Code (LAC). MME group IDs are 16-bit numbers which always have their most significant bit set. As a result, their range is 32768 - 65535.

However, some operators may have already configured their networks with LACs for UTRAN and GERAN coverage in the 32768 - 65535 range. To provide backward compatibility for such deployments, a custom list of MME group IDs must be configured for use by both the S4-SGSN and MME products for UTRAN/GERAN and E-UTRAN handovers.

Once the custom MME Group IDs have been configured, operators then can configure the S4-SGSN to use the available custom MME Group IDs configured for both GPRS (2G) and UTRAN (3G) network services.

Use the following procedure to configure the SGSN to use the custom MME Group IDs:

- 
- Step 1** Access *LTE Network Global MME ID Management Database Configuration Mode*.
- Step 2** Specify the PLMN MCC and MNC values.
- Step 3** Configure the low and high end values of the LAC range to be used.
- Step 4** Access the context in which the SGSN (3G) service is configured.
- Step 5** Associate the 3G service (if configured), with the MME's Network Global MME ID Management Database that contains the custom list of MME Group IDs.
- Step 6** Access the context in which the 2G GPRS service is configured.
- Step 7** Associate the 2G service, if configured, with the MME's Network Global MME ID Management Database that contains the custom list of MME Group IDs.
- 

## Example Configuration

```

config
  lte-policy
    network-global-mme-id-mgmt-db
      plmn mcc mcc_value mnc mnc_value mme-group-id-range first low_end_of_range
      last high_end_of_range
    exit
  exit
context context_name
  sgsn-service sgsn_service_name
  associate network-global-mme-id-mgmt-db
end
config
context context_name
  gprs-service gprs_service_name
  associate network-global-mme-id-mgmt-db
end

```

## Configuring and Associating the Selection of an SGW for RAI (S4 Only, Optional)

If operators wish to bypass DNS resolution of RAI FQDN for obtaining the S-GW address, the SGSN can select an S-GW by performing a local configuration look-up for the current Routing Area Instance (RAI). This is accomplished by configuring the TAI Management Database (tai-mgmt-db) of the SGSN to select an

S-GW address and its associated RAI. In addition, the TAI Management Database must be associated with the 2G and/or 3G services configured on the SGSN. The TAI Management Database can also be associated with a call-control-profile for RAI-to-SGW address mapping.

Use the following procedure to configure the selection of an SGW for RAI:

- 
- Step 1** Access *Global Configuration Mode*.
  - Step 2** Access *LTE Policy Configuration Mode*.
  - Step 3** Create a TAI Management Database and enter *TAI Management Database Configuration Mode*.
  - Step 4** Create a TAI Management Object and enter *TAI Management Object Configuration Mode*.
  - Step 5** Configure the RAI. Specify the RAI MCC, MNC, LAC and RAC values.
  - Step 6** Configure the SGW address serving the RAI. Specify the IPv4 address, the S5-to-S8 protocol as GTP, and the load balancing Weight for this SGW. On the S4-SGSN, only GTP is supported as the protocol option.
  - Step 7** Access *SGSN Service Configuration Mode* and associate the configured UTRAN (3G) service with the S-GW addresses and their associated RAIs.
  - Step 8** Access *GPRS Service Configuration Mode* and associate the configured GERAN (2G) and service with the S-GW addresses and their associated RAIs.
  - Step 9** *Optional*. Associate the SGW address-to-RAI mapping with a call-control-profile.
- 

## Example Configuration

```

config
  lte-policy
    tai-mgmt-db tai_mgmt_db_name
    tai-mgmt-obj obj_name
    rai mcc mcc_value mnc mnc_value lac lac_value rac rac_value
    sgw-address ipv4_addr | ipv6_addr s5-s8-protocol gtp weight number
  end

config
  context context_name
    sgsn-service sgsn_service_name
    associate tai-mgmt-db tai_mgmt_db_name
  end

config
  context context_name
    gprs-service gprs_service_name
    associate tai-mgmt-db tai_mgmt_db_name
  end

config
  call-control-profile cc_profile_name
  associate tai-mgmt-db tai_mgmt_db_name
end

```

## Configuring a Local PGW Address (S4 Only, Optional)

If operators wish to bypass DNS resolution of APN FQDN on the S4-SGSN for obtaining a PGW address, the S4-SGSN can be configured to use a locally configured PGW IPv4 address in an APN profile.

Use the following procedure to configure the local PGW address:

- 
- Step 1** Access *APN Profile Configuration Mode* and create an APN profile.
  - Step 2** Specify the address resolution mode for the PGW as **local**.
  - Step 3** Configure the P-GW address.
  - Step 4** Configure the load balancing **weight** preference for the P-GW.
- 

### Example Configuration

```
config
  apn-profile apn_profile_name
    address-resolution-mode local
    pgw-address ipv4_address | ipv6_address weight weight_preference
  end
```

## Configuring the Peer MME Address (S4 Only, Optional)

For operators wishing to bypass DNS resolution to obtain the peer EPC MME address, the SGSN supports the local configuration of a peer MME address for a given MME group (LAC) and MME code (RAC).

Use the following procedure to configure the peer MME address:

- 
- Step 1** Access *Call Control Configuration Mode* and create a call-control-profile.
  - Step 2** Configure the peer MME Group ID LAC and RAC values or the TAC.
  - Step 3** Specify a **local** preference for selection of the peer MME address.
  - Step 4** Specify the local MME address to use for lookup instead of a DNS query.
  - Step 5** Specify the interface type to use when communicating with the peer MME. The interface must be **s3**.
- 

### Example Configuration

```
config
  call-control-profile cc-profile-name
    peer-mme { mme-groupid lac_value mme-code rac_code | tac tac } prefer
  local address ipv4_address | ipv6_address interface { gn [ s3 ] | s3 [ gn ] }
  end
```

Notes:

- The **tac** keyword can be used instead of the **mme-groupid** and **mme-code** parameters to configure the Tracking Area Code (TAC) of the target eNodeB that maps to the peer MME address. The TAC is used by the S4-SGSN for UTRAN to E-UTRAN (SGSN to MME) SRNS relocation across the S3 interface. Configuration of the **tac** is valid only if SRNS relocation first has been configured in *Call Control Profile Configuration Mode* via the **srns-inter** and/or **srns-intra** commands.

## Configuring the ISR Feature (S4 Only, Optional)

Idle Mode Signaling Reduction (ISR) is a license-enabled feature that allows the UE to roam between LTE and 2G/3G networks while reducing the frequency of TAU and RAU procedures due to the UE selecting E-UTRAN or UTRAN networks. ISR reduces the signaling between the UE and the network, and also reduces the signaling between the E-UTRAN and UTRAN networks.

Use the following procedure to configure the ISR feature:

- 
- Step 1** Access *Call Control Configuration Mode*.
  - Step 2** Create a call-control-profile.
  - Step 3** Enable the Idle Mode Signaling Reduction feature for 3G (UMTS) network access
  - Step 4** Set the T3323 timeout value that the configured SGSN service will send to the UE in Attach Accept and RAU Accept messages.
  - Step 5** Enable the ISR feature for 2G network access
  - Step 6** Configure the implicit detach timer for 2G subscribers.
- 

## Example Configuration

```

config
  call-control-profile cc-profile-name
    idle-mode-signaling-reduction access-type umts
  end
config
  context context_name
    sgsn-service sgsn_service_name
    gmm T3323-timeout dur_mins
  end

config
  call-control-profile name
    idle-mode-signaling-reduction access-type gprs
  end
config
  context plmn_name
    gprs-service gprs_service_name
    gmm implicit-detach-timeout secs
  end

```

Notes:

- **idle-mode-signaling-reduction access-type umts** enables ISR for 3G network access.
- **gmm T3323-timeout** *dur\_mins* is the amount of time, in minutes, the UE should wait after the Periodic RAU timer (T3312 timer) expiry before deactivating ISR for the 3G subscriber. Valid entries are from 1 to 186. The default is 54.
- **idle-mode-signaling-reduction access-type umts** enables ISR for 2G network access.
- **gmm implicit-detach-timeout** *secs* specifies the implicit detach timeout value to use for 2G ISR. Valid entries are from 240 to 86400 seconds. The default value is 3600 seconds.

## Configuring IDFT for Connected Mode Handover (S4 Only, Optional)

The S4-SGSN supports the setup of indirect data forwarding tunnels (IDFT) between the eNodeB and the RNC via the SGW during connected mode handovers. This allows the S4-SGSN to support connected mode handovers between the UTRAN and E-UTRAN networks across the S3 interface.

Once enabled, IDFT is employed under the following conditions:

- **If the SGSN is the old node participating in the connected mode handover:**
  - The target node to which the connected mode handover is initiated should be an eNodeB (i.e., the SGSN performs the handover to the MME).
  - The **enb-direct-data-forward** CLI setting is not configured in the target RNC configuration (in RNC Configuration Mode).
- **If the SGSN is the new node participating in the connected mode handover:**
  - The source node from which connected mode handover is initiated is an eNodeB (i.e., the MME is performing a handover to the SGSN).
  - The **enb-direct-data-forward** CLI setting is not configured in the target RNC configuration (in RNC Configuration Mode).
  - The source MME indicated that it does not support direct forwarding via a Forward Relocation Request.



### Important

If the target SGSN did **not** relocate to a new SGW, then IDFT does not apply. The target SGSN sets up an indirect data forwarding tunnel with the SGW only if the SGW is relocated. If the SGW is not relocated, then the source MME sets up the indirect data forwarding tunnel between the source eNodeB and the target RNC through the SGW.



### Important

By default, indirect data forwarding is enabled, and direct forwarding is disabled.

To configure IDFT for connected mode inter RAT handovers:

**Step 1** Enter the context where the IuPS service is configured.

- Step 2** Enter IuPS Service Configuration Mode and enter the configured IuPS service.
- Step 3** Enter the RNC ID of the IuPS service for which you want to enable IDFT.
- Step 4** Disable direct data forwarding for connected mode inter RAT handovers.
- 

## Example Configuration

```
config
  context context_name
  iups-service iups_service_name
  rnc id rnc_id
  no enb-direct-data-forward
end
```

Where:

- **no enb-direct-data-forward** enables the setup of IDFT between the eNodeB and the RNC via the SGW for connected mode inter RAT handovers. If IDFT is enabled, the SGSN/MME will send the IDFT request towards the SGW. Once enabled, the SGSN/MME will send IDFT requests towards the SGW.
- To disable IDFT, enter the **enb-direct-data-forward** command.

## Creating and Configuring ATM Interfaces and Ports (3G only)

ATM ports and their associated PVCs can be configured for use with point-to-point interfaces and defined in a context or they can be bound to link IDs defined in SS7 routing domains.

Refer to the chapter titled *System Element Configuration Procedures* in the *System Administration Guide* for information on configuring ATM interfaces.

## Creating and Configuring Frame Relay Ports (2.5G only)

Frame Relay ports and their associated DLCIs can be configured for communication with 2G Base Station subsystem (BSS) for an SGSN implementation.

Refer to the chapter titled *System Element Configuration Procedures* in the *System Administration Guide* for information on configuring Frame Relay ports.

## Configuring APS/MSP Redundancy

ASP/MSP redundancy is only available for the OLC2 and CLC2 line cards. It is setup per linecard -- all ports share the same setup.

APS is enabled with the **redundancy** command in the Card configuration mode.



### Important

At this time the **aps** command in the *Card Configuration Mode* chapter is still in development and should not be used. The parameters are all set by default and cannot be changed or disabled.

---

- Related configuration for signal degrade and signal failure bit error rate thresholds for high path, low path, and transport overhead - use the commands in the Port Channelized configuration mode.

For command details, refer to the *Card Configuration Mode Commands* chapter and the *Port Configuration Mode Commands* chapter in the *Cisco UMTS Command Line Interface Reference*.

- 
- Step 1** Configure a line card for either SONET or SDH.
- Step 2** Configure APS for a SONET line card or MPS for an SDH line card.
- Use the configuration example below:
- 

## Example Configuration

Use the following example (replacing specific values) to setup a CLC2 (Frame Relay) line card:

```
config
  card 27
    framing sdh e1
    header-type 4-byte
    initial-e1-framing standard
    redundancy aps-mode
    service-type frame-relay
    no shutdown
  end
```