



GGSN Service Configuration Procedures

This chapter is meant to be used in conjunction with the previous chapter that describes the information needed to configure the system to support GGSN functionality for use in GPRS/UMTS networks.

It is recommended that you identify the options from the previous chapters that are required for your specific deployment. You can then use the procedures in this chapter to configure those options.



Important At least one Packet Accelerator Card (PAC) or Packet Services Card (PSC) must be made active prior to service configuration. Information and instructions for configuring PACs/PSCs to be active can be found in the Configuring System Settings chapter of the System Administration Guide.



Caution While configuring any base-service or enhanced feature, it is highly recommended to take care of conflicting or blocked IP addresses and port numbers for binding or assigning. In association with some service steering or access control features, like *Access Control List* configuration, use of inappropriate port number may result in communication loss. Refer respective feature configuration document carefully before assigning any port number or IP address for communication with internal or external network.

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GGSN Service Configuration

GGSN services are configured within contexts and allow the system to function as a GGSN in the either a GPRS or UMTS wireless data network.



Important This section provides the minimum instruction set for configuring a GGSN service that allows the system to process PDP contexts. Commands that configure additional GGSN service properties are provided in the *GGSN Service Configuration Mode Commands* chapter of *Command Line Interface Reference*.

These instructions assume that you have already configured the system level configuration as described in *System Administration Guide*.

To configure the system to work as GGSN service:

-
- Step 1** Create the GGSN service, local User Datagram Protocol (UDP) port for the Gn interfaces' IP socket, and bind it to an IP address by applying the example configuration in the *GGSN Service Creation and Binding* section.
 - Step 2** Associate the accounting context for the GGSN service and configure charging characteristic profile parameters for GGSN service by applying the example configuration in the *Accounting Context and Charging Characteristics Configuration* section.
 - Step 3** Configure the SGSN and PLMN related policy and session setup timeout for the GGSN service by applying the example configuration in the *SGSN and PLMN Policy Configuration* section.
 - Step 4** Optional. Configure the GGSN service to support network-requested PDP contexts by applying the example configuration in the *Network-requested PDP Context Support Configuration* section.
 - Step 5** Verify your GGSN configuration by following the steps in the *GGSN Configuration Verification* section.
 - Step 6** Save your configuration as described in the *Verifying and Saving Your Configuration* chapter.
-

GGSN Service Creation and Binding

Use the following example to create the GGSN service and bind it to an IP address:

```
configure
    context <vpn_ctxt_name> -noconfirm
        ggsn-service <ggsn_svc_name>

    end
```

Notes:

- A maximum of 256 services (regardless of type) can be configured per system.
- Bind address should not conflict with any other GTP-based service.

Accounting Context and Charging Characteristics Configuration

Use the following example to configure a GTPP accounting context and charging characteristics parameters for GGSN service.

```
configure
context <vpn_ctxt_name>
  ggsn-service <ggsn_svc_name>
  accounting context <aaa_ctxt_name>

  cc profile <cc_prof_index>
end
```

Notes:

- Charging characteristics behavior and profile index can be configured for multiple CC profile indexes. For more options and keywords like **buckets**, **interval**, **sgsns**, **tariff**, **volume** etc., refer cc profile section in Command Line Interface Reference.
- This command works in conjunction with the **cc-sgsn** command located in the APN configuration mode that dictates which CCs should be used for subscriber PDP contexts. Refer to the *APN Configuration* section in this chapter.

SGSN and PLMN Policy Configuration

Use the following example to configure the SGSN and PLMN related policy and session setup timeout for the GGSN service:

```
configure
context <vpn_ctxt_name>
  ggsn-service <ggsn_svc_name>
    plmn id mcc <mcc_number> [ mnc <mnc_number> ] [primary]
    sgsn address <ip_address> / <subnet_mask>
    plmn unlisted-sgsn [foreign | home | reject]
    setup-timeout <dur_sec>
end
```

Notes:

- SGSN or PLMN related policy can be defined for multiple SGSNs or PLMN.
- For optional configuration parameters of SGSN address, refer Command Line Interface Reference.



Important

The GGSN only communicates with the SGSNs configured using this command unless a PLMN policy is enabled to allow communication with unconfigured SGSNs. PLMN policies are configured using the **plmn unlisted-sgsn** command.

Network-requested PDP Context Support Configuration

Use the following example to configure the GGSN to support the network-requested PDP context:

```

configure
  context <vpn_ctxt_name>
    network-requested-pdp-context activate <ip_address> dst-context
    <dst_ctxt_name> imsi <imsi> apn <apn_name>
    network-requested-pdp-context gsn-map <ip_address>
  end

```

Notes:

- It is recommended that this functionality be configured in the system source context(s) along with the GGSN service(s).
- Up to 1000 IP address can be configured for network request PDP context support.
- Only one GSN-MAP node can be configured per system context.

GGSN Configuration Verification

Step 1 Verify that your GGSN services were created and configured properly by entering the following command in Exec Mode:

```
show ggsn-service name <ggsn_svc_name>}
```

The output of this command given below is a concise listing of GGSN service parameter settings as shown in the sample output displayed. In this example, a GGSN service called *ggsn1* was configured and you can observe some parameters configured as default.

```

Service name:                               ggsn1
Context:                                     ggsn1
Associated PGW svc:                          None
Associated GTPU svc:                         None
Accounting Context Name: ggsn1
dns-client Context Name:
Authorize:                                   Disabled
Fqdn-name:                                   Disabled
Bind:                                         Done
Local IP Address:                            192.168.70.1      Local IP Port: 2123
Self PLMN Id.:                               MCC: 450, MNC: 06
Retransmission Timeout: 20 (secs)
Max Retransmissions:                         4
Restart Counter:                             16
Echo Interval:                               60 (secs)

```

```

Guard Interval:                             100 (secs)
Setup Timeout:                               60 (secs)
PLMN Policy:                                 Reject unlisted SGSN
Reject Code Policy:
  Authentication Server Timeout: User Authentication Failed
  Accounting Server Timeout:     No Resources Available
Ran Procedure Ready:                        Disabled
NSAPI in Create PDP response:               Disabled
Duplicate Subscriber Addr Request:          Reject
trace-collection-entity:                    Disabled
Path Failure Detection on gtp msgs:         Echo
GTP Private Extensions:
  None
Max IP sessions:                            4000000

```

```

Max PPP sessions:                2500000
Max sessions:                    4000000
Service Status:                  Started
Newcall Policy:                  None
MBMS Policy:                     None
MBMS Charging ID Optimization:   Disabled

3GPP Qos to DSCP Mapping (for G-PDUs):
  qci 1:                          ef
  qci 2:                          ef
  qci 3:                          af11
  qci 4:                          af11
  qci 5:                          ef
  qci 6:                          ef
  qci 7:                          af21
  qci 8:                          af21
  qci 9:                          be

3GPP Qos to DSCP Mapping based on Alloc. Prio:
  qci 5 (Alloc. P 1):             ef
  qci 5 (Alloc. P 2):             ef
  qci 5 (Alloc. P 3):             ef
  qci 6 (Alloc. P 1):             ef
  qci 6 (Alloc. P 2):             ef
  qci 6 (Alloc. P 3):             ef
  qci 7 (Alloc. P 1):             af21
  qci 7 (Alloc. P 2):             af21
  qci 7 (Alloc. P 3):             af21
  qci 8 (Alloc. P 1):             af21
  qci 8 (Alloc. P 2):             af21
  qci 8 (Alloc. P 3):             af21
  GTPC messages:                  be
  Background:                     be

Charging Characteristics(CC) Behaviors:
  No records (Bit No.):           0
Charging Characteristics(CC) Profiles:
  Profile 0:
    Buckets: 4                     SGSN changes: 4
  Profile 1:
    Buckets: 4                     SGSN changes: 4

SGSN Configuration List:
  sgsn address 2.2.2.2/32 mcc 111 mnc 999 description aaa-ggsn

```

Step 2 Verify configuration for errors by entering the following command in Exec Mode:

```
show configuration errors section ggsn-service verbose
```

GTPP Accounting Support Configuration

This section provides instructions for configuring GTPP-based accounting for subscriber PDP contexts. GTPP-based accounting for a subscriber can be configured by CGF server configuration in a GTPP group. Additionally individual CGF server can be configured with this example.

For more information, refer to the *AAA Interface Administration and Reference*.

When the GTPP protocol is used, accounting messages are sent to the charging gateways (CGs) over the Ga interface. The Ga interface and GTPP functionality are typically configured within the system's source context. CDRs are generated according to the interim triggers configured using the charging characteristics configured for the GGSN, and a CDR is generated when the session ends.

GTPP version 2 is used by default. However, if version 2 is not supported by the CGF, the system reverts to using GTPP version 1. All subsequent CDRs are always fully-qualified partial CDRs. For CDR encoding different dictionaries are supported.

For more information, refer to the *GTPP Interface Administration and Reference*.

Whether or not the GGSN accepts charging characteristics from the SGSN can be configured on a per-APN basis based on whether the subscriber is visiting, roaming or, home.

By default, the GGSN always accepts the charging characteristics from the SGSN. However it accepts charging characteristics from RADIUS too, they must always be provided by the SGSN for GTPPv1 requests for primary and secondary PDP contexts.

If the system is configured to reject the charging characteristics from the SGSN, the GGSN can be configured with its own that can be applied based on the subscriber type (visiting, roaming, or home) at the APN level (refer to the *APN Configuration* section of this chapter for more information). GGSN charging characteristics consist of a profile index and behavior settings (refer to the *GGSN Service Configuration* section of this chapter for more information). The profile indexes specify the criteria for closing accounting records based specific criteria (refer to the *GGSN Service Configuration* section of this chapter for more information).



Important This section provides the minimum instruction set for configuring a GTPP accounting support in a GGSN service. Commands that configure additional GTPP accounting properties are provided in the *Command Line Interface Reference* guide.

These instructions assume that you have already configured the system level configuration as described in System Administration Guide and GGSN service as described in *GGSN Service Configuration* section of this chapter.

To configure the GTPP accounting support for a GGSN service:

-
- Step 1** Create the GTPP group in accounting context by applying the example configuration in the *GTPP Group Creation* 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 *GTPP Group Configuration* section.
 - Step 3** Verify your GTPP group and accounting configuration by following the steps in the *GTPP Group Configuration Verification* section.
 - Step 4** Save your configuration as described in the *Verifying and Saving Your Configuration* chapter.
-

GTPP Group Creation

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.

GTPP Group Configuration

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, 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.
- Operator can select transport layer protocol as TCP or UDP for Ga interface with **gtp transport-layer** command.
- 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 or in the overall configuration
 - Total 33 GTPP groups (1 default and 32 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.
 - Total 32 GTPP groups can also be configured under an APN

GTPP Group Configuration Verification

Step 1 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
```

Step 2 Verify configuration for errors by entering the following command in Exec Mode:

```
show configuration errors section ggsn-service verbose
```

APN Configuration

This section provides instructions for configuring the APN templates that are used to determine how PDP contexts should be processed. APNs are configured in system authentication contexts.



Important

This section provides the minimum instruction set for configuring APNs in a GGSN service. Commands that configure additional APN properties are provided in *APN Configuration Mode Commands* chapter of *Command Line Interface Reference*.

These instructions assume that you have already configured the system level configuration as described in System Administration Guide and GGSN service as described in the *GGSN Service Configuration* section of this guide.

To configure the APN properties for a GGSN service:

- Step 1** Create the APN in system context and specify the support of PDP contexts and selection mode by applying the example configuration in the APN Creation and Configuration section.
- Step 2** Configure the authentication and accounting parameters in APN by applying the example configuration in the Authentication, Accounting, and GTPP Group Configuration in APN section.
- Step 3** Configure the IP allocation method in APN by applying the example configuration in the IP Address Allocation Method Configuration in APN section.
- Step 4** Optional. Configure the charging characteristics related parameters for the APN by applying the example configuration in the Charging Characteristics Parameter Configuration in APN section.
- Step 5** Optional. Configure virtual APNs by applying the example configuration in the Virtual APN Configuration section.
- Step 6** Optional. Configure other optional parameters for the APN by applying the example configuration in the Other Optional Parameter Configuration in APN section.
- Step 7** Verify your APN configuration by following the steps in the APN Configuration Verification section.

Step 8 Save your configuration as described in the *Verifying and Saving Your Configuration* chapter.

APN Creation and Configuration

Use the following example to create and configure the APNs:

```
configure
  context <vpn_ctxt_name>
    apn <apn_name> -noconfirm
      pdp-type {ipv4 [ipv6] | ipv6 [ipv4] | ppp}
      selection-mode {sent-by-ms | chosen-by-sgsn | subscribed}
      ip context-name <dst_ctxt_name>
    end
```

Notes:

- Up to 2,048 APNs can be configured on a system.
- APN templates should be created/configured within system authentication contexts or destination context.
- Selection mode parameter's setting must be identical to the selection mode setting on the SGSN(s) that the GGSN communicates with. The GGSN rejects attempts to establish PDP contexts from any SGSN having a different setting.
- For IPv6 calls to work, the destination context must have an IPv6 interface configured in it.
- If the APN supports Mobile IP for subscriber PDP contexts, then ip context-name command is used to indicate the context in which the FA service is configured.
 - If no context name is specified, the system uses the context in which the APN is configured.
 - If Mobile IP is supported and no name is specified, the system uses the context in which the GGSN service facilitating the PDP context is located.

Authentication, Accounting, and GTPP Group Configuration in APN

This section describes the procedure to configure the authentication and accounting parameters for an APN. It also specifies the procedure to attach a GTPP group with an APN.

Step 1 Configure the authentication and accounting parameters by applying the example configuration in the *Authentication and Accounting Configuration in APN* section.

Step 2 Attach a GTPP group with APN by applying the example configuration in the *GTPP Group Association to APN* section.

Authentication and Accounting Configuration in APN

Use the following example to configure the accounting mode and authentication parameter for APN:

```
configure
  context <dst_ctxt_name>
    apn <apn_name>
```

```

        accounting-mode {none | gtp | radius [no-interims]
[no-early-pdus]}
        default authentication
        end
    
```

Notes:

- APNs are configured in system authentication contexts or destination context.
- The authentication process varies depending on whether the PDP context is of type IP or PPP. The **authentication** command provides **imsi-auth**, **msisdn-auth**, **eap initial-access-request**, **allow-noauth**, **chap**, **mschap**, and **pap** options. For more information on type of authentication, refer authentication section in APN Configuration Mode Commands chapter of Command Line Interface Reference.

GTPP Group Association to APN

After configuring GTPP group at context-level, an APN within the same context can be configured to use the user defined GTPP group.

Refer section *GTPP Accounting Support Configuration* for GTPP group configuration.

```

configure
    context <vpn_ctxt_name>
        apn <apn_name>
            gtp group <gtp_group_name> [accounting-context <aaa_ctxt_name>]
        end
    
```

Notes:

- GTPP group must be configured before associating with APN or "default" GTPP group can be used.

IP Address Allocation Method Configuration in APN

Use the following example to configure the IP address allocation method for APN:



Important Additional charging characteristics parameters are configurable as part of the GGSN service. Refer to the *GGSN Service Configuration* section of this chapter for more information.

```

configure
    context <dst_ctxt_name>
        apn <apn_name>
            ip address alloc-method { dhcp-proxy [allow-deferred]
[prefer-dhcp-options] | dhcp-relay | local [allow-deferred] | no-dynamic
[allow-deferred] } [allow-user-specified]
        end
    
```

Notes:

- The process used by the system to determine how the address should be allocated. For detail information on IP address allocation, refer Usage section of **ip address alloc-method** command in *APN Configuration Mode Commands* chapter of Command Line Interface Reference.

- If DHCP-Proxy and DHCP-Relay method is selected for IP address allocation, a DHCP service must be configured on the system as described in *DHCP Service Configuration* section and specified the name of DHCP Service by entering the **dhcp service-name** command as described in APN Configuration Mode Commands chapter of Command Line Interface Reference.
- If local pool is selected for IP address allocation, a local pool must be configured on the system as described in *IP Address Pool Configuration on the System* section and specified the name of a private IP address pool by entering the **ip address pool** command as described in APN Configuration Mode Commands chapter of Command Line Interface Reference.

Charging Characteristics Parameter Configuration in APN

Use the following example to configure the charging characteristics parameter for APN:



Important Additional charging characteristics parameters are configurable as part of the GGSN service. Refer to the *GGSN Service Configuration* section of this chapter for more information.

```
configure
  context <dst_ctxt_name>
    apn <apn_name>
      cc-sgsn {home-subscriber-use-GGSN | roaming-subscriber-use-GGSN
| visiting-subscriber-use-GGSN}+
      cc-home behavior <bit> profile <index>
      cc-roaming behavior <bit> profile <index>
      cc-visiting behavior <bit> profile <index>
    end
```

Notes:

- If multiple behavior bits are configured for a single profile index, the variable bits is achieved by "Or"ing the bit strings and converting the result to hexadecimal.

Example

If behavior bits 5 (0000 0001 0000) and 11 (0100 0000 0000) are both being assigned to profile index 5 for a home subscriber, the appropriate command is **cc-home behavior 410 profile 5**.

Virtual APN Configuration

Virtual APNs are references (or links) to alternative APNs to be used for PDP context processing based on properties of the context. Use the following example to configure the virtual APNs.

```
configure
  context <dst_ctxt_name>
    apn <apn_name>
  virtual-apn preference priority apn apn_name [ access-gw-address { ip_address
| ip_address/mask } | bearer-access-service service_name | cc-profile
cc_profile_index [ pre-rel-9.1-cc-behavior cc_behavior_value ][ rat-type { eutran
```

```

| gan | geran | hspa | utran | wlan } ] | cc-behavior cc_behavior_value [
rat-type { eutran | gan | geran | hspa | utran | wlan } ] | domain
domain_name | mcc mcc_number mnc mnc_number [ cc-profile cc_profile_index [
pre-rel-9.1-cc-behavior cc_behavior_value ] | cc-behavior cc_behavior_value | [
msin-range from msin_range_from to msin_range_to ] | [ rat-type { eutran | gan
| geran | hspa | utran | wlan } ] | msisdn-range from msisdn_start_range to
msisdn_to_range [ rat-type { eutran | gan | geran | hspa | utran | wlan }
] | pdp-type { ipv4 | ipv6 | ipv4v6 } | roaming-mode { roaming } ] } |
rat-type { eutran | gan | geran | hspa | utran | wlan } | roaming-mode {
home | roaming | visiting } ] }
end

```

Notes:

- Up to 1023 references can be configured per APN. Additional information about "virtual" APNs and their operation can be found in the *Command Line Interface Reference*.

Other Optional Parameter Configuration in APN

Use the following example to configure various optional parameter for APN:

```

configure
context <dst_ctxt_name>
  apn <apn_name>
    dns {primary | secondary} {<dns_ip_address>}
    mobile-ip required
    mobile-ip home-agent <ha_ip_address>
    ip source-violation {ignore | check [drop-limit <limit>]}
  [exclude-from-accounting]
    restriction-value <value>
    timeout {absolute | idle | qos-renegotiate} <timeout_dur>
    timeout long-duration <ldt_dur> [inactivity-time <inact_dur>]
    long-duration-action detection
    long-duration-action disconnection [suppress-notification]
  [dormant-only] +
end

```

Notes:

- Mobile is supported for IP PDP contexts only. Mobile IP configuration attributes returned as part of a successful authentication during the GTP authentication phase (for non-transparent IP PDP contexts) supersede the APN configuration. Any attributes returned during the FA authentication phase are ignored.
- If mobile-ip required option is enabled, the system deletes any PDP context using the APN that can not establish a Mobile IP session.

APN Configuration Verification

Step 1 Verify that your APN were configured properly by entering the following command in Exec Mode:

```
show apn all
```

This command produces an output similar to that displayed below is an excerpt from a sample output. In this example, an APN called *apn1* was configured.

```

access point name (APN):      apn1
authentication context:      test
pdp type:                    ipv4
ehrpd access:                N/A
Selection Mode:              subscribed
ip source violation:          Checked
accounting mode:              gtp
no-interims:                  Disabled
Bearer Control Mode:         none
max-primary-pdp-contexts:    1000000
current primary-pdp-contexts: 0
primary contexts:            not available
max secondary contexts per-subscriber: 10
Credit Control:              disabled
mbms bearer absolute timeout: 0
mbms ue absolute timeout:    0
permission:
local ip:                     0.0.0.0
primary dns:                   0.0.0.0
primary nbns:                  0.0.0.0
ppp keep alive period :       0
absolute timeout :            0
idle-timeout-activity ignore-downlink: Disabled
long duration timeout:        0
long duration action:         Detection
wimax header compression/suppression: none
ip header compression:        vj
ip hide service address:      Disabled
ip output access-group:
ipv6 output access-group:
policy-group in:
permit ip multicast:          False
ppp authentication:
eap authentication initial-access-request: authenticate-authorize
allow noauthentication:        Enabled
msisdn authentication:        Disabled
ip destination context:       ip-ctx
Rule Base:                    default
FW-and-NAT Policy:            default
Bandwidth-Policy:             default
Link-Monitoring:              OFF
Content-Filtering Policy-Id:   Not configured
mediation accounting:         Disabled
mediation-device context:     Not set
mediation no-interims:        Disabled
outbound username:            N/A
ip address pools:              N/A
ip address secondary pools:    N/A
access-link ip-frag:          df-ignore
ignore DF-bit data-tunnel:    On
ip allocation type:            local pool
prefer dhcp options:          false
allow deferred:                true
3GPP Qos to DSCP Mapping:
    qci 1:                     ef
    qci 2:                     ef
    qci 3:                     af11
    qci 4:                     af11
    qci 5:                     ef
    qci 6:                     ef
    qci 7:                     af21
drop limit:                    10
No early PDUs:                Disabled
total-pdp-contexts:           1000000
total-pdp-contexts:           0
total contexts: not available
IMS Authorization:            disabled
mbms bearer idle timeout:     0
next hop gateway addr:
secondary dns:                 0.0.0.0
secondary nbns:                0.0.0.0
ppp mtu :                      1500
idle timeout :                  0
long dur inactivity time:      Disabled
ip input access-group:
ipv6 input access-group:
policy-group out:
mediation no early PDUs:      Disabled
mediation delay-GTP-response: Disabled
allow user specified ip addr: true

```

```

qci 8:          af21
qci 9:          be
3GPP Qos to DSCP Mapping based on Alloc. Prio:
qci 5 (Alloc. P 1):  ef
qci 5 (Alloc. P 2):  ef
qci 5 (Alloc. P 3):  ef
qci 6 (Alloc. P 1):  ef
qci 6 (Alloc. P 2):  ef
qci 6 (Alloc. P 3):  ef
qci 7 (Alloc. P 1):  af21
qci 7 (Alloc. P 2):  af21
qci 7 (Alloc. P 3):  af21
qci 8 (Alloc. P 1):  af21
qci 8 (Alloc. P 2):  af21
qci 8 (Alloc. P 3):  af21
GTPP Group:      gtpg-gp          GTPP Accounting Context:  acc
Mobile IPv6 Tunnel MTU:      1500
Mobile IPv6 Tunnel MTU Exceed Action:  notify-sender
Mobile IPv6 Home Agent:      none
Mobile IPv6 Home Link Prefix:  ::/0
Mobile IPv6 Home Address:     none

```

Step 2 Verify configuration for errors in APN configuration by entering the following command in Exec Mode:

```
show configuration errors section ggsn-service verbose
```

DHCP Service Configuration

The system can be configured to use the Dynamic Host Control Protocol (DHCP) to assign IP addresses for PDP contexts. IP address assignment using DHCP is done using one of two methods as configured within an APN:

- **DHCP-proxy:** The system acts as a proxy for client (MS) and initiates the DHCP Discovery Request on behalf of client (MS). Once it receives an allocated IP address from DHCP server in response to DHCP Discovery Request, it assigns the received IP address to the MS. This allocated address must be matched with the an address configured in an IP address pool on the system. This complete procedure is not visible to MS.

As the number of addresses in memory decreases, the system solicits additional addresses from the DHCP server. If the number of addresses stored in memory rises above the configured limit, they are released back to the DHCP server.

- **DHCP-relay:** The system acts as a relay for client (MS) and forwards the DHCP Discovery Request received from client (MS). Once it receives an allocated IP address from DHCP server in response to DHCP Discovery Request, it assigns the received IP address to the MS.

Regardless of the DHCP method, there are parameters that must first be configured that specify the DHCP servers to communicate with and how the IP address are handled. These parameters are configured as part of a DHCP service.



Important This section provides the minimum instruction set for configuring a DHCP service on system for DHCP-based IP allocation. For more information on commands that configure additional DHCP server parameters and working of these commands, refer DHCP Service Configuration Mode Commands chapter of Command Line Interface Reference.

These instructions assume that you have already configured the system level configuration as described in *System Administration Guide* and GGSN service as described in *GGSN Service Configuration* section of this chapter.

To configure the DHCP service:

-
- Step 1** Create the DHCP service in system context and bind it by applying the example configuration in the *DHCP Service Creation* section.
 - Step 2** Configure the DHCP servers and minimum and maximum allowable lease times that are accepted in responses from DHCP servers by applying the example configuration in the *DHCP Server Parameter Configuration* section.
 - Step 3** Verify your DHCP Service configuration by following the steps in the *DHCP Service Configuration Verification* section.
 - Step 4** Save your configuration as described in the *Verifying and Saving Your Configuration* chapter.
-

DHCP Service Creation

Use the following example to create the DHCP service to support DHCP-based address assignment:

```
configure
  context <dest_ctxt_name>
    dhcp-service <dhcp_svc_name>
      bind address <ip_address> [nexthop-forwarding-address
<nexthop_ip_address> mpls-label input <in_mpls_label_value> output
<out_mpls_label_value1> [out_mpls_label_value2]]]
    end
```

Notes:

- To ensure proper operation, DHCP functionality should be configured within a destination context.
- Optional keyword **nexthop-forwarding-address** <nexthop_ip_address> [mpls-label input <in_mpls_label_value> output <out_mpls_label_value1> [out_mpls_label_value2]] applies DHCP over MPLS traffic.

DHCP Server Parameter Configuration

Use the following example to configure the DHCP server parameters to support DHCP-based address assignment:

```
configure
  context <dest_ctxt_name>
    dhcp-service <dhcp_svc_name>
      dhcp server <ip_address> [priority <priority>
```

```

dhcp server selection-algorithm {first-server | round-robin}
lease-duration min <minimum_dur> max <max_dur>
dhcp deadtime <max_time>
dhcp detect-dead-server consecutive-failures <max_number>
max-retransmissions <max_number>
retransmission-timeout <dur_sec>
end

```

Notes:

- Multiple DHCP services can be configured. Each service can have multiple DHCP servers configured by entering **dhcp server** command multiple times. A maximum of 225 DHCP services can be configured with maximum of 8 DHCP servers configurations per DHCP service.
- The **dhcp detect-dead-server** command and **max-retransmissions** command work in conjunction with each other.
- The retransmission-timeout command works in conjunction with **max-retransmissions** command.

DHCP Service Configuration Verification

Step 1 Verify that your DHCP servers configured properly by entering the following command in Exec Mode:

```
show dhcp service all
```

This command produces an output similar to that displayed below where DHCP name is *dhcp1*:

```

Service name:                dhcp1
Context:                     isp
Bind:                        Done
Local IP Address:            150.150.150.150
Next Hop Address:            192.179.91.3
MPLS-label:
  Input:                      5000
  Output:                     1566  1899
Service Status:              Started
Retransmission Timeout:      3000 (milli-secs)
Max Retransmissions:         2
Lease Time:                   600 (secs)
Minimum Lease Duration:       600 (secs)
Maximum Lease Duration:       86400 (secs)
DHCP Dead Time:               120 (secs)
DHCP Dead consecutive Failure:5
DHCP T1 Threshold Timer:      50
DHCP T2 Threshold Timer:      88
DHCP Client Identifier:        Not Used
DHCP Algorithm:                Round Robin
DHCP Servers configured:
  Address: 150.150.150.150      Priority: 1
DHCP server rapid-commit:     disabled
DHCP client rapid-commit:     disabled
DHCP chaddr validation:       enabled

```

Step 2 Verify the DHCP service status by entering the following command in Exec Mode:

```
show dhcp service status
```


DHCPv6 Service Configuration

The system can be configured to use the Dynamic Host Control Protocol (DHCP) for IPv6 to enable the DHCP servers to pass the configuration parameters such as IPv6 network addresses to IPv6 nodes.

These instructions assume that you have already configured the system level configuration as described in *System Administration Guide* and APN as described in *APN Configuration* section of this chapter.

To configure the DHCPv6 service:

-
- Step 1** Create the DHCPv6 service in system context and bind it by applying the example configuration in the *DHCPv6 Service Creation* section.
 - Step 2** Configure the DHCPv6 server and other configurable values for Renew Time, Rebind Time, Preferred Lifetime, and Valid Lifetime by applying the example configuration in the *DHCPv6 Server Parameter Configuration* section.
 - Step 3** Configure the DHCPv6 client and other configurable values for Maximum Retransmissions, Server Dead Tries, and Server Resurrect Time by applying the example configuration in the *DHCPv6 Client Parameter Configuration* section.
 - Step 4** Configure the DHCPv6 profile by applying the example configuration in the *DHCPv6 Profile Configuration* section.
 - Step 5** Associate the DHCPv6 profile configuration with the APN by applying the example configuration in the *Associate DHCPv6 Configuration* section.
 - Step 6** Verify your DHCPv6 Service configuration by following the steps in the *DHCPv6 Service Configuration Verification* section.
 - Step 7** Save your configuration as described in the *Verifying and Saving Your Configuration* chapter.
-

DHCPv6 Service Creation

Use the following example to create the DHCPv6 service to support DHCP-based address assignment:

```

configure
  context <dest_ctxt_name>
    dhcpv6-service <dhcpv6_svc_name>
      bind address <ipv6_address> port <port>
    end

```

Notes:

- To ensure proper operation, DHCPv6 functionality should be configured within a destination context.
- The Port specifies the listen port and is used to start the DHCPv6 server bound to it. It is optional and if unspecified, the default port is 547.

DHCPv6 Server Parameter Configuration

Use the following example to configure the DHCPv6 server parameters to support DHCPv6-based address assignment:

```

configure
  context <dest_ctxt_name>

```

```

dhcpv6-service <dhcpv6_svc_name>
  dhcpv6-server
  renew-time <renewal_time>
  rebind-time <rebind_time>
  preferred-lifetime <pref_lifetime>
  valid-lifetime <valid_lifetime>
end

```

Notes:

- Multiple DHCP can be configured by entering **dhcp server** command multiple times. A maximum of 256 services (regardless of type) can be configured per system.
- **renew-time** configures the renewal time for prefixes assigned by dhcp-service. Default is 900 seconds.
- **rebind-time** configures the rebind time for prefixes assigned by dhcp-service. Default is 900 seconds.
- **preferred-lifetime** configures the preferred lifetime for prefixes assigned by dhcp-service. Default is 900 seconds.
- **valid-lifetime** configures the valid lifetime for prefixes assigned by dhcp-service. Default is 900 seconds.

DHCPv6 Client Parameter Configuration

Use the following example to configure the DHCPv6 client parameters to support DHCPv6-based address assignment:

configure

```

context <dest_ctxt_name>
  dhcpv6-service <dhcpv6_svc_name>
  dhcpv6-client
  server-ipv6-address <ipv6_addr> port <port> priority <priority>
  max-retransmissions <max_number>
  server-dead-time <dead_time>
  server-resurrect-time <revive_time>
end

```

Notes:

- DHCPv client configuration requires an IPv6 address, port, and priority. The port is used for communicating with the DHCPv6 server. If not specified, default port 547 is used. The Priority parameter defines the priority in which servers should be tried out.
- **max-retransmissions** configures the max retransmission that DHCPV6-CLIENT will make towards DHCPV6-SERVER. Default is 20.
- **server-dead-time**: PDN DHCPV6-SERVER is considered to be dead if it does not respond after given tries from client. Default is 5.
- **server-resurrect-time**: PDN DHCPV6-SERVER is considered alive after it has been dead for given seconds. Default is 20.

DHCPv6 Profile Configuration

Use the following example to configure the DHCPv6 profile:

```

configure
  context <dest_ctxt_name>
    dhcp-server-profile <server_profile>
      enable rapid-commit-dhcpv6
      process dhcp-option-from { AAA | LOCAL | PDN-DHCP } priority
<priority>
      dhcpv6-server-preference <pref_value>
      enable dhcpv6-server-unicast
      enable dhcpv6-server-reconf
      exit
    dhcp-client-profile <client_profile>
      dhcpv6-client-unicast
      client-identifier { IMSI | MSISDN }
      enable rapid-commit-dhcpv6
      enable dhcp-message-spray
      request dhcp-option dns-address
      request dhcp-option netbios-server-address
      request dhcp-option sip-server-address
      end

```

Notes:

- **dhcp-server-profile** command allows to create a server profile and then enter the DHCP Server Profile configuration mode.
- **enable rapid-commit-dhcpv6** command enables rapid commit on the DHCPv6 server. By default it is disabled. This is done to ensure that if there are multiple DHCPv6 servers in a network, with rapid-commit-option, they would all end up reserving resources for the ue.
- **process dhcp-option-from** command configures in what order should the configuration options be processed for a given client request. For a given client configuration, values can be obtained from either AAA, PDN-DHCP-SERVER, or LOCAL. By default, AAA is preferred over PDN-DHCP which is preferred over LOCAL configuration.
- **dhcpv6-server-preference**: According to RFC-3315, DHCPv6-CLIENT should wait for a specified amount of time before considering responses to its queries from DHCPv6-SERVERS. If a server responds with a preference value of 255, DHCPv6-CLIENT need not wait any longer. Default value is 0 and it may have any integer between 0 and 255.
- **enable dhcpv6-server-unicast** command enables server-unicast option for DHCPv6. By default, it is disabled.
- **enable dhcpv6-server-reconf** command configures support for reconfiguration messages from the server. By default, it is disabled.
- **dhcp-client-profile** command allows to create a client profile and then enter the DHCP Client Profile configuration mode.
- **dhcpv6-client-unicast** command Enables client to send messages on unicast address towards the server.
- **client identifier** command configures the client-identifier which is sent to the external dhcp server. By default, IMSI is sent. Another available option is MSISDN.

- **enable rapid-commit-dhcpv6** command configures the rapid commit for the client. By default rapid-commit option is enabled for DHCPv6.
- **enable dhcp-message-spray** command enables dhcp-client to spray a dhcp messages to all configured dhcp servers in the PDN. By default this is disabled. With Rapid-Commit, there can only be one server to which this can be sent.
- **request dhcp-option** command configures DHCP options which can be requested by the dhcp-client. It supports the following options:
 - dns-address
 - netbios-server-address
 - sip-server-address

Associate DHCPv6 Configuration

Use the following example to associate the DHCPv6 profile with an APN:

```
configure
  context <dest_ctxt_name>
    apn <apn_name>
      dhcpv6 service-name <dhcpv6_svc_name> server-profile
<server_profile> client-profile <client_profile>
      dhcpv6 ip-address-pool-name <dhcpv6_ip_pool>
      dhcpv6 context-name <dest_ctxt>
    exit
```

Notes:

- **dhcpv6 ip-address-pool-name** command is optional. In case pool name is not specified, it searches across all the configured static pools.

DHCPv6 Service Configuration Verification

Step 1 Verify that your DHCPv6 servers configured properly by entering the following command in Exec Mode:

```
show dhcpv6-service all
```

This command produces an output similar to that displayed below where DHCPv6service name is *dhcp6-service*:

```
Service name:          dhcpv6-service
Context:              A
Bind Address:         2092::192:90:92:40
Bind :                Done
Service Status:      Started
Server Dead Time:    120 (secs)
Server Dead consecutive Failure:5
Server Select Algorithm: First Server
Server Renew Time:   400 (secs)
Server Rebind Time:  500 (secs)
Server Preferred Life Time: 600 (secs)
Server Valid Life Time: 700 (secs)
Max Retransmissions: 3 (secs)
```

```

Server Dead Tries:                4 (secs)
Server Resurrect Time:           10 (secs)
ipv6_nd_flag:                    O_FLAG
DHCPv6 Servers configured:
    Address:                      2092::192:90:92:40 Priority: 1
enabled

```

Step 2 Verify the DHCPv6 service status by entering the following command in Exec Mode:

```
show dhcpv6 status servicedhcpv6_service_name
```

DNS Configuration for IPv4v6 PDP Context

The system can be configured to provide DNS support for IPv4v6 PDP context.

These instructions assume that you have already configured the system level configuration as described in *System Administration Guide* and APN as described in *APN Configuration* section of this chapter.

To configure the DNS support for IPv4v6 PDP contexts:

- Step 1** Configure the list of domain name servers with IPv4/IPv6 address in context configuration mode by applying the example configuration in the *Creating IPv4 and IPv6 DNS List* section.
- Step 2** Configure the IPv4 primary and secondary domain name server in APN configuration mode by applying the example configuration in the *Configuring IPv4 DNS* section.
- Step 3** Configure the IPv6 primary and secondary domain name server in APN configuration mode by applying the example configuration in the *Configuring IPv6 DNS* section.
- Step 4** Verify your DNS configuration by following the steps in the *APN Configuration Verification*.
- Step 5** Save your configuration as described in the *Verifying and Saving Your Configuration*.

Creating IPv4/IPv6 DNS List

Use the following example to create the domain name server list in context configuration mode:

```

configure
  context <src_ctxt_name>
    ip name-server <ip_address secondary_ip_address>
  end

```

Notes:

- <ip_address> is primary IP address of the domain name server having IPv4/IPv6 address.
- <secondary_ip_address> is the secondary IP address of the domain name server having IPv4/IPv6 address.
- Multiple DNS can be configured by entering **ip name-server** command multiple times.

Configuring IPv4 DNS

Use the following example to configure the IPv4 DNS support in IPv4v6 PDP context:

```
configure
  context <src_ctxt_name>
    apn <apn_name>
      dns primary <ipv4_address>
      dns secondary <ipv4_address>
    end
```

Notes:

- *<ipv4_address>* is the IP address of the domain name server configured as DNS list in context configuration mode.

Configuring IPv6 DNS

Use the following example to configure the IPv6 DNS support in IPv4v6 PDP context:

```
configure
  context <src_ctxt_name>
    apn <apn_name>
      ipv6 dns primary <ipv6_address>
      ipv6 dns secondary <ipv6_address>
    end
```

Notes:

- *<ipv6_address>* is the IP address of the domain name server configured as DNS list in context configuration mode.

IP Address Pool Configuration on the System

Before an MS is able to access data services, they must have an IP address. As described previously, the GGSN supports static or dynamic addressing (through locally configured address pools on the system, DHCP client-mode, or DHCP relay-mode). Regardless of the allocation method, a corresponding address pool must be configured.

IP addresses can be dynamically assigned from a single pool/a group of IP pools/a group of IP pool groups. The addresses/IP pools/ IP pool groups are placed into a queue in each pool or pool group. An address is assigned from the head of the queue and, when released, returned to the end. This method is known as least recently used (LRU).

On initiation of a session, a request of IP address from IP pool is sent and system assigns an IP address out of "available" IP address(es) in the pool. This assigned IP address is set to "allocated" state and cannot be used for any other session during this state. As soon as the session is cleared the state of "allocated" IP address is changed to "released" and is ready for allocation to any other subscriber session. If a "hold" timer is set for assigned/released IP address(es), it will go into the "hold" state and remain there till the timer expires. As soon as "hold timer" expires its state is changed from "hold" to "released" state and it will be available for reallocation. The "available" IPs include "free" and "released" IP addresses.

Free IPs are used first depending on which subscriber is connecting. Normally same IP is given to a subscriber. So if a subscriber is connecting again, instead of using a free IP, GGSN allocates the IP which was given to him previously. This IP will be from the released state. For GGSN, Username and IMSI are used as key for generating subscriber ID used by VPN while allocating IP from the IP pool. Therefore if the subscriber ID matches to any of the previous ones for IPs in released state, that IP is re-allocated to that subscriber, otherwise a new IP is allocated.

When a group of pools have the same priority, an algorithm is used to determine a probability for each pool based on the number of available addresses, then a pool is chosen based on the probability. This method, over time, allocates addresses evenly from the group of pools.



Important Setting different priorities on each individual pool can cause addresses in some pools to be used more frequently.



Important This section provides the minimum instruction set for configuring local IP address pools on the system. For more information on commands that configure additional parameters and options, refer ip pool command section in *Context Configuration Mode Commands* chapter of *Command Line Interface Reference*.



Caution For configuration of multiple IP pool in an APN, GGSN expects Framed-IP-Address and Framed-Pool from RADIUS.



Caution The IP pools limit is changed for static address allocation to 1 and out of the maximum 16 pools which can be configured under a particular APN, the first IP pool should be a static pool, which is the only working static pool from an APN.

These instructions assume that you have already configured the system level configuration as described in *System Administration Guide* and GGSN service as described in *GGSN Service Configuration* section of this chapter.

To configure the IP pool:

-
- Step 1** Create the IP pool for IPv4 addresses in system context by applying the example configuration in the *IPv4 Pool Creation* section.
 - Step 2** Optional. Configure the IP pool for IPv6 addresses in system context by applying the example configuration in the *IPv6 Pool Creation* section.
 - Step 3** Verify your IP pool configuration by following the steps in the *IP Pool Configuration Verification* section.
 - Step 4** Save your configuration as described in the *Verifying and Saving Your Configuration* chapter.
-

IPv4 Pool Creation

Use the following example to create the IPv4 address pool:

```
configure
  context <dest_ctxt_name>
    ip pool <pool_name> <ip_address/mask> [{private| public}[priority]]
  | static]
  end
```

Notes:

- To ensure proper operation, IP pools should be configured within a destination context.
- Each address in the pool requires approximately 24 bytes of memory. Therefore, in order to conserve available memory, the number of pools may need to be limited depending on the number of addresses to be configured and the number of PACs/PSCs installed.
- Setting different priorities on individual pools can cause addresses in some pools to be used more frequently.
- For more information on commands/keywords that configure additional parameters and options, refer ipv6 pool command section in Context Configuration Mode Commands chapter of Command Line Interface Reference.

IPv6 Pool Creation

Use the following example to create the IPv6 address pool:

```
configure
  context <dest_ctxt_name>
    ipv6 pool <pool_name> 6to4 local-endpoint
  <ip_address>[private] [public] [shared] [static]
  end
```

Notes:

- To ensure proper operation, IP pools should be configured within a destination context.
- Each address in the pool requires approximately 24 bytes of memory. Therefore, in order to conserve available memory, the number of pools may need to be limited depending on the number of addresses to be configured and the number of PACs/PSCs installed.
- Setting different priorities on individual pools can cause addresses in some pools to be used more frequently.
- For more information on commands/keywords that configure additional parameters and options, refer ipv6 pool command section in Context Configuration Mode Commands chapter of Command Line Interface Reference.

IP Pool Configuration Verification

Step 1 Verify that your IPv4 address pool configured properly by entering the following command in Exec Mode:

show ip pool

The output from this command should look similar to the sample shown below. In this example all IP pools were configured in the *isp1* context.

```
context : isp1:
+-----Type:          (P) - Public          (R) - Private
|
|                      (S) - Static          (E) - Resource
|
|+-----State:       (G) - Good            (D) - Pending Delete          (R)-Resizing
||
||+---Priority: 0..10 (Highest (0) .. Lowest (10))
||||
||||+---Busyout: (B) - Busyout configured
|||||
|||||
vvvvvv Pool Name      Start Address      Mask/End Address      Used      Avail
-----
PG00   ipsec          12.12.12.0          255.255.255.0          0          254
RG00   pool3             30.30.0.0           255.255.0.0
65534
SG00   pool2             20.20.0.0           255.255.0.0          10
65524
PG00   pool1             10.10.0.0           255.255.0.0          0
65534
SG00   vpnpool           192.168.1.250       192.168.1.254          0          5
Total Pool Count: 5
```

Step 2 Verify that your IPv6 address pools configured properly by entering the following command in Exec Mode:

show ipv6 pools

The output from this command should look similar to the sample shown above except IPv6 addresses.

Gn-Gp Handoff Support Configuration

This section describes all about the configurations that are required to enable the handoff between the 3GPP 2G/3G SGSN and P-GW over Gn-Gp interfaces.



Important This feature is a license-enabled support and you may need to install a feature specific session license on your system to use some commands related to this configuration.

These instructions assume that you have already configured the system level configuration as described in *System Administration Guide*, GGSN service as described in *GGSN Service Configuration* section in this chapter.

To configure the Gn-Gp handoff on GGSN node:

Step 1 Create and configure the GTP-U service by applying the example configuration in the *GTP-U Service Configuration* section.

Step 2 Modify GGSN service to facilitate the handoff between SGSN/GGSN and P-GW by applying the example configuration in the *Modifying GGSN Configuration for Gn-Gp Handoff* section.

- Step 3** Modify APN configuration to the "subscribed" selection mode by applying the example configuration in *APN Configuration for Gn-Gp Handoff* section.
- Step 4** Verify your handoff configuration by following the steps in the *Gn-Gp Configuration Verification* section.
- Step 5** Save your configuration as described in the *Verifying and Saving Your Configuration* chapter.

GTP-U Service Configuration

Use the following example to configure the GTP-U service:

```
configure
  context <ctxt_name> -noconfirm
    gtpu-service <gtpu_svc_name>
      bind ipv4-address <ip_address>
      echo-interval <time_interval>
    end
```

Notes:

- <ctxt_name> is name of the context which contains GTPU service on system.
- <time_interval> is the time interval in seconds at which GPRS Tunneling Protocol (GTP) v1-U Echo packets are sent.
- <ip_address> is the IP address of IPv4 or IPv6 type to which the GTP-U service will be binded.

Modifying GGSN Configuration for Gn-Gp Handoff

Use the following example to create/modify the GGSN config for this feature.

```
configure
  context <ctxt_name>
    ggsn-service <ggsn_svc_name>

      associate gtpu-service <gtpu_svc_name>
      associate pgw-service <pgw_svc_name>
      bind address <ip_address>
    end
```

Notes:

- <ggsn_svc_name> is name of the existing GGSN service.
- <gtpu_svc_name> is name of the existing GTP-U service created in *GTP-U Service Configuration* example.
- <pgw_svc_name> is the existing P-GW service name.
- <ip_address> is the same IP address to which GTP-U service is binded in *GTP-U Service Configuration* example.
- <ctxt_name> is the name of the context which contains the GGSN service.

APN Configuration for Gn-Gp Handoff

Use the following example to modify the APN configuration for the smooth handover support between SGSN/GGSN and P-GW:

```
configure
  context <ctxt_name>
    apn <apn_name>
      selection-mode subscribed
      ip context-name <ctxt_name>
      pdp-type <ipv4 | ipv6>
    end
```

Notes:

- Make sure that the APN Selection mode parameters setting is set to "subscribed", which is also the default mode.

Gn-Gp Configuration Verification

Verify that all the configurations made in a specific context under Context Configuration mode are in place and the P-GW service and GTP-U services have been associated to the GGSN service by entering the following command in Exec mode:

```
show ggsn-service name ggsn
```

The output from this command should look similar to the sample shown below. In this example context name *A* was created in Exec mode, GGSN service *ggsn* was created in GGSN Service Configuration mode, PGW service named *pgw* was an already configured service and GTP-U service named *gtpu* was configured in the GTPU Service Configuration mode:

```
Service name:                ggsn
context:                      A
Associated PGW svc:          pgw
Associated GTPU svc:         gtpu
.
.
Bind:                          Done
Local IP Address:           120.56.45.12      Local IP Port:           2123
...
...
Echo Interval:              ...           60 (secs)
.
.
.
```

FA Services Configuration

FA services are configured within contexts and allow the system to function as an FA in the 3G wireless data network.



Important This section provides the minimum instruction set for configuring an FA service that allows the system to process data sessions. Commands that configure additional FA service properties are provided in the Command Line Interface Reference. Additionally, when configuring Mobile IP take into account the MIP timing considerations discussed in *Mobile-IP and Proxy-MIP Timer Considerations*.

These instructions assume that you have already configured the system level configuration as described in *System Administration Guide* and GGSN service as described in *GGSN Service Configuration* section of this chapter.

To configure the FA service:

-
- Step 1** Create the FA service in the system context created to facilitate FA service by applying the example configuration in the *FA Service Creation* section.
 - Step 2** Bind the configured FA service to a local IP address interface with UDP port and specify the maximum number of subscribers that can access this service for the Pi interfaces' IP socket by applying the example configuration in the *IP Interface and UDP Port Binding for Pi Interface* section.
 - Step 3** Configure the security parameter index (SPI) between FA service and HA by applying the example configuration in the *Security Parameter Index (SPI) Configuration* section.
 - Step 4** Specify the FA agent advertisement related parameters like lifetime, number of advertisements, and registration lifetime by applying the example configuration in the *FA Agent Advertisement Parameter Configuration* section.
 - Step 5** Configure the number of registration per subscriber, authentication procedure, and registration timeout parameters for this FA service by applying the example configuration in the *Subscriber Registration, Authentication and Timeout Parameter Configuration* section.
 - Step 6** Optional. Configure the FA service for controlling the negotiation and sending of the I-bit in revocation messages by applying the example configuration in the *Revocation Message Configuration* section.
 - Step 7** Verify your FA service configuration by following the steps in the *FA Service Configuration Verification* section.
 - Step 8** Save your configuration as described in the *Verifying and Saving Your Configuration* chapter.
-

FA Service Creation

Use the following example to create the FA service:



Important A maximum of 256 services (regardless of type) can be configured per system.

```
configure
  context <fa_ctxt_name> -noconfirm
    fa-service <fa_svc_name> -noconfirm]
  end
```

Notes:

- *<fa_ctxt_name>* is name of the context to use for FA service configuration. Generally FA should be configured within a destination context.

- `<fa_svc_name>` is name of the FA service where other parameters have to configure for FA functionality.

IP Interface and UDP Port Binding for Pi Interface

Use the following example to bind the FA service to an local IP interface and specify the maximum number of subscribers that can access this service. Binding an interface to the FA service causes the interface to take on the characteristics of a Pi interface.

configure

```

context <fa_ctxt_name>
  fa-service <fa_svc_name>
    bind address <fa_ip_address> max-subscribers <max_subs>
    ip local-port <udp_port_num>
  end

```

Notes:

- `<fa_svc_name>` is name of the FA service which is created to configure FA functionality.
- `<fa_ip_address>` is the local IP address in IPv4/IPv6 notation for providing Pi interface characteristics.
- `<max_subs>` is the maximum number of subscribers that can access this service on this interface. This can be configured to any integer value from 0 to 500,000. The default is 500,000.



Important

The maximum number of subscribers supported is dependant on the session capacity license installed and the number of active PACs/PSCs installed in the system. For more information on session capacity license, refer to the Software Management Operations chapter of the System Administration Guide.

- `<udp_port_num>` is the UDP port number from 1 through 65535 to be used for Pi interface. Default port number is 434.
- For more information on commands/keywords that configure additional parameters and options, refer *FA Service Configuration Mode Commands* chapter of *Command Line Interface Reference*.

Security Parameter Index (SPI) Configuration

Use the following example to configure the security parameter index (SPI) between FA service and HA:



Important

A maximum of 2048 FA-HA SPIs can be configured for a single FA service.

configure

```

context <fa_ctxt_name>
  fa-service <fa_svc_name>
    fa-ha-spi remote-address <ha_ip_address> spi-number <spi_num>
    {encrypted secret <enc_secret_key> | secret <secret_key>} [description

```

```
<desc_string>]
    end
```

Notes:

- *<fa_svc_name>* is name of the FA service which is created to configure FA functionality.
- *<ha_ip_address>* is the IP address in IPv4/IPv6 notation of HA to which this FA service will interact.
- *<spi_num>* specifies the SPI number which indicates a security context between the FA and the HA in accordance with RFC 2002 and can be configured to any integer value from 256 through 4294967295.
- *<enc_secret_key>* specifies the encrypted shared key between the FA and the HA services. It must be from 1 to 127 alpha and/or numeric characters and is case sensitive.



Important The encrypted keyword is intended only for use by the system while saving configuration scripts. The system displays the encrypted keyword in the configuration file as a flag that the variable following the **secret** keyword is the encrypted version of the plain text secret. Only the encrypted secret is saved as part of the configuration file.

- *<secret_key>* specifies the secret shared key between the FA and the HA services. It must be from 1 to 127 alpha and/or numeric characters and is case sensitive.
- *<desc_string>* is the description for this SPI and must be from 1 to 31 alpha and/or numeric characters.
- For more information on commands/keywords that configure additional parameters and options, refer FA Service Configuration Mode Commands chapter of Command Line Interface Reference.

FA Agent Advertisement Parameter Configuration

Use the following example to configure the agent advertisement parameters for this FA service:

```
configure
    context <fa_ctxt_name>
        fa-service <fa_svc_name>
            advertise adv-lifetime <advt_dur>
            advertise num-adv-sent <advt_num>
            advertise reg-lifetime <reg_dur>
        end
    end
```

Notes:

- *<fa_svc_name>* is name of the FA service which is created to configure FA functionality.
- *<advt_dur>* is the amount of time that an FA agent advertisement remains valid in the absence of further advertisements. It is measured in seconds and can be configured to any integer value from 1 to 65535. The default is 9000.
- *<advt_num>* is the number of unanswered agent advertisements that the FA service allows during call setup before it rejects the session. It can be any integer value from 1 to 65535. The default is 3.

- *<reg_dur>* specify the longest registration lifetime that the FA service allows in any Registration Request message from the mobile node. It is measured in seconds and can be configured to any integer value from 1 to 65534. The default is 600.

Subscriber Registration, Authentication and Timeout Parameter Configuration

Use the following example to configure the number of subscriber registration, authentication procedure and registration timeout parameters for this FA service:

```
configure
  context <fa_ctxt_name>
    fa-service <fa_svc_name>
      multiple-reg <reg_num>
      reg-timeout <timeout_dur>
      authentication mn-aaa {always | ignore-after-handoff | init-reg
| init-reg-except-handoff | renew-and-dereg-noauth | renew-reg-noauth}
[optimize-retries]
    end
```

Notes:

- *<fa_svc_name>* is name of the FA service which is created to configure FA functionality.
- *<reg_num>* is the number of simultaneous Mobile IP sessions that are to be supported for a single subscriber. It can be configured to any integer value from 1 to 3. The default value is 1.



Important

The system supports multiple Mobile IP sessions per subscriber only if the subscriber's mobile node has a static IP address. The system only allows a single Mobile IP session for mobile nodes that receive a dynamically assigned home IP address.



Important

In addition, because only a single Mobile IP or proxy-Mobile IP session is supported for IP PDP contexts, this parameter must remain at its default configuration.

- *<timeout_dur>* is the maximum amount of time that the FA service waits for a Registration Rely message from the HA. It is measured in seconds and can be configured to any integer value from 1 to 65535. The default value is 45.
- For more information on authentication mn-aaa commands/keywords that configure additional parameters and options, refer FA Service Configuration Mode Commands chapter of Command Line Interface Reference.

Revocation Message Configuration

Use the following example to configure the FA service for controlling the negotiation and sending of the I-bit in revocation messages:

```

configure
  context <fa_ctxt_name>
    fa-service <fa_svc_name>
      revocation negotiate-i-bit
    end

```

Notes:

- By default the system will not send the I-bit in the revocation message.

FA Service Configuration Verification

Step 1 Verify that your FA service is configured properly by entering the following command in Exec Mode:

```
show fa-service all
```

The output from this command should look similar to the sample shown below. In this example an FA service named `fa1` was configured in the `isp1` context.

```

Service name:          fa1
  Context:             isp1
  Bind:                Done                               Max Subscribers:
500000
  Local IP Address: 195.20.20.3                          Local IP Port      434
  Lifetime:           00h10m00s                          Registration Timeout: 45 (secs)
  Advt Lifetime      02h30m00s                          Advt Interval:    5000 (msecs)

  Num Advt:           5
  Advt Prefix Length Extn: NO
  Reverse Tunnel:     Enabled                             GRE Encapsulation: Enabled
SPI(s):
  FAHA: Remote Addr: 195.30.30.3/32
  Hash Algorithm:     HMAC_MD5                           SPI Num:          1000
  Replay Protection: Timestamp                          Timestamp Tolerance: 60
IPSEC Crypto Map(s):
  Peer HA Addr:      195.30.30.2
  Crypto Map:        test
  Registration Revocation: Enabled                       Reg-Revocation I bit: Enabled
  Reg-Revocation Max Retries: 3                          Reg-Revocation Timeout: 3 (secs)
  Reg-Rev on InternalFailure: Enabled

```

Step 2 Verify configuration for errors in FA service by entering the following command in Exec Mode:

```
show configuration errors section fa-service verbose
```

Common Gateway Access Support Configuration

This section describes some advance feature configuration to support multiple access networks (CDMA, eHRPD and LTE) plus a GSM/UMTS for international roaming with the same IP addressing behavior and access to 3GPP AAA for subscriber authorization. Subscribers using static IP addressing will be able to get the same IP address regardless of the access technology.

This configuration combines 3G and 4G access technologies in a common gateway supporting logical services of HA, PGW, and GGSN to allow subscribers to have the same user experience, independent of the access technology available.



Important This feature is a license-enabled support and you may need to install a feature specific session license on your system to use some commands related to this configuration.

These instructions assume that you have already configured the system level configuration as described in *System Administration Guide* and GGSN service as described in *GGSN Service Configuration* section in this chapter.

To configure the S6b and other advance features:

-
- Step 1** Configure Diameter endpoint by applying the example configuration in the *Diameter Endpoint Configuration* section.
 - Step 2** Create or modify AAA group by applying the example configuration in the *AAA Group Configuration* section.
 - Step 3** Modify GGSN service to allow authorization with HSS by applying the example configuration in the *Authorization over S6b Configuration* section.
 - Step 4** *Optional.* Create and associate DNS client parameters by applying the example configuration in the *DNS Client Configuration* section.
 - Step 5** *Optional.* Modify GGSN service to accept duplicate calls when received with same IP address by applying the example configuration in the *Duplicate Call Accept Configuration* section.
 - Step 6** Verify your S6b configuration by following the steps in the *Common Gateway Access Support Configuration Verification* section.
 - Step 7** Save your configuration as described in the *Verifying and Saving Your Configuration* chapter.
-

Diameter End-Point Configuration

Use the following example to define the diameter accounting end-point and associate a diameter accounting dictionary for this feature:

```
configure
  context <ctxt_name>
    diameter endpoint <endpoint_name>
      origin host <diameter_host_name> address <ip_address>
      peer <peer_name> realm <peer_realm_name>
    address <ip_address>
    port <port_number>
  end
```

AAA Group Configuration

Use the following example create/modify the AAA group for this feature.

```
configure
  context <fa_ctxt_name>
    aaa group <aaa_grp_name>
```

```

diameter authentication dictionary aaa-custom15
diameter authentication endpoint <s6b_endpoint_name>
diameter authentication server <server_name> priority <priority>
end

```

Notes:

- <s6b_endpoint_name> is name of the existing Diameter endpoint.

Authorization over S6b Configuration

Use the following example to enable the S6b interface on GGSN service with 3GPP AAA/HSS:

```

configure
context <ggsn_ctxt_name>
  ggsn-service <ggsn_svc_name>
    plmn-unlisted-sgsn home
    authorize-with-hss
    fqdn host <host_name> realm <realm_name>
  end

```

Notes:

- <ggsn_svc_name> is name of the GGSN service which is already created on the system.

DNS Client Configuration

Use the following example to enable the S6b interface on GGSN service with 3GPP AAA/HSS:

```

configure
context <ggsn_ctxt_name>
  ip domain-lookup
  ip name-servers <ip_address/mask>
  dns-client <dns_name>
    bind address <ip_address>
    resolver retransmission-interval <duration>
    resolver number-of-retries <retrie>
    cache ttl positive <tll_value>
  exit
  ggsn-service <ggsn_svc_name>
    default dns-client context
  end

```

Notes:

- <ggsn_svc_name> is name of the GGSN service which is already created on the system.

Duplicate Call Accept Configuration

Use the following example to configure GGSN service to accept the duplicate session calls with request for same IP address:

```

configure
  context <ggsn_ctxt_name>
    ggsn-service <ggsn_svc_name>
      newcall duplicate-subscriber-requested-address accept
    end

```

Notes:

- <ggsn_svc_name> is name of the GGSN service which is already created on the system.

Common Gateway Access Support Configuration Verification

Verify that your common gateway access support is configured properly by entering the following command in Exec Mode:

```
show ggsn-service all
```

The output from this command should look similar to the sample shown below. In this example GGSN service named *GGSN1* was configured in the *vpn1* context.

```

Service name:                ggsn1
Context:                     cn1
Associated PGW svc:          None
Associated GTPU svc:         None
Accounting Context Name:cn1
dns-client Context Name:cn1
Authorize:                   hss
Fqdn-name:                   xyz.abcstarent.networks.com
Bind:                         Not Done
Local IP Address:            0.0.0.0                Local IP Port:                2123
Self PLMN:                   Not defined
Retransmission Timeout: 5 (secs)

```

Rf Interface Configuration for Offline Charging

This section describes the step-by-step procedure for the configurations that are required to setup the Rf interface on GGSN to support offline charging.

These instructions assume that you have already configured the system level configuration as described in *System Administration Guide*, GGSN service as described in *GGSN Service Configuration* section in this chapter.

To configure the Rf interface on GGSN node:

- Step 1** Create and configure the accounting policy by applying the example configuration in the *Accounting Policy Configuration* section.
- Step 2** Configure a AAA group to associate the diameter accounting dictionary with the by applying the example configuration in the *AAA Group Configuration* section.
- Step 3** Configuring an APN to associate the accounting policy by applying the example configuration in *APN Configuration for Rf Interface* section.

- Step 4** Verify your Rf interface configuration by following the steps in the *Rf Interface Configuration Verification*
- Step 5** Save your configuration as described in the *Verifying and Saving Your Configuration* chapter.

Accounting Policy Configuration

Use the following example to configure the accounting policy for this feature:

```
configure
  context <ctxt_name>
    policy accounting <policy_name>
      operator-string <ip_address>
      accounting-level [ sdf | flow ]
      cc profile [ 2 | 4 | 6 | 8 ] [ buckets | interval | sdf-interval
| sdf-volume | serving nodes | tariff | volume ]
    end
```

Diameter End-Point Configuration

Use the following example to define the diameter accounting end-point and associate a diameter accounting dictionary for this feature:

```
configure
  context <ctxt_name>
    diameter endpoint <endpoint_name>
      origin host <diameter_host_name> address <ip_address>
      peer <peer_name> realm <peer_realm_name>
    address <ip_address>
    port <port_number>
  end
```

AAA Group Configuration

Use the following example to create/modify the AAA group for this feature:

```
configure
  context <ctxt_name>
    aaa group <group_name>
      diameter accounting endpoint <endpoint_name>
      diameter accounting dictionary [ aaa-custom1 | aaa-custom10 |
aaa-custom2 | aaa-custom3 | aaa-custom4 | aaa-custom5 | aaa-custom6 |
aaa-custom7 | aaa-custom8 | aaa-custom9 ]
      diameter accounting server <diameter_hostname> priority <number>
    end
```

APN Configuration for Rf Interface

Use the following example create/modify the APN configuration for this feature:

```

configure
  context <ctxt_name>
    apn <apn_name>
      associate accounting-policy <policy_name>
    end

```

Rf Interface Configuration Verification

Verify that your Rf interface configuration for offline charging support is configured properly by entering the following command in Exec Mode:

```
show configuration context <ctxt_name>
```

The output from this command should look similar to the sample shown below. In this example accounting policy named *test_policy* was configured in the *rf_context* context.

```

config
  context rf_context
    subscriber default
    exit
    apn apn
      associate accounting-policy test_policy
    exit
    aaa group default
    exit
    aaa group rf_aaa
      diameter accounting dictionary aaa-custom6
      diameter accounting endpoint rf_endpoint
      diameter accounting server rf_server priority 2
    exit
    gtpv group default
    exit
    policy accounting test_policy
      accounting-level flow
      operator-string Rf_string
      cc profile 2 buckets 5
    exit
    diameter endpoint rf_endpoint
      origin host rf_diameter address 1.2.3.4
      peer ak realm ak_realm address 2.3.4.5 port 52
    exit
    ip igmp profile default
    exit
  exit
end

```

Configuring RFL Bypass Feature

The Bypass Rate Limit Function is an enhancement to the existing GTP Throttling feature. The RLF feature allows the operator to control the bypassing of some messages being throttled.

A new command option **throttling-override-policy** has been added to the existing CLI command **gtpc overload-protection egress rlf-template rlf-temp** which allows you to selectively by-pass throttling for a configured message type or for all messages in emergency call or priority call or call for the configured APN. A new CLI command mode **throttling-override-policy** has been also been introduced for Generic syntax for throttling override policy.

Configuring the Throttling Override Policy Mode

The following configuration helps to create a GTP-C Throttling Override Policy and to enter GTP-C Throttling Override Policy mode.

```
configure
  throttling-override-policy throttling-override-policy_name
```

Notes:

Entering the above command sequence results in the following prompt:

```
[local]host_name(config-throttling-override-policy)
```

Configuring the RLF Bypass Feature

The following configuration configures message types which can bypass the rate limiting function.

```
configure
  throttling-override-policy throttling-override-policy_name
    [ default | no ] egress bypass-rlf ggsn msg-type { dpc | ipca
| nrupc | emergency-call | arp { 1 | 2 | 3 }+ | apn-names <apn-name1>
<apn-name2> <apn-name3> }
  end
```

Notes:

- If an empty throttling-override-policy is created, then the default values for all the configurables are zeros/disabled.
- If no throttling-override-policy is associated, then **show service configuration** for GGSN will show it as "n/a".
- Maximum number of throttling-override-policy that can be added are 1024. This limit is the same as max RLF templates.

Example

The following command configures Delete PDP message type at the GGSN node to bypass throttling.

```
egress bypass-rlf ggsn msg-type dpc
```