



## GGSN Configuration Example

This chapter provides information for configuring the system to function as a Gateway GPRS Support Node (GGSN) in General Packet Radio Service (GPRS) or Universal Mobile Telecommunications System (UMTS) wireless data networks.



### Important

This chapter does not discuss the configuration of the local context. Information about the local context can be found in the *Command Line Interface Overview* chapter of the *System Administration Guide* and the *Command Line Interface Reference*.

The most simple configuration that can be implemented on the system to support GGSN functionality requires that two contexts (one source and one destination) be configured on the system as shown in the following figure.

The source context facilitates the following:

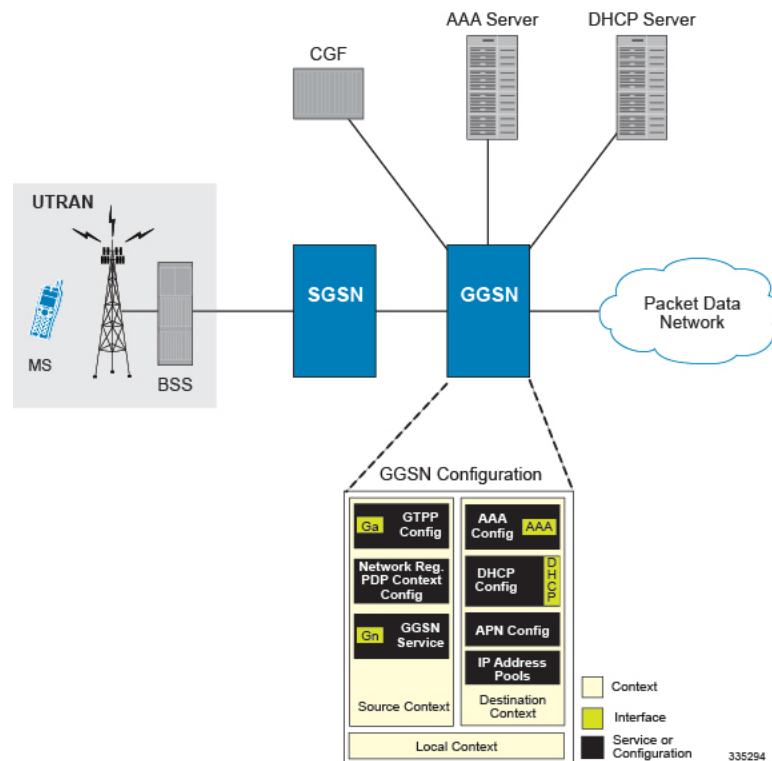
- GGSN service(s) and Gn interface to the Service GPRS Support Node (SGSN)
- GPRS Tunneling Protocol Prime (GTPP) configuration and Ga interface to the Charging Gateway Function (CGF)

The destination context facilitates the following:

- Access Point Name (APN) configuration
- RADIUS authentication configuration and the interface to the authentication server
- DHCP configuration and the interface to the DHCP server
- IP address pools
- Gi interface to the packet data network (PDN)

This configuration supports IP (transparent and non-transparent) and PPP PDP contexts as well as network requested PDP contexts.

Figure 1: GGSN Support Using a Single Source and Destination Context



This chapter contains the following sections:

- [Information Required, on page 2](#)
- [How This Configuration Works, on page 14](#)

## Information Required

The following sections describe the minimum amount of information required to configure and make the GGSN operational on the network. To make the process more efficient, it is recommended that this information be available prior to configuring the system.

There are additional configuration parameters that are not described in this section. These parameters deal mostly with fine-tuning the operation of the GGSN in the network. Information on these parameters can be found in the appropriate sections of the Command Line Reference.

## Source Context Configuration

Table 1: Required Information for Source Context Configuration

Required Information	Description
Source context name	An identification string from 1 to 79 characters (alpha and/or numeric) by which the source context will be recognized by the system.

Required Information	Description
<b>Gn Interface Configuration</b>	
Gn interface name	<p>An identification string between 1 and 79 characters (alpha and/or numeric) by which the interface will be recognized by the system.</p> <p>Multiple names are needed if multiple interfaces will be configured.</p>
IP address and subnet	<p>These will be assigned to the Gn interface.</p> <p>Multiple addresses and/or subnets are needed if multiple interfaces will be configured.</p>
Physical port number	<p>The physical port to which the interface will be bound. Ports are identified by the chassis slot number where the line card resides in, followed by the number of the physical connector on the line card. For example, port 17/1 identifies connector number 1 on the card in slot 17.</p> <p>A single physical port can facilitate multiple interfaces.</p>
Physical port description	<p>An identification string from 1 to 79 characters (alpha and/or numeric) by which the physical port will be recognized by the system.</p> <p>Multiple descriptions are needed if multiple ports will be used.</p> <p>Physical ports are configured within the source context and are used to bind logical Gn interfaces.</p>
Gateway IP address	Used when configuring static routes from the Gn interface(s) to a specific network.
<b>GGSN service Configuration</b>	
GGSN service name	<p>An identification string from 1 to 63 characters (alpha and/or numeric) by which the GGSN service will be recognized by the system.</p> <p>Multiple names are needed if multiple GGSN services will be used.</p>
Accounting context	<p>The name of the context configured on the system in which the processing of GTPP accounting records is performed.</p> <p>The context name is an identification string from 1 to 79 characters (alpha and/or numeric).</p> <p>By default, the system attempts to use the same context as the one in which the GGSN service is configured.</p>

Required Information	Description
UDP port number for GTPC traffic	The port used by the GGSN service and the SGSN for communicating GTPC sockets for GTPv1. The UDP port number and can be any integer value from 1 to 65535. The default value is 2123.
Public Land Mobile Network (PLMN) Identifiers	<b>Mobile Country Code (MCC):</b> The MCC can be configured to any integer value from 0 to 999.
	<b>Mobile Network Code (MNC):</b> The MNC can be configured to any integer value from 0 to 999.
SGSN information (optional)	The GGSN can be configured with information about the SGSN(s) that it is to communicate with. This includes the SGSN's IP address and subnet mask and whether or not the SGSN is on a foreign PLMN.  Multiple SGSNs can be configured.

Required Information	Description
GGSN charging characteristics (CC) (optional)	<p><b>Behavior Bits:</b> If charging characteristics will be configured on the GGSN, behavior bits for the following conditions can be configured:</p> <ul style="list-style-type: none"> <li>• GGSN use of the accounting server specified by the profile index</li> <li>• GGSN rejection of Create PDP Context Request messages</li> <li>• GGSN ceases sending accounting records</li> </ul> <p>Each value must be a unique bit from 1 to 12 to represent the 12 possible behavior bits allowed for in the standards. The default configuration is disabled (0).</p> <p><b>Profile Index:</b> If the GGSN's charging characteristics will be used for subscriber PDP contexts, profile indexes can be modified/configured for one or more of the following conditions:</p> <ul style="list-style-type: none"> <li>• The number of statistics container changes is met or exceeded causing an accounting record to be closed. The number can be configured from 1 to 15. The default is 4.</li> <li>• The up and/or downlink traffic volume limits are met or exceeded within a specific time interval causing a partial record to be generated. The up and downlink volumes can be configured from 0 to 1000000 octets. The interval can be configured from 60 to 40000000 seconds.</li> <li>• The up and/or downlink traffic volume limits are met or exceeded causing an accounting record to be closed. The up and downlink volumes can be configured from 100000 to 4000000000 octets.</li> <li>• The number of SGSN switchovers is met or exceeded causing an accounting record to be closed. The number can be configured from 1 to 15. The default is 4.</li> <li>• Specific tariff times within a day are reached causing an accounting record to be closed. Up to four times can be configured using the hour of the day (1-24) and the minute (1-60).</li> <li>• Prepaid accounting can be disabled for a specified profile index.</li> </ul> <p>The system supports the configuration of up to 16 profile indexes numbered 0 through 15</p>

Required Information	Description
PLMN policy	<p>The GGSN can be configured treat communications from unconfigured SGSNs in one of the following ways:</p> <ul style="list-style-type: none"> <li>• Treat the SGSN as if it is on a foreign PLMN</li> <li>• Treat the SGSN as if it is on a home PLMN</li> <li>• Reject communications from unconfigured SGSNs (default)</li> </ul>
Ga Interface Configuration	
Ga interface name	<p>An identification string from 1 to 79 characters (alpha and/or numeric) by which the interface will be recognized by the system.</p> <p>Multiple names are needed if multiple interfaces will be configured.</p>
IP address and subnet	<p>These will be assigned to the Ga interface.</p> <p>Multiple addresses and/or subnets are needed if multiple interfaces will be configured.</p>
Physical port number	<p>The physical port to which the interface will be bound. Ports are identified by the chassis slot number where the line card resides in, followed by the number of the physical connector on the line card. For example, port 17/1 identifies connector number 1 on the card in slot 17.</p> <p>A single physical port can facilitate multiple interfaces.</p>
Physical port description	<p>An identification string between 1 and 79 characters (alpha and/or numeric) by which the physical port will be recognized by the system.</p> <p>Multiple descriptions are needed if multiple ports will be used.</p> <p>Physical ports are configured within the source context and are used to bind logical Ga interfaces.</p>
Gateway IP address	<p>Used when configuring static routes from the Ga interface(s) to a specific network.</p>
GTPP Configuration	
Charging gateway address	<p>The IP address of the system's GGSN interface.</p>

Required Information	Description
CGF server information	<p><b>IP address:</b> The IP address of the CGF server to which the GGSN will send accounting information.</p> <p>Multiple CGFs can be configured.</p>
	<p><b>Priority:</b> If more than one CGF is configured, this is the server's priority. It is used to determine the rotation order of the CGFs when sending accounting information.</p> <p>The priority can be configured to any integer value from 1 to 1000. The default is 1.</p>
	<p><b>Maximum number of messages:</b> The maximum number of outstanding or unacknowledged GTPP messages allowed for the CGF.</p> <p>The maximum number can be configured to any integer value from 1 to 256. The default is 256.</p>
GCDR optional fields	<p>The following optional fields can be specified/configured in CDRs generated by the GGSN:</p> <ul style="list-style-type: none"> <li>• diagnostics</li> <li>• duration-ms (the time specified in the mandatory Duration field is reported in milliseconds)</li> <li>• local-record-sequence-number</li> <li>• plmn-id</li> </ul>
Network Requested PDP Context Support Configuration (optional)	
Activation Requirements	<p><b>IP address:</b> The static IP address of the mobile station's for which network-requested PDP context activation will be supported.</p> <p>Up to 1000 addresses can be configured.</p>
	<p><b>Destination context name:</b> The name of the destination context configured on the system that contains the IP address pool containing the mobile station's static address.</p>
	<p><b>International Mobile Subscriber Identity (IMSI):</b> The IMSI of the mobile station.</p>
	<p><b>APN:</b> The name of the access point that will be passed to the SGSN by the GGSN for the mobile station.</p>
GSN-map node	<p>Communications with the HLR from the GGSN go through a GSN-map node that performs the protocol conversion from GTPC to SS7.</p> <p>The IP address of the map node must be configured. Only one GSN-map node can be configured per source context.</p>

## Destination Context Configuration

*Table 2: Required Information for Destination Context Configuration*

Required Information	Description
Destination context name	<p>An identification string from 1 to 79 characters (alpha and/or numeric) by which the destination context will be recognized by the system.</p> <p><b>Important</b> For this configuration, the destination context name should <b>not</b> match the domain name of a specific APN.</p>
APN Configuration	
APN name	<p>An identification string by which the APN will be recognized by the system. The name can be from 1 to 62 alpha and/or numeric characters and is not case sensitive. It may also contain dots ( . ) and/or dashes ( - ).</p> <p>Multiple names are needed if multiple APNs will be used.</p>
Accounting mode	<p>Selects the accounting protocol. GTPP or RADIUS are supported. In addition, accounting can be completely disabled. The default is to perform accounting using GTPP.</p> <p><b>Important</b> The examples discussed in this chapter assumes GTPP is used.</p>
Authentication protocols used	<p>Specifies how the system handles authentication: using a protocol (such as CHAP, PAP, or MSCHAP), or not requiring any authentication.</p>
APN charging characteristics (CC) (optional)	<p>Specifies whether or not the GGSN accepts the CC from the SGSN for home, visiting, and roaming subscribers.</p> <p>By default the GGSN accepts the CC from the SGSN for all three scenarios.</p> <p>If the GGSN is to use its own CC for any of these scenarios, then each scenario requires the specification of behavior bits and a profile index to use.</p> <p><b>Important</b> The profile index parameters are configured as part of the GGSN service.</p>
Domain Name Service (DNS) information (optional)	<p>If DNS will be used for the APN, IP addresses can be configured for primary and secondary DNS servers.</p>



Required Information	Description
IP address allocation method	<p>Specifies how sessions facilitated by this APN will receive an IP address. IP addresses can be assigned using one of the following methods:</p> <ul style="list-style-type: none"> <li>• <b>Dynamic:</b> Address can be dynamically assigned from one of the sources.</li> <li>• <b>Dynamic Host Control Protocol (DHCP) server:</b> The system can be configured to act as a DHCP proxy and receive address from the server in advance and assign them as needed or it can relay DHCP messages from the MS.</li> <li>• <b>Local address pools:</b> The system can be configured with local address pools.</li> <li>• <b>Static:</b> MS IP addresses can be permanently assigned.</li> </ul> <p>By default, the system is configured to either dynamically assign addresses from a local pool and/or allow static addresses.</p>
IP address pool name	<p>If addresses will be dynamically assigned from a locally configured private pool, the name of the pool must be configured. If no name is configured, the system will automatically use any configured public pool.</p>
IP destination context name	<p>The name of the system destination context to use for subscribers accessing the APN. If no name is specified, the system automatically uses the system context in which the APN is configured.</p>
Maximum number of PDP contexts	<p>The maximum number of PDP contexts that are supported for the APN.</p> <p>The maximum number can be configured to any integer value from 1 to 1500000. The default is 1000000.</p>
PDP type	<p>The type of PDP contexts supported by the APN. The type can be IPv4, IPv6, both IPv4 and IPv6, or PPP. IPv4 support is enabled by default. For IPv6 PDP configuration, at least one IPv6 interface needs to be configured in the destination context.</p>
Verification selection mode	<p>The level of verification that will be used to ensure a MS's subscription to use the APN. The GGSN uses any of the following methods:</p> <ul style="list-style-type: none"> <li>• No verification and MS supplies APN</li> <li>• No verification and SGSN supplies APN</li> <li>• Verified by SGSN (default)</li> </ul>

Required Information	Description
DHCP Interface Configuration (optional)	
DHCP interface name	<p>An identification string from 1 to 79 characters (alpha and/or numeric) by which the interface will be recognized by the system.</p> <p>Multiple names are needed if multiple interfaces will be configured.</p>
IP address and subnet	<p>These will be assigned to the DHCP interface and be bound to the DHCP service.</p> <p>Multiple addresses and/or subnets are needed if multiple interfaces will be configured.</p>
Gateway IP address	Used when configuring static routes from the DHCP interface(s) to a specific network.
Physical port number	<p>The physical port to which the interface will be bound. Ports are identified by the chassis slot number where the line card resides in, followed by the number of the physical connector on the line card. For example, port 17/1 identifies connector number 1 on the card in slot 17.</p> <p>A single physical port can facilitate multiple interfaces.</p>
Physical port description	<p>An identification string from 1 to 79 characters (alpha and/or numeric) by which the physical port will be recognized by the system.</p> <p>Multiple descriptions are needed if multiple ports will be used.</p> <p>Physical ports are configured within the source context and are used to bind logical DHCP interfaces.</p>
DHCP Service Configuration (optional)	
DHCP Service Name	<p>This is an identification string between 1 and 63 characters (alpha and/or numeric) by which the DHCP service will be recognized by the system.</p> <p>Multiple names are needed if multiple GGSN services will be used.</p>
DHCP Server Information	<p>The IP address of each DHCP server that the system is to communicate with must be configured</p> <p>.Multiple servers can be configured. If multiple servers are configured, each can be assigned a priority from 1 to 1000. The default priority is 1.</p>

Required Information	Description
Lease Duration	<p>Specifies the minimum and maximum allowable lease times that are accepted in responses from DHCP servers.</p> <ul style="list-style-type: none"> <li>• <b>Minimum Lease Time:</b> Measured in seconds and can be configured to any integer value from 600 to 3600. The default is 600 seconds.</li> <li>• <b>Maximum Lease Time:</b> Measured in seconds and can be configured to any integer value from 10800 to 4294967295. The default is 86400 seconds.</li> </ul>
AAA Interface Configuration	
AAA interface name	<p>This is an identification string from 1 to 79 characters (alpha and/or numeric) by which the interface will be recognized by the system.</p> <p>Multiple names are needed if multiple interfaces will be configured.</p>
IP address and subnet	<p>These will be assigned to the AAA interface.</p> <p>Multiple addresses and/or subnets are needed if multiple interfaces will be configured.</p>
Physical port number	<p>This specifies the physical port to which the interface will be bound. Ports are identified by the chassis slot number where the line card resides in, followed by the number of the physical connector on the line card. For example, port 17/1 identifies connector number 1 on the card in slot 17.</p> <p>A single physical port can facilitate multiple interfaces.</p>
Physical port description	<p>This is an identification string from 1 to 79 characters (alpha and/or numeric) by which the physical port will be recognized by the system.</p> <p>Multiple descriptions are needed if multiple ports will be used.</p> <p>Physical ports are used to bind logical AAA interfaces.</p>
Gateway IP address	<p>Used when configuring static routes from the AAA interface(s) to a specific network.</p>
RADIUS Server Configuration	

Required Information	Description
RADIUS Authentication server	<p><b>IP Address:</b> Specifies the IP address of the RADIUS authentication server the system will communicate with to provide subscriber authentication functions.</p> <p>Multiple addresses are needed if multiple RADIUS servers will be configured. If multiple servers are configured, each can be assigned a priority.</p>
	<p><b>Shared Secret:</b> The shared secret is a string between 1 and 15 characters (alpha and/or numeric) that specifies the key that is exchanged between the RADIUS authentication server and the source context.</p> <p>A shared secret is needed for each configured RADIUS server.</p>
	<p><b>UDP Port Number:</b> Specifies the port used by the source context and the RADIUS authentication server for communications. The UDP port number can be any integer value between 1 and 65535. The default value is 1812.</p>
RADIUS Accounting server (optional)	<p><b>IP Address:</b> Specifies the IP address of the RADIUS accounting server that the source context will communicate with to provide subscriber accounting functions.</p> <p>Multiple addresses are needed if multiple RADIUS servers will be configured. RADIUS accounting servers are configured within the source context.</p> <p>Multiple servers can be configured and each assigned a priority.</p>
	<p><b>Shared Secret:</b> The shared secret is a string between 1 and 15 characters (alpha and/or numeric) that specifies the key that is exchanged between the RADIUS accounting server and the source context.</p> <p>A shared secret is needed for each configured RADIUS server.</p>
	<p><b>UDP Port Number:</b> Specifies the port used by the source context and the RADIUS Accounting server for communications. The UDP port number can be any integer value between 1 and 65535. The default value is 1813.</p>
RADIUS attribute NAS Identifier	<p>Specifies the name by which the source context will be identified in the Access-Request message(s) it sends to the RADIUS server. The name must be from 1 to 32 alpha and/or numeric characters and is case sensitive.</p>

Required Information	Description
RADIUS NAS IP address	Specifies the IP address of the system's AAA interface. A secondary address can be optionally configured.
PDN Interface Configuration	
PDN interface name	<p>This is an identification string from 1 to 79 characters (alpha and/or numeric) by which the interface will be recognized by the system.</p> <p>Multiple names are needed if multiple interfaces will be configured.</p> <p>PDN interfaces are configured in the destination context.</p>
IP address and subnet	<p>These will be assigned to the PDN interface.</p> <p>Multiple addresses and/or subnets are needed if multiple interfaces will be configured.</p>
Physical port number	<p>This specifies the physical port to which the interface will be bound. Ports are identified by the chassis slot number where the line card resides in, followed by the number of the physical connector on the line card. For example, port 17/1 identifies connector number 1 on the card in slot 17.</p> <p>A single physical port can facilitate multiple interfaces.</p>
Physical port description(s)	<p>This is an identification string from 1 to 79 characters (alpha and/or numeric) by which the physical port will be recognized by the system.</p> <p>Multiple descriptions will be needed if multiple ports will be used.</p> <p>Physical ports are configured within the destination context and are used to bind logical PDN interfaces.</p>
Gateway IP address(es)	Used when configuring static routes from the PDN interface(s) to a specific network.
IP Address Pool Configuration	
IP address pool name(s)	<p>This is an identification string from 1 to 31 characters (alpha and/or numeric) by which the physical port will be recognized by the system.</p> <p>Multiple descriptions will be needed if multiple ports will be used.</p>

Required Information	Description
Pool addresses, subnet mask and type	<p>The pool can consist of either of the following:</p> <ul style="list-style-type: none"> <li>• An entire subnet configured using the initial address and the subnet mask</li> <li>• A range of addresses configured using the first and last IP addresses in the range</li> </ul> <p>The pool can be configured as public, private, or static. Public pools can also be assigned a priority.</p>

## How This Configuration Works

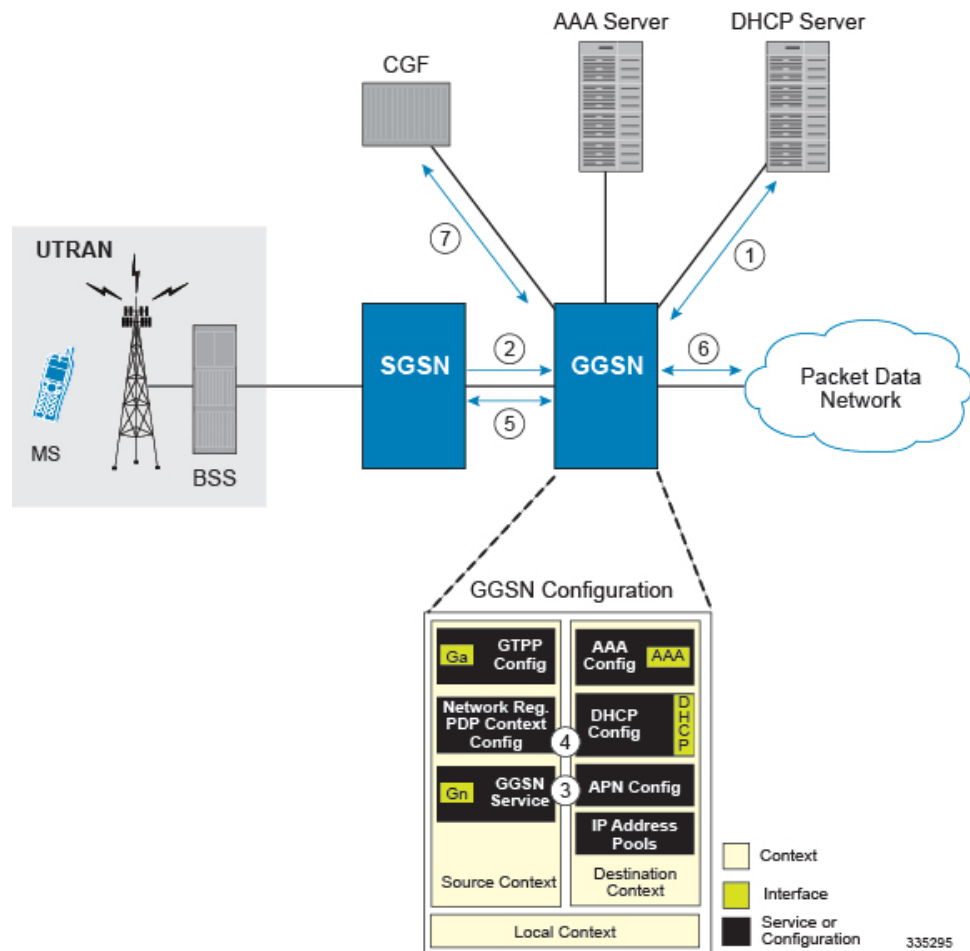
This section provides a description of how the information detailed in the previous sections of this chapter are used in the processing of the following types of subscriber sessions:

- [Transparent IP PDP Context Processing, on page 14](#)
- [Non-transparent IP PDP Context Processing, on page 16](#)
- [PPP PDP Context Processing, on page 16](#)
- [Network-requested PDP Context Processing, on page 17](#)

## Transparent IP PDP Context Processing

The following figure and the text that follows describe how this configuration with a single source and destination context would be used by the system to process a transparent IP PDP context.

Figure 2: Transparent IP PDP Context Call Processing



1. If the DHCP client mode is used for the dynamic assignment of IP addresses for subscriber PDP contexts, the system will retrieve addresses from the server over the DHCP interface during boot up and store them in cache memory.
2. A Create PDP Context Request message for a subscriber session is sent from the SGSN to the GGSN service over the Gn interface. The message contains information such as the PDP Type, APN, and charging characteristics.
3. The GGSN determines whether or not it is configured with an APN identical to the one specified in the message. If so, it determines how to process the session based on the configuration of the APN.
4. If the MS requires a dynamically assigned address, the GGSN assigns one from those stored in its memory cache.
5. The GGSN returns an affirmative Create PDP Context Response to the SGSN over the Gn interface.
6. The MS sends/receives data to/from the packet data network over the GGSN's PDN interface.
7. Upon termination of the subscriber session, the GGSN sends GGSN charging detail records to the CGF using GTPP over the Ga interface.

## Non-transparent IP PDP Context Processing

The following figure and the text that follows describe how this configuration with a single source and destination context would be used by the system to process a non-transparent IP PDP context.

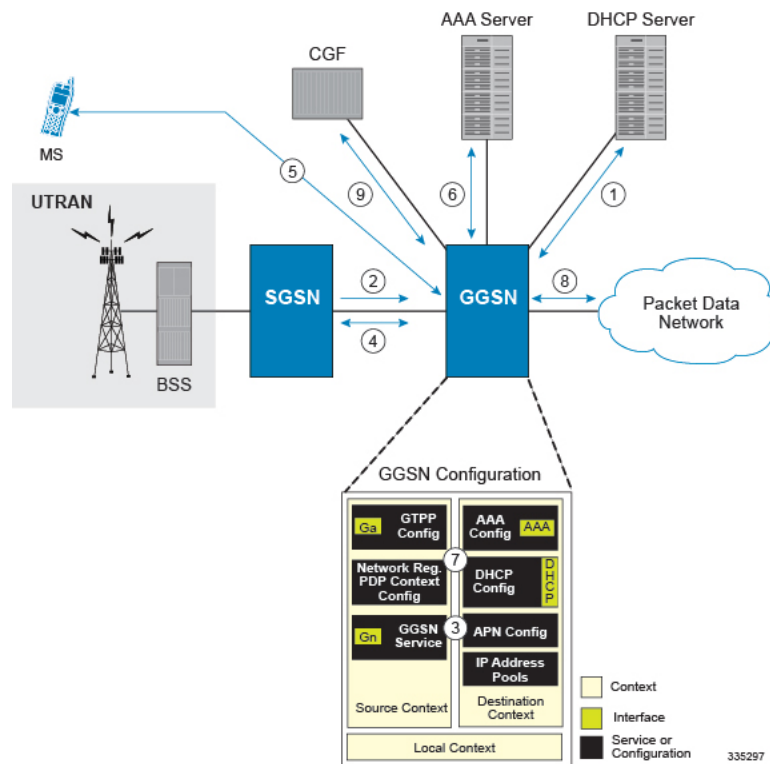
1. If the DHCP client mode is used for the dynamic assignment of IP addresses for subscriber PDP contexts, the system will retrieve addresses from the server over the DHCP interface during boot up and store them in cache memory.
2. A Create PDP Context Request message for a subscriber session is sent from the SGSN to the GGSN service over the Gn interface. The message contains information such as the PDP Type, APN, and charging characteristics.
3. The GGSN determines whether or not it is configured with an APN identical to the one specified in the message. If so, it determines how to process the session based on the configuration of the APN.
4. If the MS requires a dynamically assigned address, the GGSN assigns one from those stored in its memory cache.
5. If subscriber authentication is required, the GGSN authenticates the subscriber by communicating with a RADIUS server over the AAA interface.
6. The GGSN returns an affirmative Create PDP Context Response to the SGSN over the Gn interface.
7. The MS sends/receives data to/from the packet data network over the GGSN's PDN interface.
8. Upon termination of the subscriber session, the GGSN sends GGSN charging detail records to the CGF using GTPP over the Ga interface.

## PPP PDP Context Processing

The following figure and the following text describe how this configuration with a single source and destination context would be used by the system to process a PPP PDP context.



Figure 4: PPP PDP Context Call Processing

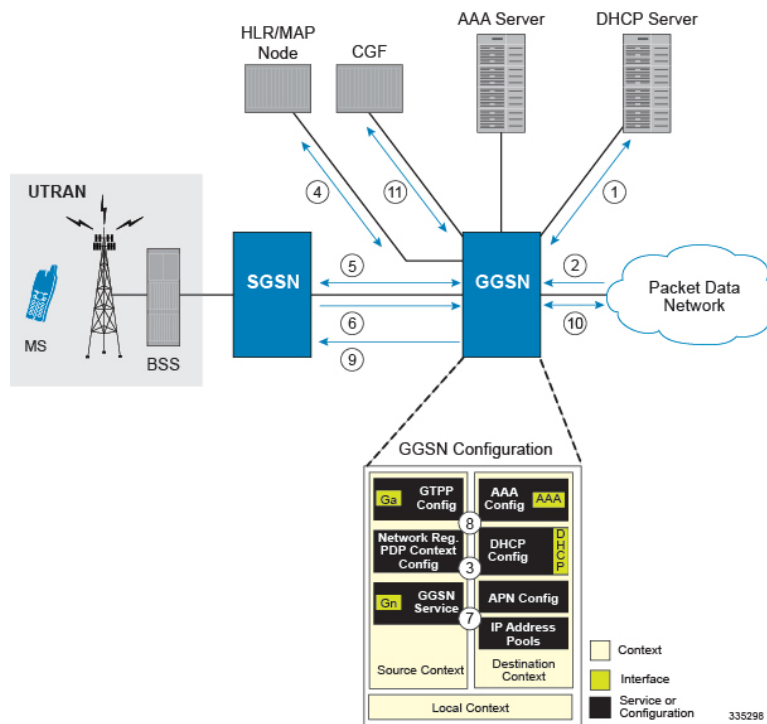


1. If the DHCP client mode is used for the dynamic assignment of IP addresses for subscriber PDP contexts, the system will retrieve addresses from the server over the DHCP interface during boot up and store them in cache memory.
2. A Create PDP Context Request message for a subscriber session is sent from the SGSN to the GGSN service over the Gn interface. The message contains information such as the PDP Type, APN, and charging characteristics.
3. The GGSN determines whether or not it is configured with an APN identical to the one specified in the message. If so, it determines how to process the session based on the configuration of the APN.
4. The GGSN returns an affirmative Create PDP Context Response to the SGSN over the Gn interface.
5. The MS and GGSN negotiate PPP.
6. The GGSN authenticates the subscriber as part of the PPP negotiation by communicating with a RADIUS server over the AAA interface.
7. Upon successful authentication, the GGSN assigns an IP address to the MS from one of those stored in its memory cache.
8. The MS sends/receives data to/from the packet data network over the GGSN's PDN interface.
9. Upon termination of the subscriber session, the GGSN sends GGSN charging detail records to the CGF using GTPP over the Ga interface.

## Network-requested PDP Context Processing

The following figure and the text that follows describe how this configuration with a single source and destination context would be used by the system to process a network-requested PDP context.

Figure 5: Network-requested PDP Context Call Processing



1. If the DHCP client mode is used for the dynamic assignment of IP addresses for subscriber PDP contexts, the system will retrieve addresses from the server over the DHCP interface during boot up and store them in cache memory.
2. An IP packet data unit (PDU) is received by the GGSN from the PDN.
3. The GGSN determines if it is configured to support network-initiated sessions. If so, it begins the Network-Requested PDP Context Activation procedure, otherwise it discards the packet.
4. The GGSN determines if the MS is reachable by communicating with the HLR through a MAP node over one of the Gn interfaces.
5. The GGSN works with the SGSN to activate the MS.
6. Once activated, the MS initiates a PDP context resulting in the sending of a Create PDP Context Request message from the SGSN to the GGSN service over the Gn interface. The message contains information such as the PDP Type, APN, and charging characteristics.
7. The GGSN determines whether or not it is configured with an APN identical to the one specified in the message. If so, it determines how to process the session based on the configuration of the APN.
8. If the MS requires a dynamically assigned address, the GGSN assigns one from those stored in its memory cache.
9. The GGSN returns an affirmative Create PDP Context Response to the SGSN over the Gn interface.
10. The MS sends/receives data to/from the packet data network over the GGSN's PDN interface.
11. Upon termination of the subscriber session, the GGSN sends GGSN charging detail records to the CGF using GTPP over the Ga interface.