Simple IP and Mobile IP in a Single System Configuration Example

This chapter provides information for several configuration examples that can be implemented on the system to support Simple IP and Mobile IP data services in a single system.

Important This chapter does not discuss the configuration of the localout-of-band management context. Information about the localout-of-band management context can be found in Chapter 1 of *Command Line Reference*. Additionally, when configuring Mobile IP take into account the MIP timing considerations discussed in the section MIP Timer Considerations.

The following topics are covered:

Using the System as Both a PDSN/FA and an HA

The system supports both Simple and Mobile IP. For Mobile IP applications, the system can be configured to perform the function of a Packet Data Service Node/Foreign Agent (PDSN/FA) and/or a Home Agent (HA). This example describes what is needed and how a single system simultaneously supports both of these functions.

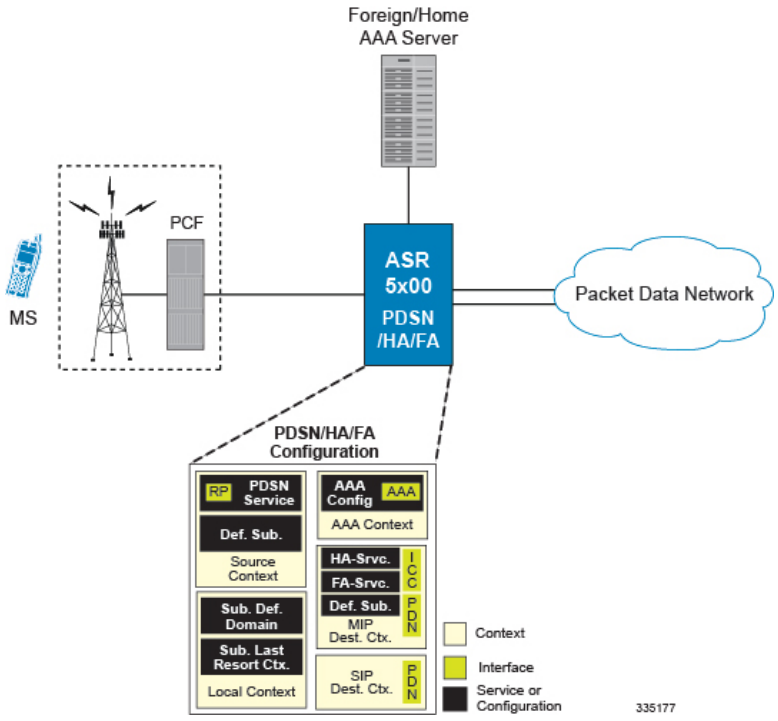
In order to support PDSN, FA, and HA functionality, the system must be configured with at least one source context and at least two destination contexts as shown in the following figure.

The source context will facilitate the PDSN service(s), and the R-P interfaces. The AAA context will be configured to provide foreign/home AAA functionality for subscriber sessions and facilitate the AAA interfaces.

The Mobile IP destination context will be configured to facilitate the FA service, the HA service and the PDN interfaces for Mobile IP data services. The Simple IP destination context will facilitate the PDN interfaces for Simple IP data Services.

In addition to the source and destination contexts, there are additional system-level AAA parameters that must be configured.

Figure 1: Simple and Mobile IP Support Within a Single System



Information Required

Prior to configuring the system as shown in this example, there is a minimum amount of information required. The following sections describe the required information to configure the source and destination contexts.

Source Context Configuration

The following table lists the information that is required to configure the source context.

Table 1: Required Information for Source Context Configuration

Required Information	Description
Source context name	This is an identification string between 1 and 79 characters (alpha and/or numeric) by which the source context will be recognized by the system.
R-P Interface Configuration	
R-P interface name	This is an identification string between 1 and 79 characters (alpha and/or numeric) by which the interface will be recognized by the system. Multiple names are needed if multiple interfaces will be configured. R-P interfaces are configured in the source context.

Required Information	Description
IP address and subnet	These will be assigned to the R-P interface. Multiple addresses and/or subnets are needed if multiple interfaces will be configured.
Physical port number	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. A single physical port can facilitate multiple interfaces.
Physical port description	This is an identification string between 1 and 79 characters (alpha and/or numeric) by which the physical port will be recognized by the system. Multiple descriptions are needed if multiple ports will be used. Physical ports are configured within the source context and are used to bind logical R-P interfaces.
Gateway IP address	Used when configuring static routes from the R-P interface(s) to a specific network.
PDSN service Configuration	
PDSN service name	This is an identification string between 1 and 63 characters (alpha and/or numeric) by which the PDSN service will be recognized by the system. Multiple names are needed if multiple PDSN services will be used. PDSN services are configured in the source context.
UDP port number for R-P traffic	Specifies the port used by the PDSN service and the PCF for communications. The UDP port number and can be any integer value between 1 and 65535. The default value is 699.
Authentication protocols used	Specifies how the system handles authentication: using a protocol (such as CHAP, PAP, or MSCHAP), or not requiring any authentication.
Domain alias for NAI-construction	Specifies a context name for the system to use to provide accounting functionality for a subscriber session. This parameter is needed only if the system is configured to support no authentication.

Required Information	Description
Security Parameter Index Information	**PCF IP address:** Specifies the IP address of the PCF that the PDSN service will be communicating with. The PDSN service allows the creation of a security profile that can be associated with a particular PCF. Multiple IP addresses are needed if the PDSN service will be communicating with multiple PCFs.
	Index: Specifies the shared SPI between the PDSN service and a particular PCF. The SPI can be configured to any integer value between 256 and 4294967295. Multiple SPIs can be configured if the PDSN service is to communicate with multiple PCFs.
	Secret: Specifies the shared SPI secret between the PDSN service and the PCF. The secret can be between 1 and 127 characters (alpha and/or numeric). An SPI secret is required for each SPI configured.
	Hash-algorithm: Specifies the algorithm used to hash the SPI and SPI secret. The possible algorithms that can be configured are MD5 per RFC 1321 and keyed-MD5 per RFC 2002. The default is MD5. A hash-algorithm is required for each SPI configured.
	Replay-protection process: Specifies how protection against replay-attacks is implemented. The possible processes are nonce and timestamp. The default is timestamp with a tolerance of 60 seconds. A replay-protection process is required for each SPI configured.
Subscriber session lifetime	Specifies the time in seconds that an A10 connection can exist before its registration is considered expired. The time is expressed in seconds and can be configured to any integer value between 1 and 65534, or the timer can be disabled to set an infinite lifetime. The default value is 1800 seconds.
Mobile IP FA context name	Specifies the name of the context in which the FA service is configured.

Required Information	Description
Default Subscriber Configuration	
"Default" subscriber's IP context name	Specifies the name of the egress context on the system that facilitates the PDN ports. **Important** For this configuration, the IP context name should be identical to the name of the destination context.

AAA Context Configuration

The following table lists the information that is required to configure the AAA context.

Table 2: Required Information for AAA Context Configuration

Required Information	Description
AAA context name	This is an identification string between 1 and 79 characters (alpha and/or numeric) by which the AAA context will be recognized by the system.
AAA Interface Configuration	
AAA interface name	This is an identification string between 1 and 79 characters (alpha and/or numeric) by which the interface will be recognized by the system. Multiple names are needed if multiple interfaces will be configured. AAA interfaces will be configured in the source context.
IP address and subnet	These will be assigned to the AAA interface. Multiple addresses and/or subnets are needed if multiple interfaces will be configured.
Physical port number	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. A single physical port can facilitate multiple interfaces.

Required Information	Description
Physical port description	This is an identification string between 1 and 79 characters (alpha and/or numeric) by which the physical port will be recognized by the system. Multiple descriptions are needed if multiple ports will be used. Physical ports are configured within the source context and are used to bind logical AAA interfaces.
Gateway IP address	Used when configuring static routes from the AAA interface(s) to a specific network.
Foreign/Home RADIUS Server Configuration	
Foreign/Home RADIUS Authentication server	IP Address: Specifies the IP address of the foreign/home RADIUS authentication server the source context will communicate with to provide subscriber authentication functions. Multiple addresses are needed if multiple RADIUS servers will be configured. Foreign/home RADIUS authentication servers are configured within the source context. Multiple servers can be configured and each assigned a priority.
	Shared Secret: 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. A shared secret is needed for each configured RADIUS server.
	UDP Port Number: Specifies the port used by the source context and the foreign/home RADIUS authentication server for communications. The UDP port number can be any integer value between 1 and 65535. The default value is 1812.

Required Information	Description
Foreign/Home RADIUS Accounting server	IP Address: Specifies the IP address of the foreign/home RADIUS accounting server that the source context will communicate with to provide subscriber accounting functions. Multiple addresses are needed if multiple RADIUS servers will be configured. Foreign/home RADIUS accounting servers are configured within the source context. Multiple servers can be configured and each assigned a priority.
	Shared Secret: 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. A shared secret is needed for each configured RADIUS server.
	UDP Port Number: Specifies the port used by the source context and the foreign/home RADIUS Accounting server for communications. The UDP port number can be any integer value between 1 and 65535. The default value is 1813.
RADIUS attribute NAS Identifier	Specifies the name by which the source context will be identified in the Access-Request message(s) it sends to the foreign/home RADIUS server. The name must be between 1 and 32 alpha and/or numeric characters and is case sensitive.
RADIUS NAS IP address	Specifies the IP address of the source context's AAA interface. A secondary IP address interface can optionally be configured.

Mobile IP Destination Context Configuration

The following table lists the information that is required to configure the destination context.

Table 3: Required Information for Destination Context Configuration

Required Information	Description
Mobile IP Destination context name	This is an identification string between 1 and 79 characters (alpha and/or numeric) by which the Mobile IP destination context will be recognized by the system. **Important** For this configuration, the destination context name should **not** match the domain name of a specific domain. It should, however, match the name of the context in which the HA service is configured if a separate system is used to provide HA functionality.
ICC Interface Configuration	
ICC interface name	The intra-context communication (ICC) interface is configured to allow FA and HA services configured within the same context to communicate with each other. The ICC interface name is an identification string between 1 and 79 characters (alpha and/or numeric) by which the interface will be recognized by the system. Multiple names are needed if multiple interfaces will be configured. ICC interface(s) are configured in the same destination context as the FA and HA services.
IP address and subnet	These will be assigned to the ICC interface(s). Multiple addresses (at least one per service) on the same subnet will be needed to assign to the same ICC interface.
Physical port number	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. A single physical port can facilitate multiple interfaces.

Required Information	Description
Physical port description	This is an identification string between 1 and 79 characters (alpha and/or numeric) by which the physical port will be recognized by the system. Multiple descriptions are needed if multiple ports will be used. Physical ports are configured within the destination context and are used to bind logical ICC interfaces.
PDN Interface Configuration	
PDN interface name	This is an identification string between 1 and 79 characters (alpha and/or numeric) by which the interface will be recognized by the system. Multiple names are needed if multiple interfaces will be configured. PDN interfaces are configured in the destination context.
IP address and subnet	These will be assigned to the PDN interface. Multiple addresses and/or subnets are needed if multiple interfaces will be configured.
Physical port number	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. A single physical port can facilitate multiple interfaces.
Physical port description(s)	This is an identification string between 1 and 79 characters (alpha and/or numeric) by which the physical port will be recognized by the system. Multiple descriptions will be needed if multiple ports will be used. Physical ports are configured within the destination context and are used to bind logical PDN interfaces.
Gateway IP address(es)	Used when configuring static routes from the PDN interface(s) to a specific network.
IP Address Pool Configuration (optional)	

Required Information	Description
IP address pool name(s)	If IP address pools will be configured in the destination context(s), names or identifiers will be needed for them. The pool name can be between 1 and 31 alpha and/or numeric characters and is case sensitive.
IP pool addresses	An initial address and a subnet, or a starting address and an ending address, are required for each configured pool. The pool will then consist of every possible address within the subnet , or all addresses from the starting address to the ending address. The pool can be configured as public, private, or static.
FA Service Configuration	
FA service name	This is an identification string between 1 and 63 characters (alpha and/or numeric) by which the FA service will be recognized by the system. Multiple names are needed if multiple FA services will be used. FA services are configured in the destination context.
UDP port number for Mobile IP traffic	Specifies the port used by the FA service and the HA for communications. The UDP port number can be any integer value between 1 and 65535. The default value is 434.

Required Information	Description
Security Parameter Index (indices) Information	**HA IP address:** Specifies the IP address of the HAs with which the FA service communicates. The FA service allows the creation of a security profile that can be associated with a particular HA.
	Index: Specifies the shared SPI between the FA service and a particular HA. The SPI can be configured to any integer value between 256 and 4294967295. Multiple SPIs can be configured if the FA service is to communicate with multiple HAs.
	Secrets: Specifies the shared SPI secret between the FA service and the HA. The secret can be between 1 and 127 characters (alpha and/or numeric). An SPI secret is required for each SPI configured.
	Hash-algorithm: Specifies the algorithm used to hash the SPI and SPI secret. The possible algorithms that can be configured are MD5 per RFC 1321 and keyed-MD5 per RFC 2002. The default is hmac-md5. A hash-algorithm is required for each SPI configured.
FA agent advertisement lifetime	Specifies the time (in seconds) that an FA agent advertisement remains valid in the absence of further advertisements. The time can be configured to any integer value between 1 and 65535. The default is 9000.
Number of allowable unanswered FA advertisements	Specifies the number of unanswered agent advertisements that the FA service will allow during call setup before it will reject the session. The number can be any integer value between 1 and 65535. The default is 5.
Maximum mobile-requested registration lifetime allowed	Specifies the longest registration lifetime that the FA service will allow in any Registration Request message from the mobile node. The lifetime is expressed in seconds and can be configured between 1 and 65534. An infinite registration lifetime can be configured by disabling the timer. The default is 600 seconds.

Required Information	Description
Registration reply timeout	Specifies the amount of time that the FA service will wait for a Registration Reply from an HA. The time is measured in seconds and can be configured to any integer value between 1 and 65535. The default is 7.
Number of simultaneous registrations	Specifies the number of simultaneous Mobile IP sessions that will be supported for a single subscriber. The maximum number of sessions is 3. The default is 1. **Important** The system will only support multiple Mobile IP sessions per subscriber if the subscriber's mobile node has a static IP address.
Mobile node re-registration requirements	Specifies how the system should handle authentication for mobile node re-registrations. The FA service can be configured to always require authentication or not. If not, the initial registration and de-registration will still be handled normally.
HA service Configuration	
HA service name	This is an identification string between 1 and 63 characters (alpha and/or numeric) by which the HA service will be recognized by the system. Multiple names are needed if multiple HA services will be used. HA services are configured in the destination context.
UDP port number for Mobile IP traffic	Specifies the port used by the HA service and the FA for communications. The UDP port number can be any integer value between 1 and 65535. The default value is 434.

Required Information	Description
Mobile node re-registration requirements	Specifies how the system should handle authentication for mobile node re-registrations. The HA service can be configured as follows: • Always require authentication • Never require authentication (**NOTE:** the initial registration and de-registration will still be handled normally) • Never look for mn-aaa extension • Not require authentication but will authenticate if mn-aaa extension present
FA-to-HA Security Parameter Index Information	**FA IP address:** The HA service allows the creation of a security profile that can be associated with a particular FA. This specifies the IP address of the FA that the HA service will be communicating with. Multiple FA addresses are needed if the HA will be communicating with multiple FAs.
	Index: Specifies the shared SPI between the HA service and a particular FA. The SPI can be configured to any integer value between 256 and 4294967295. Multiple SPIs can be configured if the HA service is to communicate with multiple FAs.
	Secret: Specifies the shared SPI secret between the HA service and the FA. The secret can be between 1 and 127 characters (alpha and/or numeric). An SPI secret is required for each SPI configured.
	Hash-algorithm: Specifies the algorithm used to hash the SPI and SPI secret. The possible algorithms that can be configured are MD5 per RFC 1321 and keyed-MD5 per RFC 2002. The default algorithm is hmac-md5. A hash-algorithm is required for each SPI configured.

Required Information	Description
Mobile Node Security Parameter Index Information	**Index:** Specifies the shared SPI between the HA service and the mobile node(s). The SPI can be configured to any integer value between 256 and 4294967295. Multiple SPIs can be configured if the HA service is to communicate with multiple mobile nodes.
	Secret(s): Specifies the shared SPI secret between the HA service and the mobile node. The secret can be between 1 and 127 characters (alpha and/or numeric). An SPI secret is required for each SPI configured.
	Hash-algorithm: Specifies the algorithm used to hash the SPI and SPI secret. The possible algorithms that can be configured are MD5 per RFC 1321 and keyed-MD5 per RFC 2002. The default algorithm is hmac-md5. A hash-algorithm is required for each SPI configured.
	Replay-protection process: Specifies how protection against replay-attacks is implemented. The possible processes are nonce and timestamp. The default is timestamp with a tolerance of 60 seconds. A replay-protection process is required for each mobile node-to-HA SPI configured.
Maximum registration lifetime	Specifies the longest registration lifetime that the HA service will allow in any Registration Request message from the mobile node. The time is measured in seconds and can be configured to any integer value between 1 and 65535. An infinite registration lifetime can also be configured by disabling the timer. The default is 600.
Maximum number of simultaneous bindings	Specifies the maximum number of "care-of" addresses that can simultaneously be bound for the same user as identified by NAI and Home address. The number can be configured to any integer value between 1 and 5. The default is 3.
Default Subscriber Configuration	

Required Information	Description
"Default" subscriber's IP context name	Specifies the name of the egress context on the system that facilitates the PDN ports. **Important** For this configuration, the IP context name should be identical to the name of the destination context.

Simple IP Destination Context

The following table lists the information that is required to configure the optional destination context. As discussed previously, This context is only required if Reverse Tunneling is disabled in the FA service.

Table 4: Required Information for Destination Context Configuration

Required Information	Description
Destination context name	This is an identification string between 1 and 79 characters (alpha and/or numeric) by which the destination context will be recognized by the system. **Important** For this configuration, the destination context name should **not** match the domain name of a specific domain.
PDN Interface Configuration	
PDN interface name	This is an identification string between 1 and 79 characters (alpha and/or numeric) by which the interface will be recognized by the system. Multiple names are needed if multiple interfaces will be configured. PDN interfaces are configured in the destination context.
IP address and subnet	These will be assigned to the PDN interface. Multiple addresses and/or subnets are needed if multiple interfaces will be configured.
Physical port number	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. A single physical port can facilitate multiple interfaces.

Required Information	Description
Physical port description	This is an identification string between 1 and 79 characters (alpha and/or numeric) by which the physical port will be recognized by the system. Multiple descriptions are needed if multiple ports will be used. Physical ports are configured within the destination context and are used to bind logical PDN interfaces.
Gateway IP address(es)	Used when configuring static routes from the PDN interface(s) to a specific network.
IP Address Pool Configuration (optional)	
IP address pool name	Each IP address pool is identified by a name. The pool name can be between 1 and 31 alpha and/or numeric characters and is case sensitive. IP address pools are configured in the destination context(s). Multiple address pools can be configured within a single context.
IP pool addresses	An initial address and a subnet, or a starting address and an ending address, are required for each configured pool. The pool will then consist of every possible address within the subnet , or all addresses from the starting address to the ending address. The pool can be configured as public, private, or static.

System-Level AAA Parameter Configuration

The following table lists the information that is required to configure the system-level AAA parameters.

Table 5: Required Information for System-Level AAA Configuration

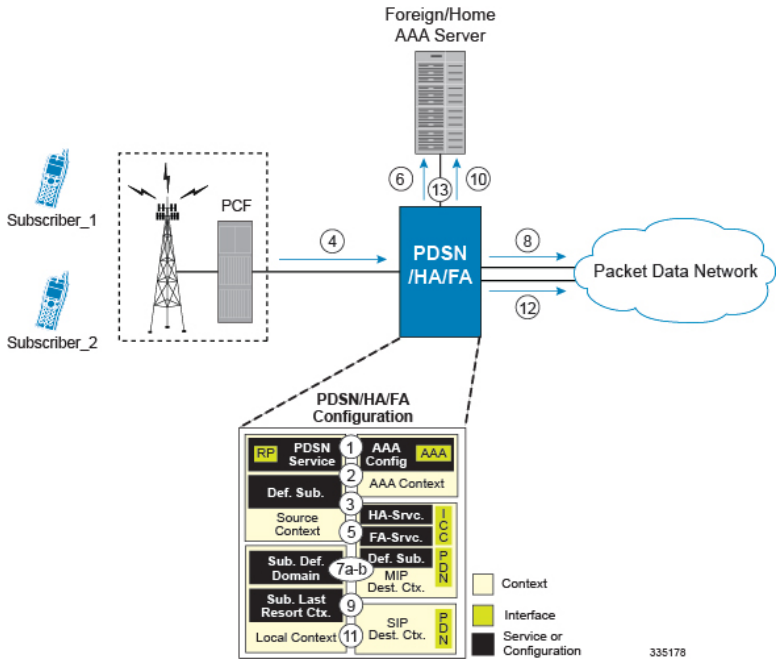
Required Information	Description
Subscriber default domain name	Specifies the name of a context that can provide AAA functions in the event that the domain-part of the username is missing or poorly formed. This parameter will be applied to all subscribers if their domain can not be determined from their username regardless of what domain they are trying to access. **Important** The default domain name can be the same as the source context.

Required Information	Description
Subscriber Last-resort context	Specifies the name of a context that can provide AAA functions in the event that the domain-part of the username was present but does not match the name of a configured destination context. This parameter will be applied to all subscribers if their specified domain does not match a configured destination context regardless of what domain they are trying to access. **Important** The last-resort context name can be the same as the source context.
Subscriber username format	Specifies the format of subscriber usernames as to whether or not the username or domain is specified first and the character that separates them. The possible separator characters are: • @ • % • - • \ • # • / Up to six username formats can be specified. The default is *username* @. **Important** The username string is searched from right to left for the separator character. Therefore, if there is one or more separator characters in the string , only the first one that is recognized is considered the actual separator. For example, if the default username format was used, then for the username string *user1@enterprise@isp1*, the system resolves to the username *user1@enterprise* with domain *isp1*.

How This Configuration Works

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 Simple IP data call.

Figure 2: Call Processing When Using the System as a PDSN, FA, and HA



In this example, *Subscriber1* is establishing a Simple IP data session, while *Subscriber2* is establishing a Mobile IP data session.

1. The system-level AAA settings were configured as follows:
   - Default domain name = *AAA*
   - Subscriber username format = *username @*
   - Last-resort context name = *AAA*
2. The Default Subscriber was configured with an IP context name of *SIP Destination.*
3. The Mobile IP FA context name parameter within the PDSN service was configured to the *MIP Destination* context.
4. Sessions for *Subscriber1* and *Subscriber2* are received by the PDSN service over the R-P interface from the PCF.
5. The PDSN service determines which context to use to provide foreign AAA functionality for each session. This process is described in the How the System Selects Contexts section located in the Understanding the System Operation and Configuration chapter of the *System Administration Guide*.

   For this configuration, the result of this process for both *Subscriber1* and *Subscriber2* would be that the system determines that AAA functionality should be provided by the *AAA* context.
6. The system would then communicate with the AAA server specified in the *AAA* context's AAA configuration to authenticate the subscribers.
7. Upon successful authentication, the PDSN service will take the following actions for *Subscriber1* and *Subscriber2*:

1. *Subscriber1*: The system will go through the process of determining which destination context to use for the subscriber session. This process is described in the How the System Selects Contexts section located in the Understanding the System Operation and Configuration chapter of the *System Administration Guide*. For this configuration, the system determines that the egress context is the *SIP Destination* context based on the configuration of the *Default* subscriber in the *Source* context.
2. *Subscriber2*: The system uses the Mobile IP FA context name configured within the PDSN service to determine what destination context facilitates the FA service. In this example, it determines that it must use the *MIP Destination* context and it passes the HA IP address to the FA service.

8. For *Subscriber1's session*, data traffic would then be routed through the PDN interface in the *SIP Destination* context.
9. For *Subscriber2*, the FA service then establishes a connection to the specified HA service through the ICC interface.
10. For *Subscriber2*, the system would then communicate with the AAA server specified in the *AAA* context\'s AAA configuration to authenticate the subscriber.
11. For *Subscriber2*, upon successful authentication, the *MIP Destination* context determines which destination context to use for the session and Mobile IP registration would be completed. This process is described in the How the System Selects Contexts section located in the Understanding the System Operation and Configuration chapter of the *System Administration Guide*.

    For this example, the *Source* context determines that the egress context is the *MIP Destination* context based on the configuration of the *Default* subscriber.
12. For *Subscriber2's session*, data traffic would then be routed through the PDN interface in the *MIP Destination* context.
13. Accounting messages for both sessions would be sent to the AAA server over the AAA interface in the *AAA* context.