Tekelec EAGLE® 5

Feature Manual - G-Flex® C7 Relay

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Chapter 1

Introduction

Topics:

This chapter contains general information about the G-Flex documentation, the organization of this manual, and how to get technical assistance.

Overview

This manual describes the configuration and operation of the G-Flex® C7 Relay (G-Flex) feature in the EAGLE 5 ISS (Integrated Signaling System). The G-Flex feature enables efficient Home Location Register (HLR) management in ITU networks, ANSI networks, Global System for Mobile communications (GSM) networks, and IS-41 networks. G-Flex optimizes the use of subscriber numbers and number ranges by providing a logical link between any MSISDN number or IMSI and an HLR. This arrangement allows subscribers to be moved easily from one HLR to another.

The following G-Flex-related functions are described in this manual:

- The G-Flex Relay function, which provides enhancements to GTT Processing such as number conditioning, discrimination between G-Flex Relay and GTT processing, and outgoing CdPA modification. See *G-Flex Relay Function Description*.
- *DigitAction Expansion*, which provides flexible rules for formatting the SCCP CdPA GTA field.
- *G-Flex SCCP Service Re-Route Capability*, which provides the ability to re-route the traffic from one EAGLE 5 ISS to other G-Flex nodes within an operator's network, and inform the originating nodes to re-route the G-Flex service-related traffic to other G-Flex service nodes.
- *G-Flex in an ANSI Environment*, which increases the DSM card transaction capacity from 850 TPS to 1700 TPS for G-Flex in an ANSI system.

G-Flex is optional on the EAGLE 5 ISS, and can be turned on, but not off, using a feature part number and a feature access key. G-Flex and North American LNP (Local Number Portability) are mutually exclusive on an EAGLE 5 ISS node. The Global Title Translations (GTT) feature is required for operation of the G-Flex feature.

This manual also describes the use of the G-Flex MAP Layer Routing feature to obtain subscriber digits from either the SCCP layer or MAP layer of a message for RTDB lookup.

Scope and Audience

This manual is intended for anyone responsible for installing, maintaining, and using the G-Flex feature in the EAGLE 5 ISS. Users of this manual and the others in the EAGLE 5 ISS family of documents must have a working knowledge of telecommunications and network installations.

Manual Organization

This document is organized into the following chapters:

- *Introduction* contains general information about the G-Flex documentation, the organization of this manual, and how to get technical assistance.
- *G-Flex C7 Relay (G-Flex) Feature* provides a functional description of G-Flex, including the G-Flex SCCP Service Re-Route Capability and use of G-Flex in an ANSI system.
- *G-Flex MAP Layer Routing (G-Flex MLR) Feature* describes the use of the G-Flex MAP Layer Routing feature.

- *EAGLE 5 ISS Commands* describes the EAGLE 5 ISS commands that can be used for G-Flex feature configuration functions.
- *G-Flex Feature Configuration* provides procedures for configuring the G-Flex feature, the G-Flex SCCP Service Re-Route Capability, ANSI G-Flex, and the G-Flex MAP Layer Routing feature for use in the EAGLE 5 ISS.
- *Measurements* describes G-Flex-related measurements, measurements reports, and methods of collection.
- *Maintenance* describes G-Flex-related UAMs and UIMs; commands that can be used for maintenance functions; and status and alarm reporting for the EAGLE 5 ISS, EPAP, Service Module cards, services, and the local subsystem.

Documentation Admonishments

Admonishments are icons and text throughout this manual that alert the reader to assure personal safety, to minimize possible service interruptions, and to warn of the potential for equipment damage.

Table 1: Admonishments

	**DANGER**: (This icon and text indicate the possibility of *personal injury*.)
	**WARNING**: (This icon and text indicate the possibility of *equipment damage*.)
	**CAUTION**: (This icon and text indicate the possibility of *service interruption*.)

Customer Care Center

The Tekelec Customer Care Center is your initial point of contact for all product support needs. A representative takes your call or email, creates a Customer Service Request (CSR) and directs your requests to the Tekelec Technical Assistance Center (TAC). Each CSR includes an individual tracking number. Together with TAC Engineers, the representative will help you resolve your request.

The Customer Care Center is available 24 hours a day, 7 days a week, 365 days a year, and is linked to TAC Engineers around the globe.

Tekelec TAC Engineers are available to provide solutions to your technical questions and issues 7 days a week, 24 hours a day. After a CSR is issued, the TAC Engineer determines the classification of the trouble. If a critical problem exists, emergency procedures are initiated. If the problem is not critical, normal support procedures apply. A primary Technical Engineer is assigned to work on the CSR and provide a solution to the problem. The CSR is closed when the problem is resolved.

Tekelec Technical Assistance Centers are located around the globe in the following locations:

Tekelec - Global

Email (All Regions): support@tekelec.com

- **USA and Canada**

  Phone:

  1-888-FOR-TKLC or 1-888-367-8552 (toll-free, within continental USA and Canada)

  1-919-460-2150 (outside continental USA and Canada)

  TAC Regional Support Office Hours:

  8:00 a.m. through 5:00 p.m. (GMT minus 5 hours), Monday through Friday, excluding holidays

- **Caribbean and Latin America (CALA)**

  Phone:

  USA access code +1-800-658-5454, then 1-888-FOR-TKLC or 1-888-367-8552 (toll-free)

  TAC Regional Support Office Hours (except Brazil):

  10:00 a.m. through 7:00 p.m. (GMT minus 6 hours), Monday through Friday, excluding holidays

  - **Argentina**

    Phone:

    0-800-555-5246 (toll-free)

  - **Brazil**

    Phone:

    0-800-891-4341 (toll-free)

    TAC Regional Support Office Hours:

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  - **Chile**

    Phone:

    1230-020-555-5468

  - **Colombia**

    Phone:

    01-800-912-0537

  - **Dominican Republic**

    Phone:

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    Phone:

    001-888-367-8552

- **Peru**

  Phone:

  0800-53-087

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  - **Software Solutions**

    Phone:

    +33 3 89 33 54 00

- **Asia**

  - **India**

    Phone:

    +91 124 436 8552 or +91 124 436 8553

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  - **Singapore**

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    TAC Regional Support Office Hours:

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In the event of a critical service situation, emergency response is offered by the Tekelec Customer Care Center 24 hours a day, 7 days a week. The emergency response provides immediate coverage, automatic escalation, and other features to ensure that the critical situation is resolved as rapidly as possible.

A critical situation is defined as a problem with the installed equipment that severely affects service, traffic, or maintenance capabilities, and requires immediate corrective action. Critical situations affect service and/or system operation resulting in one or several of these situations:

- A total system failure that results in loss of all transaction processing capability
- Significant reduction in system capacity or traffic handling capability
- Loss of the system's ability to perform automatic system reconfiguration
- Inability to restart a processor or the system
- Corruption of system databases that requires service affecting corrective actions
- Loss of access for maintenance or recovery operations
- Loss of the system ability to provide any required critical or major trouble notification

Any other problem severely affecting service, capacity/traffic, billing, and maintenance capabilities may be defined as critical by prior discussion and agreement with the Tekelec Customer Care Center.

Related Publications

For information about additional publications that are related to this document, refer to the *Related Publications* document. The *Related Publications* document is published as a part of the *Release Documentation* and is also published as a separate document on the Tekelec Customer Support Site.

Documentation Availability, Packaging, and Updates

Tekelec provides documentation with each system and in accordance with contractual agreements. For General Availability (GA) releases, Tekelec publishes a complete EAGLE 5 ISS documentation set. For Limited Availability (LA) releases, Tekelec may publish a documentation subset tailored to specific feature content or hardware requirements. Documentation Bulletins announce a new or updated release.

The Tekelec EAGLE 5 ISS documentation set is released on an optical disc. This format allows for easy searches through all parts of the documentation set.

The electronic file of each manual is also available from the *Tekelec Customer Support* site. This site allows for 24-hour access to the most up-to-date documentation, including the latest versions of Feature Notices.

Printed documentation is available for GA releases on request only and with a lead time of six weeks. The printed documentation set includes pocket guides for commands and alarms. Pocket guides may also be ordered separately. Exceptions to printed documentation are:

- Hardware or Installation manuals are printed without the linked attachments found in the electronic version of the manuals.
- The Release Notice is available only on the Customer Support site.

Note: Customers may print a reasonable number of each manual for their own use.

Documentation is updated when significant changes are made that affect system operation. Updates resulting from Severity 1 and 2 Problem Reports (PRs) are made to existing manuals. Other changes are included in the documentation for the next scheduled release. Updates are made by re-issuing an electronic file to the customer support site. Customers with printed documentation should contact their Sales Representative for an addendum. Occasionally, changes are communicated first with a Documentation Bulletin to provide customers with an advanced notice of the issue until officially released in the documentation. Documentation Bulletins are posted on the Customer Support site and can be viewed per product and release.

Locate Product Documentation on the Customer Support Site

Access to Tekelec's Customer Support site is restricted to current Tekelec customers only. This section describes how to log into the Tekelec Customer Support site and locate a document. Viewing the document requires Adobe Acrobat Reader, which can be downloaded at www.adobe.com.

1. Log into the *Tekelec Customer Support* site.

   Note: If you have not registered for this new site, click the **Register Here** link. Have your customer number available. The response time for registration requests is 24 to 48 hours.

2. Click the **Product Support** tab.
3. Use the Search field to locate a document by its part number, release number, document name, or document type. The Search field accepts both full and partial entries.
4. Click a subject folder to browse through a list of related files.
5. To download a file to your location, right-click the file name and select **Save Target As**.

Chapter 2

G-Flex C7 Relay (G-Flex) Feature

Topics:

This chapter describes the G-Flex C7 Relay (G-Flex) feature and the following related functions:

- DigitAction Expansion
- G-Flex SCCP Service Re-Route Capability
- G-Flex in an ANSI environment (ANSI G-Flex)

The chapter includes an overview of the EAGLE Provisioning Application Processor (EPAP). EPAP provides the Real Time Database (RTDB) that is used in the database lookup functions.

Introduction

This chapter describes the G-Flex C7 Relay (G-Flex) feature and the following related functions:

- The G-Flex Relay function
- DigitAction Expansion
- G-Flex SCCP Service Re-Route Capability
- G-Flex in an ANSI environment

The EPAP Provisioning Blacklist feature is described in *EPAP Provisioning Blacklist* and in the *EPAP Administration Manual*.

G-Flex Feature Description

In today's mobile networks, subscribers are assigned to Home Location Registers (HLRs) and AuCs (Authentication Centers) in blocks or ranges of subscriber numbers. These ranges are used by MSCs (Mobile Switching Centers) to route many types of signalling messages to HLRs/AuCs. In this document, the term HLR is used to include AuC, as applicable.

G-Flex allows an operator to flexibly assign individual subscribers to HLRs and route signaling messages accordingly, based on subscriber numbering.

The G-Flex C7 Relay node is located in the operator's C7/SS7 network between the MSCs and HLRs. It can also serve as the direct interface to other networks.

There are several types of numbers that identify subscribers, which are assigned by MSCs to HLR/AuCs using this range mechanism:

- MSISDN (Mobile Station International Integrated Services Digital Network) numbers, which use numbering plan E.164
- IMSI (International Mobile Subscriber Identity) numbers, which use numbering plan E.212
- MIN (Mobile Identification Number), which uses the E.164 numbering plan
- MDN (Mobile Directory Number), which uses the E.164 numbering plan

G-Flex optimizes the use of subscriber numbers and number ranges by providing a logical link between any MSISDN number or IMSI, and an HLR.

- Subscribers can be easily moved from one HLR to another.
- Each HLR can be filled to 100% of its capacity by allowing subscriber number ranges to be split over different HLRs and individual subscriber numbers to be assigned to any HLR.
- Subscriber number routing data is not required to be maintained in all MSCs in the network.

G-Flex is designed to alleviate problems in areas such as network load balancing and efficient use of HLR capacity. Today's rigid scheme for assigning subscribers to HLRs leads to several inefficiencies for network operators, as described in the following examples:

- When IMSI numbers, which identify the SIM (Subscriber Identity Module), get lost or are otherwise out of service, "holes" sometimes open in the IMSI ranges. These holes result in HLR capacity that cannot be used because switches will not be routing messages using those lost numbers anymore.

- In many cases, subscribers are "split" across multiple HLRs, as their IMSI range can point to a different HLR than their MSISDN range. Operators must take special steps to ensure that calls are not mishandled.
- With the advent of MNP (Mobile Number Portability), the MSISDN no longer indicates the subscription network. This leads to holes in the MSISDN ranges that address HLRs. As in the case with IMSIs, these MSISDN holes result in HLR capacity that cannot be used by existing MSC routing schemes.
- With the advent of MNP, operators need to handle message routing based on MSISDNs that are imported to the network from another operator and do not fit into the existing range mechanism.
- Prepaid service may result in the allocation of a large block of IMSIs to an HLR, many of which may not be put in service immediately.
- Corporate clients may reserve a large block of numbers that must be assigned to an HLR. Many of these may not be used immediately, or ever.

Number Conditioning

Incoming SCCP CdPAs (Called Party Numbers) destined for G-Flex processing are conditioned as follows to fit the RTDB lookup requirements where possible:

- If the G-Flex GTT selectors available in the incoming message match an entry in the Selector table, then the service Numbering Plan from the Selector table entry uses the CdPA Numbering Plan. Further conditioning is applied based on the CdPA Numbering Plan.
- If the G-Flex GTT selectors available in the incoming message match an entry in the Selector table, then the service Nature of Address from the Selector table entry uses the CdPA Nature of Address. Further conditioning is applied based on the CdPA Nature of Address.
- If the Nature of Address is National (Significant), the default CC (country code for E.164 or E.214) or default MCC (mobile country code for E.212) is prepended to the number for RTDB look up. The default country code to be used by the EAGLE 5 ISS must be previously provisioned in the GSMOPTS table. If not, a UIM (Unsolicited Information Message) is issued, and the message falls through to GTT.
- If the Nature of Address is Subscriber, the default CC + default NC (network code for E.164 or E.214) or default MCC + default MNC (for E.212) are prepended to the number. The default codes to be used by the EAGLE 5 ISS must be previously provisioned in the GSMOPTS table. If not, a UIM is issued, and the message falls through to GTT.
- If the Numbering Plan is E.214, the CC + NC part of the number is replaced with its corresponding MCC + MNC from the provisioned conversion data. If no matching CC + NC has been provisioned, a UIM is issued, and the message falls through to GTT.

Numbers with fewer than 5 digits after the conditioning are not processed by G-Flex. A UIM is issued, and the message falls through to GTT.

Numbers with more than 15 digits after the conditioning are not processed by G-Flex. A UIM is issued, and the message falls through to GTT.

G-Flex Call Flows

Several types of subscriber numbers can be used as a basis for routing messages to HLRs: IMSI, MSISDN, MIN, and MDN.

G-Flex handle the two types of IMSI routing:

- IMSI routing that uses the actual IMSI (an E.212 number)
- IMSI routing that uses the Mobile Global Title (MGT), which is an E.214 number derived from the IMSI

G-Flex also handles the MSISDN/MIN/MDN cases, which use the E.164 numbering plan. The call flows in this section address these three cases.

The call flows in this section show only one possible scenario for how messages are routed in the network and where various stages of GTT are performed. G-Flex C7 Relay may perform intermediate or final GTT and/or replace the SCCP (Signaling Connection Control Part) CdPA (Called Party Address) with the HLR entity address, depending on the message received and provisioned data. All call flows here assume that G-Flex C7 Relay is integrated with the EAGLE 5 ISS.

Note: In GSM networks, each network entity (for example, MSC, HLR, VLR [Visitor Location Register]) is identified by an E.164 entity address. GSM networks also route messages based on E.164 entity addresses when those addresses are known by the sender. While the routing of these messages must also be handled by G-Flex C7 Relay, this function is not considered to be a core part of G-Flex. Because these numbers are not expected to be populated in the G-Flex data, messages routed using these addresses should fall through to normal or enhance) GTT (Global Title Translation). Therefore, call flows for this type of routing are not described here.

MGT (E.214) Routing

The partial Update Location procedure shown in *Figure 1: E.214 (E.212) Routing Example - Location Updating* is an example of E.214 mobile global title routing. MGT is employed in situations where the E.164 address of the receiving node (labeled HLRB) is not yet known by the sending node (labeled VLRA).

In order to update information about the subscriber's location, VLRA sends a MAP (Mobile Application Part) Update_Location message to the G-Flex Relay (possibly through a Gateway Mobile Switching Center).

The steps in *Figure 1: E.214 (E.212) Routing Example - Location Updating* are cross-referenced in the following procedure.

1. The message is received at the G-Flex Relay. Global title information triggers G-Flex processing. Because the SCCP CdPA contains an E.214 number, G-Flex first converts the E.214 number to an international E.212 number before searching the EAGLE 5 ISS Real Time Database (RTDB) with the E.212 number (Step 1). G-Flex also handles the case where an E.212 number is received in the SCCP CdPA. In this case, the database is searched directly using the E.212 number.
2. G-Flex finds a match with HLR GT information and routes the message to the designated DPC (HLRB) (Step 2).
3. HLRB responds to VLRA with an Update_Location `ack`. This message has the E.164 address of VLRA in the SCCP CdPA and is routed by normal or enhanced GTT, not G-Flex (Step 3).
4. The message is relayed to VLRA (Step 4).

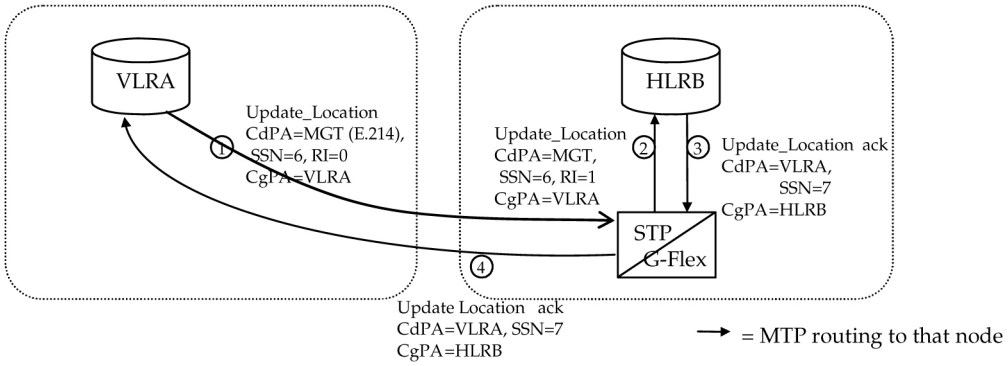

Figure 1: E.214 (E.212) Routing Example - Location Updating

There are other MAP messages from VLR to HLR that also fall into this category of requiring E.214 global title routing. All of these messages are handled the same way by G-Flex, using the process described above.

IMSI (E.212) Routing

G-Flex processing for a message routed with an E.212 number in the SCCP CdPA GTA (Global Title Address) is essentially the same as the processing for a message routed with an E.214 number. The only difference is that the number does not have to be converted to E.212 (since it is already E.212) before doing the database lookup. Therefore, those call flows are not shown here.

MSISDN/MIN/MDN (E.164) Routing

A mobile terminated call results in the GMSC (Gateway Mobile Switching Center) querying the HLR through the use of the called number as a GTA. G-Flex is used to locate the appropriate HLR. The partial mobile terminated call procedure shown in *Figure 2: Mobile Terminated Call* is an example of MSISDN global title SCCP addressing. This applies to MIN and MDN routing numbers as well.

The steps in *Figure 2: Mobile Terminated Call* are cross-referenced in the following procedure.

1. A call is originated and an IAM (Initial Address Message) is sent from the originating network to the subscription network (Step 1).
2. Digit analysis at GMSCB detects a mobile terminated call to a mobile station and generates a MAP Send_Routing_Info (SRI) message to the G-Flex Relay (Step 2).
3. The EAGLE 5 ISS receives the message. Global title information triggers G-Flex processing. Since the SCCP CdPA contains an E.164 number, G-Flex searches the RTDB with the E.164 number, which must be converted to an international number if it is not one already. The G-Flex finds a match with HLR GT information and routes the message to the designated DPC (HLRB) (Step 3).
4. HLRB responds to GMSCB with an SRI `ack`. This message has the E.164 address of GMSCB in the SCCP CdPA, and is routed by normal or enhanced GTT, not G-Flex (Step 4).
5. The message is relayed to GMSCB (Step 5).
6. GMSCB sends an IAM containing the MSRN (Mobile Station Roaming Number) to the visited network (Step 6).

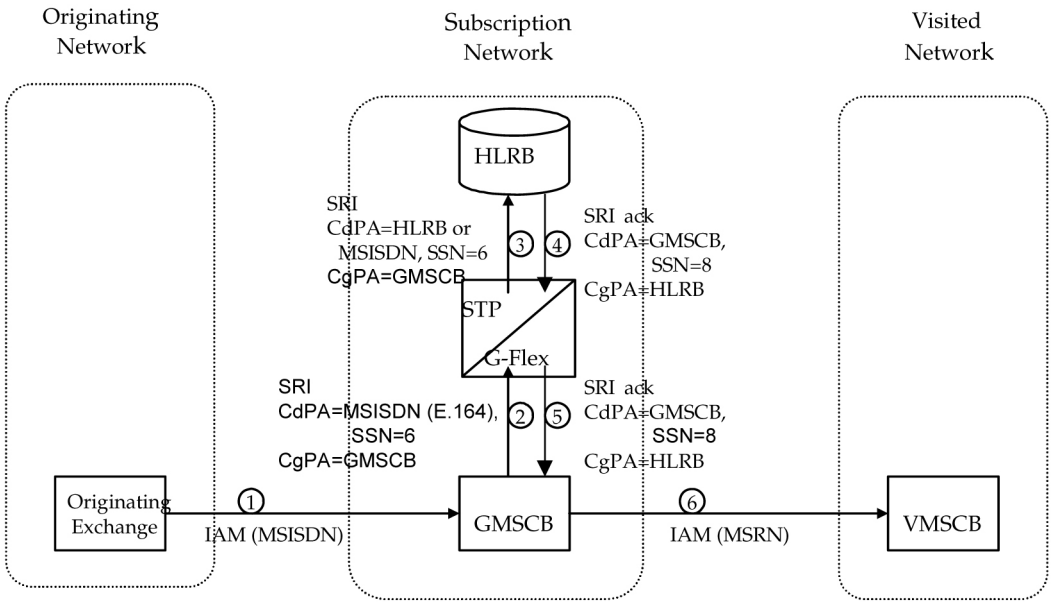

Figure 2: Mobile Terminated Call

Other MAP messages that are routed using MSISDN/MIN/MDN global title routing to an HLR are handled the same way by G-Flex. This includes mobile terminated short messages.

G-Flex Relay Function Description

The G-Flex Relay Function (G-Flex Relay) provides the following enhancements to EAGLE 5 ISS GTT:

- **Increased number of translations** – The GTT limit is 270,000 total translations. With G-Flex Relay, the number is millions. However, G-Flex Relay translations are only from international MSISDNs and IMSIs to HLRs.
- **Number conditioning** – Because the RTDB stores MSISDNs and IMSIs as international numbers and does not store MGTs, G-Flex provides the capability to condition incoming numbers to be international MSISDNs or IMSIs for the database look up.
- **Provides discrimination of messages that need its functionality** – Because G-Flex is used only for translating to HLRs, it provides a method to identify which messages are processed by G-Flex Relay and which by. GTT. This is provided using a G-Flex Service Selector table that defaults back to the GTT Selector table if a match is not found, and by providing SSN-based discrimination.
- **Variable number of digits** – There is no fixed number of digits for MSISDNs or IMSIs. For example, a 12-digit MSISDN can coexist with a 15-digit one. However, the number of digits of the stored numbers must be between 5 and 15.
- **Replacement of GT with entity address** – The ability to set the outgoing CdPA GT (NP, NAI, ES, GTAI) to the HLR international entity number is provided.

Figure 3: G-Flex in SCCP shows the basic functioning of SCCP, with the parts for G-Flex in bold.

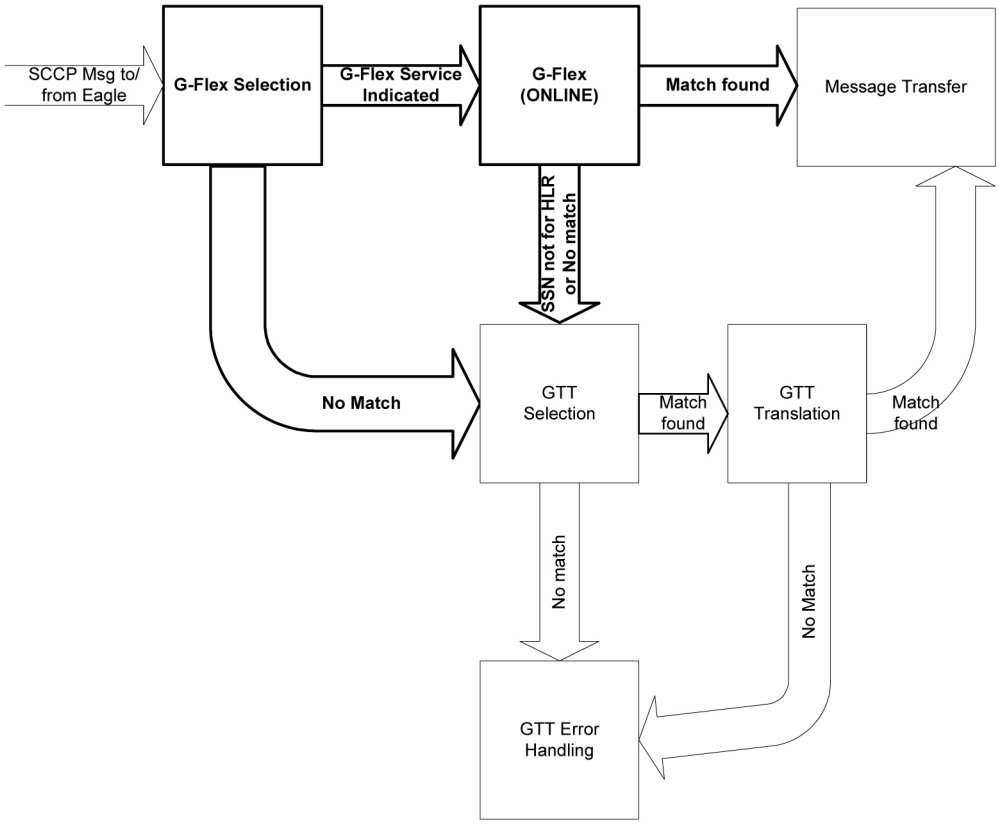

Figure 3: G-Flex in SCCP

In order to keep the diagram simple, the only error conditions shown are the no-match cases for G-Flex and GTT selectors and translations. G-Flex has its own error handling for some cases that issues UIMs and peg measurements appropriately before letting the MSU fall through to GTT translation. Also, there are error conditions in GTT selection, GTT translation, and message transfer that are handled by GTT error handling.

G-Flex Relay is performed in the following stages.

1. The message arrives at EAGLE 5 ISS Route-on-GT. The EAGLE 5 ISS decodes the SCCP portion and uses the data to perform G-Flex selection based on the CdPA GT fields other than the ES and GTAI. The result of this selection provides two pieces of data, identification of the NP and NAI for G-Flex and a G-Flex Service Indicator. The Service Indicator is G-Flex if G-Flex Relay is required. If a G-Flex selector does not match the incoming GT fields, then GTT selection is attempted. It is possible that G-Flex and GTT selectors will not match the incoming GT fields. In this case, GTT error handling is used.
2. If stage 1 indicates that G-Flex Relay is required and if the message is not a UDTS-generated by the EAGLE 5 ISS, the EAGLE 5 ISS performs SSN-based discrimination. If the G-Flex service state is ONLINE, then step 3 is performed. Otherwise, G-Flex SCCP Service Re-Route is performed.
3. The conditioned number is looked up in the RTDB.
4. If the number is found, the translation data for the number is used to alter and route the message.
5. If G-Flex Relay is not required, or the number is not found in the RTDB, the set of GTT translations is used for translation.

Table 2: G-Flex Relay Data Combinations lists possible combinations for G-Flex selector and G-Flex data provisioning, and the resulting action of G-Flex Relay.

Table 2: G-Flex Relay Data Combinations

G-Flex Selector Matches Incoming GT	Number in RTDB	EAGLE 5 ISS Action
No	N/A	GTT used
Yes	No	Fall-through to GTT
Yes	Yes	G-Flex translation

G-Flex Relay is divided into the following subtasks:

- Conversion of national/local numbers to international numbers
- Conversion of E.214 MGT to E.212 international IMSI
- RTDB lookup
- Message forwarding
- Error handling

Conversion of National/Local Numbers to International Numbers

G-Flex stores international DNs and IMSIs in the RTDB. SCCP CdPA numbers may need to be converted to international numbers in order to do an RTDB lookup. When a message needs G-Flex Relay and has either a national (significant) number or Subscriber Number as the Service NAI, then the national/local to international number conversion is triggered. G-Flex uses the SCCP CdPA GTAI number and its SNAI to convert to an international number based on the numbering plan. See *Table 3: National/Local Numbers to International Numbers Conversion Logic*.

Table 3: National/Local Numbers to International Numbers Conversion Logic

Service Numbering Plan	Service Nature of Address	Action
E.164	National (Significant) number	Prepend GTAI digits with the default E.164 Country Code (CC).
E.164	Subscriber number	Prepend GTAI digits with the default E.164 country code (CC) and network code (NC).
E.212	National (Significant) number	Prepend GTAI digits with the default mobile country code (MCC).

Service Numbering Plan	Service Nature of Address	Action
E.212	Subscriber number	Prepend GTAI digits with the default Mobile Country Code (MCC) and Mobile Network Code (MNC).
E.214	National (Significant) number	Prepend GTAI digits with the default E.164 Country Code (CC).
E.214	Subscriber number	Prepend GTAI digits with the default E.164 Country Code (CC) and Network Code (NC).
Other	N/A	Assume the default to be E.164 International number

Notes:

- If any of the default CC, NC, MCC, or MNC are required for conversion and are not provisioned in the database, G-Flex Relay issues a UIM and falls through to GTT.
- If the converted number is fewer than five digits, G-Flex Relay falls through and performs GTT on the message. G-Flex Relay issues a UIM when a converted number is fewer than five digits.
- If the converted number is more than 15 digits, then G-Flex Relay issues a UIM when the number exceeds 15 digits and falls through to GTT.
- G-Flex Relay uses the conditioned number for database lookup purposes only and does not modify the CdPA GTAI in the message unless rcgta=yes or ccgt=yes.
- For the G-Flex selector-specified service numbering plan (IMSI, DN, or MGT), the numbering plan in the incoming message is replaced with the G-Flex Selector service numbering plan (E.164, E.212, or E.214, respectively). This is for RTDB lookup purposes only.

Conversion of E.214 MGT to E.212 IMSI

Because the RTDB does not store MGTs, the messages with E.214 MGT in the CdPA GTAI are converted to an E.212 International IMSI in order to perform the RTDB lookup. G-Flex maintains a logical MGT2IMSI conversion table to perform this conversion. The MGT2IMSI conversion table contains up to ten entries of E.164 part (CC + NC digits) and its corresponding E.212 part (MCC + MNC). If a G-Flex message has E.214 as the CdPA numbering plan, G-Flex Relay performs the following steps to derive the E.212 International IMSI:

1. G-Flex Relay uses MGT as the key and does a lookup in the MGT2IMSI conversion table to find a match on E.164 part (CC + NC digits).
2. If a match is found, G-Flex Relay replaces the matched digits of the MGT with the corresponding E.212 part (MCC + MNC digits). If a match is not found, a UIM is issued and the G-Flex Relay falls through to GTT.
3. G-Flex Relay uses this complete E.212 International IMSI number to do the RTDB lookup.

Note: If the IMSI for a particular country/network is the complete 15 digits and the E.164 CC + NC for that country is more than five digits, the MGT generated could contain a truncated MSIN. This is

possible because the converted MGT is more than 15 digits and the maximum number of digits allowed in the MGT is 15 digits. (Refer to E.214 for more details on conversion.) Under these circumstances, the MGT is truncated at 15 digits. Therefore, the MGT-to-IMSI reconversion would not regenerate a complete IMSI and would lead to incorrect results and errors.

RTDB Lookup

G-Flex Relay performs the RTDB lookup using either the complete international DN or IMSI. If the DN or IMSI number is found in the RTDB and it has an HLR translation, then G-Flex Relay extracts the HLR translation data and generates a forwarding message. G-Flex Relay falls through and performs GTT for the following error cases:

- The DN number is not present in the database.
- The IMSI number is not present in the database.

The preceding error cases do not generate any UIM or UAM, but fall through to GTT processing.

If the RTDB lookup is for GTI=2 and is an even number of digits ending in 0, then G-Flex performs a less than or equal to lookup for the odd number of digits (digit length minus 1). If a match is found, G-Flex saves the record and record index.

G-Flex then tries to continue to find an exact match on the even number of digits. If the exact match is found in the RTDB, then the HLR translation data corresponding to the even number of digits record is used. Otherwise the HLR translation data corresponding to the found odd number of digits record is used. If the even and odd translation is not found, then the G-Flex Relay falls through and performs GTT.

The important issue is that the less than or equal to search re-enters the search where the comparison left off. This minimizes any impact on performance for this special case.

Message Forwarding

GFRF Forwarding Message: MTP Portion

G-Flex modifies the MTP routing label to include the HLR PC as the DPC and the EAGLE 5 ISS true PC as the OPC. G-Flex modifies the MTP Level 2 length based on the size of the forwarding message. *Table 4: G-Flex Relay Forwarding Message: MTP Portion* lists the fields modified by G-Flex Relay.

Table 4: G-Flex Relay Forwarding Message: MTP Portion

Fields	Values
MTP Level 2 length	Number of octets in response MSU starting from MTP3 SIO field. If number of octets is greater than 63, Level 2 length is set to 63
MTP Level 3 DPC	Point code obtained from the HLR GT information in RTDB
MTP Level 3 OPC	EAGLE 5 ISS true PC

G-Flex Relay Forwarding Message: SCCP Portion

The following functions are performed for the SCCP portion of the message:

Replacing the CdPA GTAI digits with the HLR entity number

When an MSISDN or IMSI number is found in the RTDB and the Replace GT flag is set for this entry, G-Flex Relay replaces the CdPA GTAI digits with the provisioned HLR entity number. G-Flex also modifies the numbering plan (E.164), nature of address (international), and encoding scheme to match the HLR entity number.

G-Flex Relay does not replace the Global Title Indicator format (GTI) element of the GT.

Replacing of SSN in the CdPA

When the HLR translation data includes a SSN, G-Flex Relay replaces the SSN in the called party address of the message with the new SSN. If the SSN is not present in the incoming message, then G-Flex Relay updates the Subsystem Number Indicator and includes the new SSN in the Called Party Address of the message before it forwards the message to the next node.

Inclusion of OPC in the CgPA

When the routing indicator of the calling party address is set to Route-on-SSN, and no SPC is present in it, the OPC from the received message is taken and inserted into the CgPA before the message is forwarded to the next node.

Deleting the CdPA GT Digits

When G-Flex performs Final-GTT, the Routing Indicator of the Called Party Address is set to Route-on-SSN. G-Flex provides an option to delete the Global Title present in the Called Party Address. If the Delete GT option is set, G-Flex modifies the GTI to zero and deletes the GT information from the SCCP CdPA before the message is forwarded to the end node. *Table 5: G-Flex Relay Forwarding Message: SCCP Portion* summarizes the possible changes by G-Flex Relay to the SCCP fields.

Table 5: G-Flex Relay Forwarding Message: SCCP Portion

Field	Value
SCCP CdPA Length	New CdPA length after the possible modifications
SCCP CdPA Routing indicator	Routing Indicator obtained from the RTDB. (GT or DPCSSN)
SCCP CdPA Global Title Indicator	Same as incoming message or zero
SCCP CdPA Subsystem Number Indicator	Same as incoming message or replaced/inserted with the subsystem number indicator based on the existence of the SSN provisioned in the HLR translation
SCCP CdPA SSN	Same as incoming message or replaced/inserted with the SSN provisioned in the HLR translation

Field	Value
SCCP CdPA GT	Same as incoming message or replaced or deleted with HLR entity address provisioned in the RTDB
SCCP CgPA Length	New CgPA length after the possible modifications
SCCP CgPA Point Code Indicator	Same as incoming message *or* if CgPA RI is Route-on-SSN and PCI is not 1, then set PCI to 1
SCCP CgPA SPC	If the CgPA RI is Route-on-SSN and no point code is present in the CgPA SPC, then the OPC is included as the SPC (Secondary Point Code)
SCCP CdPA Subsystem Number Indicator	Same as incoming message or replaced/inserted with the Subsystem Number indicator based on the existence of the SSN provisioned in the HLR translation

Error Handling

The purpose of the Error Handling is to discard or return messages that encounter routing and database failures and cannot be delivered to the HLR. When G-Flex Relay is unable to transfer a message and Return on Error is set, then G-Flex Relay follows the same error handling procedures used by GTT. The DATA field of the UDT message and the reason cause for return are included in UDTS message.

G-Flex Relay follows the same error handling procedures as GTT for the following error cases:

- Routing failures
- Network congestion

Forwarding message after replace GT and/or Insertion of OPC or SSN is greater than the CCS7 message limit (272 bytes).

An exception to GTT error handling is when the G-Flex Relay RTDB entry cannot be found. In this case, it is not considered an error and the G-Flex Relay capability will forward the message to GTT processing.

MTP-Routed SCCP Message Processing

An MTP-routed message is a “through-switched” message that is not generated by or destined to the EAGLE 5 ISS (neither the MTP OPC nor DPC is the EAGLE 5 ISS true point code or capability point code). An MTP-routed message is routed to the destination designated by the DPC of the MTP3 routing label.

Typically, MSUs that receive service on a Service Module card require the message to be GT-routed to the EAGLE 5 ISS, so that GTT service selector-based discrimination can be applied to the message to select a specific service (such as GFLEX).

When the MTP Routed Messages for SCCP Applications (MTP Msgs for SCCP Apps) feature is on, it forwards all incoming MTP-routed SCCP messages (SI=3 in the message) from LIM cards to Service

Module cards for processing. The feature is available system-wide and can be enabled and turned on when the GTT feature is turned on.

If the MTP-routed message arrives with the CdPA RI=GT or RI=SSN, and the CdPA GTI=2 (ANSI) or GTI=2 or 4 (ITU), service selection is performed.

- If the GFLEX service is selected, then the message is handled by the GFLEX service and the message processing is the same as that used for GT-routed messages.
- If the service selection does not find a match, or if the service is OFFLINE, then the message is MTP-routed.

Service re-route is not performed on MTP-routed messages.

The GFLEX service is not supported for MTP-routed messages that contain SCCP CdPA GTI=0.

G-Flex Configuration Options

The GSMOPTS table contains configuration option values for the G-Flex feature and the G-Flex MAP Layer Routing (G-Flex MLR) feature. The GSMOPTS option data is loaded to the LIM cards and to Service Module cards that contain the RTDB database. The configuration option values influence number conditioning, response message formatting and generation, and G-Flex MLR processing.

The GSMOPTS options described in *Table 6: GSMOPTS Configuration Options for G-Flex and G-Flex MLR* can be provisioned only after the G-Flex feature and the G-Flex MLR feature are enabled and turned on.

Table 6: GSMOPTS Configuration Options for G-Flex and G-Flex MLR

Parameter	Value	Description	Notes
CCNC - Country Code and Network Code	2-8 digits		Mandatory when the MCCMNC parameter is specified.
DEFMCC - E.212 Default Mobile Country Code	3 hexadecimal digits, NONE		The value NONE deletes the current parameter value.
DEFMNC - E.212 Default Mobile Network Code	1-4 hexadecimal digits, NONE		The value NONE deletes the current parameter value.
MCCMNC - E.212 Mobile Country Code and Mobile Network Code	4-7 hexadecimal digits, NONE	Specifies the CgPN NAI that is used during number conditioning.	The value NONE deletes the current parameter value.
GFLEXMAPLAYERRTG - Type of G-Flex MLR to be performed (see *G-Flex MAP Layer Routing*)	NONE	G-Flex MLR is not performed.	The G-Flex MLR feature must be on to specify this parameter.
	IMSI	Use the IMSI parameter value for RTDB lookup.	

Parameter	Value	Description	Notes
	MSISDN	Use the MSISDN parameter value for RTDB lookup.	
	ALL	Use the IMSI or the MSISDN parameter value for RTDB lookup, based on the message operation code.	
MAPLYRRTGON MAPLYRRTGOFF - Perform (ON) or do not perform (OFF) G-Flex MLR for each specified operation or all operations (see *G-Flex MAP Layer Routing*)	REGSS	Perform (ON) or do not perform (OFF) G-Flex MLR processing for the registerSS operation.	The G-Flex MLR feature must be on to specify these parameters.
	ACTSS	Perform (ON) or do not perform (OFF) G-Flex MLR processing for the activateSS operation.	
	DACTSS	Perform (ON) or do not perform (OFF) G-Flex MLR processing for the deactivateSS operation.	
	INTROSS	Perform (ON) or do not perform (OFF) G-Flex MLR processing for the interrogateSS operation.	
	AUTHFAILRPT	Perform (ON) or do not perform (OFF) G-Flex MLR processing for the authenticationFailureReport operation.	
	RSTDATA	Perform (ON) or do not perform (OFF) G-Flex MLR processing for the restoreData operation.	
	PROCUNSTRQT	Perform (ON) or do not perform (OFF) G-Flex MLR processing for the processUnstructuredSS-Request operation.	
	RDYFORSM	Perform (ON) or do not perform (OFF) G-Flex MLR processing for the readyForSM operation.	

Parameter	Value	Description	Notes
	PURGMOBSS	Perform (ON) or do not perform (OFF) G-Flex MLR processing for the purgeSS operation.	
	SRILOC	Perform (ON) or do not perform (OFF) G-Flex MLR processing for the sendRoutingInfoForLCS operation.	
	ALL	Perform (ON) or do not perform (OFF) G-Flex MLR processing for all 10 of the listed operations.	

DigitAction Expansion

DigitAction Expansion provides more flexibility to formulate the SCCP (SCCP) Called Party Address (CdPA) Global Title Address (GTA) field of the MAP messages relayed by G-Flex.

Without DigitAction Expansion, G-Flex supports four options (none, insert, prefix, and replace) to overwrite the SCCP CdPA GTA field. With DigitAction Expansion, four additional options (delcc, delccprefix, spare1, and spare2) are included to overwrite the SCCP CdPA GTA field.

DigitAction Expansion is provisioned using the PDBI Enter Network Entity or Update Network Entity commands. DigitAction Expansion can also be modified using the **Add an NE** and **Update an NE** EPAP GUI screens.

The rules for formatting the SCCP CdPA GTA field are based on the value specified in the DigitAction field. If DigitAction = none, the EAGLE 5 ISS does not overwrite the SCCP CdPA GTA. For all other values, the EAGLE 5 ISS formats the SCCP CdPA GTA according to the value assigned to DigitAction. See *Table 7: DigitAction Applications* for examples of DigitAction Expansion on the SCCP CdPA GTA of an outgoing message when the Entity ID = 1404 and the default country code = 886.

Table 7: DigitAction Applications

DigitAction	Value in Incoming CdPA GTA	Value in Outgoing CdPA GTA	Meaning
none	886944000213	886944000213	No change to the Called Party GTA (default)
prefix	886944000213	1404886944000213	Prefix Called Party GTA with the entity id
replace	886944000213	1404	Replace Called Party GTA with the entity ID

DigitAction	Value in Incoming CdPA GTA	Value in Outgoing CdPA GTA	Meaning
insert	886944000213	8861404944000213	Insert entity ID after country code. (CC + Entity Id + NDC + SN)
delccprefix	886944000213	1404944000213	Delete country code and add prefix (No action is taken if country code is not present.)
delcc	886944000213	944000213	Delete country code
spare1	886944000213	treated as none	No change to the Called Party GTA (default)
spare2	886944000213	treated as none	No change to the Called Party GTA (default)

Digit Action DELCCPREFIX

The Digit Action to delete country code if present and prefix database entity feature allows the DELCCPREFIX Digit Action to be applied to the Called Party Global Title Address (CdPA GTA) when the GTA has a National format, as well as when the GTA has an International format. The DELCCPREFIX option in the SCCPOPTS table specifies how the DELCCPREFIX digit action is applied to a Called Party Global Title Address (CdPA GTA).

- When the SCCPOPTS:DELCCPREFIX option is set to PFXWCC, the DELCCPREFIX digit action is applied to the CdPA GTA only when the address has a International format. The Country Code is deleted and the GTA is prefixed with the Entity ID.
- When the SCCPOPTS:DELCCPREFIX option is set to PFX4ALL, the DELCCPREFIX digit action is applied to the CdPA GTA in all cases. For an International format, the Country Code is deleted and the GTA is prefixed with the Entity ID. For a National format, the GTA is prefixed with the Entity ID.

The `chg-sccpopts` command is used to specify the `delccprefix` parameter value to configure the DELCCPREFIX Digit Action functionality.

G-Flex SCCP Service Re-Route Capability

G-Flex SCCP Service Re-Route Capability provides the ability to re-route the traffic from one EAGLE 5 ISS to other G-Flex nodes within an operator's network, and inform the originating nodes to re-route the G-Flex service related traffic to other G-Flex service nodes. The following functions are used to provide G-Flex re-routing capability:

- Service Capability Point Codes
- Service State
- Service Re-routing (using alternate point codes and a configuration option)

Service State

G-Flex SCCP Service Re-Route Capability provides an option to change the state of the G-Flex service to OFFLINE or ONLINE. The service state is persistent. Booting the OAM or all of he Service Module cards would not change the service state. The service state must be manually changed .

- The G-Flex service state defaults to OFFLINE when the G-Flex feature is turned on in the system. The service must be set to ONLINE and at least one Service Module card must be IS-NR (In-Service-Normal) before G-Flex processing occurs in the system.
- The G-Flex service can be taken OFFLINE at any time, such as when the databases are incoherent or Service Module cards need to be reloaded for some reason. Taking the service OFFLINE causes processing of G-Flex traffic to stop and allows a controlled re-routing procedure to be performed. A Critical UAM is generated as a warning that the G-Flex service is disabled because it has been taken OFFLINE.

Service Re-routing

Service re-routing is optional and does not affect normal G-Flex processing.

Service re-routing can be enabled by using the `chg-sccp-serv` command to define a list of alternate PCs or to set the GTT option to YES. Re-routing is initiated by taking a service OFFLINE.

- If alternate PCs are provisioned any messages destined to that service would be re-routed to available alternate PCs defined for that service. Up to 7 alternate point codes per domain can be defined. ANSI, ITU-I, ITU-N, ITU-I spare, ITU-N spare, and ITU-N24 domains are supported. An entire set of alternate point codes is called a Re-route set. Intermediate GTT loadsharing rules apply to the Alternate PC Re-route set.
- The GTT option is used if alternate PCs are not provisioned or none of them are available. If the GTT option value is YES (the default), then messages destined to that service would fall through to GTT as part of the re-routing procedure.

Service Capability Point Codes

One or more G-Flex Capability Point Codes (CPC) can be provisioned when the G-Flex feature is on. The Capability Point Code is used to distinguish G-Flex messages from other types of messages, so that the G-Flex service OFFLINE state can be reported by sending response method TFPs to G-Flex nodes. (Response method TFx messages are not generated if CPCs are not used.)

The service CPCs aid the adjacent nodes in knowing about a service outage. When a service is taken OFFLINE and capability point codes are defined for the service, the following actions occur for all traffic destined to the service node:

- A response method TFP message is generated to the adjacent node about the service CPC.
- The TFP response to the adjacent node causes the traffic-originating nodes to stop sending service traffic to this node.
- All service traffic coming into this node is sent to the alternate service nodes.
- Adjacent nodes initiate route-set-test procedures after receipt of the TFP.

If the messages are destined to the EAGLE 5 ISS true point code, then TFP messages are not generated when a service is OFFLINE, and the originator would not be aware of the outage.

After the service is back ONLINE in the EAGLE 5 ISS, a TFA message is sent to the traffic-adjacent nodes in response to route-set-test message. The traffic-originating nodes then start sending service traffic to this node.

G-Flex Re-Route Message Handling

Table 8: G-Flex SCCP Re-Route Message Handling Summary shows the actions that the EAGLE 5 ISS takes with the G-Flex service is OFFLINE, a message requiring G-Flex service arrives at the affected node, and Service Module cards are available.

Table 8: G-Flex SCCP Re-Route Message Handling Summary

DPC	Alternate PC Defined and Available	GTT to be Performed as Fall Through	Message Handling	Network Management
G-Flex CPC	Yes	N/A	Rer-oute to alternate PC based on Relative Cost (RC)	TFP concerning CPC
G-Flex CPC	No (Defined, and prohibited or congested)	Yes	Fall through to and perform GTT	TFP concerning CPC
G-Flex CPC	No (Defined, and prohibited or congested)	No	Generate UDTS (Return Cause = Network Failure)	TFP concerning CPC
G-Flex CPC	Not Defined	Yes	Fall through to and perform GTT	TFP concerning CPC
G-Flex CPC	Not Defined	No	Generate UDTS (Return Cause = No xlation for this addr)	TFP concerning CPC
True or Secondary PC or non-G-Flex CPC	Yes	N/A	Re-route to alternate PC based on Relative Cost (RC)	None
True or Secondary PC or non-G-Flex CPC	No (Defined, and prohibited or congested)	No	Generate UDTS (Return Cause = Network Failure)	None
True or Secondary PC or non-G-Flex CPC	No (Defined, and prohibited or congested)	Yes	Fall through to and perform GTT	None
True or Secondary PC or non-G-Flex CPC	Not Defined	Yes	Fall through to and perform GTT	None
True or Secondary PC or non-G-Flex CPC	Not Defined	No	Generate UDTS (Return Cause = No xlation for this addr)	None

Table 9: G-Flex LIM Card Re-Route Message Handling Summary shows the actions of LIM re-route functions when Service Module cards are unavailable or down.

Note: G-Flex does not support Rt-on SSN.

* If some Service Module cards are available but are overloaded, this is considered a partial failure.

Table 9: G-Flex LIM Card Re-Route Message Handling Summary

Routing Indicator in Incoming Message	DPC	Full or Partial Failure	G-Flex Service Status	Message Handling	Network Management
Rt-on-GT	G-Flex CPC	Full	N/A	Generate UDTS	TFP concerning CPC, UPU
Rt-on-GT	Non-G-Flex CPC	Full	N/A	Generate UDTS	TFP concerning CPC, UPU
Rt-on-GT	True PC	Full	N/A	Generate UDTS	UPU
Rt-on-GT	G-Flex CPC	Partial*	ONLINE	Generate UDTS	None
Rt-on-GT	True PC or non-G-Flex CPC	Partial*	ONLINE	Generate UDTS	None
Rt-on-GT	G-Flex CPC	Partial*	OFFLINE	Generate UDTS	TFP concerning CPC, UPU (ITU only)
Rt-on-GT	True PC or non-G-Flex CPC	Partial*	OFFLINE	Generate UDTS	None
Rt-on-SSN	G-Flex CPC	N/A	N/A	Generate UDTS	None

Route-Set-Test Messages

When the G-Flex service is OFFLINE,

- If a Route-Set-Test Message - Prohibited (RSP) is received for a G-Flex CPC, the EAGLE 5 ISS does not reply.
- If a Route-Set-Test Message - Restricted (RSR) is received for a G-Flex CPC, the EAGLE 5 ISS replies with a TFP concerning the CPC.

When the G-Flex service is ONLINE and at least one Service Module card is in the IS-NR state, the EAGLE 5 ISS replies with a TFA message to RSRs and RSPs for the G-Flex CPC.

Gateway Screening and GSM MAP Screening

Gateway Screening and GSM MAP Screening are not performed on messages that are re-routed to alternate PCs.

If G-Flex Re-Route processing falls through to GTT based on the SCCP-SERV GTT configuration option, Gateway Screening and GSM MAP Screening can be applied after GTT translation.

G-Flex in an ANSI Environment

The Support ANSI G-Flex at 1700 TPS per DSM function increases the transaction capacity of the G-Flex feature running on a DSM card from 850 TPS to 1700 TPS for ANSI systems. (ITU systems operate at 850 TPS per DSM.)

The STPOPTS ANSIGFLEX option (`chg-stpopts:ansigflex=yes` command) allows DSM cards to operate at 1700 TPS when the G-Flex feature is ON. The default for the ANSIGFLEX system option is NO (disabled).

The G-Flex feature must be on, no other EPAP-related features can be on, and no ITU service selectors can be provisioned, before the ANSIGFLEX system option can be set to YES.

The ANSIGFLEX system option can be set to NO after it has been set to YES. DSM card TPS granting is reduced to 850 TPS when the option setting is NO. A notification to the user concerning the reduction in SCCP capacity is generated.

Although a warning message is provided when the ANSIGFLEX option is set to NO, the user must perform system checks manually to ensure that SCCP system capacity will be sufficient after the ANSIGFLEX option is set to NO. If the user does not perform these capacity checks, the system may discard SCCP messages (TVG grant failures).

The SCCP capacity is reported in the `rept-stat-sccp:mode=perf` command output; the command lists the performance of all DSM cards, including message rates for TVG. The TVG capacities that are reported in the `rept-stat-sccp` command take into account the ANSIGFLEX system option.

G-Flex as a "Stand-Alone" Node

G-Flex can be deployed two ways (the G-Flex processing is the same for both ways, as described in this manual):

- As an integrated part of the STP (Signal Transfer Point)
- As a "stand-alone" node

  Destinations, routes, and point codes can be configured so that one STP of a mated EAGLE 5 ISS pair performs only G-Flex processing, while the other STP performs all of the STP other functions.

Assumptions/Limitations

The following assumptions and limitations apply.

1. The EAGLE 5 ISS does not perform any conversion in the SCCP portion of the message to support message routing across the domain boundary (ANSI to ITU and visa versa).
2. The EAGLE 5 ISS supports message routing across network boundaries (ITU-N to ITU-I and visa versa). However, GTT and Enhanced GTT (EGTT) do not modify the National Indicator bit in the CdPA Address Indicator (AI) or convert the CdPA PC (Point Code) to match the network type.
3. For messages with E.214 numbers in the SCCP CdPA, a simple conversion can form an E.212 number. The E.212 number formed in this way is the full IMSI of the subscriber, that is, it is assumed that no truncation occurs when the E.214 number is originally formed from the E.212 number. Such truncation is allowed by the E.214 recommendation.
4. G-Flex allows for up to eight MSISDN numbers per subscriber (that is, per IMSI) to be related. It is assumed that operators do not need to support more than eight MSISDN numbers per subscriber.

5. No overload controls are required beyond the existing EAGLE 5 ISS lower level mechanisms (for example, for MTP congestion)
6. Using combinations of the GTT selectors GTI (Global Title Indicator), TT (Translation Type), NP (Number Portability), and NAI as triggers for G-Flex processing plus SSN discrimination provide the ability to limit G-Flex processing to only the messages for which it is appropriate.
7. G-Flex C7 Relay supports message routing to a single network node for a particular subscriber. For example, an individual subscriber cannot have some messages routed to his HLR and other messages routed to a separate AuC. In this example, G-Flex does not support the AuC being collocated with the HLR.
8. For performance estimates, EAGLE 5 ISS-generated UDTS messages will count as two processed messages.

Hardware Requirements

EPAP-related features that perform an RTDB lookup require Service Module cards (DSM cards, E5-SM4G cards, or E5-SM8G-B cards) running the VSCCP application. The EAGLE 5 ISS can be equipped with up to 32 (31+1) Service Module cards.

Features that do not perform an RTDB lookup require Service Module cards only for GTT processing that might be performed for the feature. These features can coexist in systems with EPAP, but do not require an EPAP connection.

MPS/EPAP Platform

Tekelec provides the Multi-Purpose Server (MPS) platform as a subsystem of the EAGLE 5 ISS. The MPS provides support for EPAP-related features that perform Real Time Database (RTDB) lookups.

The MPS is composed of hardware and software components that interact to create a secure and reliable platform. For details about the MPS hardware, refer to *Tekelec 1200 Application Server Hardware Manual*. The MPS provides the means of connecting the customer provisioning application with the EAGLE 5 ISS and accepts the customer number portability data, while accommodating numbers of varying lengths.

The EAGLE Provisioning Application Processor (EPAP) is software that runs on the MPS hardware platform. It collects and organizes customer provisioning data, and forwards the data to the EAGLE 5 ISS Service Module cards. *Figure 4: MPS/EPAP Platform Architecture* shows the overall system architecture from customer provisioning through the MPS subsystem to the EAGLE 5 ISS Service Module card databases.

In this manual, Service Module card refers to a DSM card, an E5-SM4G card, or an E5-SM8G-B card unless a specific card is required. For more information about the supported cards, refer to *EAGLE 5 ISS Hardware Manual*.

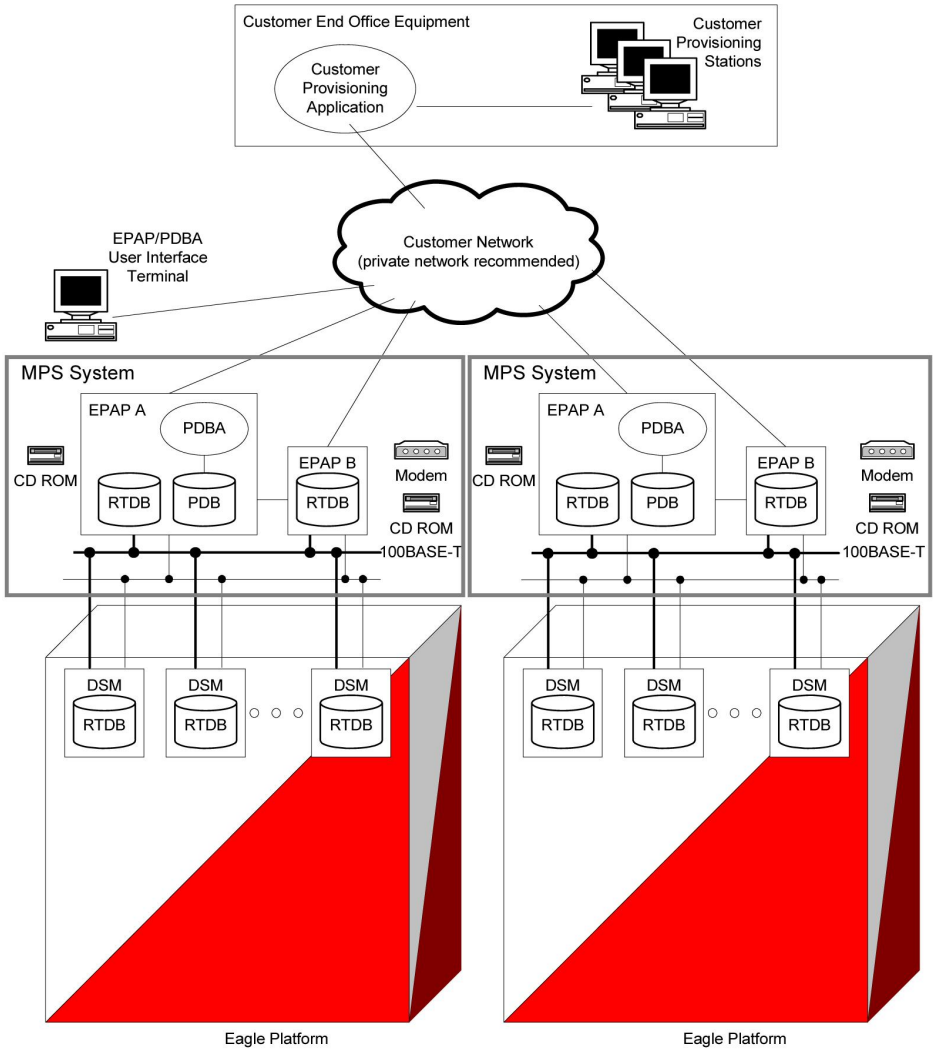

Figure 4: MPS/EPAP Platform Architecture

Design Overview and System Layout

Figure 4: MPS/EPAP Platform Architecture identifies the tasks, databases and interfaces which constitute the overall system architecture. The system consists of two mated MPS servers. Each MPS contains two EPAP platforms - EPAP A and EPAP B with each containing a Real Time Database (RTDB) , Provisioning Database (PDB), servers, optical media, modems, and network switches when using a T1200 AS system. Each MPS and its associated EPAPs are an *EPAP system*; the EPAP system and the mated EAGLE 5 ISS are the *mated EPAP system*. Each EPAP system is a T1200 AS system with a total of four Ethernet interfaces: one from each EPAP to the 100BASE-T Ethernet and one from each EPAP to either a 10BASE-T or a 100BASE-T Ethernet. See *Table 10: Service Module Card Provisioning and Reload Settings* for the link speed.

On the EAGLE 5 ISS, a set of Service Module cards, which hold the RTDB, is part of the STP. Two high-speed Ethernet links connect the Service Module cards and the EPAPs. One of the links is a 100BASE-T Ethernet bus, and the other is either a 10BASE-T or a 100BASE-T Ethernet bus. See *Table 10: Service Module Card Provisioning and Reload Settings* for the link speed.

The RTDB is provisioned and maintained through the EPAPs. EPAP A and EPAP B act as the active EPAP and the standby EPAP. One link serves as the active link, and the other link as the standby link. Only one EPAP and one link are active at a time. The database is provisioned through the active link by the active EPAP; the other EPAP provides redundancy.

If the active EPAP fails, the standby EPAP takes over the role of active EPAP and continues to provision the subscriber database. If the active link fails, the active EPAP switches to the standby link to continue provisioning the Service Module cards. The two Ethernet links are part of the DSM network.

Another 100BASE-T Ethernet link exists between the EPAPs; that link is called the EPAP Sync Network.

The major modules on the EPAP are:

- Service Module card provisioning module
- Maintenance module
- RTDB module
- PDB module

The Service Module card provisioning module is responsible for updating subscriber databases on the EAGLE 5 ISS Service Module cards using the Reliable Multicast Transport Protocol (RMTP) multicast. The maintenance module is responsible for the proper functioning of the EPAP platform. The PDB module is responsible for preparing and maintaining the Real Time Database, which is the *golden copy* of the subscriber database. The PDB module can run on one of the EPAPs of either mated EAGLE 5 ISS.

Functional Overview

The main function of the MPS/EPAP platform is to provision data from the customer network to the Service Module cards on the EAGLE 5 ISS. Subscriber database records are continuously updated from the customer network to the PDB. The PDB module communicates with the maintenance module and the RTDB task over a TCP/IP connection to provision the Service Module cards on the EAGLE 5 ISS. The maintenance module is responsible for the overall stability and performance of the system.

The RTDB on the EPAP contains a coherent, current copy of the subscriber database. If the current copy of the RTDB on the Service Module cards becomes *out-of-sync* because of missed provisioning or card rebooting, the EPAP Service Module card provisioning module sends database information through the provisioning link to the Service Module cards. The Service Module cards are reprovisioned with current subscriber information.

EPAP/PDBA Overview

The EAGLE Provisioning Application Processor (EPAP) platform and the Provisioning Database Application (PDBA), coupled with the Provisioning Database Interface (PDBI) facilitate the user database required for EAGLE 5 ISS EPAP-related features. The following functions are supported:

- Accept and store subscription data provisioned by the customer
- Update and reload subscriber databases on the Service Module cards

The PDBA operates on the master Provisioning Database (PDB). The EPAP and PDBA are both installed on the MPS hardware platform.

The EPAP platform performs the following:

- Maintains an exact copy of the real time database (RTDB) on the EPAP

- Distributes the subscription database to the Service Module cards
- Maintains a redundant copy of the RTDB database

The EPAP platform is a mated pair of processors (the upper processor, called EPAP A, and the lower processor, EPAP B) contained in one frame.

During normal operation, information flows through the EPAP/PDBA software with no intervention. Subscription data is generated at one or more operations centers and is delivered to the PDBA through a TCP socket interface (PDBI). The PDBA software stores and replicates data on EPAP A on the mated EPAP system. The data is then transmitted by the EPAPs across a private network to the Service Module cards located in the EAGLE 5 ISS frame.

The primary interface to the PDBA consists of machine-to-machine messages. The interface is defined by Tekelec and is described in the *Provisioning Database Interface Manual*. Provisioning software compatible with the EPAP socket interface can be created or updated using the interface described in that manual.

Additionally, a direct user interface is provided on each EPAP to allow for configuration, maintenance, debugging, and platform operations. A direct user interface is also provided by the PDBA for configuration and database maintenance.

The MPS/EPAP is an open-systems platform and easily accommodates the required high provisioning rates. Compared to the traditional OAM platform, the persistent database and provisioning in an open systems platform provides these benefits:

- Variety of hardware components and vendors
- Availability of third party communication and database tools
- Standard communication protocols
- Availability of personnel with related experience

Each EPAP server maintains a copy of the Real Time Database (RTDB) in order to provision the EAGLE 5 ISS Service Module cards. The EPAP server must comply with the hardware requirements in the *Tekelec 1200 Application Server Hardware Manual*. *Figure 4: MPS/EPAP Platform Architecture* illustrates the EPAP architecture contained in the MPS subsystem.

Each EPAP has a dedicated optical media drive. One EPAP per EAGLE 5 ISS platform has a modem capable of supporting remote diagnostics, configuration, and maintenance. These remote operations are performed through EPAP login sessions and are accessible across the customer network as well as through a direct terminal connection to the EPAP using an RS232 connection. Refer to *Tekelec 1200 Application Server Hardware Manual* for details about the hardware devices and network connections.

Subscriber Data Provisioning

Figure 5: Subscriber Data Provisioning Architecture (High Level) shows a high-level view of the subscriber data provisioning architecture. Only those parts of the EAGLE 5 ISS platform that are relevant to subscriber data provisioning are shown. This section defines requirements for the Provisioning Database Interface (PDBI) between the EPAP and the operator's provisioning system (OPS). Provisioning clients connect to the EPAPs using the PDBI. This interface contains commands that allow all of the provisioning and retrieval of subscription data. The PDBI is used for real-time provisioning of subscriber and network entity data only. Refer to *Provisioning Database Interface Manual* for more details.

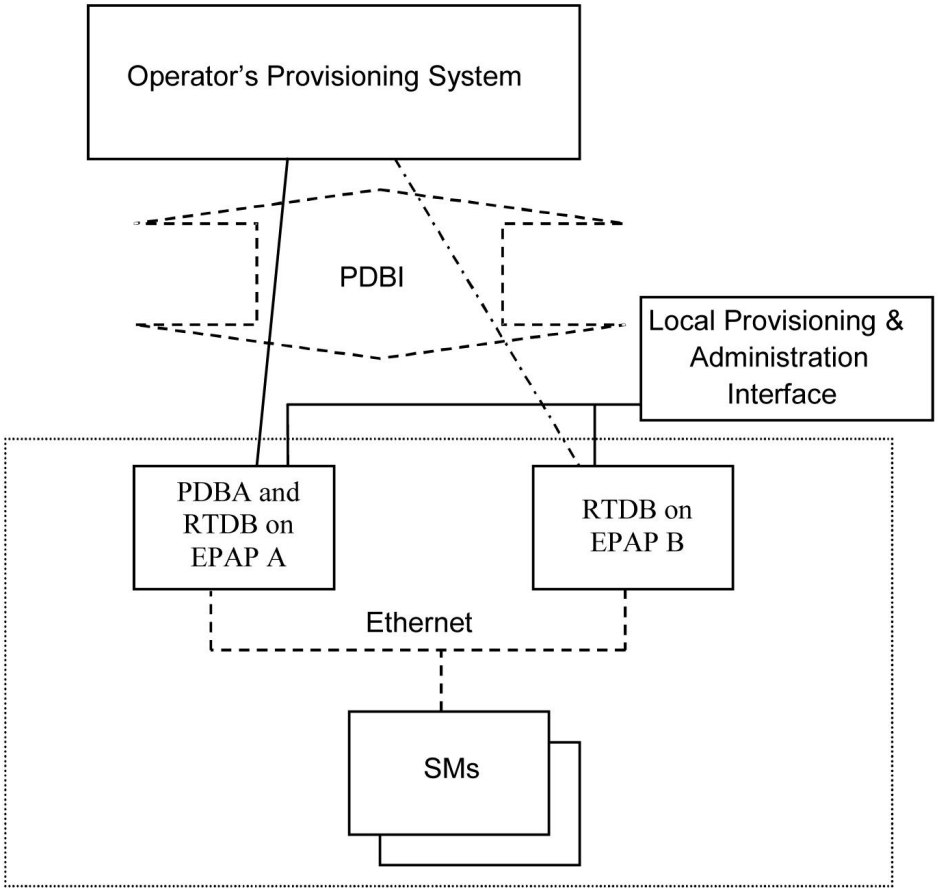

Figure 5: Subscriber Data Provisioning Architecture (High Level)

A pair of active/standby EPAP servers provides the interface between the Real Time Database (RTDB) of the EAGLE 5 ISS Service Module cards and the OPS. EPAP A is equipped with both the PDB (Provisioning Database) and the RTDB, and EPAP B has only the RTDB. An EPAP with only the RTDB must be updated by the EPAP that is equpped with the PDB.

For more information about the EPAP, refer to *EPAP Administration Manual*. For more information about the MPS hardware, refer to *Tekelec 1200 Application Server Hardware Manual* .

Distributed Administrative Architecture

This section describes, at a high level, the distributed administrative architecture for the EAGLE 5 ISS, including the EPAP.

Databases requiring high update and retrieval rates, such as the EPAP RTDB, are populated using redundant Ethernet connections to Service Module cards from an EPAP MPS platform.

An EPAP consists of a combined Provisioning (MySQL) and Real Time Database (RTDB). The Provisioning Database (PDB) responds to requests for updates by the active and standby RTDBs on both mated EAGLE 5 ISSs. The active EPAP RTDB is responsible for initiating multi-cast updates of changed database records to the Service Module cards after the data has been committed to the EPAP disks. Furthermore, the PDB may accept and commit more database updates while the RTDBs are completing their previous updates.

It is this overlapping of database updates, coupled with an RTDB transactional database engine and fast download time, that allows larger amounts of data at a time to be transferred from the PDB. Committing larger amounts of data at a time to the RTDB (versus a single update at a time) allows faster overall transaction rates to be achieved. The boundaries of the transaction rates become more closely related to cache size and disk cache flush time than the disk access time of a single update. Thus, successful completion of EPAP database updates only guarantees that the PDB has been updated, but it does not mean the RTDB has completed the update and sent the new subscription data to the Service Module card.

The EPAP architecture contains a local provisioning terminal and a modem for remote access, as well as other functions. A backup device can be used to back up or restore the provisioning database. The local provisioning terminal is used to manually repair the standby EPAP RTDB or to turn the subscriber database audit on or off. For additional information, refer to *Tekelec 1200 Application Server Hardware Manual* and the *EPAP Administration Manual*.

EPAP (EAGLE Provisioning Application Processor)

As shown in *Figure 4: MPS/EPAP Platform Architecture*, a single MPS system contains two EAGLE Provisioning Application Processor (EPAP) servers. At any given time, only one EPAP actively communicates with the Service Module cards on the EAGLE 5 ISS. The other EPAP server is in standby mode. In addition, two MPS systems can be deployed in a mated pair configuration.

The primary purpose of the EPAP system is to maintain the Real Time Database (RTDB) and Provisioning Database (PDB), and to download copies of the RTDB to the Service Module cards.

The PDB on the active EPAP receives subscription data from the customer network through the Provisioning Database Interface (PDBI), the external source of provisioning information. The Provisioning Database Application(PDBA) continually updates the PDB of the active EPAP. The PDB uses MySQL database software. After an update is applied to the active PDB, the data is sent to the RTDBs on the active and standby EPAPs.

Both the active and standby EPAPs maintain copies of the RTDB. Periodically, the Service Module card polls the active EPAP RTDB for any new updates. The active EPAP downloads the updates to the Service Module card which stores a resident copy of the RTDB.

A mated pair configuration has two mated MPS Systems, as shown in *Figure 4: MPS/EPAP Platform Architecture*. The PDB on the active EPAP automatically updates the PDB on the mate platform. The PDB on the mate platform then updates RTDBs on its EPAPs, which in turn update the RTDBs on the associated Service Module cards.

Provisioning of the EAGLE 5 ISS Service Module cards is performed through two interfaces using two different sets of commands. Provisioning is accomplished by the STP updates from EAGLE 5 ISS terminals and by updates from the customer's external provisioning system. This system of dual provisioning is illustrated in *Figure 6: Database Administrative Architecture*.

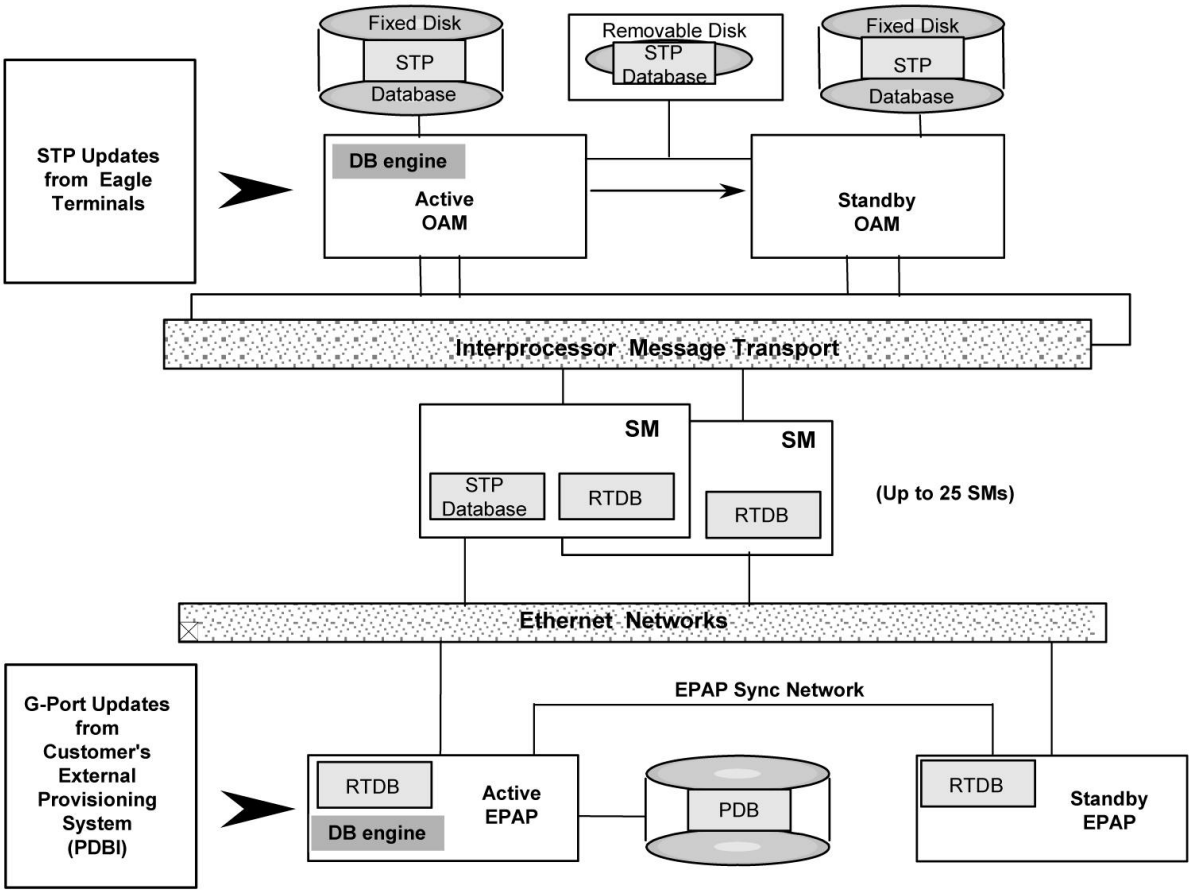

Figure 6: Database Administrative Architecture

Service Module Cards

Up to 32 cards (31+1) Service Module cards can be provisioned with one or more EPAP-related features enabled and EPAP running on a T1200 AS.

EPAP-related features require that all Service Module cards contain 4 GB of memory. *Figure 6: Database Administrative Architecture* illustrates each Service Module card having two Ethernet links, the main DSM network on the 100BASE-T link and the backup DSM network . See *Table 10: Service Module Card Provisioning and Reload Settings* for the link speed. The Service Module cards run the VSCCP software application.

The Service Module card Ethernet ports are linked to the EPAP system to receive the downloaded Real Time Database (RTDB). Multiple Service Module cards provide a means of load balancing in high-traffic situations. The RTDB on the Service Module card is in a format that facilitates rapid lookups.

Though the Service Module card copies of the RTDB are intended to be identical, the various databases may not be identical at all times for the following reasons:

- When a Service Module card is initialized, the card downloads the current copy of the database from the EPAP. While that card is being loaded, it cannot receive new updates that have arrived at the EPAP since reload began.

- Card databases can become out-of-sync with the EPAP RTDB when the EPAP receives updates from its provisioning source, but it has not yet sent the updates down to the Service Module cards. Updates are applied to the Provisioning Database (PDB) as they are received.

Two possible scenarios contribute to a condition where a Service Module card may not have enough memory to hold the entire database:

- The database is downloaded successfully to the Service Module card, but subsequent updates eventually increase the size of the database beyond the capacity of the Service Module card memory. In this situation, it is desirable for EPAP-related features to continue processing transactions, even though the database might not be up-to-date.
- When a Service Module card is booted and it is determined then that the card does not have enough memory for the entire database, the database is not loaded on that card. Each Service Module card is responsible for recognizing and reporting its out-of-memory conditions by means of alarms.

Overview of EPAP to Service Module Card Communications

Before discussing Service Module card status reporting or EPAP status reporting, it is helpful to understand the communications between the Service Module cards and the EPAP in broad terms.

- UDP - sending Service Module card status messages

  The Service Module cards and EPAPs create a UDP (User Datagram Protocol) socket which is used for status messages. One of the last things a Service Module card does when it is initialized is to send a status message to the EPAP, containing the Service Module ID, database level, and memory size. The EPAP maintains tables containing the last known status of each Service Module card. EPAP uses these to determine whether or not the Service Module card needs to download the database.

- IP - reporting EPAP maintenance data

  The Service Module cards create an TCP socket when they are initialized, and listen for connection requests. During initialization or after a loss of connectivity, the active EPAP chooses one of the Service Module cards and issues a *Connect* to establish the TCP/IP connection with that Service Module card which is referred to as the primary Service Module card. The purpose of this link is to provide a path for reporting EPAP alarms and to forward maintenance blocks to the Service Module card.

- IP Multicast - downloading GSM database

  Because of the large size of the database and the need to download it quickly on up to 32 Service Module cards, EPAP-related features use a technique known as IP multicasting. This technique is based on Reliable Multicast Transport Protocol-II (RMTP-II), a product of Globalcast Communications. IP multicasting downloads the RTDB and database updates to all of the Service Module cards simultaneously.

  The administration of IP multicasting is based on the concept of a “tree”, or stream of data, which is constantly being broadcast by the EPAP. Service Module cards that need to download the real time database or to receive database updates “join the tree”. Service Module cards can also “leave the tree”, typically when the database fills their available memory.

Service Module Card Provisioning and Reload

One of the core functions of the EPAP is to provision the Service Module cards with the Real Time Database (RTDB) updates. In order to provide redundancy for this feature, separate RMTP channels are created on each interface from each EPAP:

Table 10: Service Module Card Provisioning and Reload Settings

RMTP Channel	T1200 running only DSM cards	T1200 running any combination of E5-SM4G and E5-SM8G-B cards	T1200 running DSM cards with any combination of E5-SM4G and E5-SM8G-B cards
EPAP A, Link A (on the main DSM network)	100BASE-T	100BASE-T	100BASE-T
EPAP A, Link B (on the backup DSM network)	10BASE-T	100BASE-T	10BASE-T
EPAP B, Link A (on the main DSM network)	100BASE-T	100BASE-T	100BASE-T
EPAP B, Link B (on the backup DSM network)	10BASE-T	100BASE-T	10BASE-T
Note: Full duplex mode is supported only when running any combination of E5-SM4G and E5-SM8G-B cards on the T1200. In all other cases, half duplex mode is supported.			

Provisioning and other data is broadcast on one of these channels to all of the Service Module cards. Provisioning is done by database level to leave tables coherent between updates.

The Service Module cards perform the following:

- Detect the need for incremental updates and send a status message to the EPAP.
- Discriminate between the various streams according to the database level contained in each message and accept updates based on the Service Module card database level.

Service Module Card Reload Model

Service Module cards may require a complete database reload in the event of reboot or loss of connectivity for a significant amount of time. The EPAP provides a mechanism to quickly load a number of Service Module cards with the current database. The database on the EPAP is large and may be updated constantly. The database sent to the Service Module card or cards will likely be missing some of these updates making it corrupt, in addition to being "back level."

EPAP Continuous Reload

It is important to understand how the EPAP handles reloading of multiple Service Module cards from different starting points. Reload begins when the first Service Module card requires it. Records are read sequentially from the Real Time Database (RTDB) from an arbitrary starting point, wrapping back to the beginning. If another Service Module card requires reloading at this time, it uses the existing

record stream and notifies the Service Module card provisioning task of the first record it read. This continues until all Service Module cards are satisfied.

Service Module Card Database Levels and Reloading

The current database level when the reload started is of special importance during reload. When a Service Module card detects that the last record has been received, it sends a status message back to the EPAP indicating the database level at the start of reload. This action starts incremental loading. The Service Module card continues to reload until it is completely caught up with the current level of the RTDB. As database records are sent to the Service Module cards during reload, normal provisioning can change those records. All records changed between the start and end of reloading must be incrementally loaded before the database is coherent and usable by the Service Module card.

The following terminology is used here for the stages of database reload for a given Service Module card.

- **Stage 1 loading**: The database is being copied record for record from the golden RTDB in the EPAP to the Service Module card RTDB. The database is incoherent during stage 1 loading.
- **Incremental update**: The database is receiving all of the updates missed during stage 1 loading or some other reason, such as network outage, processor limitation, or lost communication. The database is coherent, but back-level during incremental update.
- **Current**: The database is receiving current updates from the Service Module card provisioning task.
- **Coherent:** The database is at a whole database level which means not currently updating records belonging to a database level.

EPAP Status and Error Reporting via Maintenance Blocks

The EPAP forwards all status and error messages to the Service Module cards in maintenance blocks. Maintenance blocks are asynchronously sent whenever the EPAP has something to report. The maintenance blocks eventually update EPAP Device Control Blocks (DCBs) located on the EAGLE 5 ISS. The DCBs provide the status information that is received when a `rept-stat-mps` command is issued.

Network Connections

Several customer and Tekelec-installed private networks are required to support the provisioning of subscription data. These networks are:

- *Customer Provisioning Network*
- *EPAP Sync Network*
- *DSM Networks*
- *Dial-Up PPP Network*

The following discussion is an overview of these private networks. It expands on the networks in the architecture diagram shown in *Figure 7: Customer Provisioning Network*. For details about configuring these networks, refer to *EPAP Administration Manual*.

Customer Provisioning Network

The customer network carries the following traffic:

- Customer queries and responses to the PDB via the PDBI from the customer provisioning network

- Updates between PDBs of a mated EAGLE 5 ISS pair
- Updates between a PDB on one EAGLE 5 ISS and RTDBs on a mated EAGLE 5 ISS
- PDBA import/export (file transfer) traffic
- Traffic from a PDBA reloading from its mate
- EPAP and PDBA user interface traffic.

A typical customer network is shown in *Figure 7: Customer Provisioning Network*.

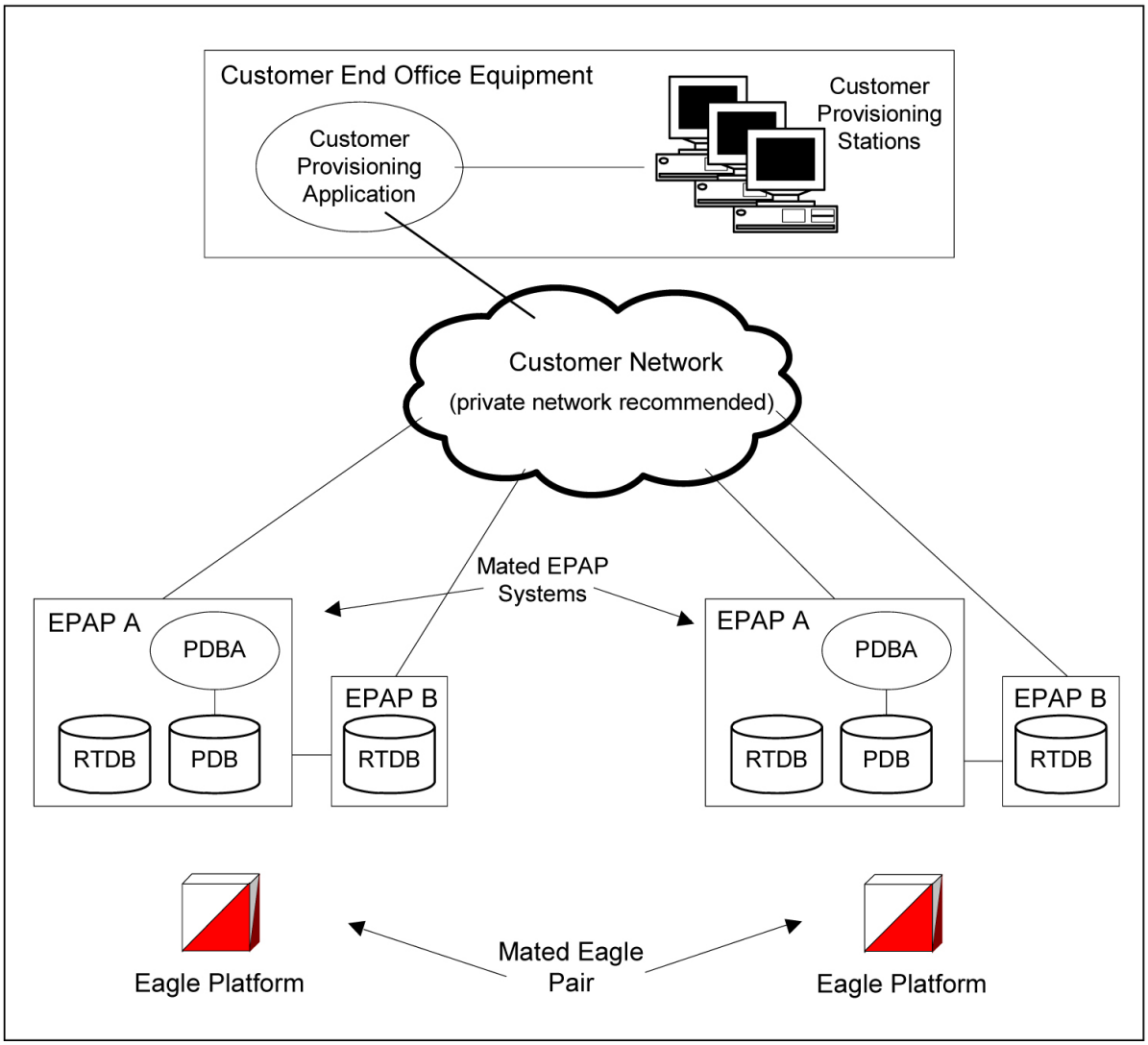

Figure 7: Customer Provisioning Network

Although a dedicated network is recommended, it is possible that unrelated customer traffic can use the network as well. The determination, either to have a dedicated network or to allow other customer traffic, should be based on available external Ethernet bandwidth and network performance considerations.

EPAP Sync Network

The EPAP sync network carries RTDB and maintenance application traffic between active and standby EPAP servers on an MPS system. It synchronizes the contents of the RTDBs of both EPAP A and B. The EPAP Sync network is a single Ethernet connection between EPAP A and EPAP B running at 100BASE-T, as shown in *Figure 8: EPAP Sync Network*. The T1200 EPAP Sync network is truncated with the EPAP backup DSM connection and communicates through the switch.

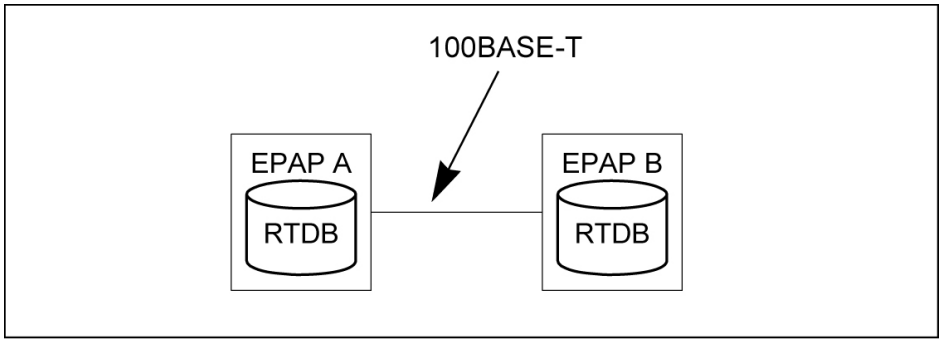

Figure 8: EPAP Sync Network

DSM Networks

The DSM networks are shown in *Figure 9: DSM Networks*. They carry provisioning data from the active EPAP RTDB to the Service Module cards. They also carry reload and maintenance traffic to the Service Module cards.

The DSM networks consist of two Ethernet networks: the main DSM network running at 100BASE-T, and the backup DSM network running at either 10BASE-T or 100Base-T. See *Table 11: EPAP IP Addresses in the DSM Network* for the link speed. Both Ethernet networks connect EPAP A and EPAP B with every Service Module card on a single EAGLE 5 ISS platform.

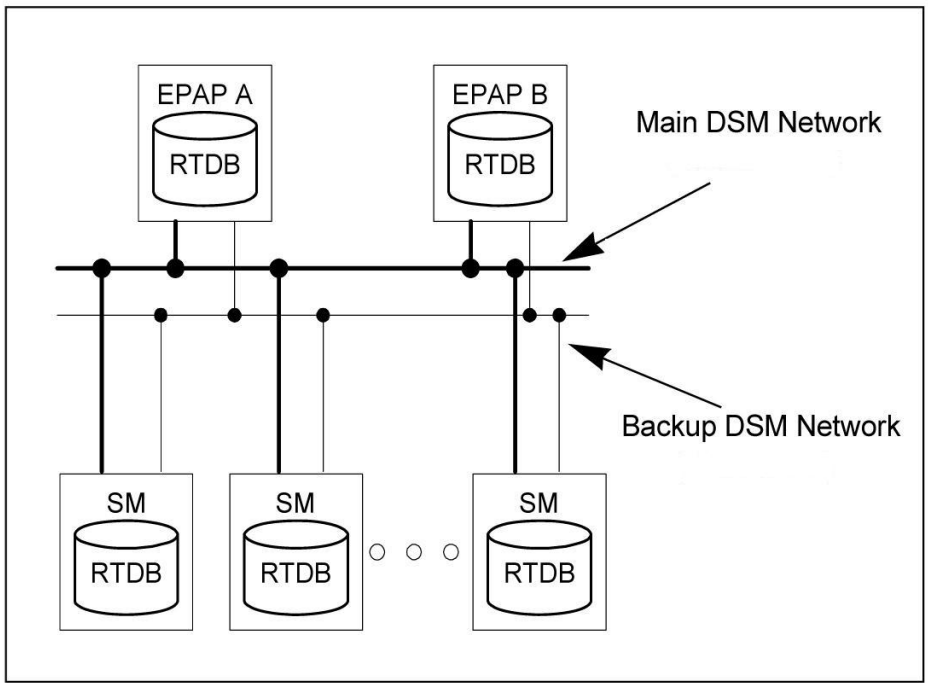

Figure 9: DSM Networks

Maintenance information is sent from the active EPAP to an arbitrarily selected Service Module card. The selected Service Module card is known as the primary Service Module card. Static information is exchanged across this interface at initialization, and dynamic information is exchanged on occasion.

While much of the traditional OAM provisioning and database functionality is implemented on the EPAP, the maintenance reporting mechanism is still the OAM.

The first and second octets of the EPAP network addresses for this network are 192.168. (The first two octets for private class C networks are defined in RFC 1918.)

The third octet is customer specifiable for each DSM network. It is important to select values that do not interfere with the customer's network addressing scheme.

The fourth octet of the address is specified as follows:

- If the EPAP is configured as “EPAP A”, the fourth octet has a value of 100.
- If the EPAP is configured as “EPAP B”, the fourth octet has a value of 200.

Table 11: EPAP IP Addresses in the DSM Network summarizes the contents of each octet.

Table 11: EPAP IP Addresses in the DSM Network

Octet	Value
1	*192*
2	*168*
3	One customer-provisioned value for DSM network A and another for DSM network B

Octet	Value
4	*100* for EPAP A and *200* for EPAP B

Dial-Up PPP Network

The dial-up PPP network allows multiple user-interface sessions to be established with the EPAP. The network connects a remote EPAP/PDBA user interface terminal with the EPAP in the EAGLE 5 ISS's MPS subsystem. The dial-up PPP network is illustrated in *Figure 10: Dial-Up PPP Network*.

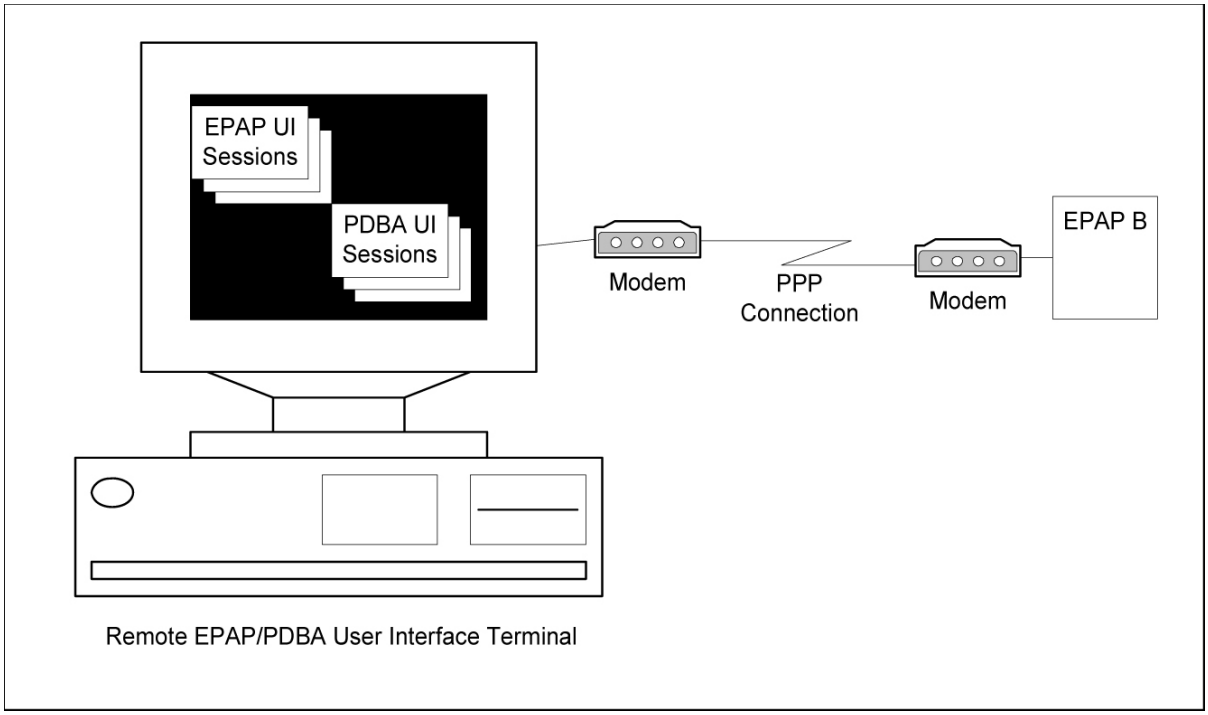

Figure 10: Dial-Up PPP Network

Chapter 3

G-Flex MAP Layer Routing (G-Flex MLR) Feature

Topics:

This chapter describes the G-Flex MAP Layer Routing (G-Flex MLR) feature. G-Flex MLR allows subscriber digits to be obtained from either the SCCP layer or the MAP layer of a message during RTDB lookup.

G-Flex MAP Layer Routing

The EAGLE 5 ISS G-Flex feature can perform RTDB subscriber number lookup based either on a subscriber's E.164 MSISDN number, or the subscriber's E.212 IMSI number. In some GSM networks, MSCs use an E.214 MGT (Mobile Global Title) number for routing between networks. G-Flex cannot perform database lookup directly with an E.214 MGT number, but it can convert the E.214 MGT into a E.212 IMSI number, and thus correctly process the message. In an ITU network, when a visited network entity (VLR, GGSN, SGSN, or GMLC) needs to contact a home network entity (AuC or HLR) given only the IMSI of a subscriber, it will convert the E.212 IMSI into an E.214 MGT. This process applies only to the first message of a dialogue. Subsequent messages of that same dialogue will be routed using E.164 numbers.

When the SCCP CdPA is truncated by the MSC in a message that is received for G-Flex service, G-Flex needs to use the subscriber number from the MAP layer for routing.

The G-Flex MLR feature supports G-Flex routing for messages based on the MAP-layer IMSI and MSISDN parameters that does not involve checking the format of the CdPA , though the messages contain SCCP Called Party Address (CdPA) parameters in ITU E.214 format. The CdPA should contain an E.214 number, but its format and content have no bearing on the G-Flex MLR function.

G-Flex MLR processes messages with the MAP operations shown in *Table 12: MAP Operations Processed by G-Flex MLR*:

Table 12: MAP Operations Processed by G-Flex MLR

MAP Operation Name	Processing
updateLocation	G-Flex MLR processes messages with MAP operations that commonly encode the SCCP CdPA GTA in the E.214 format (MGT) where trailing IMSI digits may be truncated from the MGT, and that always include IMSI in the MAP layer.
updateGprsLocation	
sendParameters	
sendAuthenicationInfo	
registerSS	
activateSS	
deactivateSS	
interrogateSS	
authenticationFailureReport	
restoreData	
readyForSM	
purgeMS	
processUnstructuredSS-Request	G-Flex MLR processes messages with MAP operations that include either an IMSI or an MSISDN in the TCAP component.
sendRoutingInfoForLCS	

MAP Operation Name	Processing
AnyTimeInterrogation	G-Flex MLR processes messages with the AnyTimeInterrogation (ATI) operation, using the MSISDN from the MAP layer of the ATI message for conditioning and RTDB look up. The MSISDN is converted to International format for RTDB searching based on the Nature of Address Indicator in the MAP MSISDN parameter. No HomeRN deletion is required.

For the following MAP Operations, G-Flex MLR uses the GSMOPTS GFLEXMAPLAYERRTG configuration option value to determine whether to use the IMSI or MSISDN to obtain subscriber digits from the MAP layer when performing RTDB lookup:

- updateLocation
- updateGprsLocation
- sendParameters
- sendAuthenicationInfo
- AnyTimeInterrogation

The GFLEXMAPLAYERRTG option can have the following values:

- NONE - The G-Flex MLR function is not performed for a message that contains an updateLocation, sendParameters, sendAuthenticationInfo, updateGprsLocation, or AnyTimeInterrogation operation code. Normal G-Flex processing is applied to the message. The IMSI or MSISDN is taken from the SCCP CdPA parameter for TC-BEGIN messages.
- IMSI - The G-Flex MLR function uses the IMSI for the RTDB lookup, for the updateLocation, sendParameters, sendAuthenticationInfo, and updateGprsLocation operations.
- MSISDN - The G-Flex MLR function uses the MSISDN for the RTDB lookup, for the AnyTimeInterrogation operation.
- All - The G-Flex MLR function uses the IMSI or the MSISDN for the RTDB lookup, based on the operation code of the message. If the message contains an updateLocation, sendParameters, sendAuthenticationInfo, or updateGprsLocation operation code, the G-Flex MLR function uses the IMSI parameter. If the message contains an AnyTimeInterrogation operation code, the G-Flex MLR function uses the MSISDN parameter.

For the operations shown in *Table 13: GSMOPTS Configuration Options MAPLYRRTGON and MAPLYRRTGOFF*, G-Flex MLR uses the GSMOPTS MAPLYRRTGON configuration option to turn on processing of each specified operation or all operations, and the MAPLYRRTGOFF configuration option to turn off processing of each specified operation or all operations. The values are specified in a comma-separated list for the option in the `chg-gsmopts` command. One or both options can be specified in one command, but the same value cannot be specified in both options in the same command. When ALL is specified for one option, the other option cannot be specified in the same command.

Table 13: GSMOPTS Configuration Options MAPLYRRTGON and MAPLYRRTGOFF

Operation Name	Configuration Option Value
registerSS	regss
activateSS	actss

Operation Name	Configuration Option Value
deactivateSS	dactss
interrogateSS	intross
authenticationFailureReport	authfailrpt
restoreData	rstdata
processUnstructuredSS-Request	procunstrqt
readyForSM	rdyforsm
purgeMS	purgmobss
sendRoutingInfoForLCS	sriloc
All 10 operations listed in this table	all

"Normal" G-Flex processing is performed using the SCCP CdPA when:

- The G-Flex MLR feature is not turned on.
- The received message does not include an operation of interest.
- The operation does not contain an IMSI parameter.
- The operation does not contain an MSISDN parameter. No UIM is generated.

The G-Flex MLR feature applies only when:

- The G-Flex MLR feature is enabled and turned on.
- An incoming MSU contains and SCCP UDT message type code or XUDT non-segmented message type code.
- The message contains a TCAP Message Type of Begin (in the MAP layer information of only the first TCAP component of the message).
- The TCAP component is Invoke.
- For the message processing controlled by the GSMOPTS GFLEXMAPLAYERRTG configuration option, the option is not NONE.
- For the message processing controlled by the MAPLYRRTGON option, the option must be set for the operation code in the incoming message, and
  - SCCP CdPA NP=E.214 if NP is present.
  - The length of the MCC+MNC (Mobile Country Code + Mobile Network Code) in the resulting E.212 IMSI number must be greater than the length of the CC+NDC (Country Code+Network Destination Code) in the E214 MGT number that is converted to the E212 IMSI number. The maximum length of the SCCP CdPA is 15 digits.

    If the MCC+MNC length is greater than the CC+NDC length and CdPA is 15 digits, then after E.214 MGT to E.212 IMSI conversion, the resulting number of digits is greater than 15. The last digits may be truncated; in this case IMSI digits can be taken from the MAP layer.
  - The CdPA GTI=2.
    - The SCCP CdPA GTA length is not checked because the SCCP CdPA Encoding Scheme (ODD or EVEN) is not known in this case, and there might be filler digits ('0') that make the length determination uncertain.

    or

The CdPA GTI=4 and the SCCP CdPA length is 15 digits.

- If the length of the SCCP CdPA GTA is 16 digits and the last digit is a stop digit ('0xF'), the stop digit is treated as a filler digit and the CdPA GTA length is considered to be 15 digits.
- If the CdPA GTI=4, the SCCP CdPA GTA is 8 bytes, and the Encoding Scheme is not BCD ODD (1) or BCD EVEN (2), the Encoding Scheme is assumed to be BCD EVEN (2).

The G-Flex MLR UIMs listed in *G-Flex-Related UIMs* are generated to indicate the following errors in the IMSI and MSISDN parameter in a message. Normal G-Flex processing is applied to the message.

- Missing IMSI (a UIM is not generated for a missing MSISDN)
- Decoding errors such as an IMSI parameter value that does not have at least 5 digits and no more than 15 digits, or an MSISDN parameter value that does not have at least 1 digit and no more than 15 digits
- MSISDN digits with the NAI set to Subscriber or National and the STPOPTS Default Country Code (DEFCC) or Default Network Destination Code (DEFNDC) configuration option is not set appropriately
- Invalid TCAP component

G-Flex MLR affects only the selection of digits for RTDB lookup. All other processing is the same as G-Flex. No changes are made to the MAP layer of the outgoing message; the SCCP layer may be changed per the provisioned Network Entity parameters in the EPAP (such as Digit Action).

Limitations

ANSI G-Flex traffic at 1700 TPS per DSM card and 5000 or 6800 TPS per E5-SM4G card are not supported by the G-Flex MLR feature. ANSI traffic operates at the standard G-Flex 850 TPS rate if the G-Flex MLR feature is turned on.

Chapter 4

EAGLE 5 ISS Commands

Topics:

This chapter contains brief descriptions of the EAGLE 5 ISS commands that can be used for configuration of the G-Flex feature and related features and functions.

EAGLE 5 ISS Commands

This chapter describes the EAGLE 5 ISS commands that can be used for the configuration of the G-Flex feature and the G-Flex MAP Layer Routing (MLR) feature.

Refer to the *Commands Manual* for complete descriptions of the commands, including parameter names, valid values, and output examples for the commands.

Table 14: Commands used for the G-Flex and G-Flex MLR Features

Type	Commands
System Serial Number	ent/rtrv-serial-num
Card	ent/dlt/rtrv/alw/inh/init/rept-stat-card
STP Options	chg/rtrv-stpopts
Feature Control	chg/rtrv-feat, enable/chg/rtrv-ctrl-feat
Service Selector	chg/dlt/ent/rtrv-srvsel
GSM Options	chg/rtrv-gsmopts
SCCP Service	chg/dlt/rtrv-sccp-serv

`chg-rtrv-stpopts`

The `chg/rtrv-stpopts` commands are used to change and report on the values of one or more of the STP node level processing option indicators maintained in database tables. System default values for the options are assigned initially at STP installation time.

`enable/chg/rtrv-ctrl-feat`

These commands are used to enable, turn on, and display the on/off status of the G-Flex feature and the G-Flex MAP Layer Routing (G-Flex MLR) feature.

`ent/dlt/chg/rtrv-srvsel`

The service selector (`srvsel`) commands are used to enter, delete, change, and display the service selectors required to define a service entry for a DSM service entry.

- The G-Flex service is `gflex`.
- G-Flex supports ANSI, ITU-I, ITU-N, and ITU-N24 Global Title Indicators

  The Global Title Indicator (GTI) value is 1- 4. The Numbering Plan and Nature of Address Indicator cannot be specified when the GTI is 2, and must be specified when the GTI is 4.
- G-Flex supports the Translation Type (TT), Nature of Address Indicator (NAI), NAI Value (NAIV), Numbering Plan (NP), NP Value (NPV), Service Nature of Address Indicator (SNAI), and Service Numbering Plan (SNP) selector values.
- The Subsystem Number (SSN) must be defined in the MAP table, and supports the asterisk (*) value.

chg/rtrv-gsmopts

The GSM Options commands are used to provision configuration options that are used for the G-Flex-related features. The options control number portability, processing for incoming messages, and formatting of response messages. See *G-Flex Configuration Options*.

Up to 10 CCNC/MCCMNC numbering plan conversion parameter combinations can be created. If NONE is specified for MCCMNC, then the CCNC combination is deleted.

chg/dlt/rtrv-sccp-serv

The SCCP Service commands are used to:

- Take SCCP services online and offline
- Shift the processing load of a service to other designated nodes
- Assign alternate point codes to PC groups used for G-Flex SCCP Service Re-Route assignment, and change the Relative Cost (RD) of of existing point codes in a group

SCCP Service groups are organized by service (G-Flex or G-Port) and point code network type (ANSI, ITU-I, Spare ITU-I, ITU-N, Spare ITU-N, or ITUN-24). Up to seven PCs may be in a network type grouping for service re-route load sharing. This command allows for additions and modifications of up to 4 PCs at once.

The alternate PCs entered using the `chg-sccp-serv` command reduce the maximum number of entries that the MRN table can contain. Each Alternate PC Re-route Set uses up to 8 MRN table entries (7 for alternate PCs and one for the search key).

Chapter 5

G-Flex Feature Configuration

Topics:

This chapter provides procedures for configuring the G-Flex feature and the G-Flex MAP Layer Routing feature for use in the EAGLE 5 ISS.

The chapter also describes some EPAP provisioning considerations.

Introduction

The G-Flex feature is configured on the EAGLE 5 ISS and on the EPAP. This chapter describes prerequisites and procedures for the EAGLE 5 ISS configuration only. The EPAP configuration is explained in the *EPAP Administration Manual*. This chapter also includes procedures for configuration of the G-Flex MAP Layer Routing (G-Flex MLR) feature for use with G-Flex.

G-Flex and G-Flex MLR Configuration Procedure lists the steps for enabling and turning on the G-Flex feature and the G-Flex MLR feature, for the provisioning required for the feature, and for the provisioning of the G-Flex SCCP Service Re-Route Capability and ANSI G-Flex. Each step contains a link or reference to information and procedures to use to complete the step. Feature provisioning can be performed after the features are enabled and before the features are turned on.

The G-Flex feature and other related features are optional and must be purchased from Tekelec before they can be used in your system. If you are not sure whether you have purchased a specific feature, contact your Tekelec Sales or Account Representative.

Note: For an in-service environment, contact the *Customer Care Center* before continuing to configure the G-Flex feature. For an environment that is not yet in-service, continue with the configuration.

EPAP Provisioning Blacklist

This feature provides blacklist functions for protected E.164 addresses of network elements, such as HLRs. All G-Flex provisioning data is checked against this blacklist to prevent inadvertent population of protected E.164 addresses into the RTDB as MSISDNs.

The G-Flex blacklist ranges are stored in the EPAP PDB database. G-Flex blacklist ranges are not sent to or stored in the RTDB.

The provisioning of blacklist ranges does not cause PDB database levels to increment.

The customer is responsible for determining the ranges of address strings that should be considered, protected, and entered into the blacklist. Reliability of this feature depends on the completeness of the blacklist.

CAUTION: If the G-Flex blacklist does not include all protected address strings in the customer network and one of those protected address strings is provisioned as a DN, DN Block, or IMSI, there will be unintended message routing that can cause network outages.

Provisioning of the E.164 addresses for this feature can be done only through the EPAP GUI. The EPAP GUI is used to retrieve, view, and delete entries in the blacklist. EPAP GUI menus to add and delete G-Flex blacklist ranges are accessible only to the EPAP PDBA group and the User Administration (uiadmin) user.

A maximum of 1000 blacklist ranges are supported by the EPAP. A valid G-Flex blacklist range is defined by two address strings of 5-15 hexadecimal digits, where the ending address is greater than or equal to the beginning address. Address strings must be of the same length. G-Flex blacklist ranges cannot overlap. A valid G-Flex blacklist range cannot conflict with DN, DN block, or IMSI values in the PDB. If a conflict is determined, the blacklist range will be rejected.

The EPAP Provisioning Blacklist feature provides PDBI checks against the blacklist ranges in memory when PDBI is used for the provisioning of DNs, DN blocks, and IMSIs. The command is rejected if a conflict is found.

Refer to the *EPAP Administration Manual* for more information about using the EPAP Provisioning Blacklist.

EPAP Entity Provisioning

It is recommended that EPAP entity (SP or RN) administration not be done until after the point code and/or subsystem number has been entered into the EAGLE 5 ISS MAP table.

- EPAP-administered entity data can possibly become out-of-sync with the EAGLE 5 ISS MAP table when the creation of point codes and/or subsystem numbers in the MAP table is performed after EPAP database administration.
- If this mismatch is discovered in real-time operations, a UIM (such as `SCCP did not route - DPC not in MAP tbl` or `SCCP did not route - SS not in MAP tbl`) is sent to the EAGLE 5 ISS maintenance terminal.

System Prerequisites

Before any feature that is described in this manual can be enabled, the prerequisites listed in *Table 15: System Prerequisites* are required in the system.

Table 15: System Prerequisites

Prerequisite	Verification and Provisioning
The system serial number must be correct and locked. For new installations, the system is shipped with an unlocked serial number. The serial number can be changed if necessary and must be locked after the system is on-site. For systems that are being upgraded, the serial number is usually already verified and locked.	**Note:** The serial number cannot be changed after it is entered and locked in the system. Locate the serial number for the system on a label affixed to the control shelf (1100). Enter the `rtrv-serial-num` command to display the serial number and its locked status. Verify that the displayed serial number is correct for the system. If no serial number is displayed, enter the `ent-serial-num` command (without the lock parameter) to provision the serial number that appears on the control shelf label. Enter the `rtrv-serial-num` command and verify that the serial number was entered correctly. Enter the `ent-serial-num` command with the lock=yes parameter to lock the serial number in the system.
A sufficient number of Service Module cards must be equipped. Some features require only E5-SM4G cards and cannot use DSM cards. See specific feature prerequisites, if any, in this section.	Enter the `rept-stat-card:appl=vsccp` command to list the Service Module cards in the system. If more cards or cards of a different type are needed, refer to the procedures in the *Database*

Prerequisite	Verification and Provisioning
	Administration Manual - GTT to add Service Module cards or remove DSM cards.
The GTT feature must be on in the system. Some features require an additional GTT-related feature such as EGTT. See the specific feature prerequisites in this section.	Enter the `rtrv-feat` command to display the GTT feature status. If the GTT feature is on, the gtt=on entry appears in the output. If the gtt=off entry appears in the output, use the procedures in the *Database Administration Manual - GTT* to turn on and provision the GTT feature and any other GTT-related features and functions that will be used in the system.

G-Flex Feature Prerequisites

Before the G-Flex feature can be enabled, the following prerequisites are required in the system:

Table 16: G-Flex Feature Prerequisites

Prerequisite	Verification and Provisioning
The system must be configured for HLR destinations.	See *Configure the System for HLR Destinations*.
The ANSIGFLEX system option cannot be set to YES when G-Flex is used in an ITU system. If G-Flex will be used in an ANSI environment, see *G-Flex in an ANSI Environment*and *G-Flex and G-Flex MLR Configuration Procedure*.	Enter the `rtrv-stpopts` command. Verify that the `ANSIGFLEX` entry does not appear in the command output or that the `ANSIGFLEX` entry shows a value of `no`.
The LNP feature cannot be on in the system.	Enter the `rtrv-ctrl-feat` command. If the LNP feature is on, shown with a quantity greater than zero for the LNP ported TNs entry in the command output, the feature described in this manual cannot be enabled.

G-Flex MAP Layer Routing Feature Prerequisites

Before the G-Flex MAP Layer Routing (MLR) feature can be enabled, the following prerequisites are required in the system:

Table 17: G-Flex MAP Layer Routing Feature Prerequisites

Prerequisite	Verification and Provisioning
The G-Flex feature must be enabled and on.	Enter the `rtrv-ctrl-feat` command. If the `G-Flex` entry does not appear in the output, follow the steps in the *G-Flex and G-Flex MLR Configuration Procedure* to enable and turn on the G-Flex feature.
The ANSIGFLEX system option cannot be set to Yes.	Enter the `rtrv-stpopts` command. Verify that the `ANSIGFLEX` entry does not appear in the command output or that the `ANSIGFLEX` entry shows a value of `no`.
The LNP feature cannot be on in the system.	Enter the `rtrv-ctrl-feat` command. If the LNP feature is on, shown with a quantity greater than zero for the `LNP ported TNs` entry in the command output, the G-Flex MLR feature cannot be enabled.
The E5-SM4G Throughput Capacity feature cannot be enabled in the system.	Enter the `rtrv-ctrl-feat` command. If the E5-SM4G Throughput Capacity feature entry appears in the command output, the G-Flex MLR feature cannot be enabled.

G-Flex and G-Flex MLR Configuration Procedure

The EAGLE 5 ISS configuration of the G-Flex feature and the G-Flex MAP Layer Routing (G-Flex MLR) feature consists of the following steps. The steps contain links and references to detailed procedures and information needed to complete each step.

1. Verify, and provision if needed, the system prerequisites. See *System Prerequisites*.
2. Verify, and provision if needed, the G-Flex feature prerequisites. See *G-Flex Feature Prerequisites*.
3. If the G-Flex MLR feature will be used, verify and provision if needed, the G-Flex MLR feature prerequisites. See *G-Flex MAP Layer Routing Feature Prerequisites*.
4. Enable and turn on the G-Flex feature. See *Enable and Turn on the G-Flex Feature*.
5. Change the STPOPTS options for the Default Country Code (DEFCC) and Default Network Destination Code (DEFNDC) to values other than NONE. See *Provision STPOPTS Options for G-Flex*.
6. Provision GSMOPTS options for G-Flex, including the following options. See *Provisioning the GSMOPTS Options*.
   - E.214 country code and network code (CCNC)
   - Default GSM mobile country code (DEFMCC)

- Default GSM mobile network destination code (DEFMNDC)
- E.212 mobile country code and mobile network code (MCCMNC)

7. Provision the service selector mechanism to route MSUs to the G-Flex service. See *Provisioning the G-Flex Service Selector*.
   - G-Flex service (gflex)
   - Translation Type

     Specify tt=2 when ANSI G-Flex will be used.
   - Global Title Indicators - G-Flex supports ANSI, ITU-I, and ITU-N Global Title Indicators.

     ITU-N24 is not supported.

     ANSI G-Flex uses only ANSI GTI=2 and GTIA=2.

     ANSI G-Flex is not supported when the G-Flex MLR feature is enabled.
   - Nature of Address Indicator (NAI) and Numbering Plan (NP) - required when the GTI value is 2
   - Service Nature of Address (SNAI) and Service Numbering Plan (SNP)
8. If G-Flex will be used in an ANSI environment, enable the ANSIGFLEX STPOPTS option. See *Provision the STPOPTS ANSIGFLEX Option*.
9. Set the G-Flex service state to ONLINE. See *Provision the SCCP Service State and Point Codes*.
10. If the *G-Flex SCCP Service Re-Route Capability* function will be used, provision either alternate point codes or set the GTT option to YES. See *Provision the SCCP Service State and Point Codes*.
11. If the G-Flex MLR feature will be used, continue with step 12.

    If the G-Flex MLR feature will not be used, go to step 13.
12. If the G-Flex MLR feature will be used,
    a. Enable and turn on the G-Flex MLR feature. See *Enable and Turn on the G-Flex MLR Feature*.
    b. Provision the GSMOPTS GFLEXMAPLAYERRTG, MAPLYRRTGON, and MAPLYRRTGOFF options for the G-Flex MLR feature. See *Provisioning the GSMOPTS Options*.
13. Verify the operational status of the system.
    a. Enter the `rept-stat-sccp` command to verify that all Service Module cards are loaded and in IS-NR status.
    b. Enter the `rept-stat-mps` command to verify that all Service Module cards and the EPAP are connected and operational.
    c. Enter the `rept-stat-db` command to verify that database levels are identical for the EPAP PDB and RTDB and the RTDB on each Service Module card.
14. Configure the measurements collection method, scheduling, and reporting if measurements will be collected for G-Flex.

    Refer to the procedures in the *Database Administration Manual - System Management* for configuring OAM-based measurements, the Measurements Platform feature, the E5-OAM Integrated Measurements feature, and the EAGLE OA&M Security feature in the EAGLE 5 ISS.
15. Back up the changes using the `chg-db:action=backup:dest=fixed` command.

The following messages appear, the active Maintenance and Administration Subsystem Processor (MASP) appears first.

```
BACKUP (FIXED): MASP A - Backup starts on active MASP.
BACKUP (FIXED): MASP A - Backup on active MASP to fixed disk complete.
BACKUP (FIXED): MASP A - Backup starts on standby MASP.
BACKUP (FIXED): MASP A - Backup on standby MASP to fixed disk complete.
```

Configure the System for HLR Destinations

This section describes the configuration of the system for HLR destinations, so that the system can communicate with the system of the HLR database. The route to this database may already be configured.

Perform the steps in the following procedure to verify that all HLR destinations for G-Flex are entered, and make configuration changes as needed. The steps contain links and references to procedures and information that is needed to complete each step.

Refer to the command descriptions in the *Commands Manual* for valid parameter values, input examples, rules for entering a command correctly, and output examples.

1. Display and note current system settings for point codes (PCs) and capability point codes (CPCs), destination point codes (DPCs), routes, and linksets.
   - Enter the `rtrv-stpopts` command to display the ITU-N point code format if the network is an ITU-N network.
   - Enter the `rtrv-sid` command to display current PCs and CPCs by network type.
   - Enter the `rtrv-dstn` command to display current DPCs.
   - Enter the `rtrv-rte` command to display current route configurations.
2. Identify PCs and CPCs; determine new PCs and CPCs to be entered.
3. Remove the system PC from the MAP table if necessary (refer to the *Database Administration Manual - Global Title Translation*, "Removing A Mated Application").
4. Change PC, CPC, DPC, route, linkset, and LIM card configurations for the HLR database.
   - Refer to the procedures in the *Database Administration Manual - SS7* to configure PCs and CPCs by network type.
   - Refer to the procedures in the *Database Administration Manual - SS7* to configure DPCs for HLR destinations.
   - Refer to the procedures in the *Database Administration Manual - System Management* to provision LIM cards in the system, if needed.
   - Refer to the procedures in the *Database Administration Manual - SS7* to assign DPCs and configure linksets, signaling links, and routes for HLR destinations.
   - Refer to the procedures in the *Database Administration Manual - Global Title Translation* to configure mated applications.
5. Allow LIM card operation in the system and verify the card operating status. Refer to the procedures in the *Database Administration Manual - System Management* .
6. Allow the operation of the signaling links in the system and verify the link operating status. Refer to the procedures in the *Database Administration Manual - SS7* .

7. Verify the service selector changes. Enter the `rtrv-srvsel` command.
8. Back up the changes using the `chg-db:action=backup:dest=fixed` command.

   The following messages appear, the active Maintenance and Administration Subsystem Processor (MASP) appears first.

```
BACKUP (FIXED): MASP A - Backup starts on active MASP.
BACKUP (FIXED): MASP A - Backup on active MASP to fixed disk complete.
BACKUP (FIXED): MASP A - Backup starts on standby MASP.
BACKUP (FIXED): MASP A - Backup on standby MASP to fixed disk complete.
```

Adding a Service Module Card

This procedure is used to add Service Module cards to the database to support GTT-related features and EPAP-related features.

EPAP-related features require Service Module cards running the VSCCP application. The following cards can be used as Service Module cards running the VSCCP application in the system:

- DSM 4G – a Service Module card with 4 gigabytes of memory and supports Group Ticket Voucher (TVG) and Message Flow Control (MFC)
- E5-SM4G - a Service Module card with 4 gigabytes of memory and supports TVG and MFC
- E5-SM8G-B - a Service Module card with 8 gigabytes of memory and supports only MFC

The system can contain a maximum of 32 (31+1) Service Module cards for EPAP-related features with EPAP running on a T1200 AS:

- The following Warning appears when more than 25 Service Module cards have been provisioned in the system and the `enable-ctrl-feat` command is entered to enable the first EPAP-related feature in the system:

```
Warning: The Eagle must be connected to an EPAP T1200 or higher
```

- The following Caution appears when the `ent-card` commend is entered to add the 26th Service Module card to the database and any EPAP-related feature is enabled in the system:

```
CAUTION: Please ensure EPAP Application Server is running on
         hardware supporting 32 SCCP cards e.g.: T1200.
         Re-enter command within 30 seconds to confirm change.
```

A Service Module card occupies two card slots. A Service Module card can be inserted in only an odd/even numbered pair of empty card slots of an EAGLE 5 ISS shelf. The even-numbered card slot to the right of the odd-numbered slot where the Service Module card is to be inserted must be empty. A Service Module card cannot be inserted in slots 09 and 10 because slots 09 and 10 of each shelf contain HMUX cards, HIPR cards, or HIPR2 cards. The Service Module card is connected to the network through the odd-numbered card slot connector.

Note: Service Module cards can be inserted only in slots 01, 03, 05, 07, and 11 of the control shelf (1100).

Table 18: Service Module Card Locations

Location of the Service Module Card	Empty Card Location
Slot 01	Slot 02
Slot 03	Slot 04
Slot 05	Slot 06
Slot 07	Slot 08
Slot 11	Slot 12
Slot 13	Slot 14
Slot 15	Slot 16
Slot 17	Slot 18

Prerequisites

Before a Service Module card can be added, the prerequisites in *Table 19: System Prerequisites for Adding a Service Module Card* must be present in the system.

Table 19: System Prerequisites for Adding a Service Module Card

Prerequisite	Verification and Actions
The shelf to which the card is to be added must already be provisioned in the database.	Enter the `rtrv-shlf` command. If the shelf is not in the database, refer to the procedure for adding a shelf in *Database Administration Manual – System Management*.
The odd/even slots in which the card will be inserted must not have a card already assigned in the database.	Enter the `rtrv-card` command. If a slot has a card assigned to it, use the dlt-card command to remove the card from the database. Refer to the `dlt-card` command description in *Commands Manual*.
The GTT feature must be on.	Enter the `rtrv-feat` command to display the GTT feature status. If the GTT feature is on, the gtt=on entry appears in the output. If the gtt=off entry appears in the output, use the procedures in *Database Administration Manual - GTT* to turn on and provision the GTT feature and any other GTT-related features and functions that will be used in the system.

Prerequisite	Verification and Actions
To add more than 25 Service Module cards to the database, the EPAP connected to the EAGLE 5 ISS must be running on a T1200 AS.	Use visual inspection or contact the for assistance to determine the EPAP hardware type.

Before an E5-SM4G Service Module card can be added, the prerequisite in *Table 20: Prerequisite for Adding an E5-SM4G Service Module Card* must be present in the system.

Table 20: Prerequisite for Adding an E5-SM4G Service Module Card

Prerequisite	Verification and Actions
Slots 09 and 10 in the shelf to which the E5-SM4G card will be added must contain either HIPR cards or HIPR2 cards.	Enter the `rept-stat-gpl:gpl=hipr` command and the `rept-stat-gpl:gpl=hipr2` command to list the installed HIPR cards and HIPR2 cards in the system. If the shelf does not contain HIPR cards or HIPR2 cards, refer to procedures in *Installation Manual - EAGLE 5 ISS* to install HIPR cards or HIPR2 cards in the shelf.

Before an E5-SM8G-B Service Module card can be added, the prerequisites in *Table 21: Prerequisites for Adding an E5-SM8G-B Service Module Card* must be present in the system.

Table 21: Prerequisites for Adding an E5-SM8G-B Service Module Card

Prerequisite	Verification and Actions
Slots 09 and 10 in the shelf to which the E5-SM8G-B card will be added must contain either HIPR cards or HIPR2 cards.	Enter the `rept-stat-gpl:gpl=hipr` command and the `rept-stat-gpl:gpl=hipr2` command to list the installed HIPR cards and HIPR2 cards in the system. If the shelf does not contain HIPR cards or HIPR2 cards, refer to procedures in *Installation Manual - EAGLE 5 ISS* to install HIPR cards or HIPR2 cards in the shelf.
Fan trays must be installed.	If fan trays are not installed, refer to *Installation Manual - EAGLE 5 ISS* for the fan installation procedure.
The Cooling Fan feature (FAN) must be on.	Enter the `rtrv-feat` command to display the status of the Cooling Fan feature (FAN). If `FAN = off` in the `rtrv-feat` output, refer to procedures in *Database Administration Manual -*

Prerequisite	Verification and Actions
	System Management to turn on the Cooling Fan feature (FAN).
The Message Flow Control (MFC) option must be on.	Enter the `rtrv-stpopts` command to display the status of the Message Flow Control (MFC) option. Refer to procedures in *Database Administration Manual - System Management* to turn on the Message Flow Control (MFC) option.

Refer to *Commands Manual* for complete descriptions of the commands used in this procedure. The complete descriptions include valid parameter values and output examples.

1. Display the cards in the system by entering the `rtrv-card` command. Odd-even pairs of card locations that do not contain cards (are not listed in the output) and do not contain HMUX, HIPR, or HIPR2 cards can be used for Service Module cards.

```
   rlghncxa03w 08-03-15 16:34:56 EST  EAGLE 39.2.0
   CARD   TYPE      APPL      LSET NAME     LINK SLC LSET NAME     LINK SLC
   1201   LIMDS0    SS7ANSI   LS1           A    0   LS1           B
   1102   DSM       VSCCP     ------------  A    --  ------------  B    --
   1113   GPSM      OAM
   1114   TDM-A
   1115   GPSM      OAM
   1116   TDM-B
   1117   MDAL

;
```

2. Verify that the Service Module card to be added has been physically installed in the correct card location and the required cabling is installed to connect the card to the EPAP.

CAUTION: If the version of the BPDCM GPL on the Service Module card does not match the BPDCM GPL version in the database when the Service Module card is inserted into the card slot, UAM 0002 is generated indicating that these GPL versions do not match. If UAM 0002 has been generated, perform the alarm clearing procedure for UAM 0002 in the *Unsolicited Alarm and Information Messages* manual before proceeding with this procedure.

3. Perform this step only if the card being added will be the 26th Service Module card in the system.

   If the card is NOT the 26th Service Module card, continue to *Step 4*.

   Note: The same `ent-card` command must be entered twice within 30 seconds to complete the provisioning of the card.

   a) Enter the `ent-card` command the first time for the 26th card.

   `ent-card:loc=<card location>:type=dsm:appl=vsccp`

   When the command executes the first time and any EPAP-related feature is enabled, the following caution appears :

```
CAUTION: Please ensure EPAP Application Server is running on
          hardware supporting 32 SCCP cards e.g.: T1200.
          Re-enter command within 30 seconds to confirm change.
```

b) Enter the `ent-card` command a second time for the 26th card to complete the provisioning of the card.

c) Go to *Step 5*.

4. Add the Service Module card to the database, using the `ent-card` command.
`ent-card:loc=<card location>:type=dsm:appl=vsccp`

5. For an E5-SM4G or E5-SM8G-B card, verify the temperature threshold settings by performing the "Changing the High-Capacity Card Temperature Alarm Thresholds" procedure in *Database Administration Manual - SS7*.

6. Verify the change by entering the `rtrv-card` command with the card location specified.
`rtrv-card:loc=<card location>`

```
   rlghncxa03w 08-03-15 16:34:56 EST  EAGLE 39.2.0
   CARD   TYPE      APPL      LSET NAME     LINK SLC LSET NAME     LINK SLC
   1301   DSM       VSCCP     ------------  A    --  ------------  B
;
```

7. Display the current IP link parameters associated with the Service Module card in the database by entering the `rtrv-ip-lnk` command.

```
RLGHNCXA03W 09-08-24 21:14:37 GMT EAGLE 41.0.0
LOC PORT IPADDR   SUBMASK    DUPLEX  SPEED  MACTYPE  AUTO  MCAST
1107 A   -------  --------   HALF    10     DIX      NO    NO
1107 B   -------  --------   HALF    10     DIX      NO    NO
```

8. Enter the IP address and other parameter values associated with the Service Module card in the database using the `chg-ip-lnk` command.

   For example, enter:

   `chg-ip-lnk:loc=1107:port=a:duplex=half:ipaddrr=192.168.122.1:mactype=dix:speed=100:mcast=yes:submask=255.255.255.0`

   `chg-ip-lnk:loc=1107:port=b:duplex=half:ipaddrr=192.168.123.1:mactype=dix:speed=10:mcast=yes:submask=255.255.255.0`

   where:

   :loc

   Card location or slot number of the Service Module card in the EAGLE 5 ISS

   :port

   Ethernet interface Port ID - the physical interface of the Service Module card

   :ipaddr

   IP address for the specified port. This is a TCP/IP address expressed in standard dot notation. IP addresses consist of the network number of the system and the unique host number.

   :submask

   Subnet mask of the IP interface in the form of an IP address with a restricted range of values

   :duplex

   Mode of operation of the interface

   :speed

Interface bandwidth in megabits per second. The speed is either 100 Mbps for main Service Module network or 10 Mbps for backup Service Module network.

:mactype

Media Access Control Type of the interface. Specify `dix` for the Digital/Inter/Xerox *de facto* standard for Ethernet 2.

:mcast

Multicast Control to enable or disable multicast support for the interface. This parameter value must be `yes` to establish the connection from the Service Module card to the MPS system.

9. Verify the IP address and other parameter values associated with the Service Module card in the database by entering the `rtrv-ip-lnk` command.

```
RLGHNCXA03W 09-08-24 21:14:37 GMT EAGLE 41.0.0
LOC  PORT IPADDR        SUBMASK       DUPLEX SPEED MACTYPE AUTO MCAST
1107 A    192.168.122.1 255.255.255.0 HALF   100   DIX     NO   YES
1107 B    192.168.123.1 255.255.255.0 HALF   10    DIX     NO   YES
```

10. Display the current IP host information in the database by entering the `rtrv-ip-host` command.

```
RLGHNCXA03W 09-08-24 21:17:37 GMT EAGLE 41.0.0
IPADDR          HOST
192.1.1.32      KC_HLR2
192.1.1.50      DN_MSC1
192.1.1.52      DN_MSC2
```

11. Add the host name and IP address for each VSCCP link, using the `ent-ip-host` command.

Command examples:

```
ent-ip-host:host=vsccp_1107_a:ipaddr=192.168.122.1
```

```
ent-ip-host:host=vsccp_1107_b:ipaddr=192.168.123.1
```

where:

:host

Host name. Each VSCCP link must be specified separately.

:ipaddr

IP network address for each EPAP. The first three octets of the IP address must be the same as MPS A and B ports, respectively. The fourth octet identifies the Service Module card and must have a a unique octet identifier for the card IP address.

12. Verify the new IP host information in the database by entering the `rtrv-ip-host` command.

```
RLGHNCXA03W 09-08-24 21:19:37 GMT EAGLE 41.0.0
IPADDR          HOST
192.1.1.32      KC_HLR2
192.1.1.50      DN_MSC1
192.1.1.52      DN_MSC2
192.168.122.1   VSCCP_1107_A
192.168.123.1   VSCCP_1107_B
```

13. Enter local domain and IP router address for the Service Module card, using the `chg-ip-card` command.

Note: Most customer private networks do not require setting up a default router for the Service Module card. If your network configuration requires a default router to connect the Service Module

card communication to the EPAP, then only one default router is assignable to each Service Module card. Assign the default router address to each Service Module card as shown in this step.

For example:

```
chg-ip-card:defrouter=192.168.122.250:domain=nc.tekelec.com:loc=<card location>
```

where:

:defrouter

Default router IP address. This is a TCP/IP address expressed in standard dot notation. IP addresses consist of the network number of the system and the unique host number.

:domain

Domain name of domain server

:loc

Card location or slot number of the Service Module card in the EAGLE 5 ISS

14. Verify the new TCP/IP parameters associated with the Service Module card in the database by entering the `rtrv-ip-card` command.

```
RLGHNCXA03W 09-08-24 21:21:37 GMT EAGLE 41.0.0
   LOC 1107
     SRCHORDR  LOCAL
     DNSA      -----------
     DNSB      -----------
     DEFROUTER 192.168.122.250
     DOMAIN    NC.TEKELEC.COM
```

15. Allow the Service Module card that was added to operate in the system, using the `alw-card` command.

```
alw-card:loc=<card location>
```

16. Verify the In-Service-Normal (IS-NR) status of the Service Module card, using the `rept-stat-card` command.
17. Test the presence of the EPAP hosts on the network using the `pass` command with the ping parameter. This command is invoked with a destination that is either a hostname or IP address.

Command examples:

```
pass:loc=1107:cmd="ping 192.168.122.100".
pass:loc=1107:cmd="ping 192.168.122.200".
pass:loc=1107:cmd="ping 192.168.123.100".
pass:loc=1107:cmd="ping 192.168.123.200".
```

where:

:loc

Card location or slot number in the EAGLE 5 ISS

:cmd

Command string passed to Service Module card for processing

After successful completion of each command, the system response is similar to the following output:

```
rlghncxa03w 09-08-24 08:30:44 GMT EAGLE 41.0.0
pass: loc=1107: cmd="ping 192.168.122.100"
Command entered at terminal #1.
;
rlghncxa03w 09-08-24 08:30:44 GMT EAGLE 41.0.0
PASS: Command sent to card
;
rlghncxa03w 09-08-24 08:30:44 GMT EAGLE 41.0.0
PING command in progress
;
rlghncxa03w 09-08-24 08:30:46 GMT EAGLE 41.0.0
PING 192.168.122.100: 56 data bytes
64 bytes from tekral.nc.tekelec.com (192.168.122.100):icmp_seq=0.time=5. ms
64 bytes from tekral.nc.tekelec.com (192.168.122.100):icmp_seq=1.time=0. ms
64 bytes from tekral.nc.tekelec.com (192.168.122.100):icmp_seq=2.time=0. ms
----192.168.100.3 PING Statistics----
3 packets transmitted, 3 packets received, 0% packet loss
round-trip (ms) min/avg/max = 0/1/5
PING command complete
```

If the `pass` commands with the `ping` parameter are not successful, verify the correct connection of the hardware cabling and repeat this step. If the command fails again, contact *Customer Care Center*.

18. Back up the database changes, by entering the following command.

    `chg-db:action=backup:dest=fixed`

    The following messages should appear; the active Maintenance and Administration Subsystem Processor (MASP) appears first.

```
BACKUP (FIXED) : MASP A - Backup starts on active MASP.
BACKUP (FIXED) : MASP A - Backup on active MASP to fixed disk complete.
BACKUP (FIXED) : MASP A - Backup starts on standby MASP.
BACKUP (FIXED) : MASP A - Backup on standby MASP to fixed disk complete.
```

19. Repeat this procedure for each Service Module card that needs to be added to the system.

Enable and Turn on the G-Flex Feature

This procedure is used to enable and turn on the G-Flex feature in the EAGLE 5 ISS.

The feature must be enabled using its feature part number (893021901) and a feature access key.

Note: Controlled features must be purchased before you can receive the feature access key to use to enable the feature. If you are not sure if you have purchased a feature and received the feature access key, contact your Tekelec Sales Representative or Account Representative.

When the G-Flex feature is enabled, it is permanently enabled. The G-Flex feature cannot be temporarily enabled.

Provisioning of GSMOPTS options and other information can be done after the G-Flex feature is enabled and turned on.

1. Display the status of the features that are controlled with feature access keys. Enter the `rtrv-ctrl-feat` command. The output lists the enabled features in the system and shows the on/off status for each feature.

```
   rlghncxa03w 10-06-29 16:40:40 EST  EAGLE5 42.0.0
   The following features have been permanently enabled:
   Feature Name              Partnum    Status  Quantity
   HC-MIM SLK Capacity       893012707  on            64
 ;
```

   If the `rtrv-ctrl-feat` output shows an `LNP ported TNs` quantity entry, this procedure cannot be performed for the G-Flex and G-Flex MLR features.

   If an entry for the G-Flex feature appears in the `rtrv-ctrl-feat` output with Status `on`, performing this procedure is not necessary.

2. Enable the G-Flex feature, by entering the `enable-ctrl-feat` command and specify the part number and feature access key for the feature :
`enable-ctrl-feat:partnum=893021901:fak=<feature access key>`

   When a feature is enabled, the entry for the enabled feature appears in the output of the `rtrv-ctrl-feat` command. The feature Status is `off`.

```
rlghncxa03w 10-06-29 16:40:40 EST  EAGLE5 42.0.0
   The following features have been permanently enabled:
   Feature Name              Partnum    Status  Quantity
   HC-MIM SLK Capacity       893012707  on            64
   G-Flex                    893021901  off          ----
;
```

3. Turn on the G-Flex feature, by entering the chg-ctrl-feat command with the part number 893021901.
`chg-ctrl-feat:partnum=893021901:status=on`

   When the feature is turned on, the feature status changes to `on` in in the `rtrv-ctrl-feat` command output.

```
rlghncxa03w 10-06-29 16:40:40 EST  EAGLE5 42.0.0
   The following features have been permanently enabled:
   Feature Name              Partnum    Status  Quantity
   HC-MIM SLK Capacity       893012707  on            64
   G-Flex                    893021901  on           ----
;
```

4. Back up the database changes, by entering the following command.
`chg-db:action=backup:dest=fixed`

   The following messages appear; the active Maintenance and Administration Subsystem Processor (MASP) appears first.

```
BACKUP (FIXED) : MASP A - Backup starts on active MASP.
BACKUP (FIXED) : MASP A - Backup on active MASP to fixed disk complete.
BACKUP (FIXED) : MASP A - Backup starts on standby MASP.
BACKUP (FIXED) : MASP A - Backup on standby MASP to fixed disk complete.
```

Provision STPOPTS Options for G-Flex

Use this procedure to change the STPOPTS option values for the Default Country Code (DEFCC) and Default Network Destination Code (DEFNDC) to values other than NONE.

When the G-Flex feature has been enabled, the STP options for the default country code and the default network destination code must be changed from NONE to appropriate values for G-Flex. The `chg-stpopts` and `rtrv-stpopts` commands support the defcc, defndc and dsmaud parameters for the G-Flex feature.

The default country code (defcc) parameter and default network destination code (defndc) parameter can be provisioned for G-Flex after the G-Flex feature is enabled. The defcc and defndc parameter values must be changed from NONE to appropriated values before the G-Flex feature can be turned on in the system.

In the `rtrv-stpopts` command output:

- The defcc and defndc parameters are displayed with value NONE when the G-Flex feature is enabled.
- The dsmaud parameter is displayed with value OFF when the G-Flex feature is turned on.

After the feature is turned on:

- The defcc and defndc parameter values cannot be set to NONE.
- The DSM audit running state (dsmaud) parameter of the `chg-stpopts` command can be provisioned for G-Flex.

1. Verify the defcc and defndc STP option parameter values. Enter the `rtrv-stpopts` command.
2. Change the defcc and defndc STP option parameter values to the desired values that are not NONE for the G-Flex feature, using the `chg-stpopts` command.
3. Verify any changes. Enter the `rtrv-stpopts` command.
4. Back up the changes using the `chg-db:action=backup:dest=fixed` command.

   The following messages appear, the active Maintenance and Administration Subsystem Processor (MASP) appears first.

```
BACKUP (FIXED): MASP A - Backup starts on active MASP.
BACKUP (FIXED): MASP A - Backup on active MASP to fixed disk complete.
BACKUP (FIXED): MASP A - Backup starts on standby MASP.
BACKUP (FIXED): MASP A - Backup on standby MASP to fixed disk complete.
```

Provisioning the G-Flex Service Selector

The procedures in this section describe how to add, change, and remove a service selector. The information is indicated that is specific to G-Flex.

Refer to the *Commands Manual* for descriptions of the commands that are used in these procedures, including parameter names, valid values, rules for using the commands correctly, and output examples.

Adding a G-Flex Service Selector

This procedure is used to add an ITU service selector for the G-Flex feature. (If G-Flex will be used in an ANSI environment, go to x.

The G-Flex feature must be enabled and turned on before a G-Flex service selector can be added.

1. Verify that the G-Flex feature is enabled and turned on, by entering the `rtrv-ctrl-feat` command.

If the G-Flex feature is enabled and turned on, the status of the G-Flex entry is on.

```
   rlghncxa03w 09-06-29 16:40:40 EST  EAGLE5 41.1.0
   The following features have been permanently enabled:
   Feature Name              Partnum    Status  Quantity
   HC-MIM SLK Capacity       893012707  on           64
   G-Flex                    893021901  on         ----
;
```

- If the G-Flex feature is enabled and turned on, continue with *Step 2*.
- If the G-Flex feature is not enabled or turned on, go to *Enable and Turn on the G-Flex Feature* to enable and turn on the G-Flex feature. Then continue with *Step 2*.

2. Display any existing G-Flex service selectors in the database, by entering the `rtrv-srvsel:serv=gflex` command.
3. Add new G-Flex service selectors, using the `ent-srvsel` command.

   This command assigns applicable service selectors required to specify the service entry for Service Module services.

   For an ANSI network, for example, the following commands show how to set up service selector combinations for G-Flex services:

```
ent-srvsel:gtia=2:tt=10:snp=e164:snai=intl:serv:gflex
ent-srvsel:gtia=2:tt=11:snp=e164:snai=natl:serv:gflex
ent-srvsel:gtia=2:tt=12:snp=e164:snai=sub:serv:gflex
```

   For an ITU-I network, for example, enter the following command:

```
ent-srvsel:gtii=4:tt=1:snp=e164:snai=intl:serv:gflex:nai=intl
:np=e164
```

   where:

   :gti/gtia/gtii/gtin

   Specifies the global title translation indicator (2 = ANSI, ITU; 4 = ITU). `:tt` - specifies the translation type.

   :snp

   Defines the service numbering plan (e164, e212, or e214).

   :snai

   Specifies the international Service Nature of Address Indicator.

   :serv

   Specifies the service feature.

   :nai

   Specifies the nature of address indicator.

   :np

   Specifies the numbering plan.

4. Verify the changes by entering the `rtrv-srvsel` command with the parameters and values used in *Step 3*.
5. Enter the `chg-sccp-serv:serv=gflex:state=online` command to set the G-Flex service status to online.
6. Back up the changes using the `chg-db:action=backup:dest=fixed` command.

The following messages appear, the active Maintenance and Administration Subsystem Processor (MASP) appears first.

```
BACKUP (FIXED): MASP A - Backup starts on active MASP.
BACKUP (FIXED): MASP A - Backup on active MASP to fixed disk complete.
BACKUP (FIXED): MASP A - Backup starts on standby MASP.
BACKUP (FIXED): MASP A - Backup on standby MASP to fixed disk complete.
```

Removing a Service Selector

This procedure is used to remove a service selector from the database.

To remove a service selector, the GTI, GTII, GTIN, tt, and ssn parameter values must be entered as shown in the `rtrv-srvsel` output.

These parameters can also be used to limit the amount of information displayed with the `rtrv-srvsel` command.

1. Display the service selectors in the database, by entering the `rtrv-srvsel` command.
2. Remove the service selector from the database, using the `dlt-srvsel` command.
3. Verify the changes by entering the `rtrv-srvsel` command with the parameters and values used in *Step 2*.
4. Back up the changes using the `chg-db:action=backup:dest=fixed` command.

   The following messages appear, the active Maintenance and Administration Subsystem Processor (MASP) appears first.

```
BACKUP (FIXED): MASP A - Backup starts on active MASP.
BACKUP (FIXED): MASP A - Backup on active MASP to fixed disk complete.
BACKUP (FIXED): MASP A - Backup starts on standby MASP.
BACKUP (FIXED): MASP A - Backup on standby MASP to fixed disk complete.
```

Changing an Existing Service Selector to a G-Flex Service Selector

This procedure is used to change an existing non-G-Flex service selector to a G-Flex service selector.

The only parameter that can be changed using this procedure is the nserv parameter, to specify the new DSM service type (gflex):

The `chg-srvsel` command requires that the following parameters be specified with the values shown in the `rtrv-srvsel` output for the service selector that is being changed. If any of these parameter values need to be changed for a new G-Flex service selector, use the the procedure in *Removing a Service Selector* to remove the existing service selector. Then use the procedure in *Adding a G-Flex Service Selector* to add the new G-Flex service selector with the new parameter information.

:gtii/gtin/gtin24

Global title indicator for ITU international (gtii) and ITU national using 14-bit point codes (gtin).

:tt

Translation type

:ssn

Subsystem number

:nai

Nature of address indicator

:naiv

Nature of address indicator value

:np

Numbering plan

:npv

Numbering plan value

1. Display the service selectors in the database, using the rtrv-srvsel command.

   If the `rtrv-srvsel` output shows G-Flex service selectors, go to *Step 3*.

2. Verify that the G-Flex feature is enabled and turned on, by entering the `rtrv-ctrl-feat` command. If the feature is enabled and turned on, the status of the entry is on.

```
    rlghncxa03w 09-06-29 16:40:40 EST  EAGLE5 41.1.0
    The following features have been permanently enabled:
    Feature Name             Partnum    Status  Quantity
    HC-MIM SLK Capacity      893012707  on            64
    G-Flex                   893021901  on          ----
;
```

   - If the G-Flex feature is not enabled or turned on, go to *Enable and Turn on the G-Flex Feature* to enable and turn on the feature. Continue with *Step 3*.
   - If the G-Flex feature is enabled and turned on, continue with *Step 3*.

3. Change the service selector, using the `chg-srvsel` command.

   If the SNP, or SNAI parameter values are shown as dashes in the `rtrv-srvsel` output, these parameters cannot be specified with the `chg-srvsel` command.

   If the gtii/gtin/gtin24 parameter value is 2, the np, nai, npv, and naiv parameters cannot be specified with the `chg-srvsel` command.

   If the gtii/gtin/gtin24 parameter value is 4, either the np and nai, or the npv and naiv parameters must be specified with the `chg-srvsel` command. The np and nai parameters can be specified in place of the npv and naiv parameters, and the npv and naiv parameters can be specified in place of the np and naiv parameters, as long as parameter values be specified correspond to the values shown in the `rtrv-srvsel` output. Refer to the `chg-srvsel` command description in *Commands Manual*.

4. Verify the changes by entering the `rtrv-srvsel` command with the serv=gflex parameter and the values for the other parameters used in *Step 3*.

5. Back up the changes using the `chg-db:action=backup:dest=fixed` command.

   The following messages appear, the active Maintenance and Administration Subsystem Processor (MASP) appears first.

```
BACKUP (FIXED): MASP A - Backup starts on active MASP.
BACKUP (FIXED): MASP A - Backup on active MASP to fixed disk complete.
BACKUP (FIXED): MASP A - Backup starts on standby MASP.
BACKUP (FIXED): MASP A - Backup on standby MASP to fixed disk complete.
```

Provision the STPOPTS ANSIGFLEX Option

Use this procedure to provision the ANSIGFLEX option for allowing 1700 TPS per DSM for G-Flex in an ANSI environment.

The ANSIGFLEX system option can be set to YES only if:

- The G-Flex feature is on.
- No other EPAP-related feature or any ELAP-related feature is on.
- No ITU service selectors are provisioned.

  The only service selectors that can be used when the system option is on are GTI or GTIA , SERV=GFLEX, and TT=2.

  A check for ANSI service selectors is made before allowing the ANSIGFLEX system option to set to YES.

The ANSIGFLEX system option can be set to NO after it has been set to YES (`chg-stpopts:ansgflex=no`). DSM card TPS granting is reduced to 850 TPS when the option setting is NO. A notification to the user concerning the reduction in SCCP capacity is generated.

1. Verify that the G-Flex feature is on. Enter the `rtrv-ctrl-feat` command.
   - If the G-Flex feature is on (the `G-Flex` entry appears in the command output), continue with *Step 2*.
   - If the G-Flex feature is not on, (the entry is not in the output or the Status is `off` in the entry), go to *G-Flex and G-Flex MLR Configuration Procedure* to enable, turn on, and provision the G-Flex feature. Then continue with *Step 2*.
2. Display any provisioned service selectors. Enter the `rtrv-srvsel` command.
   - If the correct ANSI service selectors are provisioned, continue with *Step 7*.
   - If there are no service selectors provisioned or there are ITU service selectors provisioned, go to
     - *Removing a Service Selector* to remove ITU service selectors (selectors that are not GTI or GTIA and tt=2)
     - *Adding a G-Flex Service Selector* to add ANSI service selectors
3. Enable the STPOPTS ANSIGFLEX option. Enter the `chg-stpopts:ansigflex=yes` command.
4. Back up the changes using the `chg-db:action=backup:dest=fixed` command.

   The following messages appear, the active Maintenance and Administration Subsystem Processor (MASP) appears first.

```
BACKUP (FIXED): MASP A - Backup starts on active MASP.
BACKUP (FIXED): MASP A - Backup on active MASP to fixed disk complete.
BACKUP (FIXED): MASP A - Backup starts on standby MASP.
BACKUP (FIXED): MASP A - Backup on standby MASP to fixed disk complete.
```

Provisioning the GSMOPTS Options

This procedure is used to provision the configuration options for the G-Flex feature and the G-Flex MLR feature.

See *G-Flex Configuration Options* for information and considerations about provisioning G-Flex and G-Flex MLR configuration options.

Refer to the command descriptions in the *Commands Manual* for valid parameter values, input examples, rules for entering the commands correctly, and output examples for the commands used in this procedure.

1. Verify that the G-Flex feature is enabled and turned on, by entering the `rtrv-ctrl-feat` command.
   - If the G-Flex feature is enabled and turned on (the entry appears in the output with Status `on`), continue with *Step 2*.

     ```
     rlghncxa03w 09-06-29 16:40:40 EST  EAGLE5 41.1.0
     The following features have been permanently enabled:
     Feature Name              Partnum    Status  Quantity
     HC-MIM SLK Capacity       893012707  on           64
     G-Flex                    893021901  on         ----
;
     ```

   - If the G-Flex feature is not enabled (the entry does not appear in the output) or is not turned on (the entry appears with Status off, go to *Enable and Turn on the G-Flex Feature* to enable and turn on the feature. Then continue with *Step 2*.
2. Display the current settings of the feature options. Enter the `rtrv-gsmopts` command.
3. Change the GSMOPTS options for G-Flex to the required values.
4. Verify the changes. Enter the `rtrv-gsmopts` command.
5. Is the G-Flex MLR feature to be used with the G-Flex feature?.
   - If the G-Flex MLR feature will NOT be used, go to *Step 9*.
   - If the G-Flex MLR feature WILL BE used, continue with *Step 6*.
6. If the G-Flex MLR feature will be used, verify that the G-Flex MLR feature is enabled and turned on, by entering the `rtrv-ctrl-feat` command.
   - If the G-Flex MLR feature is enabled and turned on (the entry appears in the output with Status `on`), continue with *Step 7*.

     ```
     rlghncxa03w 09-06-29 16:40:40 EST  EAGLE5 41.1.0
     The following features have been permanently enabled:
     Feature Name              Partnum    Status  Quantity
     HC-MIM SLK Capacity       893012707  on           64
     G-Flex                    893021901  on         ----
     G-Flex MLR                893021701  on         ----
;
     ```

   - If the G-Flex MLR feature is not enabled (the entry does not appear in the output) or is not turned on (the entry appears with Status off, go to *Enable and Turn on the G-Flex MLR Feature* to enable and turn on the feature. Then continue with *Step 7*.

7. Set the GSMOPTS GFLEXMAPLAYERRTG , MAPLYRRTGON, and MAPLYRRTGOFF options to the required values for the desired G-Flex MLR processing, as described in *G-Flex MAP Layer Routing*.
8. Verify the changes. Enter the `rtrv-gsmopts` command.
9. Back up the changes, using the `chg-db:action=backup:dest=fixed` command.

   These messages appear, the active Maintenance and Administration Subsystem Processor (MASP) appears first.

```
BACKUP (FIXED) : MASP A - Backup starts on active MASP.
BACKUP (FIXED) : MASP A - Backup on active MASP to fixed disk complete.
BACKUP (FIXED) : MASP A - Backup starts on standby MASP.
BACKUP (FIXED) : MASP A - Backup on standby MASP to fixed disk complete.
```

Provision the SCCP Service State and Point Codes

This procedure is used to:

- Take the G-Flex service ONLINE and OFFLINE
- Indicate whether or not to use GTT as part of the re-routing procedure when the service is OFFLINE, and alternate PCs are not defined or not available
- Assign alternate point codes to PC groups used for *G-Flex SCCP Service Re-Route Capability* assignment, and change the Relative Cost (RD) of of existing point codes in a group

SCCP Service groups are organized by service (G-Flex or G-Port) and point code network type (ANSI, ITU-I, Spare ITU-I, ITU-N, Spare ITU-N, or ITUN-24). Up to 7 PCs may be in a network type grouping for service re-route load sharing. This command allows for additions and modifications of up to 4 PCs at once.

Refer to the *Commands Manual* for complete descriptions of the `chg/dlt/rtrv-sccp-serv` commands, including parameter names, rules for using the commands correctly, and output examples.

1. Display the status and provisioned options for the gflex service. Enter the `rtrv-sccp-serv:serv=gflex` command.
2. Change the status and provisioned options for the gflex service as needed.

   Include the serv=gflex parameter, and use the status=on parameter to set the service ONLINE.

   Use other command parameters to add, change, and delete alternate point codes, relative costs, and group assignments, and change the gtt parameter value (the default is YES).
3. Verify the changes be entering the `rtrv-sccp-serv` command.
4. Back up the changes using the `chg-db:action=backup:dest=fixed` command.

   The following messages appear, the active Maintenance and Administration Subsystem Processor (MASP) appears first.

```
BACKUP (FIXED): MASP A - Backup starts on active MASP.
BACKUP (FIXED): MASP A - Backup on active MASP to fixed disk complete.
BACKUP (FIXED): MASP A - Backup starts on standby MASP.
BACKUP (FIXED): MASP A - Backup on standby MASP to fixed disk complete.
```

Enable and Turn on the G-Flex MLR Feature

This procedure is used to enable the G-Flex MAP Layer Routing (G-Flex MLR) feature in the EAGLE 5 ISS.

The feature must be enabled using its feature part number (893021701) and a feature access key.

Note: Controlled features must be purchased before you can receive the feature access key to use to enable the feature. If you are not sure if you have purchased a feature and received the feature access key, contact your Tekelec Sales Representative or Account Representative.

When the G-Flex MLR feature is e enabled, it is permanently enabled. The G-Flex MLR feature cannot be temporarily enabled.

Provisioning of the GSMOPTS options can be done after the G-Flex MLR feature is enabled and turned on.

1. Display the status of the features that are controlled with feature access keys. Enter the `rtrv-ctrl-feat` command. The output lists the enabled features in the system and shows the on/off status for each feature.

```
   rlghncxa03w 10-06-29 16:40:40 EST  EAGLE5 42.0.0
   The following features have been permanently enabled:
   Feature Name              Partnum    Status  Quantity
   HC-MIM SLK Capacity       893012707  on            64
 ;
```

   If the `rtrv-ctrl-feat` output shows a LNP ported TNs quantity entry, this procedure cannot be performed for the G-Flex MLR feature.

   If an entry for the G-Flex MLR feature appears in the `rtrv-ctrl-feat` output with Status on, performing this procedure is not necessary.

2. Enable the G-Flex MAP Layer Routing feature. Enter the `enable-ctrl-feat` command and specify the part number and feature access key for the feature.

```
enable-ctrl-feat:partnum=893021701:fak=<fak>
```

   When a feature is enabled, the entry for the enabled feature appears in the output of the `rtrv-ctrl-feat` command. The feature Status is off

```
rlghncxa03w 10-06-29 16:40:40 EST  EAGLE5 42.0.0
   The following features have been permanently enabled:
   Feature Name              Partnum    Status  Quantity
   HC-MIM SLK Capacity       893012707  on            64
   G-Flex                    893021901  on          ----
   G-Flex MLR                893021701  off         ----
```

3. Turn on the G-Flex MAP Layer Routing Feature, by entering the `chg-ctrl-feat` command:

```
chg-ctrl-feat:partnum=893021701:status=on
```

   When the feature is turned on, the feature status changes to on in the `rtrv-ctrl-feat` command output.

```
rlghncxa03w 10-06-29 16:40:40 EST  EAGLE5 42.0.0
   The following features have been permanently enabled:
   Feature Name              Partnum    Status  Quantity
   HC-MIM SLK Capacity       893012707  on            64
   G-Flex                    893021901  on          ----
```

```
    G-Flex MLR                893021701  on          ----
;
```

4. Back up the database changes, by entering the following command.
   `chg-db:action=backup:dest=fixed`

   The following messages appear; the active Maintenance and Administration Subsystem Processor (MASP) appears first.

```
BACKUP (FIXED) : MASP A - Backup starts on active MASP.
BACKUP (FIXED) : MASP A - Backup on active MASP to fixed disk complete.
BACKUP (FIXED) : MASP A - Backup starts on standby MASP.
BACKUP (FIXED) : MASP A - Backup on standby MASP to fixed disk complete.
```

The 1100 TPS/DSM for ITU NP Feature

When only DSM cards or a mixture of DSM cards with E5-SM4G or E5-SM8G-B cards (Service Module cards) are equipped in the system, all of the cards are normally rated at 850 transactions per second (TPS). The 1100 TPS/DSM for ITU NP feature increases the TPS rate for a Service Module card from 850 TPS to 1100 TPS.

The feature can be enabled when the equipped Service Module cards include DSM cards and at least one of the EPAP-related features listed in *Table 23: Feature Prerequisites* is enabled and turned on.

When the maximum number of Service Module cards is installed in the EAGLE 5 ISS, the maximum processing capacity of SCCP traffic for an EAGLE 5 ISS processing traffic for EPAP-related features is increased to 34,100 TPS.

The increased capacity to 1100 TPS per DSM card assumes incoming traffic consists of at least 30% of GTT routed traffic that does not require EPAP-based lookup. If more than 70% of incoming traffic requires EPAP-based lookup, Group Ticket Voucher (TVG) may shut down and overall TVG capacity of 1100 TPS for the card may not be met. E5-SM8G-B cards are inhibited if Group Ticket Voucher (TVG) is enabled.

The 1100 TPS/DSM for ITU NP feature must be enabled using the feature part number 893018001 and a feature access key (FAK). Based on the feature part number and the serial number of the EAGLE 5 ISS, the feature access key is site-specific. The 1100 TPS/DSM for ITU NP feature cannot be enabled with a temporary feature access key.

Note: The feature access key for the 1100 TPS/DSM for ITU NP feature is provided by Tekelec when the feature is purchased. Contact your Tekelec Sales Representative or Account Representative before beginning the feature configuration procedure if you do not have the feature access key for this feature.

After the 1100 TPS/DSM for ITU NP feature has been enabled, the feature must be turned on to begin operation in the system. The feature is an On/Off feature which means that the feature can be turned off after it has been turned on.

System Prerequisites

Before the 1100 TPS/DSM for ITU NP feature can be enabled, the prerequisites listed in *Table 22: System Prerequisites* are required in the system.

Table 22: System Prerequisites

Prerequisite	Verification and Provisioning
For new installations, the system serial number must be verified and locked. The system is shipped with an unlocked serial number. The serial number can be changed if necessary and must be locked after the system is on-site. For systems that are being upgraded, the serial number has already been verified and locked.	Enter the `rtrv-serial-num` command to display the serial number and its lock status. If a serial number is displayed, verify that the serial number is correct for the system. The system serial number is shown on a label affixed to the control shelf (shelf 1100). If the displayed serial number is correct and locked, no action is necessary. If the displayed serial number is correct and not locked, enter the `ent-serial-num` command WITH the lock=yes parameter, and specify the serial number that is shown on the control shelf label. If no serial number is displayed, • Enter the `ent-serial-num` command WITHOUT the lock parameter, and specify the serial number that is shown on the control shelf label. • Enter the `rtrv-serial-num` command and verify that the correct serial number was entered. • Enter the `ent-serial-num` command again WITH the correct serial number and the lock=yes parameter. If a serial number is displayed or entered and locked that does not match the number on the control shelf, contact the *Customer Care Center* for assistance.
The GTT feature must on in the system.	Enter the `rtrv-feat` command. If the GTT feature is on, the `gtt=on` entry appears in the output. If the `gtt=off` entry appears in the output, use the procedures in *Database Administration Manual – Global Title Translation* to turn on and provision the GTT feature and any related features and functions.

Feature Prerequisites

Before the 1100 TPS/DSM for ITU NP feature can be enabled, the prerequisites shown in *Table 23: Feature Prerequisites* are required in the system.

Table 23: Feature Prerequisites

Prerequisite	Verification and Provisioning
Service Module cards running the VSCCP application must be equipped. The cards can be all DSM cards, or a mixture of DSM cards with E5-SM4G or E5-SM8G-B cards. At least one DSM card must be installed.	Enter the `rept-stat-gpl:gpl=vsccp` command and the `rept-stat-gpl:gpl=sccphc` command to list the Service Module cards in the system. If the number of cards is not sufficient, use the procedure *Adding a Service Module Card* to add Service Module cards.
The ANSIGFLEX system option cannot be set to Yes.	Enter the `rtrv-stpopts` command. Verify that the `ANSIGFLEX` entry does not appear in the command output or that the `ANSIGFLEX` entry shows a value of `no`.
The LNP feature cannot be on in the system.	Enter the `rtrv-ctrl-feat` command. If the LNP feature is on, shown with a quantity greater than zero for the `LNP ported TNs` entry in the command output, the 1100 TPS/DSM for ITU NP feature cannot be enabled.
At least one of the following EPAP-related features must be enabled and turned on: • G-Port • A-Port • INP • AINPQ • IGM • EIR • IDP Relay • V-Flex • IAR (NP, ASD, GRN) • MO-based GSM SMS NP • MO-based IS41SMS NP • TIF (NP, ASD, GRN, Number Substitution, TIF Subscr CgPN Blacklist)	Enter the `rtrv-ctrl-feat` command and verify that an entry for at least one of the listed EPAP-related features with Status `on` is present in the output. If none of the listed EPAP-related features are on, use the procedures in the Feature Manual of the EPAP-related feature to be used to enable and turn on the appropriate EPAP-related feature.

This section provides the following procedures for the 1100 TPS/DSM for ITU NP feature:

- *Enable the 1100 TPS/DSM for ITU NP Feature*
- *Turn On the 1100 TPS/DSM for ITU NP Feature*
- *Turn Off the 1100 TPS/DSM for ITU NP Feature*

Refer to *Commands Manual* for descriptions of the commands used in the procedures including parameter names, valid parameter values, rules for using the commands, and output examples.

Enable the 1100 TPS/DSM for ITU NP Feature

This procedure is used to enable the 1100 TPS/DSM for ITU NP feature.

1. Enable the 1100 TPS/DSM for ITU NP feature with part number 893018001 and the feature access key.

   ```
   enable-ctrl-feat:partnum=893018001:fak=<feature access key>
   ```

2. Verify the change by entering the `rtrv-ctrl-feat` command with the 1100 TPS/DSM for ITU NP feature part number 893018001.

   ```
   rtrv-ctrl-feat:partnum=893018001
   ```

   ```
   rlghncxa03w 09-08-24 21:15:37 EST EAGLE 40.1.0
   The following features have been permanently enabled:
   Feature Name              Partnum    Status  Quantity
   HC-MIM SLK Capacity       893012707  on            64
   Prepaid SMS Intercept Ph1 893006701  on          ----
   1100 TPS/DSM for ITU NP   893018001  off         ----
   ;
   ```

3. Back up the changes using the `chg-db:action=backup:dest=fixed` command.

   The following messages appear, the active Maintenance and Administration Subsystem Processor (MASP) appears first.

   ```
   BACKUP (FIXED) : MASP A - Backup starts on active MASP.
   BACKUP (FIXED) : MASP A - Backup on active MASP to fixed disk complete. BACKUP
   (FIXED) : MASP A - Backup starts on standby MASP.
   BACKUP (FIXED) : MASP A - Backup on standby MASP to fixed disk complete.
   ```

Turn On the 1100 TPS/DSM for ITU NP Feature

This procedure is used to turn on the 1100 TPS/DSM for ITU NP feature, after it has been enabled or turned off.

Note: If the EPAP-based traffic is higher than 70% of all traffic on the EAGLE 5 ISS, the DSM card performance may not reach 1100 TPS per DSM card.

1. Enter the `chg-ctrl-feat` command the first time and specify the 1100 TPS/DSM for ITU NP feature part number 893018001and the `status=on` parameter value.

   ```
   chg-ctrl-feat:partnum=893018001:status=on
   ```

   The following message is displayed:

   ```
   CAUTION: Rated TPS for this feature supports an engineered GTT
   traffic mix of no more than 70 percent EPAP-based traffic.
   Re-enter the command within 30 seconds to confirm change.
   ```

2. Re-enter the command the second time within 30 seconds to turn on the 1100 TPS/DSM for ITU NP feature.

   ```
   chg-ctrl-feat:partnum=893018001:status=on
   ```

3. Verify the change by entering the `rtrv-ctrl-feat` command with the 1100 TPS/DSM for ITU NP feature part number.

```
rtrv-ctrl-feat:partnum=893018001
```

```
rlghncxa03w 09-08-24 21:15:37 EST EAGLE 40.1.0
The following features have been permanently enabled:
Feature Name              Partnum    Status  Quantity
HC-MIM SLK Capacity       893012707  on           64
Prepaid SMS Intercept Ph1 893006701  on         ----
1100 TPS/DSM for ITU NP   893018001  on         ----
;
```

4. Back up the database changes using the `chg-db:action=backup:dest=fixed` command.

   The following messages appear, the active Maintenance and Administration Subsystem Processor (MASP) appears first.

```
BACKUP (FIXED): MASP A - Backup starts on active MASP.
BACKUP (FIXED): MASP A - Backup on active MASP to fixed disk complete.
BACKUP (FIXED): MASP A - Backup starts on standby MASP.
BACKUP (FIXED): MASP A - Backup on standby MASP to fixed disk complete.
```

Turn Off the 1100 TPS/DSM for ITU NP Feature

This procedure is used to turn off the 1100 TPS/DSM for ITU NP feature, after it has been enabled and turned on.

1. Enter the `chg-ctrl-feat` command the first time and specify the 1100 TPS/DSM for ITU NP feature part number 893018001 and the status=off parameter value.

   ```
   chg-ctrl-feat:partnum=893018001:status=off
   ```

   The following message is displayed:

```
CAUTION: This command decreases the total TPS of the SCCP system from 1100 to
850 TPS for each DSM card.
```

2. Re-enter the command the second time within 30 seconds to turn off the 1100 TPS/DSM for ITU NP feature.
3. Back up the database changes using the `chg-db:action=backup:dest=fixed` command.

   The following messages appear, the active Maintenance and Administration Subsystem Processor (MASP) appears first.

```
BACKUP (FIXED): MASP A - Backup starts on active MASP.
BACKUP (FIXED): MASP A - Backup on active MASP to fixed disk complete.
BACKUP (FIXED): MASP A - Backup starts on standby MASP.
BACKUP (FIXED): MASP A - Backup on standby MASP to fixed disk complete.
```

Activating the E5-SM4G Throughput Capacity Feature

The E5-SM4G Throughput Capacity feature quantities are used to increase the processing capacity of the E5-SM4G card, the E5-SM8G-B card, and the system SCCP traffic for an EAGLE 5 ISS that contains E5-SM4G or E5-SM8G-B cards only. DSM Service Module cards are not affected. The achievable TPS maximums are shown in *Table 24: Maximum E5-SM4G, E5-SM8G-B, and System TPS Capacity*.

Table 24: Maximum E5-SM4G, E5-SM8G-B, and System TPS Capacity

Feature Quantity Part Number	Maximum TPS Capacity per E5-SM4G Card	Maximum TPS Capacity per E5-SM8G -B Card	Maximum System TPS Capacity
893019101 - Feature Quantity 5000	3125	3125	96,875 TPS with one or more EPAP-related features and 31+1 cards with EPAP running on T1200 AS
	5000	5000	• 150,000 TPS with no EPAP-related or ELAP-related feature traffic and 31+1 cards • 120,000 TPS with G-Flex and the ANSIGFLEX STP option and 24+1 cards • 155,00 TPS with G-Flex and the ANSIGFLEX STP option and 31+1 cards with EPAP running on T1200 AS • 40,000 TPS with ELAP and 8+1 cards • 85,000 TPS with ELAP and 17+1 cards
893019102 - Feature Quantity 6800	6800	6800	• 210,800 TPS with no EPAP-related or ELAP-related feature traffic and 31+1 cards • 210,800 TPS with one or more EPAP-related features and 31+1 cards with EPAP running on T1200 AS • 54,400 TPS with ELAP and 8+1 cards • 115,600 TPS with ELAP and 17+1 cards
893019103 - Feature Quantity 10000	6800	10000	For E5-SM4G: • 210,800 TPS with no EPAP-related or ELAP-related feature traffic and 31+1 cards • 210,800 TPS with one or more EPAP-related features and 31+1 cards with EPAP running on T1200 AS • 54,400 TPS with ELAP and 8+1 cards

Feature Quantity Part Number	Maximum TPS Capacity per E5-SM4G Card	Maximum TPS Capacity per E5-SM8G -B Card	Maximum System TPS Capacity
			• 115,600 TPS with ELAP and 17+1 cards For E5-SM8G-B: • 310,000 TPS with no EPAP-related or ELAP-related feature traffic and 31+1 cards • 310,000 TPS with one or more EPAP-related features and 31+1 cards with EPAP running on T1200 AS • 80,000 TPS with ELAP and 8+1 cards • 170,000 TPS with ELAP and 17+1 cards

An E5-SM4G Throughput Capacity quantity feature must be enabled using an E5-SM4G Throughput Capacity feature part number (893019101, 893019102, or 893019102) and a feature access key.

The feature access key is based on the feature part number and the serial number of the EAGLE 5 ISS, making the feature access key site-specific.

Note: The E5-SM4G Throughput Capacity quantity feature must be purchased to receive the feature access key used to enable the feature. Contact your Tekelec Sales Representative or Account Representative before beginning this procedure if you have purchased the E5-SM4G Throughput Capacity quantity feature, but do not have the feature access key. A temporary feature access key is not available for this feature.

After an E5-SM4G Throughput Capacity feature is enabled and turned on, the E5-SM4G Throughput Capacity feature cannot be turned off. When the E5-SM4G Throughput Capacity feature is enabled, it is permanently enabled. The E5-SM4G Throughput Capacity feature cannot be temporarily enabled.

System Prerequisites

Before the E5-SM4G Throughput Capacity feature can be enabled, the prerequisites listed in *Table 25: System Prerequisites* are required in the system.

Table 25: System Prerequisites

Prerequisite	Verification and Provisioning
For new installations, the system serial number must be verified and locked. The system is shipped with an unlocked serial number. The serial number can be changed if necessary and must be locked after the system is on-site.	Enter the `rtrv-serial-num` command to display the serial number and its lock status. Verify that the displayed serial number is correct for the system. The serial number is shown on a label affixed to the control shelf (shelf 1100).

Prerequisite	Verification and Provisioning
For systems that are being upgraded, the serial number has already been verified and locked.	If no serial number is displayed, or if the displayed serial number is not locked, refer to the `ent-serial-num` command description in *Commands Manual* for instructions to enter and lock the serial number.
The GTT feature must on in the system.	Enter the `rtrv-feat` command. If the GTT feature is on, the gtt=on entry appears in the output. If the gtt=off entry appears in the output, use the procedures in *Database Administration Manual – Global Title Translation* to turn on and provision the GTT feature and any related features and functions.

E5-SM4G Throughput Capacity Feature Prerequisite

Before the E5-SM4G Throughput Capacity feature can be enabled, the prerequisite shown in *Table 26: E5-SM4G Throughput Capacity Feature Prerequisite* is required in the system.

Table 26: E5-SM4G Throughput Capacity Feature Prerequisite

Prerequisite	Verification and Provisioning
E5-SM4G cards or E5-SM8G-B cards running the VSCCP application must be equipped. The required number of cards depends on the desired total system TPS to be achieved by the cards. See *Table 24: Maximum E5-SM4G, E5-SM8G-B, and System TPS Capacity*.	Enter the `rept-stat-gpl:gpl=sccphc` command to list the E5-SM4G cards and E5-SM8G-B cards in the system. If the number of cards is not sufficient, use the procedure in *Adding a Service Module Card* to add E5-SM4G cards or E5-SM8G-B cards.

The following procedure explains how to enable an E5-SM4G Throughput Capacity quantity feature.

Note: After a quantity feature has been enabled, a feature for a higher quantity can be enabled; a feature for a lower quantity cannot be enabled. Quantity features are automatically turned on when they are enabled.

Refer to *Commands Manual* for complete descriptions of the commands used in this procedure, including parameter names, valid parameter values, rules for using the commands, and output examples.

1. Display the status of the features that are controlled by feature access keys. Enter the `rtrv-ctrl-feat` command.

```
    rlghncxa03w 09-07-29 16:40:40 EST  EAGLE5 41.1.0
    The following features have been permanently enabled:
    Feature Name              Partnum    Status  Quantity
    HC-MIM SLK Capacity       893012707  on           64
    E5-SM4G Throughput Cap    893019101  on         5000
;
```

   - If the `rtrv-ctrl-feat` output shows that the correct E5-SM4G Throughput Capacity quantity feature is enabled and its status is on, no further action is necessary.

- If no E5-SM4G Throughput Capacity feature quantity is enabled or a higher quantity needs to be enabled, continue with *Step 2*.

2. Enable the E5-SM4G Throughput Capacity quantity feature by entering the `enable-ctrl-feat` command with the correct part number and FAK for the desired quantity.
3. Verify the status of the E5-SM4G Throughput Capacity quantity feature by entering the `rtrv-ctrl-feat` command with the feature part number that was enabled (893033501, 893019102, or 893019103) in *Step 2*.
   `rtrv-ctrl-feat:partnum=893019102`

```
    rlghncxa03w 09-08-29 16:40:40 EST  EAGLE5 41.1.0
    The following features have been permanently enabled:
    Feature Name              Partnum    Status  Quantity
    HC-MIM SLK Capacity       893012707  on            64
    E5-SM4G Throughput Cap    893019102  on          6800
;
```

4. Back up the changes using the `chg-db:action=backup:dest=fixed` command.

   The following messages appear, the active Maintenance and Administration Subsystem Processor (MASP) appears first.

```
BACKUP (FIXED): MASP A - Backup starts on active MASP.
BACKUP (FIXED): MASP A - Backup on active MASP to fixed disk complete.
BACKUP (FIXED): MASP A - Backup starts on standby MASP.
BACKUP (FIXED): MASP A - Backup on standby MASP to fixed disk complete.
```

Chapter 6

Measurements

Topics:

This chapter describes the measurements that can be collected and generated for the G-Flex feature, and the methods that can be used for generating reports for G-Flex measurements.

G-Flex Measurements

The EAGLE 5 ISS Measurements system supports the collection and retrieval of measurements for he G-Flex features. The G-Flex measurements can be collected and reported with the following collection methods:

- OAM-based (UI) measurements collection - G-Flex measurements are available using the File Transfer Area (FTA) and not directly to EAGLE 5 ISS UI terminals, when the E5-OAM Integrated Measurements feature is not on.
- The Measurements Platform feature enabled and the Measurements Platform collection option on
- The E5-OAM Integrated Measurements feature enabled and on and the E5-OAM Integrated Measurements collection option on

15 Minute Measurements can be used with the Measurements Platform or E5-OAM Integrated Measurements

Refer to the *Measurements* manual for for descriptions of collection methods, measurements, and measurements reports

Refer to the *Commands Manual* for descriptions of the commands used to enable and turn on features, turn on measurements collection options, and schedule and generate measurements reports.

Refer to the procedures in the *Database Administration Manual - System Management* to configure the Measurements Platform feature or E5-OAM Integrated Measurements feature for use with G-Flex.

The G-Flex MSU measurements shown in *Table 27: G-Flex MSU Measurements* are supported for the G-Flex feature. No G-Flex measurements are counted when the G-Flex service is OFFLINE.

Table 27: G-Flex MSU Measurements

Event Name	Description
GFGTMATCH	G-Flex GTTs with Match – The total number of G-Flex Global Title Translation successfully completed.
GFGTNOMCH	G-Flex GTTs No Match – The total number of G-Flex Global Title Translations completed that did not match an entry in the RTDB.
GFGTNOLKUP	G-Flex GTTs No Look-up – The total number of G-Flex Global Title Translations that could not be looked up in the RTDB because of some error. **Note:** This counter is not available using `rept-meas` by TT.

The measurement events shown in *Table 28: STP Daily and Day-to-Hour Measurements that include Counts for G-Flex MSUs* are included in the STP Daily Maintenance (MTCD) and STP Day-to-Hour (MTCDTH) measurement reports and include peg counts for G-FLEX MSUs. These reports are similar to those used for GTT.

The existing GTT/SCCP measurements are used for both GTT and G-Flex and appear in the same reports. This implementation does not discriminate between the MSSCCPFL, GTTUN0NS, GTTUN1NT,

or GTTPERFD pegs for G-Flex or GTT applications. For example, a search failure could result from a problem in either the RTDB or GTT database. *G-Flex SCCP Service Re-Route Capability* will count GTT measurements if GTT is performed.

Table 28: STP Daily and Day-to-Hour Measurements that include Counts for G-Flex MSUs

Event Name	Description
MSSCCPFL	MSUs discarded due to SCCP routing failure. Also includes G-Flex MSUs that got a match from either the RTDB or GTT database, but cannot be routed because of PC (Point Code) or SS (Subsystem) congestion, PC or SS unavailable, SS unequipped, or an unqualified error.
GTTUN0NS	GTT unable to perform; no such type. Also includes G-Flex GTT MSUs that did not match on new selectors (GTI, NP, NAI) in addition to ones not matching on TT.
GTTUN1NT	GTT unable to perform: no translation on this address. Also includes G-Flex MSUs that fell through to GTT, obtained a selector match but still did not get a match on the GTA.
GTTPERFD	Number of GTTs performed. Also includes G-Flex MSUs that got a match in either the RTDB or GTT database. These measurements can also be used to determine the following: • Total number of G-Flex MSUs: `X = GFGTMATCH + GFGTNOMCH + GFGTNOLKUP` • Number of non-G-Flex GTT MSUs: `GTTPERFD + GTTUN1NT + GTTUN0NS) - (X)`

Chapter 7

Maintenance

Topics:

This chapter describes commands and reports that can be used for G-Flex maintenance, including status reporting and problem identification.

G-Flex-Related Alarms

Refer to the *Unsolicited Alarm and Information Messages Manual* for a complete description, formats, output examples, and the associated corrective procedure for each G-Flex-related UAM.

The alarms shown in *Table 29: G-Flex-Related Alarms* can be generated for the G-Flex service (including G-Flex traffic).

Table 29: G-Flex-Related Alarms

UAM #	Severity	Message Text	Output Group (UI Output Direction)
0328	None	SCCP is available	GTT
0329	None	SCCP capacity normal, card(s) abnormal	GTT
0330	Major	SCCP TPS Threshold exceeded	GTT
0331	Critical	SCCP is not available	GTT
0335	None	SCCP is removed	GTT
0336	Major	LIM(s) have been denied SCCP service	GTT
0526	None	Service is available	APSS
0527	Minor	Service abnormal	APSS
0528	Critical	Service is not available	APSS
0529	Critical	Service is disabled	APSS
0530	None	Service is removed	APSS

G-Flex-Related UIMs

The *Unsolicited Alarm and Information Messages Manual*contains a complete description of all UIM text and formats. *Table 30: G-Flex UIMs* describes the G-Flex and G-Flex MLR UIMs. All of the the G-Flex-related UIMs are generated to the Application Subsystem Output Group.

Table 30: G-Flex UIMs

UIM #	Text	Description	Recovery
1242	`Conv to intl num - Dflt CC not found`	Default CC is not defined	Define the default CC by `chg-stpopts:defcc=xxxx`
1243	`Conv to intl num - Dflt NC not found`	Conversion to international number failed because default NDC was not found	Define the default NDC by `chg-stpopts:defndc=xxxx`
1244	`Conv to intl num – Dflt MCC not found`	Default MCC is not defined	Define the default MCC by `chg-gsmopts:defmcc=xxxx`
1245	`Conv to intl num – Dflt MNC not found`	Default MNC is not defined	Define the default MNC by `chg-gsmopts:defmnc=xxxx`
1246	`Invalid length of conditioned digits`	Length of the conditioned international number is <5 or >15	Use an international number with length within this range.
1247	`Conversion of MGT to IMSI not possible`	The E.212 part for the E.214 MGT digit not found in the database	Enter the E.212 part (MCC + MNC) for the E.214 MGT part (CC + NDC) in the database using `chg-gsmopts:ccndc=xxxxxx:mccmnc=yyyyyy`
1384	`G-Flex MLR: Op without IMSI erroneous`	The G-Flex MLR Function encountered an updateLocation, updateGprsLocation, sendAuthenticationInfo, registerSS, activateSS, deactivateSS, interrogateSS, restoreData, readyForSM, or purgeMS operation that did not contain an IMSI parameter	No action necessary
1385	`G-Flex MLR: Op without IMSI skipped`	The G-Flex MLR Function encountered a sendParameters operation that did not contain an IMSI parameter	No action necessary

UIM #	Text	Description	Recovery
1386	`G-Flex MLR: Op with bad TCAP skipped`	The G-Flex MLR Function encountered problems decoding the TCAP and MAP layers of a message prior to attempting to identify IMSI or MSISDN parameters (for example, generic structure decoding problems such as Length part errors). This UIM is not generated when a valid TCAP component other than Invoke is detected.	No action necessary
1387	`G-Flex MLR: Op with bad IMSI skipped`	The G-Flex MLR Function encountered an IMSI parameter that contains fewer than 5 digits or more than 15 digits	No action necessary
1440	`G-Flex MLR: Op with bad MSISDN skipped`	The G-Flex MLR Function encountered an AnyTimeInterrogation, processUnstructuredSS-Request, or sendRoutingInfoForLCS operation that contains an invalid MSISDN parameter	No action necessary
1448	`G-Flex MLR: Op w/o IMSI/MSISDN skipped`	The G-Flex MLR Function encountered a processUnstructuredSS-Request operation that does not contain an IMSI or MSISDN parameter.	No action necessary

Maintenance Commands

The following commands can be used for maintenance when an EPAP-related feature is on.

Refer to *Commands Manual* for complete descriptions of the commands, including parameters, valid parameter values, rules for using the commands, and output examples.

Table 31: Maintenance Commands

Command	Description
rept-stat-sys	Reports the status of system entities, including cards. The output includes the number of Service Module cards that are in service (IS-NR) and how many are in another state (IS-ANR, OOS-MT, OOS-MT-DSBLD).
rept-stat-sccp	Reports operating status of services and subsystems, CPU usage, and Service Module card status. When the loc parameter is specified, the command displays detailed card traffic statistics, including cards that are denied SCCP service. See the section in this manual that describes the use of the `rept-stat-sccp` command.
rept-stat-mps	Displays the overall status of the EPAP application running on the MPS (multi-purpose server). Command output for the various reports of this command include overall MPS alarm status and card status, and status for a specific Service Module card when a feature is on.
rept-stat-trbl	Includes a summary of any trouble notifications (UAMs) for local subsystems, cards, and linksets. The severity of each alarm is indicated in the output report.
rept-stat-alm	Displays the alarm counts and totals for local subsystems and Service Mocule card/EPAP IP links.
rept-stat-db	Displays the status information for the EAGLE 5 ISS databases. This includes the level information for each Service Module card, and for the active and standby EPAP RTDB. The command reports database exception status such as corrupted, incoherent, or inconsistent, as well as providing the birth dates and levels. It shows the status of each PDB and RTDB when an EPAP-related feature is enabled.
rtrv-tbl capacity	Retrieves table use capacity summary information. For each table listed, the number of table entry elements in use and the total allowed number of table elements is presented, along with a percent (%) full value. Information is shown for some tables only if the feature that uses the table is enabled.
inh-card/alw-card	The `inh-card` command is used to change the operating state of the card from In-Service Normal (IS-NR) to Out-of-Service Maintenance-Disabled (OOS-MT-DSBLD). A craftsperson then can test the card or physically remove it from the shelf. The `alw-card` command is used to change the card from OOS-MT-DSBLD (Out-of-Service Maintenance-Disabled) to IS-NR (In-Service Normal) if card loading is successful.
inh-alm/unhb-alm	Used to allow and inhibit reporting of alarms for a given device, including the Service Module card ports. The commands allow both Port A and Port B to be specified. Inhibited alarms will not generate UAMs or cause alarm indicators to be turned on. All `rept-stat-xxx` commands continue to display the alarms with an indication that the device has its alarms inhibited.
rtrv-data-rtdb	Retrieves Entity data, DN data, IMEI data, IMSI data, TN data, NPANXX data, and LRN data from the RTDB on an active Service Module card.

Command	Description
	If the loc parameter is specified and the target card is an active Service Module card, the RTDB data is retrieved from that card. If the loc parameter is not specified, the RTDB data is retrieved on the active Service Module card that has the lowest IMT address. The RTDB status on the active Service Module card can be coherent or incoherent.

rept-stat-sccp

The `rept-stat-sccp` command provides statistics for Service Module cards and for the services that execute on the cards. The statistics can be displayed for all Service Module cards, or for a specified card.

Refer to the *Commands Manual* for a description of the `rept-stat-sccp` command, including parameter names, valid values, and output examples for the command.

The `rept-stat-sccp` command displays the following statistics for the G-Flex service when the G-Flex feature is turned on:

- State information
- Alarm information
- Number of G-Flex messages that have been re-routed for the prior 30 seconds.

  The Re-route count is incremented when the G-Flex service is OFFLINE and messages are re-routed to alternate PCs or fall through to GTT.

Debug Commands

The *Commands Manual* contains descriptions of debug commands that can be used in assessing and modifying system status and operation. Most of the debug commands are used only under the direction of Tekelec support personnel.

Refer to the *Commands Manual* for a complete description of the debug commands, including the ent-trace command.

A G-Flex MSU trigger can be created on the Service Module card, on any one or more of the following criteria defined in the `ent-trace` command. When multiple trigger criteria are entered, the MSU is trapped when any of the criteria are satisfied.

- **E.164 MSISDN number (MSISDN)** – Use this criterion to trap messages immediately before performing a G-Flex search based on the MSISDN numbers defined in the Real Time Database (RTDB). This parameter allows a variable number of digits (from 5 to 15). The number specified must be an International E.164 number (MSISDN or Entity Number).
- **E.212 IMSI number (IMSI)** – Use this criterion to trap messages immediately before performing a G-Flex search based on the IMSI numbers defined in the RTDB. This parameter allows a variable number of digits (from 5 to 15). The number specified must be an international E.212 IMSI. This parameter cannot be used to trap on E.214 MGT.

- **Global Title digits (GT)** – Use this criterion to trap messages based on the CdPA Global Title Address (that is, either E.164, E.214 MGT, or E.212 number) present in the SCCP part of the message.
- **SSP point code** (MSC or VLR PC, for example) – After the SSN has been determined to belong to a G-Flex entity object, use this criterion to trap messages based on CgPA (Calling Party Address) SPC present in the SCCP part of the message. If no point code is present in CgPA SPC, the criteria is matched with the OPC present in the MTP part of the message.

CAUTION: This command can cause the OAM card to reset if too many MSUs are trapped.

A trace must be set on all Service Module cards (`card=sccp-all`). A repetition parameter (`rep`) can be used to control the number of MSUs that are trapped.

MSUs that satisfy any of the trigger criteria are trapped on the Service Module card are forwarded to the OAM, and are displayed.

Status Reporting and Problem Identification

EAGLE 5 ISS commands can be used to obtain status and statistics for the EAGLE 5 ISS system, the EPAP systems, system devices including Service Module cards, EPAP-related features, local subsystems, and SCCP services.

Refer to the *Commands Manual* for complete descriptions of the commands, including parameters and valid values, rules for using the commands correctly, and output examples.

Refer to the *Unsolicited Alarm and Information Messages* manual for descriptions and recovery procedures for UAMs and UIMs.

Refer to the *EPAP Administration Manual* for descriptions of EPAP functions and operation.

Refer to the *EPAP Alarms on the T1200 Platform* manual for descriptions and recovery procedures for EPAP alarms.

Refer to the appropriate *Feature Manual* for information about the functions and operation of EPAP-related features.

Table 32: Status Reporting for EPAP-Related Features

Reports, Status, and Statistics	Command
EAGLE 5 ISS	
Maintenance Status Report - indicates whether Maintenance, Routing, and SCCP Baselines have been established.	rept-stat-sys
Alarms and operating state for system devices, including Service Module ("SCCP") cards.	`rept-stat-sys`

Reports, Status, and Statistics	Command
Unsolicited Alarm Messages (UAMs) and Unsolicited Information Messages (UIMs)	`rept-stat-alm` `rept-stat-trbl`
EPAP/MPS (from the EAGLE 5 ISS)	
EPAP code version and operating state for each EPAP.	`rept-stat-mps`
MPS hexadecimal alarm strings for the active and standby EPAPs.	`rept-stat-mps`
Operating state and alarm status of equipped Service Module cards and their DSM ports and IP connections.	`rept-stat-mps` rept-stat-mps:loc=<Service Module card location>
Amount of memory used by the RTDB on the specified card, as a percent of available Service Module card memory.	`rept-stat-mps:loc=<Service Module card location>`
EPAP Provisioning Database (PDB), EPAP Real Time Database (RTDB), and Service Module card RTDB status information - Coherent, birthdate (date and time of creation), and exception (condition when a problem was detected).	`rept-stat-db` `rept-stat-db:db=mps`
Service Module Cards, EPAP-Related Features, Services, Local Subsystems	
Status of the Service Module cards, and the services executing on the cards for EPAP-related features that are turned on. Includes Service Report, Subsystem Report, and Alarm Status; Total Service Statistics.	`rept-stat-sccp`
Operating state and alarm status of equipped Service Module cards and their DSM ports and IP connections; EPAP-related feature status per card.	`rept-stat-mps:loc=<Service Module card location>`
Alarms and operating state for Service Module ("SCCP") cards.	`rept-stat-sys` `rept-stat-mps`
Any cards that are denied SCCP service.	`rept-stat-sccp`

Reports, Status, and Statistics	Command
Detailed view of the status of SCCP services provided by the specified Service Module card. Includes Card Alarm Status, Card Service Statistics	`rept-stat-sccp:loc=<Service Module card location>`
General SCCP traffic performance for Service Module cards. Message rates for TVG performance.	`rept-stat-sccp:mode=perf`
Statistics for EPAP-related feature local subsystems - Subsystem Report	`rept-stat-sccp`
Statistics for EPAP-related features	`rept-stat-sccp`

EPAP Status and Alarm Reporting

Because EPAP has no direct means of accepting user input or displaying output messages on EAGLE 5 ISS terminals, EPAP maintenance, measurements, and status information are routed through a Service Module card. EPAP sends two types of messages to the Service Module card: *EPAP Maintenance Blocks* and *DSM Status Requests and DSM Status Messages*. Each message type is discussed in the following sections.

EPAP Maintenance Blocks

The EPAP forwards all status and error messages to the Service Module cards in maintenance blocks. Maintenance blocks are asynchronously sent whenever the EPAP has something to report. The status information that is displayed when a `rept-stat-mps` command is issued includes information that came from the maintenance blocks.

The active EPAP generates and sends maintenance blocks to the primary Service Module card. One maintenance block is sent as soon as the IP link is established between the active EPAP and the primary Service Module card. Additional maintenance blocks are sent whenever the EPAP needs to report any change in status or error conditions. The information returned in maintenance blocks is included in the output of the `rept-stat-mps` and `rept-stat-sccp` commands.

The EPAP sends maintenance blocks that contain at least the following information:

- Status of EPAP 'A' - actual states are active, standby, and down (inoperative). Maintenance blocks include a field for this information so that it can be available for the output of the `rept-stat-mps` command.
- Status of EPAP 'B' - actual states are active, standby, and down (inoperative). Maintenance blocks include a field for this information so that it can be available for the output of the `rept-stat-mps` command.
- Identification of Active EPAP - a field to identify the active EPAP.
- Congestion Indicator - an indicator showing provisioning link congestion. The link between the EPAPs and the external source of provisioning data can become congested in high-provisioning

traffic situations. When this occurs and subsequently as the congestion clears, the EPAP sends maintenance blocks to the Service Module card.

- Alarm Conditions - an error code field. If the EPAP needs to report an alarm condition, it puts an appropriate UAM identifier in this field.
- Current MPS Database Size - a field indicating the current RTDB size. The Service Module card uses this information to calculate the percentage of memory used by the RTDB.

DSM Status Requests and DSM Status Messages

When the EPAP needs to know the status of a Service Module card, it sends a DSM Status Request to all Service Module cards, and each Service Module card returns its status to the EPAP.

Service Module cards send a DSM Status Message to the EPAP when any the following events occur in the Service Module card:

- The Service Module card is booted.
- The Service Module card receives a DSM Status Request message from the EPAP
- The Service Module card determines that it needs to download the entire RTDB; for example, the Service Module card determines that the RTDB needs to be downloaded because it is totally corrupted, or a craftsperson requests that the RTDB be reloaded. The Service Module card sends a Full Download Request message to the EPAP
- The Service Module card starts receiving RTDB downloads or updates. When a Service Module card starts downloading the RTDB or accepting updates, it sends a DSM Status Message informing the EPAP of the first record received. This helps the EPAP keep track of downloads in progress.

The DSM Status Message provides the following information to the EPAP:

- **DSM Memory Size**. When the Service Module card is initialized, it determines the amount of memory present. The EPAP uses the value to determine if the Service Module card has enough memory to hold the RTDB.
- **Load Mode Status**. This indicator indicates whether or not a sufficient number of the IS-NR (In-Service Normal) LIMs have access to SCCP services.

Hourly Maintenance Report

The Hourly Maintenance Report, generated automatically, includes the alarm totals of the G-Flex subsystem and Service Module card /EPAP IP links. A sample follows.

```
    eagle10506 99-10-10 16:00:01 EST EAGLE 37.5.0
    5072.0000 REPT COND GSM SS
    "GSM SS :0440,MTCEINT-0,SA,99-10-10,16:00:01,,,,*C"
;
    eagle10506 99-10-10 16:00:01 EST EAGLE 37.5.0
    5073.0000 REPT COND INP SS
    "INP SS :0440,MTCEINT-0,SA,99-10-10,16:20:01,,,,*C"
;
    eagle10506 99-10-10 16:00:01 EST EAGLE 37.5.0
    5077.0000 REPT COND EPAPDSM
    "EPAPDSM :0084,MTCEINT-0,SA,99-10-10,16:00:01,,,,**"
;
    eagle10506 99-10-10 16:00:01 EST EAGLE 37.5.0
    5007.0000 REPT COND CARD
    "CARD 1102:0422,SCMMA,SA,99-10-10,16:00:01,,,,**"
```

```
;
    eagle10506 99-09-13 16:00:01 EST EAGLE 37.5.0
    3561.0000 REPT COND ALARM STATUS
    "ALARMS:PERM. INHIBITED,0,0,0"
    "ALARMS:TEMP. INHIBITED,0,0,0"
    "ALARMS:ACTIVE,10,14,3"
    "ALARMS:TOTAL,10,14,3"
;
```

Glossary

A

ANSI

American National Standards Institute

An organization that administers and coordinates the U.S. voluntary standardization and conformity assessment system. ANSI develops and publishes standards. ANSI is a non-commercial, non-government organization which is funded by more than 1000 corporations, professional bodies, and enterprises.

C

CC

Country Code

CdPA

Called Party Address

The field in the SCCP portion of the MSU that contains the additional addressing information of the destination of the MSU. Gateway screening uses this additional information to determine if MSUs that contain the DPC in the routing label and the subsystem number in the called party address portion of the MSU are allowed in the network where the EAGLE 5 ISS is located.

CPC

Capability Point Code

A capability point code used by the SS7 protocol to identify a group of functionally related STPs in the signaling network.

D

DCB

Device Control Block

D

DN	Directory number A DN can refer to any mobile or wireline subscriber number, and can include MSISDN, MDN, MIN, or the wireline Dialed Number.
DPC	Destination Point Code DPC refers to the scheme in SS7 signaling to identify the receiving signaling point. In the SS7 network, the point codes are numeric addresses which uniquely identify each signaling point. This point code can be adjacent to the EAGLE 5 ISS, but does not have to be.
DSM	Database Service Module. The DSM provides large capacity SCCP/database functionality. The DSM is an application card that supports network specific functions such as EAGLE Provisioning Application Processor (EPAP), Global System for Mobile Communications (GSM), EAGLE Local Number Portability (ELAP), and interface to Local Service Management System (LSMS).

E

EPAP	EAGLE Provisioning Application Processor
EPAP-related features	Features that require EPAP connection and use the Real Time Database (RTDB) for lookup of subscriber information. • ANSI Number Portability Query (AINPQ) • ANSI-41 AnalyzedInformation Query – no EPAP/ELAP (ANSI41 AIQ)

E

- Anytime Interrogation Number Portability (ATI Number Portability, ATINP)
- AINPQ, INP, G-Port SRI Query for Prepaid, GSM MAP SRI Redirect, IGM, and ATINP Support for ROP
- A-Port Circular Route Prevention (A-Port CRP)
- Equipment Identity Register (EIR)
- G-Flex C7 Relay (G-Flex)
- G-Flex MAP Layer Routing (G-Flex MLR)
- G-Port SRI Query for Prepaid
- GSM MAP SRI Redirect to Serving HLR (GSM MAP SRI Redirect)
- GSM Number Portability (G-Port)
- IDP A-Party Blacklist
- IDP A-Party Routing
- IDP Relay Additional Subscriber Data (IDPR ASD)
- IDP Relay Generic Routing Number (IDPR GRN)
- IDP Service Key Routing (IDP SK Routing)
- IDP Screening for Prepaid
- INAP-based Number Portability (INP)
- Info Analyzed Relay Additional Subscriber Data (IAR ASD)
- Info Analyzed Relay Base (IAR Base)
- Info Analyzed Relay Generic Routing Number (IAR GRN)
- Info Analyzed Relay Number Portability (IAR NP)
- INP Circular Route Prevention (INP CRP)
- IS41 Mobile Number Portability (A-Port)
- IS41 GSM Migration (IGM)
- MNP Circular Route Prevention (MNPCRP)

E

- MO-based GSM SMS NP
- MO-based IS41 SMS NP
- MO SMS Generic Routing Number (MO SMS GRN)
- MO- SMS B-Party Routing
- MO SMS IS41-to-GSM Migration
- MT-based GSM SMS NP
- MT-based GSM MMS NP
- MT-based IS41 SMS NP
- MTP Routed Messages for SCCP Applications (MTP Msgs for SCCP Apps)
- MTP Routed Gateway Screening Stop Action (MTPRTD GWS Stop Action)
- Portability Check for MO SMS
- Prepaid IDP Query Relay (IDP Relay, IDPR)
- Prepaid SMS Intercept Phase 1 (PPSMS)
- Service Portability (S-Port)
- S-Port Subscriber Differentiation
- Triggerless ISUP Framework Additional Subscriber Data (TIF ASD)
- Triggerless ISUP Framework Generic Routing Number (TIF GRN)
- Triggerless ISUP Number Portability (TIF NP)
- Triggerless ISUP Framework Number Substitution (TIF NS)
- Triggerless ISUP Framework SCS Forwarding (TIF SCS Forwarding)
- Triggerless ISUP Framework Simple Number Substitution (TIF SNS)
- Voice Mail Router (V-Flex)

ES

The shelves in the EAGLE 5 ISS that contain cards other than control cards (E5-OAM, GPSM-II for OAM, TDM, and MDAL cards). This shelf can be added to and removed from

E

	the database. These shelves are numbered from 1200 to 6100.

F

FTA	File Transfer Area A special area that exists on each OAM hard disk, used as a staging area to copy files to and from the EAGLE 5 ISS using the Kermit file-transfer protocol.

G

G-Flex	GSM Flexible numbering A feature that allows the operator to flexibly assign individual subscribers across multiple HLRs and route signaling messages, based on subscriber numbering, accordingly.
GSM	Global System for Mobile Communications
GTA	Global Title Address
GTAI	Global Title Address Information
GTT	Global Title Translation A feature of the signaling connection control part (SCCP) of the SS7 protocol that the EAGLE 5 ISS uses to determine which service database to send the query message when an MSU enters the EAGLE 5 ISS and more information is needed to route the MSU. These service databases also verify calling card numbers and credit card numbers. The service databases are identified in the SS7 network by a point code and a subsystem number.

G

GUI	Graphical User Interface The term given to that set of items and facilities which provide the user with a graphic means for manipulating screen data rather than being limited to character based commands.

H

HLR	Home Location Register

I

IAM	Initial Address Message
IMSI	International Mobile Subscriber Identity
IP	Internet Protocol IP specifies the format of packets, also called datagrams, and the addressing scheme. The network layer for the TCP/IP protocol suite widely used on Ethernet networks, defined in STD 5, RFC 791. IP is a connectionless, best-effort packet switching protocol. It provides packet routing, fragmentation and re-assembly through the data link layer.
ISS	Integrated Signaling System
ITU	International Telecommunications Union

L

Link	Signaling Link Signaling Link Carries signaling within a Link Set using a specific Association. A Link

L

	can belong to only one Link Set and one Association. There is generally one Link per Association in a Link Set.
LNP	Local Number Portability

M

MAP	Mobile Application Part
MCC	Mobile Country Code A three-digit number that uniquely identifies a country served by wireless telephone networks. The MCC is part of the International Mobile Subscriber Identity (IMSI) number, which uniquely identifies a particular subscriber. See also MNC, IMSI.
MDN	Mobile Dialed Number Mobile Directory Number
MFC	Message Flow Control
MGT	Mobile Global Title
MIN	Mobile Identification Number
MNC	Mobile Network Code A number that identifies a mobile phone carrier. Used in combination with a Mobile Country Code (MCC) to uniquely identify a mobile phone operator/carrier. See also MCC.
MNP	Mobile Number Portability

M

MPS

Multi-Purpose Server

The Multi-Purpose Server provides database/reload functionality and a variety of high capacity/high speed offboard database functions for applications. The MPS resides in the General Purpose Frame.

Messages Per Second

A measure of a message processor's performance capacity. A message is any Diameter message (Request or Answer) which is received and processed by a message processor.

MSISDN

Mobile Station International Subscriber Directory Number

The MSISDN is the network specific subscriber number of a mobile communications subscriber. This is normally the phone number that is used to reach the subscriber.

MSU

Message Signal Unit

The SS7 message that is sent between signaling points in the SS7 network with the necessary information to get the message to its destination and allow the signaling points in the network to set up either a voice or data connection between themselves. The message contains the following information:

- The forward and backward sequence numbers assigned to the message which indicate the position of the message in the traffic stream in relation to the other messages.
- The length indicator which indicates the number of bytes the message contains.
- The type of message and the priority of the message in the

M

signaling information octet of the message.

- The routing information for the message, shown in the routing label of the message, with the identification of the node that sent message (originating point code), the identification of the node receiving the message (destination point code), and the signaling link selector which the EAGLE 5 ISS uses to pick which link set and signaling link to use to route the message.

MTP — Message Transfer Part

The levels 1, 2, and 3 of the SS7 protocol that control all the functions necessary to route an SS7 MSU through the network

MTP3 — Message Transfer Part, Level 3

N

NAI — Nature of Address Indicator

Standard method of identifying users who request access to a network.

Network Access Identifier

NC — Network Cluster

Network Code

Not Compliant

NP — Number Plan

O

OAM — Operations, Administration, and Maintenance

O

	The application that operates the Maintenance and Administration Subsystem which controls the operation of many Tekelec products.
OPC	Originating Point Code
OPS	Operator Provisioning System

P

PDB	Provisioning Database
PDBA	Provisioning Database Application There are two Provisioning Database Applications (PDBAs), one in EPAP A on each EAGLE 5 ISS. They follow an Active/Standby model. These processes are responsible for updating and maintaining the Provisioning Database (PDB).
PDBI	Provisioning Database Interface The interface consists of the definition of provisioning messages only. The customer must write a client application that uses the PDBI request/response messages to communicate with the PDBA.
PPP	Point-to-Point Protocol

R

RFC	Request for Comment RFCs are standards-track documents, which are official specifications of the Internet protocol suite defined by the Internet Engineering Task Force (IETF) and its steering group the IESG.

R

RMTP	Reliable Multicast Transport Protocol
RN	Routing Number
Route	A signaling path from an LSP to an RSP using a specified Link Set
RSP	Remote Signaling Point Represents an SS7 network node (point code) that signaling must be sent to. An RSP has an SS7 domain (ANSI, ITUI, ITUN), a point code, and an optional Adjacent Server Group. Remote Signaling Point A logical element that represents a unique point code within a particular SS7 domain with which the SS7 application's Local Signaling Point interacts.
RSR	Reset Request Route Set Test – Restricted message
RTDB	Real Time Database

S

SCCP	Signaling Connection Control Part
Service Module card	DSM, E5-SM4G, or E5-SM8G-B card that contains the Real Time Database (RTDB) downloaded from an EPAP or ELAP system.
Service Nature of Address Indicator	See SNAI.

S

SIM	Subscriber Identity Module An ID card the size of a credit card for GSM network subscribers, and is typically referred to as a chip card or smartcard.
SIO	Service Information Octet. The network indicator code (NIC), priority (PRI), and service indicator (SI) in the SIO field in the message signaling unit (MSU). This information identifies the type of MSU (ISUP, TCAP, and so forth) that is allowed in the network where the EAGLE 5 ISS is located.
SP	Signaling Point A set of signaling equipment represented by a unique point code within an SS7 domain.
SPC	Secondary Point Code The SPC enables the EAGLE 5 ISS to assume more than one point code for SS7 routing. The EAGLE 5 ISS uses the SPC for routing and provisioning as if the SPC were an actual point code of the EAGLE 5 ISS. The EAGLE 5 ISS supports one ANSI true point code and up to seven secondary point codes. Spare Point Code
SRI	Send_Route_Information Message
SS7	Signaling System #7
SSN	Subsystem Number The subsystem number of a given point code. The subsystem number

S

	identifies the SCP application that should receive the message, or the subsystem number of the destination point code to be assigned to the LNP subsystem of the EAGLE 5 ISS. A value of the routing indicator portion of the global title translation data commands indicating that no further global title translation is required for the specified entry. Subsystem Number Used to update the CdPA.
STP	Signal Transfer Point The STP is a special high-speed switch for signaling messages in SS7 networks. The STP routes core INAP communication between the Service Switching Point (SSP) and the Service Control Point (SCP) over the network.
Subsystem Number	See SSN.

T

TCP	Transfer Control Protocol
TCP/IP	Transmission Control Protocol/Internet Protocol
TT	Translation Type. Resides in the Called Party Address (CdPA) field of the MSU and determines which service database is to receive query messages. The translation type indicates which Global Title Translation table determines the routing to a particular service database.

T

TVG	Group Ticket Voucher

U

UAM	Unsolicited Alarm Message A message sent to a user interface whenever there is a fault that is service-affecting or when a previous problem is corrected. Each message has a trouble code and text associated with the trouble condition.
UDP	User Datagram Protocol
UDTS	Unitdata Transfer Service An error response to a UDT message.
UIM	Unsolicited Information Message A message sent to a user interface whenever there is a fault that is not service-affecting or when a previous problem is corrected. Each message has a trouble code and text associated with the trouble condition.
UPU	User Part Unavailable An MTP3 management message.

V

VSCCP	VxWorks Signaling Connection Control Part The application used by the Service Module card to support EPAP-related features and LNP features. If an EPAP-related or LNP feature is not turned on, and a Service Module card is present, the

V

VSCCP application processes normal GTT traffic.