Tekelec EAGLE® 5
Integrated Signaling System

Release 41.0

Feature Manual - TIF

TEKELEC

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Chapter

1

Introduction

Topics:

This chapter contains a brief descripton of the Triggerless ISUP Framework (TIF) and the features that use TIF. The contents include sections about the manual scope, audience, and organization; how to find related publications; and how to contact Tekelec for assistance.

Introduction

The Triggerless ISUP Framework (TIF) and the EAGLE 5 ISS features that use TIF (see *TIF Features* on page 11), along with the Numbering Plan Processor (NPP), provide the following capabilities to support ISUP number portability:

- Complex prefix usage, where prefixes can be used to customize actions
- Non-NAI-compliant digit handling
- Complex outgoing digit formats
- Called Number Portability
- Calling number portability
- Concurrent Release and Relay support
- Circular route prevention
- Calling Party Number Substitution
- Called Party Number Substitution
- Simple Called Number Substitution
- Message Forwarding to SCS

Most of the TIF features require EPAP provisioning data from the Realtime Database (RTDB). Subscriber data is transferred from customer databases to the EPAP. The EPAP formats the RTDB and loads it to each Service Module card on the EAGLE 5 ISS. The RTDB data is used in obtaining number portability information and in determining how to correctly format the outgoing message. See *MPS/EPAP Platform* on page 28 in this manual for more information about EPAP.

Scope and Audience

This manual is intended for anyone responsible for installing, maintaining, and using the features in the EAGLE 5 ISS that use the Triggerless ISUP Framework (TIF). 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* on page 1 contains general information about the TIF documentation, the organization of this manual, and how to get technical assistance.

- *Triggerless ISUP Framework (TIF)* on page 9 provides a functional description of the Triggerless ISUP Framework, including configuration options, protocol handling, ISUP IAM message decoding and encoding, IAM/SAM splitting, and NPP Services.

- *TIF Features* on page 33 describes the functions and use of the EAGLE 5 ISS features that use TIF.

- *EAGLE 5 ISS Commands for TIF Features* on page 60 describes the EAGLE 5 ISS configuration, maintenance, debug, and test commands that are used for the TIF features.

- *TIF Feature Configuration* on page 71 describes Eagle 5 ISS provisioning for the TIF features, and the TIF Test Tool that is used to verify provisioning without affecting live traffic.

- *Maintenance* on page 89 describes maintenance information for TIF and EPAP, including status and alarms, hardware verification messages, EPAP-based system status reports and commands, and code and application data loading.

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 (*support.tekelec.com*). 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 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.

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

- **Central 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**

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

  - **Brazil**

    Phone:

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  - **Chile**

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    1230-020-555-5468

  - **Columbia**

    Phone:

    01-800-912-0537

  - **Dominican Republic**

    Phone:

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    Phone:

    001-888-367-8552

  - **Peru**

    Phone:

    0800-53-087

  - **Puerto Rico**

    Phone:

    1-888-367-8552 (1-888-FOR-TKLC)

- **Venezuela**

  Phone:

  0800-176-6497

- **Europe, Middle East, and Africa**

  - **Signaling**

    Phone:

    +44 1784 467 804 (within UK)

    TAC Regional Support Office Hours:

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  - **Software Solutions**

    Phone:

    +33 3 89 33 54 00

    TAC Regional Support Office Hours:

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- **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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Emergency Response

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 an EAGLE 5 ISS that severely affects service, traffic, or maintenance capabilities, and requires immediate corrective action. Critical problems affect service and/or system operation resulting in:

- 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.

Chapter

2

Triggerless ISUP Framework (TIF)

Topics:

This chapter describes the functions provided by the Trigglerles ISUP Framework, including ISUP IAM protocol handling, NPP processing for TIF, and response message formatting.

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

TIF Description

For TIF features, TIF provides an overall structure that allows the EAGLE 5 ISS to intercept ISUP messages that would normally be through-switched and apply special processing to them. For example, an IAM message could be intercepted and have the called number prefix replaced based on portability information.

At least one TIF feature must be enabled and turned on before TIF functions are available in the system.

TIF processing consists of two main sections:

- On the LIM cards, TIF uses Gateway Screening (GWS) to select an ISUP MSU for processing, and forwards the MSU to Service Module cards for processing.
- On the Service Module cards, TIF decodes the MSU, invokes the Numbering Plan Processor (NPP), and encodes the results.

  TIF features provide NPP with Service Action Handlers to perform database access, data evaluation, and any feature-specific handling for the MSU.

A high-level overview of TIF processing is shown in *Figure 1: TIF Overview* on page 10 .

Figure 1: TIF Overview
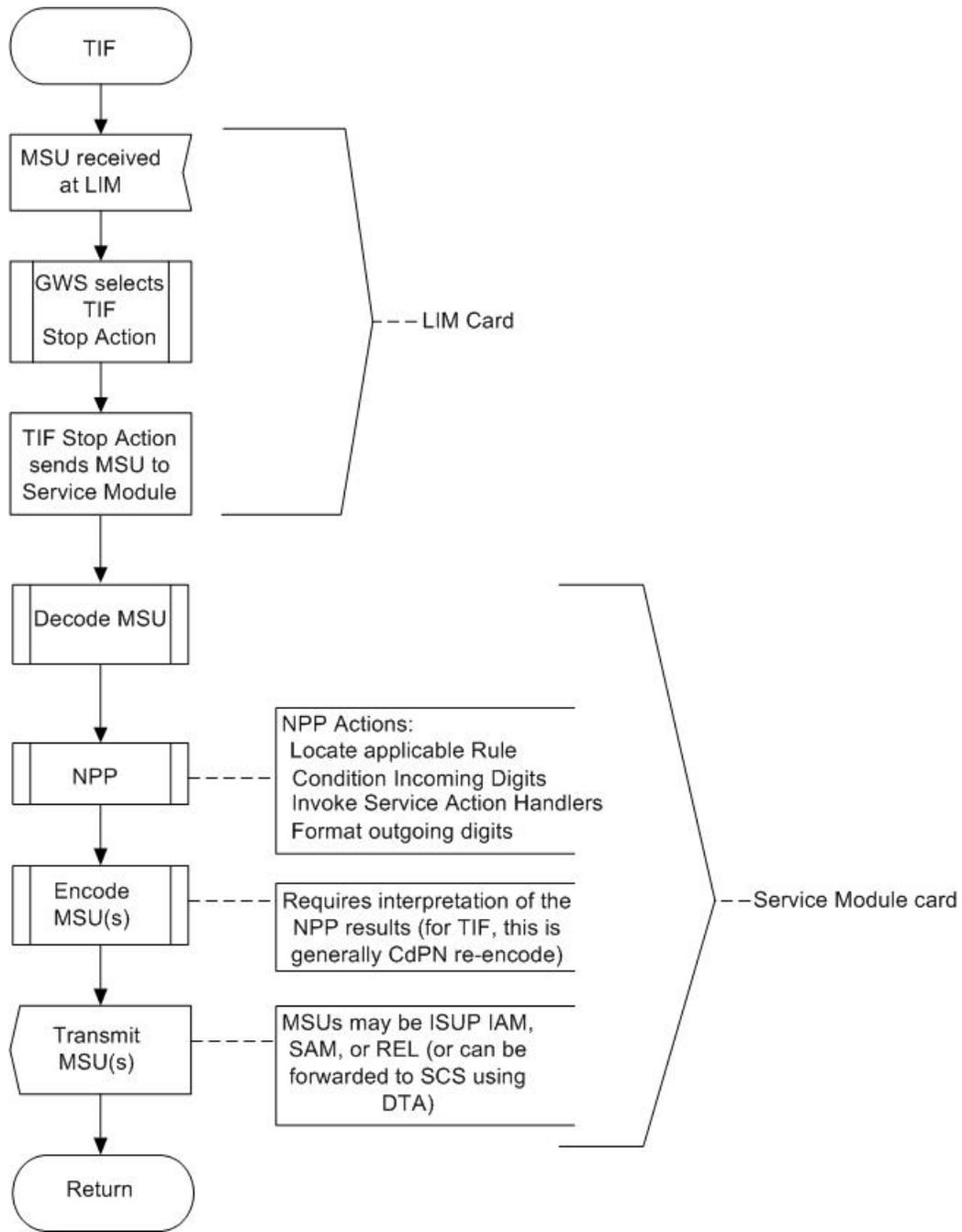
TIF Features

All of the features that are listed in *Table 2: TIF Features* on page 12 use TIF ("TIF features"). Chapter 3 in this manual describes each TIF feature.

The GTT feature and the Gateway Screening feature (GWS) must be turned on before a TIF feature can be enabled in the system.

Table 2: TIF Features

Part Number	Description	Other Dependencies/Notes
893-0189-01	TIF Number Portability (TIF NP)	Requires EPAP for RTDB lookup. Mutually exclusive with ELAP.
893-0222-01	TIF SCS Forwarding (TIF SCS)	Does not require RTDB for lookup - Can be enabled with EPAP or ELAP in the system.
893-0225-01	TIF Number Substitution (TIF NS)	Requires EPAP for RTDB lookup. Mutually exclusive with ELAP.
893-0240-01	TIF Simple Number Substitution (TIF SNS)	Does not require RTDB for lookup - Can be enabled with EPAP or ELAP in the system.
893-0245-01	TIF Additional Subscriber Data (TIF ASD)	Requires EPAP for RTDB lookup. Mutually exclusive with ELAP.
893-0255-01	TIF Generic Routing Number (TIF GRN)	Requires EPAP for RTDB lookup. Mutually exclusive with ELAP.

TIF Configuration Options

The TIFOPTS table contains option values associated with the TIF, TIF2, and TIF3 Gateway Screening Stop Actions. The TIF option data is loaded to the LIM cards and to Service Module cards that contain the RTDB database.

See *EAGLE 5 ISS TIF Options Commands* on page 63 for a description of the TIF options and the EAGLE 5 ISS commands that are used to configure the options.

Destination-based Configuration Options for TIF

The Destination table can contain TIF-related option values for destination point codes, for the following functions:

- Setting of NM bits value—DPC-based lookup on relay of ITU IAM message with non-zero NM bits when TIFOPTS NPFLAG=NM
- Specifying the Release Cause for ported and not-ported release cases—OPC-based lookup on each incoming message to extract Release Cause values
- Splitting of ITU IAM messages—DPC-based lookup on relay of ITU IAM message to determine when and how to split the IAM message into 1 IAM message and 1 SAM message

See *EAGLE 5 ISS Commands for Destination-based Options* on page 62 for a description of the destination-based options for TIF and the EAGLE 5 ISS commands that are used to configure the options.

TIF Services That Call NPP

For the following TIF services, NPP processes traffic filtered by the corresponding Gateway Screening Stop Action. Three services for TIF features allow NPP Rules to be defined for handling different types of traffic, such as inter-carrier traffic and local traffic.

Table 3: NPP Service Name to GWS Stop Action Mapping

TIF Service Name	GWS Stop Action Name
TIF	TIF
TIF2	TIF2
TIF3	TIF3

See the *Numbering Plan Processor (NPP) Overview* manual for more information about NPP components and processing.

NPP Service Actions

The NPP Service Actions listed in *Table 4: Service Actions used by TIF Features* on page 13 are used by the indicated TIF features. Before an NPP Rule can be provisioned with an Action Set containing a Service Action for a TIF feature, the TIF feature must be enabled. The precedence indicates the sequence of execution if more than one Service Action is used by a service.

Table 4: Service Actions used by TIF Features

Service Action	Description	Required Feature	Precedence
CRP	Circular Route Prevention	893018901 TIF Number Portability	92
NPNRLS	Number Portability Release on No Match	893018901 TIF Number Portability	91
ASDLKUP	Use of CdPN Additional Subscriber Data when formatting CdPN	89302450 TIF Additional Subscriber Data	90

Service Action	Description	Required Feature	Precedence
CgPNASDRqd	Use of CgPN Additional Subscriber Data when formatting CdPN	89302450 TIF Additional Subscriber Data	90
GRNLKUP	Use of CdPN Generic Routing Number when formatting CdPN	89302550 TIF Generic Routing Number	90
CgPNGRNRqd	Use of CgPN Generic Routing Number when formatting CdPN	89302550 TIF Generic Routing Number	90
CgPNNPRqd	Calling Number Lookup	893018901 TIF Number Portability	80
NPRELAY	Number Portability Relay	893018901 TIF Number Portability	80
NPRLS	Number Portability Release on Match	893018901 TIF Number Portability	80
NSCdPN	Called Number Substitution	893022501 TIF Number Substitution	80
NSCgPN	Calling Number Substitution	893022501 TIF Number Substitution	75
SNSCgPN	Simple Number Substitution	893024001 TIF Simple Number Substitution	75
CDIAL	Corrective Dialing	NPP basic functions; no TIF feature is required	10
FWDSCS	Forward to SCS	893022201 TIF SCS Forwarding	5

NPP Conditioning Actions

TIF supports all Conditioning Actions provided by NPP. TIF provides the ACCgPN Conditioning Action.

Table 5: TIF Conditioning Action

Name	Description	Mnemonic
Area Code from Calling Party	Area code needs to be extracted from the Calling Party Number	ACCgPN

The ACCgPN Conditioning Action skips over any country code digits (matching DefCC or Multiple CC) and removes the number of digits specified in the ACLEN configuration option from the beginning of the CgPN. These digits will be used as the Area Code (AC) to condition the Called Party digits for any subsequent Service Action or Formatting Action.

If the ACCgPN Conditioning Action is invoked, but the Calling Party is not present or has fewer digits than the ACLEN option value (after any CC digits), then no change to Area Code will be made.

NPP Formatting Actions

TIF supports all Formatting Actions provided by NPP. TIF does not provide any additional Formatting Actions.

Protocol Handling

TIF protocol processing consists of the following functions:

- Gateway Screening of the MSU received by a LIM card selects a TIF Stop Action, encapsulating the MSU as SCCP data, and forwarding the MSU to Service Module cards for processing.
- On the Service Module card, TIF decodes the message, passes information to NPP services for processing, and formats and sends the resulting message.

LIM Card Processing

When a LIM card receives an MSU, the following TIF processing occurs (see the LIM processing shown in *Figure 1: TIF Overview* on page 10):

- The Gateway Screening (GWS) feature filters messages for ISUP, and ISUP messages with SI=5 are screened for selection of a TIF Stop Action.
- Selected ISUP IAM messages are marked for sequencing, encapsulated as SCCP messages, and forwarded to Service Modules for processing. TIF supports proper sequencing of IAM/SAM messages. See *IAM/SAM Splitting* on page 26 for details.

  All other ISUP MSUs delivered to TIF for processing are marked for sequencing and routed.

MSUs that are TUP or not ISUP (SI=5) are routed without modification. UIM `1407 Unexpected SI in TIF Stop Action` is generated.

The TIF Stop Action processing flow is shown in *Figure 2: TIF Stop Action Processing* on page 15.

Figure 2: TIF Stop Action Processing
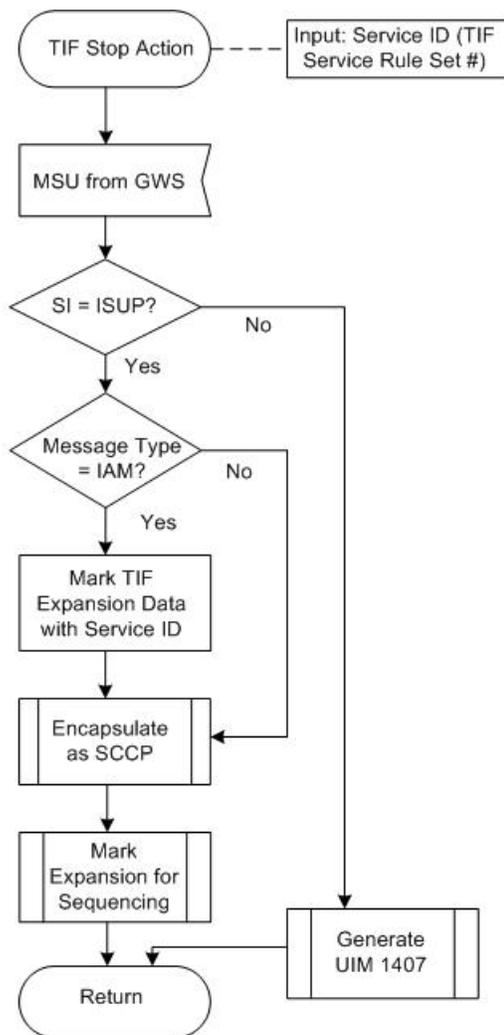
Gateway Screening supports the following TIF Stop Actions: TIF, TIF2, and TIF3. Existing GWS rules are used to separate ISUP traffic for TIF processing. The GWS rule must end with a Stop Action that contains TIF, TIF2, or TIF3.

The DTA, TIF, TIF2, and TIF3 Stop Actions are all mutually exclusive in Stop Action Sets, and each of these Stop Actions must be the last Stop Action for the set.

Table 6: TIF Stop Action Rules on page 16 defines the processing of messages within TIF Stop Actions.

Table 6: TIF Stop Action Rules

Protocol	Message Type	Encapsulate	Sequence	Action
ISUP	IAM	Yes	Yes	Send to Service Module card
	Other	No	Yes	Send to sequencer
Other	N/A	No	No	Route Message

Each TIF Stop Action encapsulates the incoming MSU as SCCP data and forwards the new MSU to a Service Module card for processing. The expanded data portion of the MSU is marked with the TIF Stop Action number so that the appropriate Service Rule Set can be invoked on the Service Module card.

Each TIF Stop Action is associated with a different NPP Service Rule Set, so that different actions can be taken on identically formatted messages that encounter different Gateway Screening rules. This allows for customized handling based on the incoming linkset, OPC, DPC, or other GWS criteria.

Each Stop Action is assigned to the corresponding NPP Service: TIF > TIF, TIF2 > TIF2, TIF3 > TIF3.

Although TIF will not impose any size limitations on the incoming MSU size, the FWDSCS Service Action Handler for the TIF SCS Forwarding feature does have some encapsulation limits imposed by DTA processing of the message. Refer to the *Database Administration Manual - Features* for information about DTA, and see *TIF SCS Forwarding Feature* on page 52 for a description of the FWDSCS Service Action Handler processing.

Service Module Card Processing

As shown in *Figure 3: SCRC Processing of TIF Messages* on page 17, SCRC provides a common entry point on Service Module cards to process SCCP messages. In LIM handling, TIF Stop Actions forward only ISUP IAM messages to Service Module cards. Because the messages from TIF are actually ISUP messages encapsulated within an SCCP header, the messages are sent to a TIF handler instead of normal SCRC processing (normally GTT or Local Subsystem handling).

Figure 3: SCRC Processing of TIF Messages on page 17 shows the basic SCRC processing for ISUP messages from TIF.

Figure 3: SCRC Processing of TIF Messages
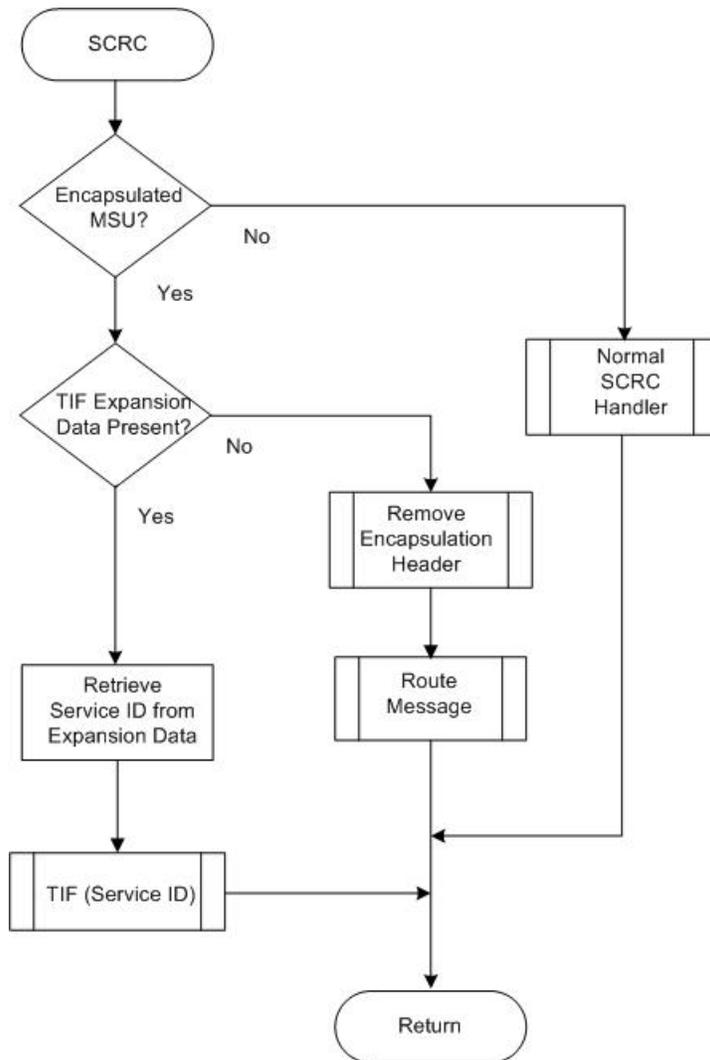
Figure 4: TIF Service Module Processing Main Flow on page 18 shows the overall TIF flow for Service Module processing. NPP provides the majority of the message processing, and is responsible for calling all Service Action Handlers, as shown in *Figure 5: Basic NPP Processing* on page 20.

Figure 4: TIF Service Module Processing Main Flow

```
        ╭─────────────╮
        │ TIF (Service Rule│
        │    Set #)    │
        ╰──────┬──────╯
               │
               ▼
          ◇ Message ◇───────────────────────────┐
          ◇ Type = IAM? ◇                         │
               │                                  │
              Yes                                No
               │                                  │
        ┌──────┴──────┐                          │
        │ Decode ISUP │                          │
        │    IAM      │                          │
        └──────┬──────┘                          │
               │                                  │
               ▼                                  │
          ◇ Decode OK? ◇────No────┐              │
               │                   ▼              │
              Yes           ┌───────────┐         │
               │            │ Generate  │         │
               │            │   UIM     │         │
               │            └─────┬─────┘         │
               │                  │               │
               │                  ▼               │
               │            ┌───────────┐         │
               └─Yes────┐   │  Route    │         │
                        │   │ Message   │         │
                        │   └─────┬─────┘         │
                        ▼          │              │
        ┌─────────────────────┐   │              │
        │ NPP (Service ID,Incoming│ │              │
        │ Digits, Incoming Digit  │ │              │
        │   Lenth , NAI)         │ │              │
        └──────────┬──────────┘   │              │
                   ▼               │              │
        ┌─────────────────────┐   │              │
        │  Results Handler    │   │              │
        └──────────┬──────────┘   │              │
                   │               │              │
                   ▼               │              │
                   └───────────────┴──────────────┘
                          │
                          ▼
                   ╭─────────────╮
                   │   Return    │
                   ╰─────────────╯
```
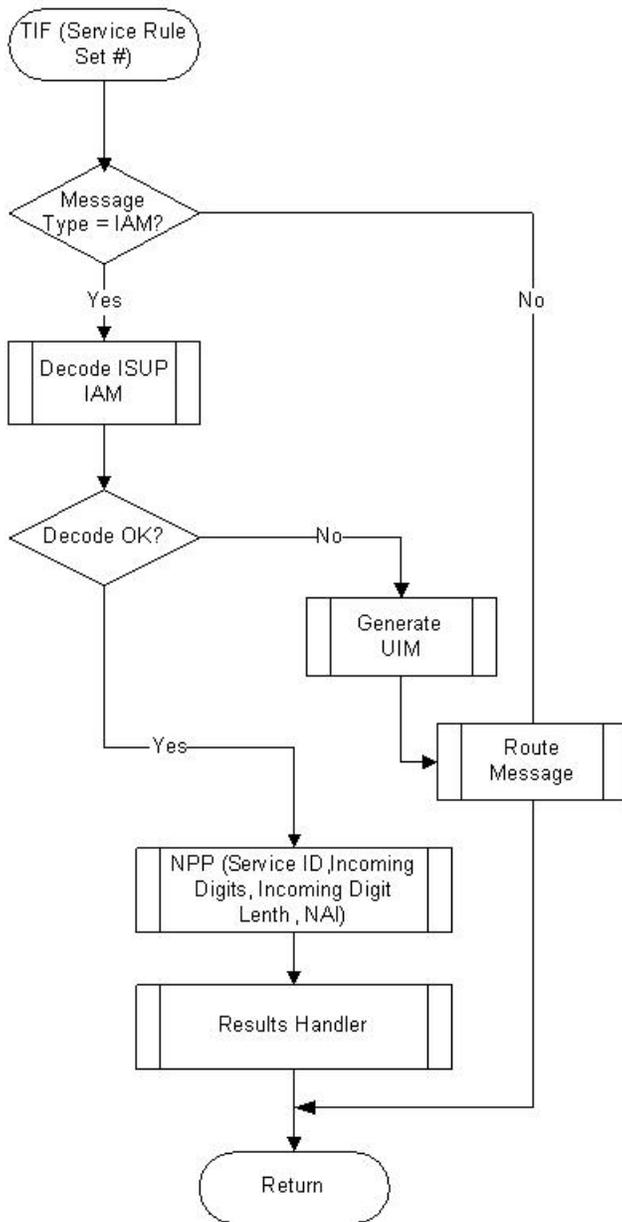
IAM Message Decoding

Fields in the incoming MSU identify the message as ISUP, IAM, and either ITU or ANSI. TIF decodes the following information in the incoming ITU ISUP IAM message:

- Called Party digits and NAI values that are passed to NPP for processing
- Calling Party digits and NAI value
- Called Party and Calling Party information that is used for RTDB lookup
- NM Bits (from the Forward Call Indicator field) that indicate whether RTDB lookup has been performed. (see *Use of NM Bits* on page 40)
- Point codes and other information that are used in encoding the outgoing message.

NPP Processing for TIF

TIF invokes NPP, and passes the TIF service name, Called Party digits and length, and the incoming NAI values to NPP. NPP conditions the Called Party digits for RTDB lookup, calls Service Action Handlers for service-specific processing, and formats the outgoing digit string.

Refer to the *Numbering Plan Processor (NPP) Overview* manual for additional information on NPP processing. *Figure 5: Basic NPP Processing* on page 20 shows the basic NPP processing flow.

Figure 5: Basic NPP Processing
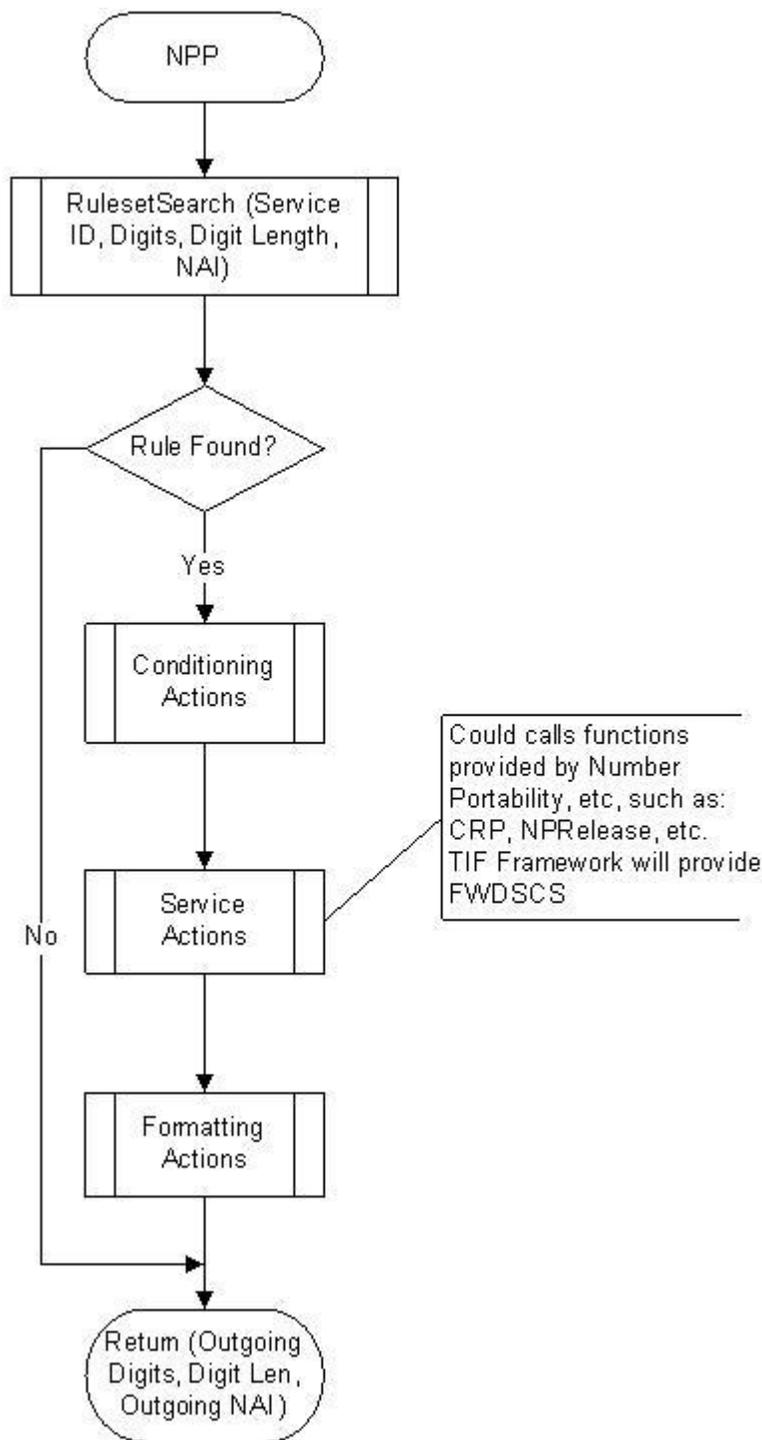
TIF Post-NPP Processing

After NPP processing is complete, the TIF post-NPP Results Handler performs the following functions:

- Evaluates results from NPP Service Actions and Formatting Actions
- Determines whether to generate a Release (REL) message or to relay the IAM message.

If Relay is indicated, the Results Handler performs the following functions:

- Updates the Called Party digits, the Calling Party digits, or both, if needed. If ISUP IAM Called Party digits terminate with a Stop Digit (F), the Stop Digit is present to terminate those digits in the relayed IAM message. If the CONDCGPN option value is ADDCC, the provisioned STPOPTS Default Country Code (DEFCC) value is pre-pended to the Calling Party digits.
- Handles IAM/SAM splitting (see *IAM/SAM Splitting* on page 26)
- Routes one IAM message, or an IAM message and a SAM message.
- Invokes any indicated TIF feature-specific Results Handlers

If Release is indicated by a Service Action Handler, the Results Handler generates an ISUP Release message. After the Release message is generated, the original IAM message is discarded and processing terminates.

- For a Release message on a successful lookup, the message includes the Cause Value specified in the TIF RCAUSENP configuration option or the destination-based RCAUSE configuration options, depending on option settings (see *EAGLE 5 ISS Commands for Destination-based Options* on page 62 and *EAGLE 5 ISS TIF Options Commands* on page 63). The Redirection Number is included in the Release message if the TIF RNRQD configuration option value is YES.
- For a Release message on an unsuccessful lookup, the message includes the Cause Value specified in the TIF RCAUSENPFX configuration option value or the destination-based RCAUSE configuration options, depending on option settings (see *EAGLE 5 ISS Commands for Destination-based Options* on page 62 and *EAGLE 5 ISS TIF Options Commands* on page 63).. The Redirection Number is not included in the Release message.

The flow of the TIF Results Handler is shown in *Figure 6: TIF Post-NPP Results Handler* on page 23.

The following examples illustrate post-NPP results handling:

Corrective Dialing

1. IAM Relay is indicated.
2. Calling Number has not changed; replacement of the CgPN is not required.
3. CdPN number has changed; the CdPN is replaced.
4. No IAM/SAM splitting is required.
5. The FWDSCS Formatting Action is not indicated; DTA is not invoked.
6. The IAM message is routed.

NP Relay

1. IAM Relay is indicated.
2. Calling Number has changed; replacement of the CgPN is performed.
3. CdPN number has changed; the CdPN is replaced.
4. The FWDSCS Formatting Action is not indicated; DTA is not invoked.
5. The NP-specific result handler is invoked for IAM Relay to update the NM bits in the ISUP IAM message.
6. The IAM is routed.

NP Circular Routing

1. Release is indicated.

2. No Redirection Number is encoded in the release message.
3. The release cause is set to a provisioned value.
4. The message is routed.

Figure 6: TIF Post-NPP Results Handler
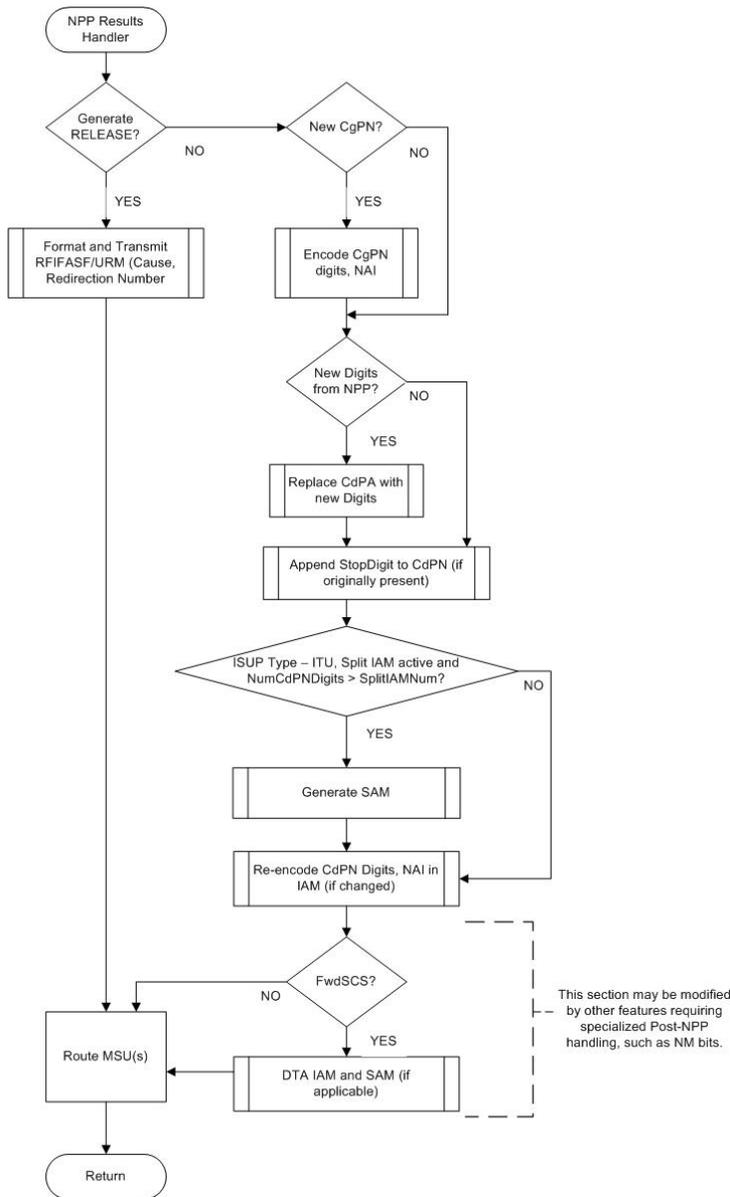
RTDB Lookup

A single invocation of NPP can result in multiple invocations of various Service Action Handlers associated with TIF features. Because nearly all TIF Service Action Handlers perform RTDB

lookups, TIF provides a common mechanism to ensure that only a single CdPN or CgPN lookup is done and that the resulting data are shared by all Service Action Handlers.

The CdPN lookup is performed on the conditioned CdPN digit string. The conditioned string is typically in International format.

The CgPN lookup is performed on the conditioned CgPN. The conditioned CgPN is typically in International format.

Interpreting Results of an RTDB Lookup

Table 7: Portability Types Relevant to NP Lookups on page 24 lists portability types that are relevant to Number Portability lookups.

Table 7: Portability Types Relevant to NP Lookups

Value	Description
0	Not known to be ported (available for backward compatibility; 36 should be used instead of 0)
1	Out-of-network; my subscriber ported out
2	Out-of-network; foreign subscriber ported in, then ported out
5	In-network; number migrated from IS41 to GSM
36	Not known to be ported
0Xff	No status; Indicates "none" in the database

Table 8: Possible Lookup Results on page 24 summarizes the meanings of the normal lookup return codes:

Table 8: Possible Lookup Results

Return Code	Meaning
ENTITY FOUND	The DN was found and at least one of the specified entities is present.
ENTITY NOT FOUND	The DN was found, but none of the specified entities are present
DN NOT FOUND	The DN was not found.

The following general rules determine portability status:

- A subscriber is considered in-network if the entity type is SP
- A subscriber is considered ported out if the entity type is RN. One exception to this rule is the case of subscribers migrated from GSM to IS41. These subscribers are considered in-network even though the entity type is RN.

The RN, SP, VMSID, and GRN (Generic Routing Number) entity types are supported.

In certain networks, a network an entity type other than RN and SP can affect portability status. For example, an entity type of GRN could imply ported number. This can be indicated by setting the NPTYPE or NPTYPECGPN configuration option to ANY or ALL.

In a CdPN or CgPN lookup, the individual DN table is searched first. If a successful match is not found in the individual DN table, then the DN range table is searched. *Table 9: RTDB Success Criteria for NPTYPE* on page 25 shows the overall match result based on NPTYPE and data from the RTDB.

Note: RNSP and RNSPDN are identical, because DN is not a supported network entity at this time.

Note: The IGM feature on, NE=RN, and PT=0 is considered entity type SP for individual or range status.

Table 9: RTDB Success Criteria for NPTYPE

NPTYPE	Individual Status	Range Status	Result
SP	Found, NE=SP	N/A	Individual.SP
SP	Found, NE≠SP	Found, NE=SP	Range.SP
SP	Found, NE≠SP	Found, NE≠SP	None
SP	Found, NE≠SP	Not found	None
SP	Not found	Found, NE=SP	Range.SP
SP	Not found	Found, NE≠SP	None
SP	Not found	Not found	None
RN	Found, NE=RN	N/A	Individual.RN
RN	Found, NE≠RN	Found, NE=RN	Range.RN
RN	Found, NE≠RN	Found, NE≠RN	None
RN	Found, NE≠RN	Not found	None
RN	Not found	Found, NE=RN	Range.RN
RN	Not found	Found, NE≠RN	None
RN	Not found	Not found	None
RNSP / RNSPDN	Found, NE=SP	N/A	Individual.SP
RNSP / RNSPDN	Found, NE=RN	N/A	Individual.RN
RNSP / RNSPDN	Found, NE≠RN or SP	Found, NE=SP	Range.SP
RNSP / RNSPDN	Found, NE≠RN or SP	Found, NE=RN	Range.RN
RNSP / RNSPDN	Found, NE≠RN or SP	Found, NE≠RN or SP	None
RNSP / RNSPDN	Found, NE≠RN or SP	Not found	None
RNSP / RNSPDN	Not found	Found, NE=SP	Range.SP
RNSP / RNSPDN	Not found	Found, NE=RN	Range.RN

NPTYPE	Individual Status	Range Status	Result
RNSP / RNSPDN	Not found	Found, NE≠RN or SP	None
RNSP / RNSPDN	Not found	Not found	None
Any/All	Found, NE=SP	N/A	Individual.SP
Any/All	Found, NE=RN	N/A	Individual.RN
Any/All	Found, NE≠ RN/SP	Found, NE=SP	Range.SP
Any/All	Found, NE≠ RN/SP	Found, NE=RN	Range.RN
Any/All	Found, NE≠ RN/SP	Found, NE≠ RN/SP	None
Any/All	Found, NE≠ RN/SP	Not found	None
Any/All	Not found	Found, NE=SP	Range.SP
Any/All	Not found	Found, NE=RN	Range.RN
Any/All	Not found	Found, NE≠ RN/SP	None
Any	Not found	Not found	None
All	Not found	Not found	None

IAM/SAM Splitting

When the CdPN parameter in the ISUP message grows too long after TIF services have added Routing Numbers (RNs) or other prefixes or delimiters, the ISUP message needs to be split. A destination-based SPLITIAM configuration option and a TIFOPTS SPLITIAM configuration option can be used for determining when to split an internationally formatted ITU ISUP IAM message into one IAM message and one SAM message.

- When the number of Called Party digits is greater than the number of digits specified in the SPLITIAM option value (15-31 digits), the IAM message is split.
- The IAM message is encoded with the number of leading Called Party digits specified in the SPLITIAM option value.
- The SAM message is encoded with the remaining Called Party digits, up to the number of digits specified in the SPLITIAM option value.
- Any Called Party digits that remain after the ISM and SAM encoding are discarded.
- The SAM message is encoded with the same OPC, DPC,SLS, and CIC that are in the IAM message.

- If the SPLITIAM option value is 15-31 in the Destination table entry associated with the DPC in the incoming message, that destination-based option value is used as the maximum CdPN length.
- If the SPLITIAM option value is none in the Destination table entry associated iwth the DPC in the incoming message , and the TIFOPTS SPLITIAM option value is 15-31, the TIFOPTS SPLITIAM value is used as the maximum CdPN length.

- If both SPLITIAM option values are none, IAM/SAM splitting is not enabled for the message. Up to 32 Called Party digits are encoded in the IAM message and any remaining digits are discarded.
- When splitting is enabled for a message and the maximum CdPN length is 15-31, then that number of digits is encoded in the IAM message. Any remaining digits (up to that value) are encoded in a trailing SAM message. Any remaining digits after filling the SAM message are discarded.
- The SAM message is encoded with the same OPC, DPC, SLS, and CIC that are in the IAM message.

Note: If the DPC in the incoming message is not found in the Destination table, a UIM is generated and the message is discarded.

The SPLITIAM option is not applicable to ANSI ISUP messages; ANSI does not support SAM messages. Up to 32 Called Party digits are always encoded for ANSI ISUP messages.

MSU Sequencing

During TIF Stop Action processing, all messages are marked for sequencing on the incoming LIM card.

Sequencing of MSUs delivered to a TIF Stop Action is provided by the existing Class 1 Sequencing capabilities.

If the message is sent to the Service Module card, then the message must be returned to the incoming LIM card before actual transmission.

On the Service Module card, there are several potential actions:

- An error occurs, and the Service Module card does not generate an MSU for transmission. In this unexpected case, but the LIM card times out and transmits all pending messages.
- The Service Module card relays the IAM message. Because the original sequence information is still present, sequencing will occur as expected.
- The Service Module card generates a response message, such as REL. The sequence information from the original MSU is transferred to the response message, and sequencing is still maintained.
- The Service Module card generates multiple messages, which can occur if the Called Party digits are increased and the IAM/SAM splitting action is invoked (see *IAM/SAM Splitting* on page 26). An IAM message and a SAM message will be generated. The SAM message must follow the IAM message. Both MSUs will be given the same sequence number and sent back to the original LIM card on the same path.

If the message does not require Service Module card processing, the message is sent directly to the sequencer on the card. The message will wait in the sequencer for any preceding messages to complete processing before it is transmitted.

ISUP Decode and Encode Errors

The UIMs listed in *Table 21: TIF UIMs* on page 92 indicate TIF encode and decode errors.

The UIMs listed in *Table 22: Existing ISUP Decode Errors* on page 92 are used to handle ISUP decode and encode error cases.

Refer to the *Unsolicited Alarm and Information Messages* manual for information about EAGLE 5 ISS UIMs.

MPS/EPAP Platform

Tekelec provides the MPS (Multi-Purpose Server) platform as a subsystem of the EAGLE 5 ISS. The MPS provides support for EPAP-based features.

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 the *Tekelec 1000 Application Server Hardware Manual*.) The MPS provides the means of interfacing the customer provisioning application with the EAGLE 5 ISS. It connects the customer 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 it to the EAGLE 5 ISS Service Module cards (DSM cards and E5-SM4G cards). *Figure 7: MPS/EPAP Platform Architecture* on page 28 shows the overall system architecture, providing a graphic overview of MPS/EPAP platform from customer provisioning through the MPS subsystem to the EAGLE 5 ISS DSM databases on Service Module cards.

Note: The EAGLE 5 ISS supports more than one type of hardware card that provides the DSM function. The term Service Module card is used to mean any hardware card that supports the DSM function. If a Service Module card or an E5-SM4G card is specifically required, the required card is indicated. For more information about the hardware cards that support the DSM function, refer to the *Hardware Manual - EAGLE 5 ISS*.

Figure 7: MPS/EPAP Platform Architecture
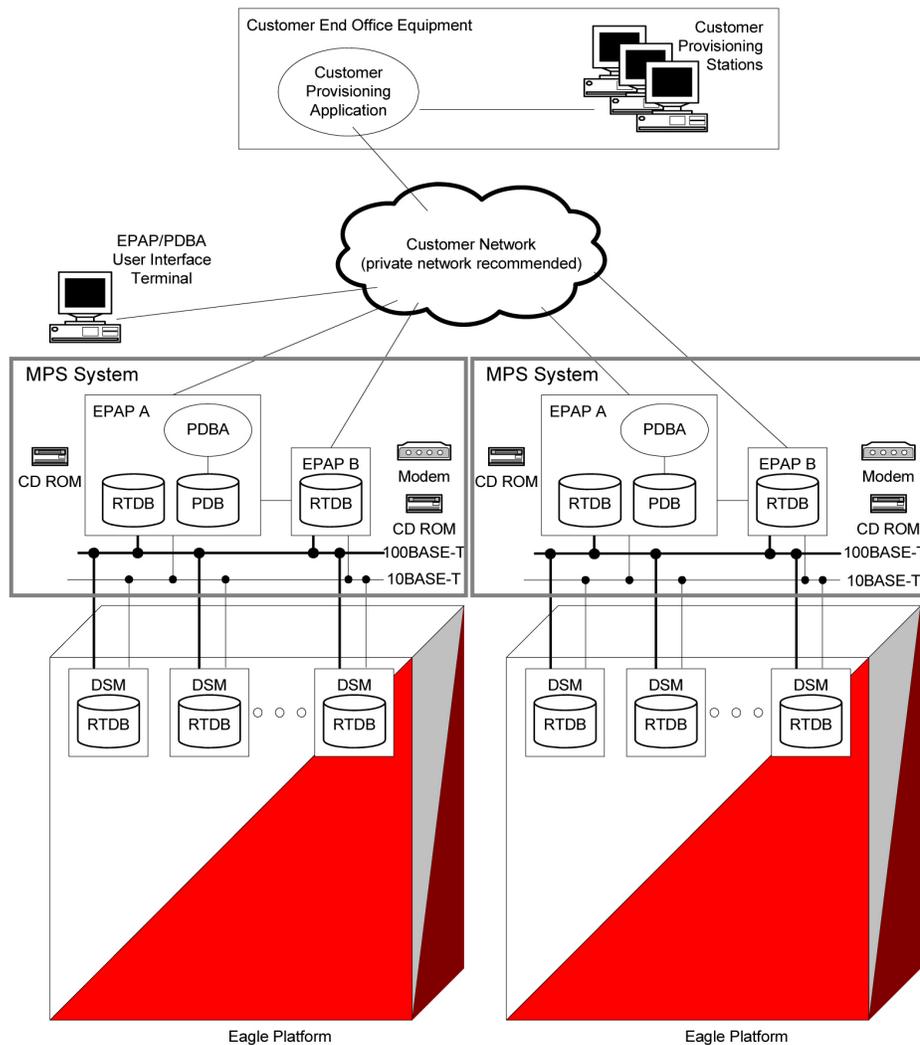
Design Overview and System Layout

Figure 7: MPS/EPAP Platform Architecture on page 28 illustrates the overall system architecture and identifies the different tasks, databases and interfaces involved. The system consists of two mated MPS servers. Each MPS contains two EPAP platforms, EPAP A and EPAP B, each containing a Realtime Database (RTDB), a Provisioning Database (PDB), servers, optical media , modems, and network hubs. Each MPS and its EPAPs may be thought of as an 'EPAP system'; the EPAP system and the mated EAGLE 5 ISS is referred to as the 'mated EPAP system'. Each EPAP system is a T1000 AS system with a total of four Ethernet interfaces: one from each EPAP to the 100Base-T Ethernet and one from each EPAP to the 10Base-T Ethernet.

On the EAGLE 5 ISS platform side, a set of Service Module cards, which hold the RTDB database, 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 a 10BASE-T Ethernet bus.

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 as the standby

link. At any given time, there is only one active EPAP and one active link. The database is provisioned through the active link by the active EPAP; the other EPAP provides redundancy.

In case of failure of the active EPAP, the standby EPAP takes over the role of active EPAP and continues to provision the subscriber database. In the case where 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.

Major modules on the EPAP are the

- DSM provisioning module
- Maintenance module
- RTDB module
- PDB module

The DSM 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 Realtime Database (RTDB), which is the "golden copy" of the subscriber database. The PDB module can run on one of the EPAPs of either of the mated EAGLE 5 ISSs.

Functional Overview

The main function of the MPS/EPAP platform is to provision the 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.

It is possible for the current copy of the RTDB on the Service Module cards to get out-of-sync due to missed provisioning or card rebooting. Therefore, the RTDB on the EPAP contains a coherent, current copy of the subscriber database. The EPAP-DSM provisioning task sends database information out on the provisioning link. The Service Module cards act as the receivers and are re-provisioned.

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 EPAP-based features. It performs the following two basic functions in support of EPAP-based features:

- Accept and store 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 maintains an exact copy of the Realtime Database (RTDB) required by the EAGLE 5 ISS Service Module cards, provisions the EAGLE 5 ISS Service Module cards, and maintains redundant copies of both databases on mated EPAP hardware. 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. 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 across a private network to the Service Module cards located in the EAGLE 5 ISS frame by the EPAPs.

The primary interface to the PDBA consists of machine-to-machine messages. The interface is defined by Tekelec and is available in the *Provisioning Database Interface Manual*. Use that manual to update or create provisioning software compatible with the EPAP socket interface.

A direct user interface is provided on each EPAP to allow 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 high provisioning rates that EPAP-based features require. Implementing the persistent database and provisioning as an open systems platform, compared to the traditional OAM 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 RTDB in order to provision the EAGLE 5 ISS Service Module cards. The EPAP server must comply with the hardware requirements in the *T1000 Application Server Hardware Manual*. MPS/EPAP Platform on page 28 illustrates the EPAP architecture contained in the MPS subsystem.

Each EPAP has a dedicated CD-ROM drive. One EPAP per EAGLE 5 ISS platform has a modem capable of supporting remote diagnostics, remote configuration, and remote maintenance; these remote operations are performed through EPAP login sessions. These sessions are accessible across the customer network as well as through an RS232 direct terminal connection to the EPAP. Refer to the *T1000 Application Server Hardware Manual* for details about the hardware devices and network connections.

Chapter

3

TIF Features

Topics:

This chapter describes the EAGLE 5 ISS features that use the Triggerless ISUP Framework (TIF) and the Numbering Plan Processor (NPP) to process ISUP messages:

- TIF Number Portability (TIF NP)
- TIF SCS Forwarding (TIF SCS)
- TIF Number Substitution (TIF NS)
- TIF Simple Number Substitution (TIF SNS)
- TIF Additional Subscriber Data (TIF ASD)
- TIF Generic Routing Number (TIF GRN)

TIF Number Portability Feature

The TIF Number Portability (TIF NP) feature, along with the Numbering Plan Processor (NPP) and the Triggerless ISUP Framework (TIF), provide the following capabilities:

- Complex prefix usage, where prefixes can be used to customize actions
- Non-NAI-compliant digit handling
- Complex outgoing digit formats
- Calling number portability
- Concurrent Release and Relay support
- Circular route prevention (CRP)
- IAM/SAM splitting

The TIF NP feature is built upon the services provided by TIF and NPP to support ISUP messages.

TIF NP provides the following functions:

- Definition of feature-specific pre-NPP processing to be performed by TIF
- Service Action specification (including Service Action names and precedence)
- Service Action Handlers
- Feature-specific post-NPP processing, if needed

TIF NP Message Flows

Figure 8: ISUP Message Flows for TIF NP CdPN Relay on page 34 shows basic TIF NP CdPN Relay use cases.

Figure 8: ISUP Message Flows for TIF NP CdPN Relay
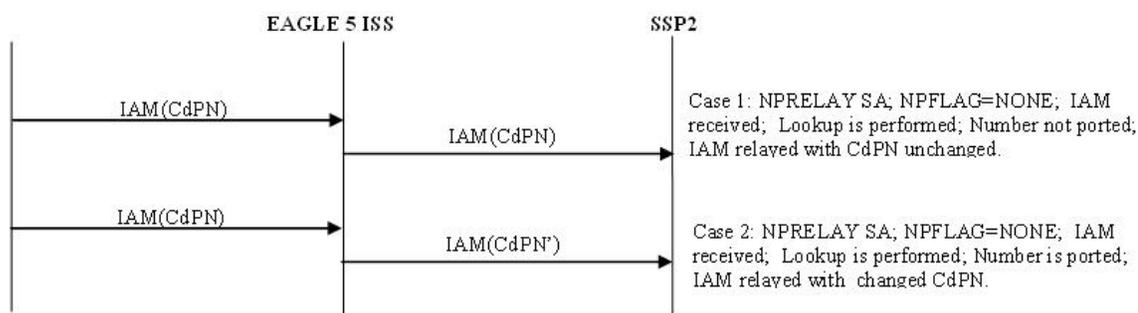
Figure 9: ISUP Message Flows for TIF NP CdPN Relay, with Optional NM Bits on page 34 shows TIF NP Relay cases where NM bits are used in the ISUP IAM message. In the sequence diagrams, the NM bits are shown as binary values. Refer to *Use of NM Bits* on page 40 for details on the use of NM bits.

Note: Use of NM bits in the IAM message is an optional part of TIF NP.

Figure 9: ISUP Message Flows for TIF NP CdPN Relay, with Optional NM Bits
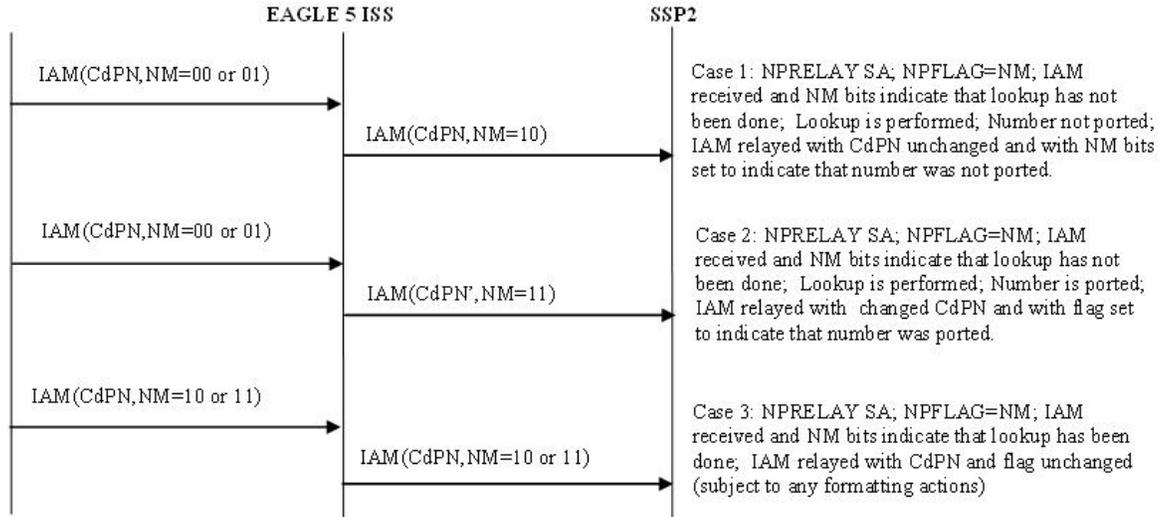
Figure 10: ISUP Message Flows for TIF NP CgPN Portability on page 35 shows basic TIF NP CgPN portability use cases.

Figure 10: ISUP Message Flows for TIF NP CgPN Portability
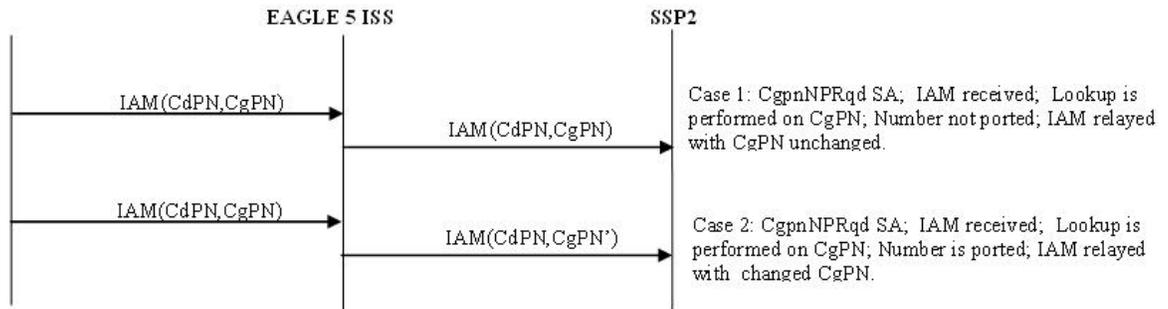
Figure 11: ISUP Message Flows for TIF NP Release on page 35 shows basic TIF NP Release use cases.

Figure 11: ISUP Message Flows for TIF NP Release
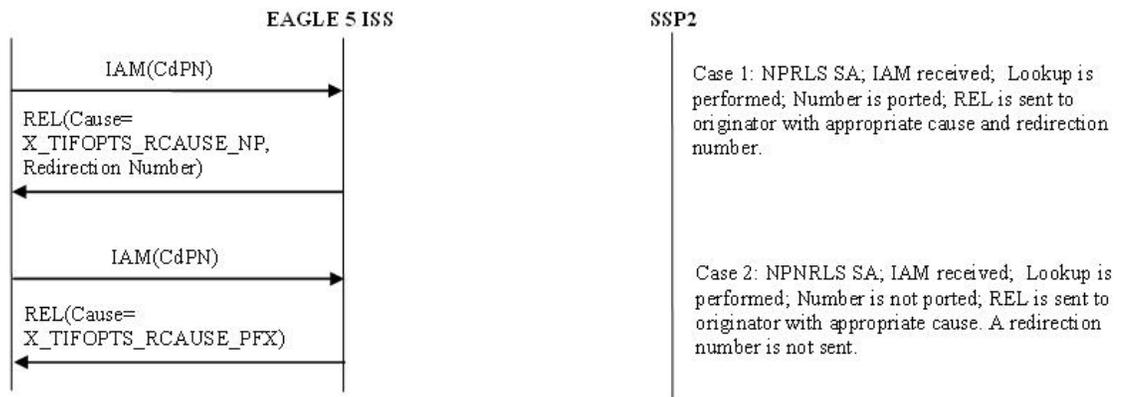
Figure 12: ISUP Message Flows for TIF NP Release, with Optional NM bits on page 36 shows TIF NP Release use cases, with use of NM bits.

Figure 12: ISUP Message Flows for TIF NP Release, with Optional NM bits
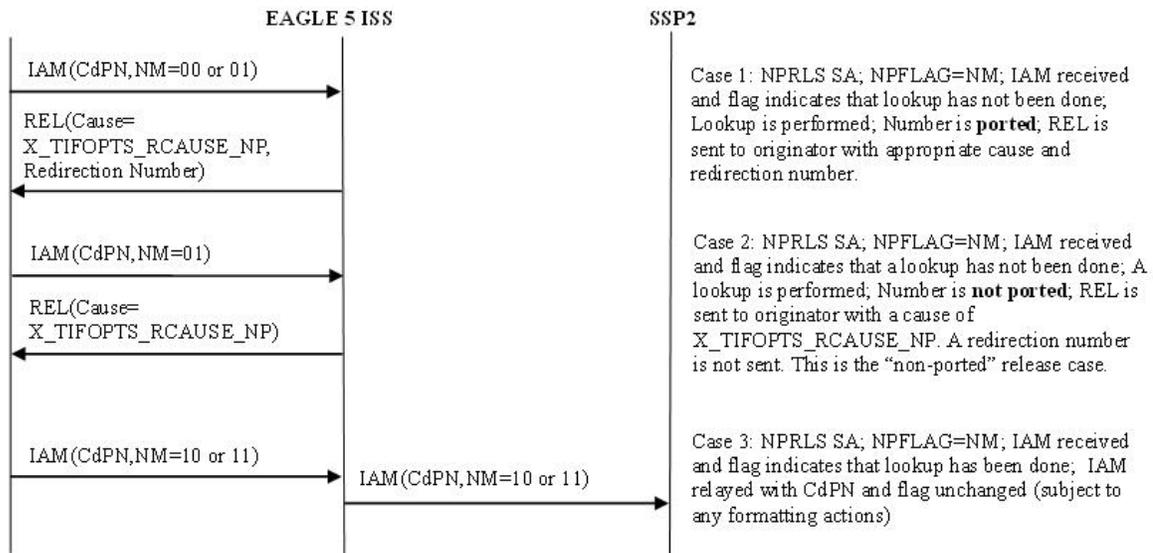
Figure 13: ISUP Message Flows for TIF CRP on page 36 shows Circular Route Prevention use cases. In these cases, subscriber X is ported from network A to network B. Network A's NP database has the correct entry indicating that subscriber X is ported, but network B has incorrect routing information, indicating that subscriber B still belongs to network A. Subscriber Y belongs to network A. In the use case, subscriber Y calls subscriber X.

Figure 13: ISUP Message Flows for TIF CRP
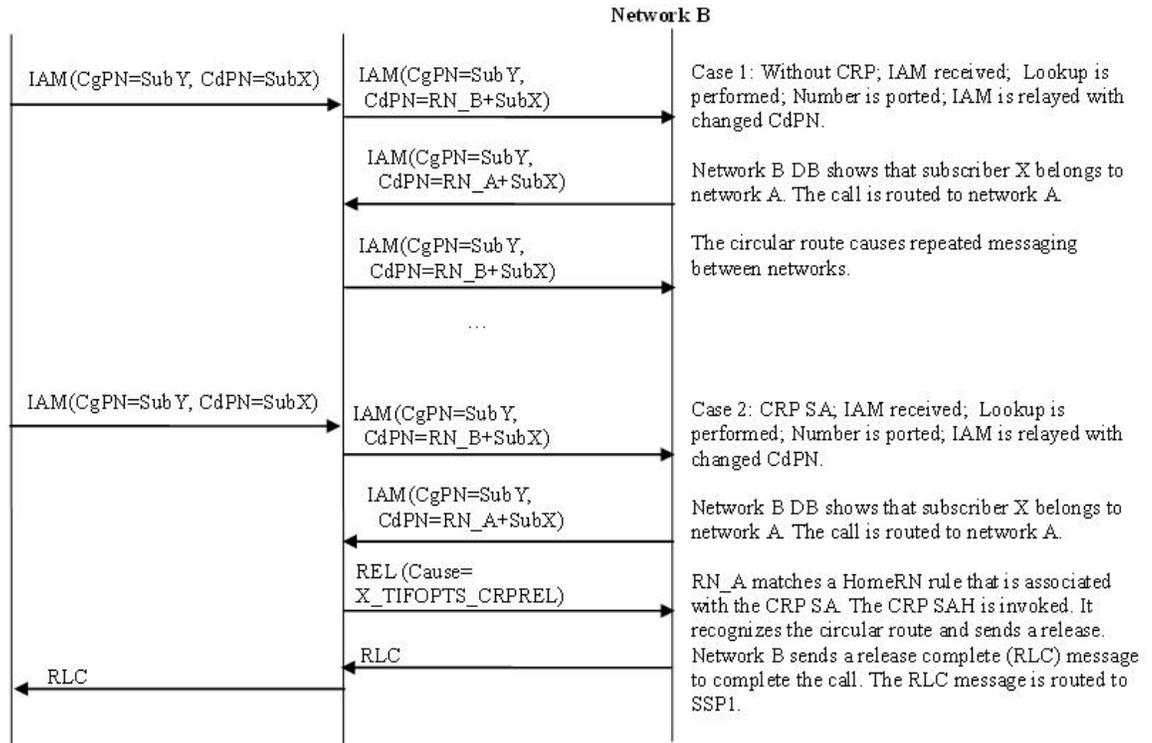
TIF NP Configuration Options

Table 17: TIF Configuration Options on page 64 indicates the TIF configuration options that can be used specifically by TIF NP. TIF NP can also use other options that are available to any TIF feature.

TIF NP Protocol Handling

TIF NP protocol handling provides the following functions:

- TIF NP-specific pre-NPP processing
- TIF NP Service Action Handlers
- Post NPP-processing

TIF Pre-NPP Processing for TIF NP

TIF decodes the incoming MSU and passes the following information to NPP:

- Conditioned CgPN
- Number of Country Code digits in CgPN
- Incoming NM bits

TIF NP Service Action Handlers

TIF NP provides Service Action Handlers for the NPP Service Actions that are specific to TIF NP. TIF and NPP perform the following functions for the TIF NP feature:

- RTDB lookup
- Interpretation of results from RTDB lookups
- NPP processing of Service Actions that are used for TIF NP

Table 10: Summary of TIF NP Service Actions on page 38 provides a summary of the Service Actions used for TIF NP.

Table 10: Summary of TIF NP Service Actions

Service Action	Description	Function	Precedence
CRP	Circular Route Prevention	Performs an RTDB lookup on the CdPN and attempts to detect a circular route.	92
NPNRLS	Number Portability Release on No Match	Performs an RTDB lookup on the CdPN and indicates release behavior on an unsuccessful lookup.	91
NPRELAY	Number Portability Relay	Performs an RTDB lookup on the CdPN and indicates relay behavior.	80
NPRLS	Number Portability Release on Match	Performs an RTDB lookup on the CdPN and indicates release behavior on a successful lookup.	80
CgPNNPRqd	Calling Number Lookup	Performs an RTDB lookup on the CgPN.	80

Relationships Between TIF NP Service Actions

Figure 14: NP Service Action Precedence on page 38 shows the relationships between NP Service Actions. The figure shows the precedence values (p) and shows which Service Action s are mutually exclusive in terms of Action Set configuration. In the diagram, Service Actions that are connected by lines are mutually exclusive. Service Actions that can be terminating actions are marked with asterisks.

Figure 14: NP Service Action Precedence

CRP*, p=92

NPNRLS*, p=91

NPRLS*, p=80

CgpnNPRqd,p=80

NPRELAY, p=80

Increasing
SA precedence
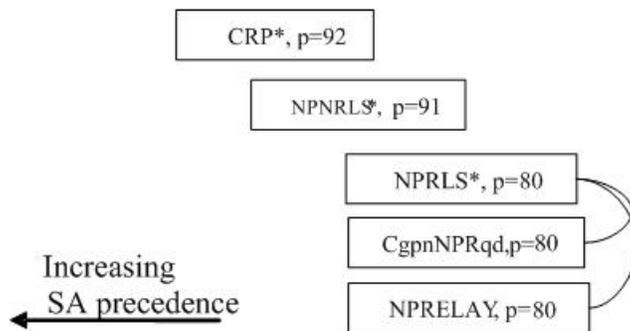
The mutual exclusion relationships can be explained as follows:

- NPRELAY and NPRLS – For the successful NP lookup case, must choose between Relay or Release
- CgpnNPRqd and NPRLS – CgpnNPRqd implies Relay behavior.

The precedence relationships can be explained as follows:

- CRP – CRP should be first since it is a special case and a terminating action.
- NPNRLS – NPNRLS is a special condition and a terminating action.
- NPRLS – Normal Release case; can be same precedence as normal Relay cases since they are mutually exclusive so can't appear in the same action set CgpnNPRqd.
- NPRELAY – normal relay case

The following principles apply to precedence relationships:

- Special NP Release cases are given higher precedence.
- Handlers that need to override conditions set by other handlers must be given lower precedence

The mutual exclusion relationships are enforced during EAGLE 5 ISS configuration for TIF NP.

RN, SP, and DFLTRN Handling

The RN and SP values are set depending on the entity type retrieved from the RTDB and the values of the NPTYPE and DFLTRN configuration options. The NPTYPE option is used as part of the matching criteria to determine when the RTDB search is considered a success.

If a match is found and the Entity Type is RN, then RN digits are inserted into the outbound field.

If a match is found and the Entity Type is SP, then SP digits are inserted into the outbound field or the DFLTRN option digit string can be used instead of actual SP digits.

The DFLTRN configuration option allows a single digit string to be inserted instead of the actual SP digits to identify 'in-network subscribers'. There may be different SPs in the RTDB for use by G-Port or other EAGLE 5 ISS features, but a single digit string is needed for TIF. The DFLTRN string is considered 'routing digits'. When a DFLTRN string is provisioned, the RN Formatting Action is used to encode: 'routing digits' (RN or DFLTRN) in the outbound digits.

The RN Formatting Action inserts the 'routing digits" into the outbound digits (either be the actual RN or the DFLTRN string).

The SP Formatting Action inserts the SP digits into the outbound digits.

Note: If the IGM Feature is turned on, Entity Type is RN, and portability type (PT) is zero, then the Entity Type is treated as SP (in-network subscriber).

on page 40 summarizes the rules for determining the outbound RN and SP.

Table 11: Rules for Determining Outbound RN and SP

Case	NPTYPE	RTDB Entity Type	DFLTRN	RN	SP
1	RN, RNSP, RNSPDN, ANY, ALL	RN	N/A	Entity data digits from the RTDB	No data
2	SP	RN	N/A	No data	No data
3	RN	SP	N/A	No data	No data
4	SP, RNSP, RNSPDN, ANY, ALL	SP	Null	No data	Entity data digits from the RTDB
5	SP, RNSP, RNSPDN, ANY, ALL	SP	Not Null	DFLTRN	Entity data digits from the RTDB
6	SP, RN, RNSP, RNSPDN, ANY, ALL	Not RN, Not SP	N/A	No data	No data

Use of NM Bits

Use of NM bits is optional, and is controlled by the destination-based NPRST configuration option for the DPC of the incoming message and the TIFOPTS NPFLAG configuration option.

TIF determines the value of the NM Bits in the incoming message. The following CdPN-based Service Action Handlers inspect the incoming NM bits value: NPRELAY, NPRLS, NPNRLS, and CRP.

Note: The configuration options and the NM bits apply only to CdPN, not to CgPN. Therefore, the CgPNNPRqd Service Action Handler does not look at the NM bits. The NM bits apply only for ITU ISUP messages when TIFOPTS NPFLAG=NM.

Table 12: NM Bits Values

NM Bits Value	Meaning
00	DPC is out-of-network, or no RTDB lookup performed
01	DPC is in-network, RTDB lookup was not performed
10	DPC is in-network, unsuccessful RTDB lookup

NM Bits Value	Meaning
11	DPC is in-network, successful RTDB lookup

If the TIFOPTS NPFLAG configuration option is set to NM and the outgoing message NM bits are not 00, the Destination table is searched for the DPC from the IAM message.

- If the NPRST option valued in the Destination table entry is ON, the NM bits in the outgoing message are set to 00 ("without indication").

- If the NPRST option valued in the Destination table entry is OFF, the NM bits in the outgoing message are not set to 00.

NPRELAY Service Action Handler

The NPRELAY Service Action Handler performs an RTDB lookup on the conditioned CdPN digit string and indicates Relay behavior.

The NPRELAY and NPRLS Service Actions are mutually exclusive in an Action Set.

Configuration Options Used

The TIFOPTS NPTYPE configuration option indicates the conditions that are used for a successful RTDB match.

The destination-based NPRST configuration option and the TIFOPTS NPFLAG configuration option indicate when and how the NM bits should be processed.

The value of the TIFOPTS DFLTRN option, if provisioned, is used to populate the RN on a successful match on SP.

Action Performed

This Service Action Handler uses the incoming NM bits to determine if a lookup has already been performed. See *.Use of NM Bits* on page 40.

If the TIFOPTS NPFLAG option is set to NM and the NM bits indicate that a lookup has already been performed, then the Service Action Handler returns immediately.

If a lookup has not already been performed, the NPRELAY Service Action Handler performs an RTDB lookup on the CdPN digit string. RN and SP can be found as a successful match. RN and SP entities are processed as described in *RN, SP, and DFLTRN Handling* on page 39.

Interpretation of lookup results is described in *Interpreting Results of an RTDB Lookup* on page 24.

Depending on the Formatting Action configuration for the selected rule, the updated RN or SP can be used during CdPN formatting by NPP.

The NPP Formatting Action processing will be skipped on an unsuccessful lookup. One way to force formatting of the outgoing CdPN, even after an unsuccessful lookup, is to configure the CDIAL Service Action.

On a successful lookup, where DN and entity data was found, the CdPN message parameter is changed to the ported number and the message is relayed to the recipient network.

On a successful lookup, where DN was found but entity data was not found (NPTYPE=ALL), the CdPN is unchanged and the message is relayed to the original destination.

The decoded NM result is used to determine if the NM bits need to be set in the outgoing IAM message.

Terminating Action?

This is not a terminating action.

NPRLS Service Action Handler

The NPRLS Service Action Handler performs a lookup on the conditioned CdPN digit string and indicates Release behavior on a successful lookup.

The NPRELAY and NPRLS Service Actions are mutually exclusive in an Action Set.

Configuration Options Used

The TIFOPTS NPTYPE configuration option indicates the conditions used for a successful match.

The TIFOPTS RNRQD configuration option indicates if a Redirection Number should be included in the Release message.

The TIFOPTS RLCOPC option indicates whether the destination-based RCAUSE configuration option value or the TIFOPTS RCAUSENP configuration option value is used as the Release Cause to be included in the Release message.

The value of the TIFOPTS DFLTRN option, if provisioned, is used to populate the RN on a successful match on SP.

The destination-based NPRST configuration option and the TIFOPTS NPFLAG configuration option indicates if the NM bits should be processed, and if a Release message should be generated if a DN is-not-found.

Action Performed

This Service Action Handler uses the incoming NM bits to determine whether a lookup has already been performed. See *Use of NM Bits* on page 40.

If the NPFLAG configuration option is set to NM and the NM bits indicate that a lookup has already been performed, then the Service Action Handler returns immediately.

If the NM bits indicate that a lookup has not already been performed, the Service Action Handler performs an RTDB lookup on the conditioned CdPN digit string. RN or SP can be found as successful match. The RN and SP values are processed as described in *RN, SP, and DFLTRN Handling* on page 39.

Interpretation of lookup results is described in *Interpreting Results of an RTDB Lookup* on page 24.

On a match, the RNRQD option indicates whether or not a Redirection Number is included in the Release message, and the RCAUSE option or the RCAUSENP option indicates the Release Cause to be included in the Release message.

On a successful lookup, where DN and entity data was found, a Release message is sent. If the Redirection Number configuration option (RNRQD) is set to YES, then the ported number is included in the ISUP Release message.

On a successful lookup, where DN was found but entity data was not found (NPTYPE=ALL), a Release message is sent. If the Redirection Number configuration option (RNRQD) is set to YES, then the original CdPN is included in the ISUP Release message.

Depending on the Formatting Action configuration for the selected rule, the updated RN or SP can be used during CdPN formatting by NPP.

The Formatting Action processing will be skipped on an unsuccessful lookup. The original message is relayed using the original CdPN (unless NPFLAG=NM and a Release message is to be generated).

Terminating Action?

This is a terminating action in either of the following two conditions:

* The NPFLAG is set to NM, lookup is not successful, and the NM bits indicate "query not performed" (binary value 01).
* The lookup is successful.

NPNRLS Service Action Handler

The NPNRLS Service Action Handler performs a lookup on the conditioned CdPN digit string and indicates Release behavior on an unsuccessful lookup.

Configuration Options Used

The TIFOPTS NPTYPE configuration option indicates the conditions used for a successful match.

The destination-based NPRST configuration option and the TIFOPTS NPFLAG configuration option indicates when and how the NM bits should be processed.

The TIFOPTS RLCOPC option indicates whether the destination-based RCAUSE configuration option value or the TIFOPTS RCAUSENP configuration option value is used as the Release Cause to be included in the Release message.

Action Performed

This Service Action Handler uses the incoming NM bit decode result to determine if a lookup has already been performed.

If the TIFOPTS NPFLAG configuration option is set to NM and the NM bits indicate that a lookup has already been performed, then the Service Action Handler returns immediately.

If the NM bits indicate that a lookup has not already been performed, the RTDB lookup is performed and does not return a match.

In this no-match case, a Release message will be sent with a Release Cause specified in the RCAUSE option or the RCAUSEPFX option. The Redirection Number is not included in the Release message.

This Service Action Handler provides no inputs to Formatting Actions.

The post-NPP processing sends a Release message with a Release Cause that is configured in the RCAUSE option or the RCAUSEPFX option. The Redirection Number is not included in the Release message.

Terminating Action?

In the no-match case, this is a terminating action.

CgPNNPRqd Service Action Handler

The CgPNNPRqd Service Action Handler performs an RTDB lookup on the conditioned CgPN digit string.

The CgPNNPRqd and NPRLS Service Actions are mutually exclusive in an Action Set.

Configuration Options Used

The NPTYPECGPN option indicates the conditions used for a successful match.

The IAMCGPN option value (DN, RN, RNDN) indicates the format of outgoing CgPN string. For the IAMCGPN configuration option, RN implies either RN or SP.

The value of the DFLTRN option, if set, is used to populate the RN on a successful match on SP.

Action Performed

On a lookup where entity data was found, the CgPN is changed according to the IAMCGPN configuration option. TIF will use the updated CgPN string to set the CgPN in the outgoing message.

On a lookup where an entry was found, but entity data was not found (NPTYPE=ALL), the CgPN is unchanged. The outgoing CgPN string is empty.

The length of the provisioned STPOPTS Default Country Code (DEFCC) parameter value provides the number of Country Code (CC) digits that are at the front of the conditioned CgPN.

On a successful lookup, where the outgoing format includes the DN (IAMCGPN=DN or RNDN) and the Country Code (CC) was added to the conditioned CgPN, the CC will be removed from the conditioned CgPN before copying the DN to the outgoing CgPN digit sting.

For example,

- On entry to the Service Action Handler:

    The conditioned CgPN is CCC1234567.
    The number of CC digits is 3.
    The IAMCGPN option values is RNDN.

- The lookup is successful.

    The value of RN is AAA.
    The resulting outgoing CgPN digit string is AAA1234567.

If a match is found and the Entity Type is RN, then RN digits are inserted into the outgoing field.

If a match is found and the Entity Type is SP, then SP digits are inserted into the outgoing field or the DFLTRN option digit string can be used instead of actual SP digits.

Note: If the IGM feature is turned on, Entity Type is RN, and PT=0, then the Entity Type is treated as SP (in-network subscriber).

Terminating Action?

This is not a terminating action.

TIF Post-NPP Processing for TIF NP

TIF post-NPP processing performs all actions required for NP Release and most actions required for NP Relay. The only extra NP-specific logic in TIF post-NPP processing is a Result Handler that performs the following functions:

- If the NPFLAG option value is NM, and the NPRST parameter value is ON for the Destination Point Code in the Destination table, then the NM bits will be set to 00 (meaning "without indication").
- If the NPFLAG option value is NM, and the NPRST parameter value is OFF for the Destination Point Code in the Destination table, and if.the incoming NM bits are not equal to the outgoing NM bits, then the outgoing NM bits are written to the outgoing ISUP IAM message (see *NPRELAY Service Action Handler* on page 41 for details).
- If the Destination Point Code is not found in the Destination table, then the message is discarded and a UIM is generated.

TIF Number Substitution Feature

Number substitution of both the Calling and Called Party provides customers the ability of supporting numbers outside their normal number range without having to upgrade all the nodes in the network. The TIF Number Substitution (TIF NS) feature, along with the Numbering Plan Processor (NPP) and the Triggerless ISUP Framework (TIF), provide the following capabilities:

- Called number substitution to change a Public DN into a Private DN
- Calling number substitution to change a Private DN into a Public DN

The TIF NS feature is built upon the services provided by TIF and NPP to support RTDB lookup of both Calling Party and Called Party numbers for substitution.

TIF NS provides the following functions:

- Definition of feature-specific pre-NPP processing to be performed by TIF
- Service Action specification (including Service Action names and precedence)
- Service Action Handlers
- Feature-specific post-NPP processing, if needed

TIF NS Message Flows

Figure 15: ISUP RELAY with TIF NS on page 45 shows CgPN and CdPN substitution in an ISUP IAM Relay call flow.

Figure 15: ISUP RELAY with TIF NS
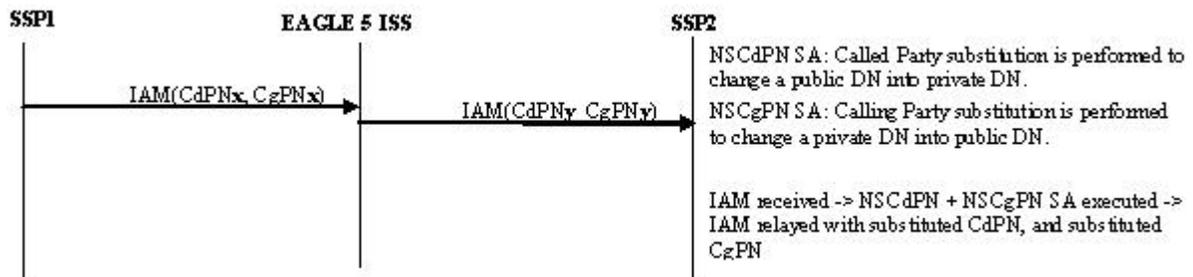
Figure 16: ISUP RELAY with TIF NS - No CgPN Substitution on page 46 shows the ISUP IAM Relay call flow where CdPN is substituted and CgPN is not substituted.

Figure 16: ISUP RELAY with TIF NS - No CgPN Substitution
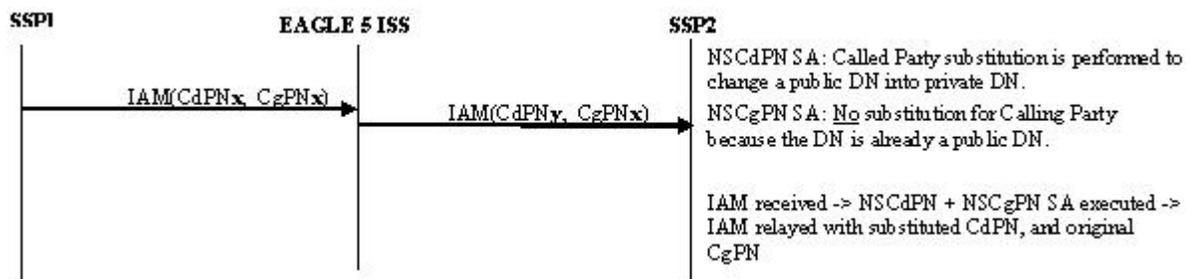
TIF NS Basic Use Case

Figure 17: TIF NS Basic Operation on page 46 shows the steps involved in a basic TIF NS use case. This case uses the following rule and configuration options:

- Filter FPFX=123
- Filter FDL=13
- Conditioning Actions=CC3+AC3+SN7
- Service Actions=NSCdPN, NSCgPN
- Formatting Actions=CC+AC+SN
- TIFOPTS options NSADDLDATA=yes, NSPUBLIC=5

Figure 17: TIF NS Basic Operation
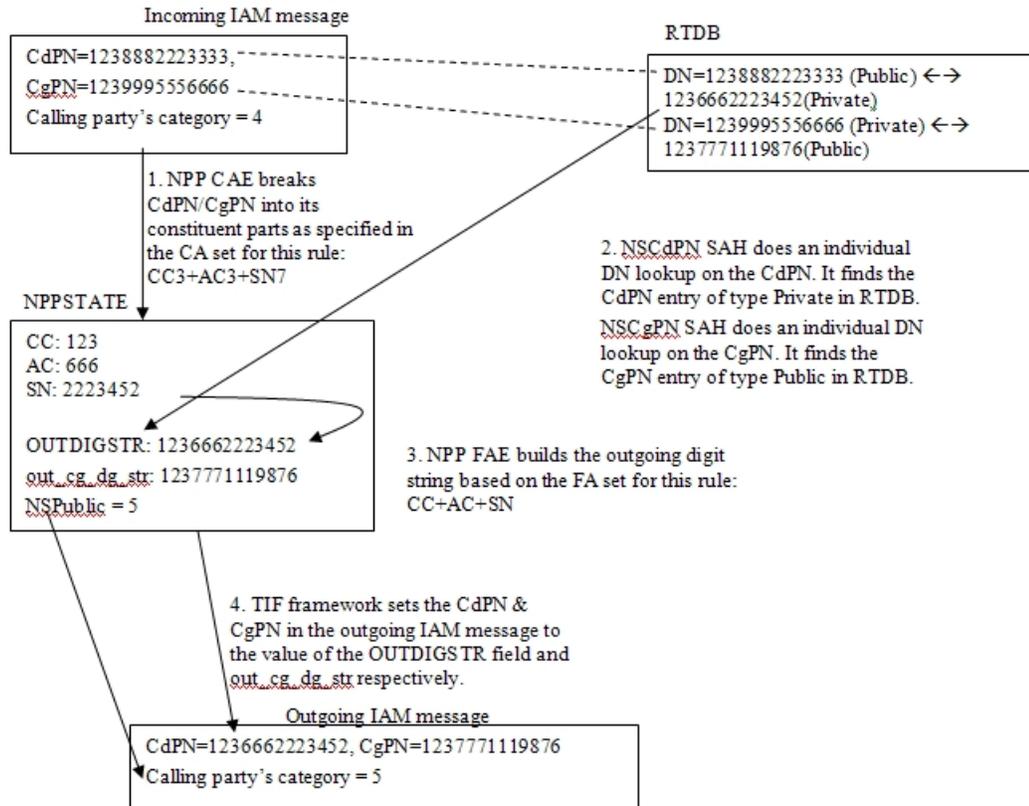
TIF NS Configuration Options

Table 17: TIF Configuration Options on page 64 indicates the TIF configuration options that can be used specifically by TIF NS. TIF NS can also use other options that are available to any TIF feature.

TIF NS Handling of IAM Message

When an IAM message is received and successfully decoded, an RTDB lookup is performed on the CdPN, the CgPN, or both.

For the CdPN, upon successful retrieval of the Called Party DN (Private), the CdPN is substituted in the outgoing IAM message.

For the CgPN, upon successful retrieval of the Calling Party DN (Public), the CgPN is substituted in the outgoing IAM message. If the Calling Party's Category is not the same as the value for the TIFOPTS nspublic configuration option and the lookup was successful, the Calling Party's Category is changed to the nspublic option value in the outgoing IAM message. The outgoing IAM message is then relayed.

TIF NS Protocol Handling

TIF NS protocol handling provides the following functions:

- TIF NS-specific pre-NPP processing

- TIF NS Service Action Handlers
- Post NPP-processing

TIF Pre-NPP Processing for TIF NS

TIF decodes the incoming MSU and passes either the conditioned CdPN or the conditioned CgPN to NPP.

For the conditioned CgPN, the country code provisioned in the STPOPTS DefCC parameter value will be prepended to the conditioned CgPN if the TIFOPTS condcgpn parameter value is set to addcc.

TIF NS Service Action Handlers

TIF NS provides Service Action Handlers for the NPP Service Actions that are specific to TIF NS. TIF and NPP perform the following functions for the TIF NS feature:

- RTDB lookup
- Interpretation of results from RTDB lookups
- NPP processing of Service Actions that are used for TIF NS

Table 13: Summary of TIF NS Service Actions on page 48 provides a summary of the Service Actions used specifically for TIF NS.

Table 13: Summary of TIF NS Service Actions

Service Action	Description	Function	Precedence
NSCdPN	Called Number Substitution	Performs an RTDB lookup on the CdPN; if the lookup is successful, replaces the outgoing CdPN.	80
NSCgPN	Calling Number Substitution	Performs an RTDB lookup on the CgPN. if the lookup is successful, replaces the outgoing CgPN.	75

NSCdPN Service Action Handler

The NSCdPN Service Action Handler performs a lookup on the conditioned CdPN digit string. On a successful lookup it replaces the outgoing CdPN. A successful lookup is one in which the subscriber type is Public and there is a pointer to an associated Private DN.

There are no mutually exclusive relationships with other NS Service Actions.

Configuration Options Used

None.

Action Performed

This Service Action Handler copies digits from the Private DN found in the successful RTDB lookup, and populates one of the following sets of Formatting Action values:

- ZN
- CC+DN
- CC+AC+SN

.

This Service Action assumes that Formatting Action execution will occur. If another Service Action determines that Formatting Action execution will not occur, the CDIAL Service Action must be used to force Formatting Action execution to occur.

The post-NPP processing replaces the CdPN in the outgoing message.

Terminating Action?

This is not a terminating action.

NSCgPN Service Action Handler

The NSCgPN Service Action Handler performs a lookup on the conditioned CgPN digit string. On a successful lookup it replaces the outgoing CgPN. A successful lookup is one in which the subscriber type is Private and there is an associated Public DN.

The SNSCgPN Service Action and the NSCgPN Service Action are mutually exclusive in the same Action Set.

Configuration Options Used

The nsaddldata configuration option indicates whether to compare the incoming Calling Party's Category to the nspublic configuration option value before the RTDB lookup.

The nspublic configuration option indicates the value for the Calling Party's Category in a Public DN for the network.

Formatting of the outgoing CgPN string is based on the value of the iamcgpn configuration option.

Action Performed

This Service Action Handler uses the nsaddldata and nspublic configuration options to determine whether to replace the Calling Party's Category in the outgoing message.

If a country code was prepended to the original CgPN by the TIF pre-NPP processing, the Public DN from the RTDB is assumed to begin with a country code. The STPOPTS default country code (DefCC) value is compared with the country code digits in the DN retrieved from the RTDB.

- If the two sets of digits match, the country code digits are removed from the retrieved DN.
- If the two sets of digits do not match, a UIM is generated and the Service Action returns normally.

The following actions are taken depending on the value of the iamcgpn configuration parameter:

- If iamcgpn=dn, all digits in the outgoing CgPN are substituted.

- If iamcgpn=rndn, the RN will contain the maximum number of digits allowed in the CgPN, and the digits following the RN are replaced with the substituted DN.

This Service Action Handler provides no inputs to Formatting Actions. Formatting of the outgoing CgPN digit string is completed in the Service Action Handler.

The post-NPP processing replaces the Calling Party's Category and the CgPN (only the digit string and the odd/even indicator bits, not the NAI) as NPP processing indicates.

Terminating Action?

This is not a terminating action.

TIF Post-NPP Processing for TIF NS

TIF post-NPP processing performs all actions required for NS functions. TIF performs the following processing for TIF NS:

- Calling Party's Category replacement
- CgPN replacement
- CdPN replacement

TIF Simple Number Substitution Feature

The TIF Simple Number Substitution (TIF SNS) feature allows the Calling Party number in the ISUP IAM message to be substituted with a single Calling Party number that is provisioned in a TIF configuration option. The RTDB is not used in this case.

The TIF SNS feature uses services provided by the Triggerless ISUP Framework (TIF), and provides the following functions:

- Feature-specific pre-NPP processing
- Service Action specification (including Service Action names and precedence)
- Service Action Handlers
- Feature-specific post-NPP processing

TIF SNS Message Flows

Figure 18: ISUP Message Flows for TIF SNS
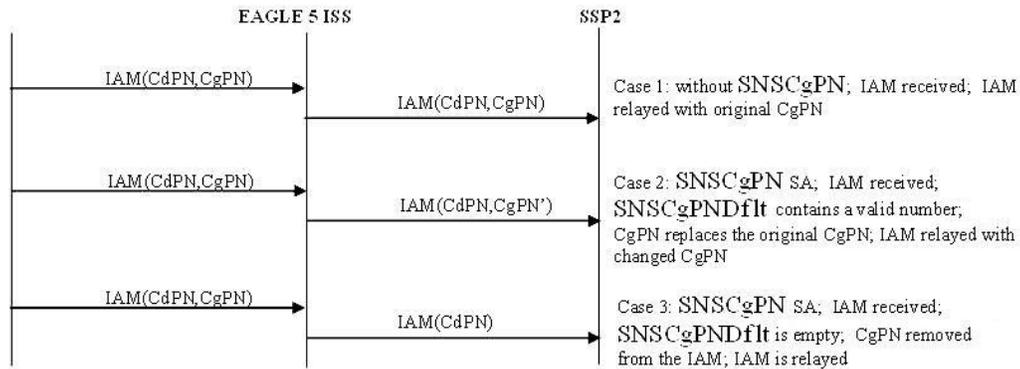
TIF SNS Configuration Option

The SNSCgPNDefault configuration option is used by TIF SNS. The provisioned option value indicates the number to be used to replace the CgPN during simple number substitution. A value of **none** indicates that the CgPN will be removed from the outgoing message.

The TIF SNS feature can use other TIF configuration options that are available to any TIF feature. See *TIF Configuration Options* on page 12.

TIF SNS Protocol Handling

TIF SNS protocol handling consists of the following functions:

- SNS-specific pre-NPP Processing

    TIF sends the conditioned CgPN to NPP.

- SNSCgPN Service Action Handler
- SNS-specific post NPP-Processing

TIF SNS Service Action Handler

The SNSCgPN Service Action Handler indicates how to update the outgoing CgPN based on the value of the SNSCgPNDefault configuration option.

Configuration Options Used

The SNSCgPNDefault option indicates the number used to replace the CgPN, or a value of NONE if the CgPN should be removed.

Actions Performed

If the SNSCgPNDefault option value is the number used to replace the CgPN, the SNSCgPN Service Action Handler indicates that the CgPN is to be replaced.

If the SNSCgPNDefault option value is NONE, then the SNSCgPN Service Action Handler indicates that the CgPN should be removed from the message.

This Service Action Handler provides no input to NPP Formatting Actions.

Note: Formatting of the outgoing CgPN string is not based on the value of the IAMCGPN configuration option.

NPP Post-Processing

TIF post-NPP processing performs all actions required for SNS-related updates to the outgoing message:

- If the value of the SNSCgPNDefault option is NONE, then TIF removes the CgPN.
- If the value of the SNSCgPNDefault option is not NONE, then TIF replaces the CgPN with the SNSCgPNDefault value in the outgoing message. The CgPN NAI is not changed.

TIF SCS Forwarding Feature

The TIF SCS Forwarding feature provides the ability to forward messages to the SCS for additional processing after TIF processing is complete.

The only modifications made to the message by TIF are:

- Re-encode a modified CdPN
- Forward message to SCS, using DTA

The TIF SCS Forwarding feature provides the Service Action Handler for the FWDSCS Service Action that is provided by TIF to NPP. Before an NPP Rule can be provisioned with the FWDSCS Service Action in the Action Set, the TIF SCS Forwarding feature must be enabled in the system.

The feature does not require EPAP and RTDB lookup, but can operate with EPAP or ELAP subsystems.

FWDSCS Service Action Handler

The FWDSCS Service Action indicates that any relayed IAM and SAM messages require processing by the Database Transport Access (DTA; also called Redirect), a feature that encapsulates an MSU in an SCCP header and forwards it to a destination (the DTA DPC, usually an SCS). Refer to the *Database Administration Manual - Features* for more information about DTA, including message size limits for encapsulation.

DTA might not be able to forward a message for the following reasons:

- The message is too large for DTA to process.
- The DTA DPC is prohibited or congested (through TFC, local link congestion is not considered).
- The DTA node is disabled.

If DTA encapsulation is requested but cannot be performed, the message is relayed without additional modification.

TIF Additional Subscriber Data Feature

The TIF Additional Subscriber Data (TIF ASD) feature allows for the insertion of Additional Subscriber Data (ASD) from the incoming CgPN and CdPN digit strings into the CdPN of an outgoing IAM or Redirection Number.

TIF ASD provides Service Action Handlers for the ASDLKUP and CgPNASDRqd Service Actions in NPP.

The NPP ASD Formatting Action is used to process the ASD that is retrieved by TIF ASD Service Actions.

Basic TIF ASD Use Case

The incoming IAM message contains CdPN=1238882223333 and CgPN=1239995556666.

The following Filter and Action Set components are used for the example:

- Filter Prefix (FPFX) = 123
- Filter Digit Length (FDL) = 13
- Conditioning Actions = CC3 + AC3 + DN7
- Service Action = CgPNASDRqd
- Formatting Actions = CC + ASD + AC + DN

NPP extracts the following information from the incoming CdPN:

- Country Code (CC) = 123
- Area Code (AC) = 888
- Dialed Number (DN) = 223333

The CgPNASDRqd Service Action Handler performs an RTDB lookup for the DN in the CgPN. The CgPN entry is found and contains ASD = a5d.

NPP Formatting Action execution uses the extracted information and the ASD to construct the outgoing digit string as CC + ASD + AC + DN = 123a5d8882223333.

TIF uses the constructed CdPN digit string in the outgoing IAM message. The CgPN is not changed. The outgoing message is relayed.

TIF ASD Message Flows

Figure 19: ISUP IAM Message Flows for TIF ASD

shows TIF ASD use cases with the NPRLS and NPNRLS Service Actions.
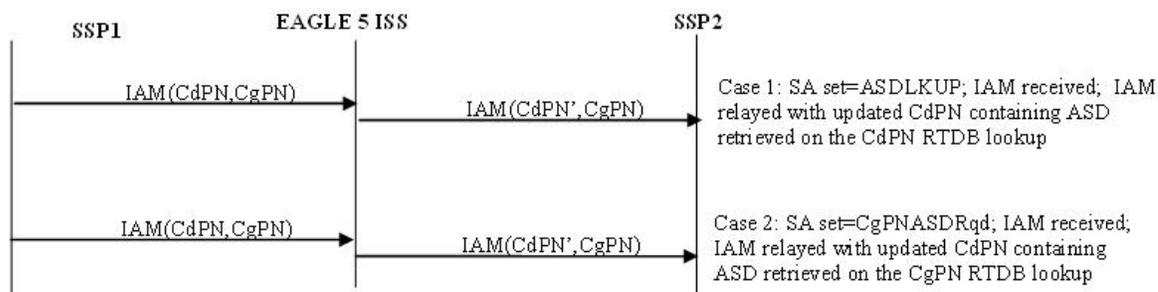
Figure 20: ISUP REL Message Flow for TIF ASD
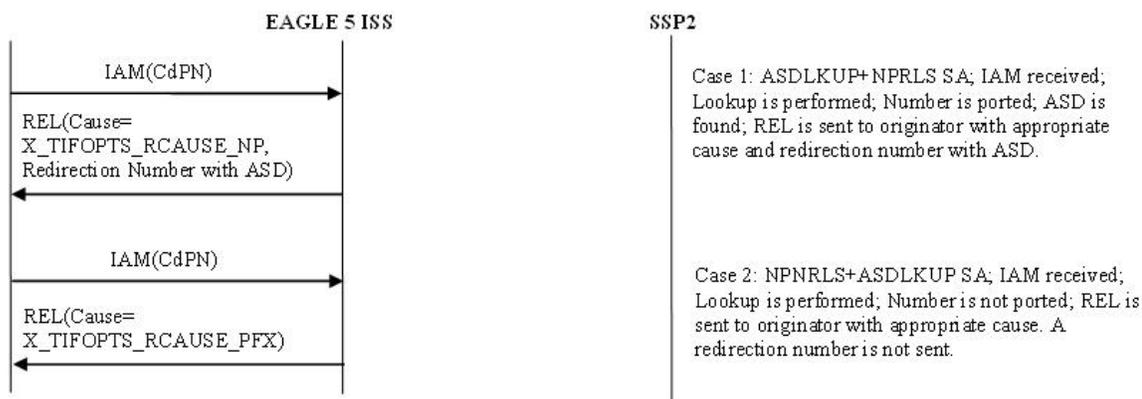
TIF ASD Service Action Handlers

TIF ASD provides Service Action Handlers for the NPP Service Actions shown in :

Table 14: NPP Service Actions used by TIF ASD

Service Action	Description
ASDLKUP	Performs an individual or range RTDB lookup on the CdPN to find an entry containing an ASD digit string.
CgPNASDRqd	Performs an individual or range RTDB lookup on the CgPN to find an entry containing an ASD digit string.

The ASDLKUP Service Action or CgPNASDRqd Service Action can coexist in the same Service Action group with any other Service Actions used by TIF. The ASDLKUP Service Action and the CgPNASDRqd Service Action are mutually exclusive in the same Action Set.

ASDLKUP Service Action Handler

The ASDLKUP Service Action Handler uses the ASDLKUP Service Action to perform an individual or range RTDB lookup on the conditioned CdPN, to find an entry containing an ASD digit string.

Depending on the Formatting Action configuration for the selected NPP Rule, the ASD digit string can be used during CdPN formatting by NPP.

TIF uses the formatted CdPN in the outgoing IAM or REL message.

If the TIF ASD feature is turned off in the system, the ASDLKUP Service Action Handler returns immediately.

CgPNASDRqd Service Action Handler

The CgPNASDRqd Service Action Handler uses the CgPNASDRqd Service Action to perform an individual or range RTDB lookup on the conditioned CgPN, to find an entry containing an ASD digit string.

Depending on the Formatting Action configuration for the selected NPP Rule, the ASD digit string can be used during CdPN formatting by NPP.

TIF uses the formatted CdPN in the outgoing IAM or REL message.

If the TIF ASD feature is turned off in the system, the CgPNASDRqd Service Action Handler returns immediately.

TIF Generic Routing Number Feature

The TIF Generic Routing Number (TIF GRN) feature allows for the insertion of a Generic Routing Number (GRN) digit string into the CdPN of an outgoing IAM or Redirection Number

TIF GRN provides Service Action Handlers for the GRNLKUP and CgPNGRNRqd Service Actions in NPP.

The NPP GRN Formatting Action is used to process the GRN that is retrieved by TIF GRN Service Actions.

TIF GRN Message Flows

Figure 21: ISUP Message Flows for TIF GRN on page 55 shows TIF GRN use cases.

Figure 21: ISUP Message Flows for TIF GRN
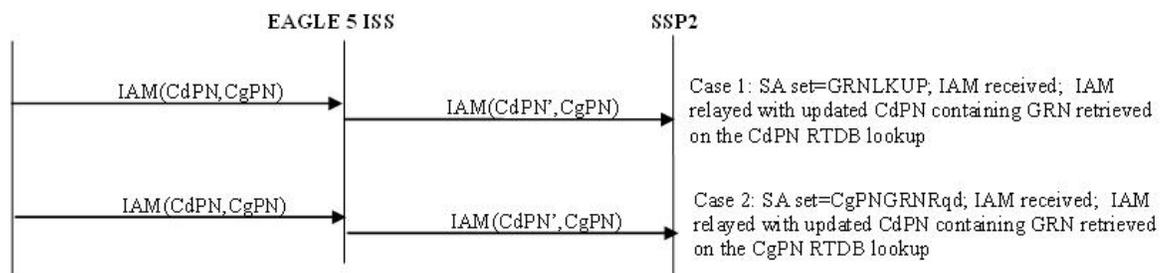
Figure 22: ISUP REL Message Flow for TIF GRN on page 56 shows TIF GRN use cases with NPRLS and NPNRLS.

Figure 22: ISUP REL Message Flow for TIF GRN
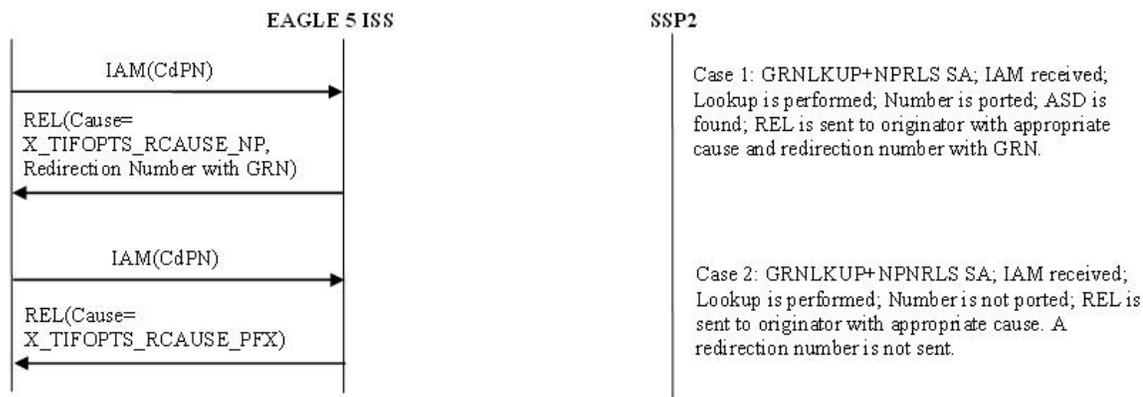
TIF GRN Service Action Handlers

TIF GRN provides Service Action Handlers for the NPP Service Actions shown in :

Table 15: NPP Service Actions used by TIF GRN

Service Action	Description
GRNLKUP	Performs an individual or range RTDB lookup on the CdPN to find an entry containing a GRN digit string.
CgPNGRNRqd	Performs an individual or range RTDB lookup on the CgPN to find an entry containing a GRN digit string.

The GRNLKUP Service Action or CgPNGRNRqd Service Action can coexist in the same Service Action group with any other Service Actions used by TIF. The GRNLKUP Service Action and the CgPNGRNRqd Service Action are mutually exclusive in the same Action Set.

GRNLKUP Service Action Handler

The GRNLKUP Service Action Handler uses the GRNLKUP Service Action to perform an individual or range RTDB lookup on the conditioned CdPN, to find an entry containing a GRN digit string.

Depending on the Formatting Action configuration for the selected NPP Rule, the GRN digit string can be used during CdPN formatting by NPP.

TIF uses the formatted CdPN in the outgoing IAM or REL message.

If the TIF GRN feature is turned off in the system, the GRNLKUP Service Action Handler returns immediately.

CgPNGRNRqd Service Action Handler

The CgPNGRNRqd Service Action Handler uses the CgPNGRNRqd Service Action to perform an individual or range RTDB lookup on the conditioned CgPN, to find an entry containing an GRN digit string.

Depending on the Formatting Action configuration for the selected NPP Rule, the GRN digit string can be used during CdPN formatting by NPP.

TIF uses the formatted CdPN in the outgoing IAM or REL message.

If the TIF GRN feature is turned off in the system, the CgPNGRNRqd Service Action Handler returns immediately.

Chapter

4

EAGLE 5 ISS TIF Commands

Topics:

This chapter contains brief descriptions of the EAGLE 5 ISS commands that are used for the configuration, maintenance, debug, and test for the Triggerless ISUP Framework (TIF) and the features that use TIF.

EAGLE 5 ISS Commands for TIF Features

This chapter describes the EAGLE 5 ISS commands that are used for the configuration and maintenance for the following features:

- TIF Number Portability
- TIF SCS Forwarding
- TIF Number Substitution
- TIF Simple Number Substitution
- TIF Additional Subscriber Data
- TIF Generic Routing Number

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

- System Serial Number commands: `ent/rtrv-serial-num`
- Card commands: `ent/dlt/rtrv/alw/inh/init/rept-stat-card`
- Feature control commands: `enable/chg/rtrv-ctrl-feat`, `chg/rtrv-feat`
- Gateway Screening and linkset commands: `chg/rtrv-gws-actset`, `ent/chg/dlt/rtrv-scr-sio`, `ent/chg/dlt/rtrv-scrset`, `ent/chg/dlt/rtrv-ls`
- TIF Options commands: `chg/rtrv-tifopts`
- NPP commands: `ent/chg/dlt/rtrv-npp-as`, `ent/chg/dlt/rtrv-npp-srs`, `chg/rtrv-npp-serv`
- Retrieve, Report Status, and Maintenance commands: `chg-th-alm`, `ent-trace`. `init-network`, `init-sys`, `rept-stat-alm`, `rept-stat-db`, `rept-stat-mps`, `rept-stat-sccp`, `rept-stat-sys`, `rept-stat-trbl`
- TIF Test Tool commands: `chg/rtrv-isup-msg`, `tst-msg`

EAGLE 5 ISS Serial Number Commands

Before any controlled features can be enabled, the database must contain a valid and locked serial number for the EAGLE 5 ISS. The system is shipped with a serial number in the database, but the serial number is not locked. The serial number can be changed, if necessary, and locked after the system is on-site.

The `ent/rtrv-serial-num` commands are used to enter, lock, and display the status of the system serial number. The serial number must be entered once in the `ent-serial-num` command without the lock parameter, and entered again with the lock=yes parameter. The serial number cannot be changed after it is locked.

EAGLE 5 ISS Card Commands

The `ent/dlt/rtrv/alw/inh-card` commands are used to add, remove, display information about, allow operation of, and stop operation of cards in the system.

The `ent-card` command is used to add cards to the database.

- For Service Module cards (DSM cards and E5-SM4G cards) the command specifies the card location, the card type (**dsm**), and the application that runs on the card (**vsccp**).

- TSM cards or E5-TSM cards can be used for Gateway Screening. The command specifies the card location, the card type (**tsm**), and the application that runs on the card (**gls**).

The `dlt-card` command is used to remove provisioned cards from the database, before they are physically removed from the card location in the shelf. The TIF features use only Service Module cards running the **vsccp** application.

The `rtrv-card` command is used to display information about the cards that are provisioned in the database. When the command is entered with no parameters, all cards that are provisioned in the database are listed. The command can be entered with the loc parameter to display nformation about a specific card.

The `alw-card` command is used to cause a card to begin operation in the system. The card status is changed from Out-of-Service-Maintenance-Disabled (OOS-MT-DSBLD) to In-Service-Normal (IS-NR) if the GPL loading is successful. When the command is entered with the loc parameter, the approved version of the GPL is loaded on the specified card.

The `inh-card` command is used to cause a card to stop operation in the system. When the card status has changed from In-Service Normal (IS-NR) to Out-of-Service Maintenance-Disabled (OOS-MT-DSBLD), the card can be physically removed from the shelf. The force parameter must be used to inhibit the last card that is supporting an SCCP subsystem or MPS-to-DSM network connection.

The `rept-stat-card` command is used to report the operating status of all cards or of a specific card in the system.

EAGLE 5 ISS Feature Control Commands

The `chg/rtrv-feat` commands are used to turn on and display the on/off status of features, such as the GTT feature, that are controlled with feature bits. After a feature that is controlled with a feature bit is turned on, the feature cannot be turned off.

The `enable/chg/rtrv-ctrl-feat` commands are used to enable, turn on, and display the status of features that are controlled by feature access keys. The feature access key is based on the feature part number and the serial number of the system that uses the feature, making the feature access key site-specific. When a feature is enabled by entering the `enable-ctrl-feat` command with the feature part number and feature access key, the feature is recognized by the system. Other actions might be required to make the feature fully operational, such as turning the feature on, installing hardware, and provisioning information in database tables.

Some features can be enabled with a temporary part number and feature access key for a limited trial of the feature. When the trial period expires, the feature must be enabled with a permanent part number and feature access key to continue use of the feature.

The following feature controls are used for the TIF features:

- The GTT feature and the Gateway Screening feature (GWS) must be turned on, using the chg-feat command, before one or more TIF features can be enabled in the system.
- Each TIF feature must be enabled, using the `enable-ctrl-feat` command with its feature part number and a feature access key.

  - TIF Number Portability - part number 893018901
  - TIF SCS Forwarding - part number 893022201
  - TIF Number Substitution - part number 893022501
  - TIF Simple Number Substitution - part number 893024001

- TIF Additional Subscriber Data - part number 893024501
- TIF Generic Routing Number - part number 893025501

- After the feature is enabled, the feature must be turned on, using the `chg-ctrl-feat` command to set the feature status to on.
- The following TIF features are Permanently On features. The features cannot be turned off after they are turned on.

```
Feature Name             Partnum    Status Quantity
TIF Number Portability   893018901 on        ----
TIF SCS Forwarding       893022201 on        ----
TIF Simple Number Subst. 893024001 on        ----
```

- The following TIF features are On/Off features. After the features have been enabled, they can be turned on and off using the chg-ctrl-feat command.

```
Feature Name             Partnum    Status Quantity
TIF ASD                  893024501 off       ----
TIF GRN                  893025501 off       ----
TIF Number Substitution  893022501 off       ----
```

- After each feature is enabled or turned off, the feature entry in the `rtrv-ctrl-feat` command output shows the Status as off. After the feature is turned on, the feature entry in the command output shows the Status as on.
- The TIF features cannot be enabled using a temporary part number and feature access key.

EAGLE 5 ISS Gateway Screening and Linkset Commands

The `chg/rtrv-gws-actset, ent/chg/dlt/rtrv-scr-<xxx>,` and `ent/chg/dlt/rtrv-scrset` commands are used to define, change, and display the gateway screening stop action sets in the system database. Stop action sets are used to define the actions performed on the Message Sending Units (MSUs) that pass the gateway screening process.

TIF adds the TIF, TIF2, and TIF3 stop actions for gateway screening; each of these stop actions must be the last stop action in its Action Set. Each TIF stop action encapsulates incoming messages as SCCP data and forwards them to Service Module cards for processing . Each TIF stop action is association with a corresponding NPP service.

The `ent/chg/dlt/rtrv-ls` commands are used to turn on the gateway screening options (gwsa, gwsm, and gwsd) for linksets. The options determine whether gateway screening is on or off for the linkset, and how MSUs are handled when gateway screening is on for the linkset. The options need to be on for the TIF features.

EAGLE 5 ISS Commands for Destination-based Options

The `chg/rtrv-dstn` commands define and display configuration options that are provisioned in the Destination table. The destination-base options for TIF are used with or instead of the TIFOPTS configuration options for the following functions:

- Indicate the setting of the NM Bits in ITU IAM messages when the TIFOPTS npflag option indicates that NM Bits are used.
- Specify the release cause for a Release message when the TIFOPTS rlcopc option is on.
- Indicate when and how to split the IAM message into an IAM message and a SAM message.

See *EAGLE 5 ISS TIF Options Commands* on page 63 for a description of the TIFOPTS options.

The `chg-dstn` command uses the following parameters to provision the data in the Destination table:

Table 16: Destination-based Configuration Options

Parameter	Range	Description	Used by TIF Feature
nprst	on, off	Indicates whether the NM Bits should be set to 00 in ITU IAM messages when the TIFOPTS npflag option value is NM.	TIF Number Portability
rcause	0-127, none	Specifies the value to be used for the Release Cause field in a REL message instead of the TIFOPTS rcausenp option value (ported case) or the TIFOPTS rcausenpfx option value (not-ported case).	TIF Number Portability
splitiam	15-31, none	Determines when and how to split the IAM into 1 IAM message + 1 SAM message for ITU IAM message, instead of using the TIFOPTS SPLITIAM option value.	Any TIF feature

EAGLE 5 ISS TIF Options Commands

The `chg/rtrv-tifopts` commands define and display TIF configuration options that are provisioned in the TIFOPTS table. The TIF options are used for the following functions:

- Specify the conditioning that is needed before CdPN or CgPN lookup.
- Specify the conditions that indicate a successful RTDB lookup.
- Specify the cause for a Release message.
- Indicate when to split the IAM message into an IAM message and a SAM message.
- Specify the digits to substitute for the Calling Party Number in Simple Number Substitution.
- Indicate the Calling Party's Category value for the Public DN for the network in Number Substitution.
- Specify the format and contents of fields in the outgoing message (CgPN digits, NM bits, delimiter digits, Area Code, Release Cause, Default RN) .

The `chg-tifopts` command uses the following parameters to provision the data in the TIFOPTS table:

Table 17: TIF Configuration Options

Parameter	Range	Description	Used by TIF Feature
iamcgpn	dn, rn, rndn	Indicates the format of the outgoing CgPN digits, if they were modified by a feature	Any TIF feature
dlma	1-16 hexadecimal digits, none	Digits used for Delimiter A (DLMA) in NPP Formatting Action **Note:** If a TIF service has DLMA-DLMC values provisioned in NPP Formatting Actions and in the TIFOPTS table, the values from the TIFOPTS table will be used in NPP processing.	Any TIF feature
dlmb	1-16 hexadecimal digits, none	Digits used for Delimiter B (DLMB) in NPP Formatting Action **Note:** If a TIF service has DLMA-DLMC values provisioned in NPP Formatting Actions and in the TIFOPTS table, the values from the TIFOPTS table will be used in NPP processing.	Any TIF feature
dlmc	1-16 hexadecimal digits, none	Digits used for Delimiter C (DLMC) in NPP Formatting Action **Note:** If a TIF service has DLMA-DLMC values provisioned in NPP Formatting Actions and in the TIFOPTS table, the values from the	Any TIF feature

Parameter	Range	Description	Used by TIF Feature
		TIFOPTS table will be used in NPP processing.	
aclen	0-8	Length of area code (used for CgPN handling)	Any TIF feature
splitiam	15-31, none	Determines when to split the IAM message into 1 IAM message + 1 SAM message. This option is used only if the splitiam option in the Destination table for the associated DPC is set to none.	Any TIF feature
condcgpn	addcc, none	Indicates the preconditioning required when a CgPN lookup is needed.	Any TIF feature
dfltrn	1-15 hexadecimal digits	Digits to substitute for an SP. Used for CdPN and CgPN	Any TIF feature
npflag	nm, none	Specifies whether the NM bits are modified in the IAM message to show that RTDB lookup has been performed. (The NM bits exist only in incoming and outgoing IAM messages.) **Note:** See the related nprst option (NP Reset flag) for point codes in the Destination table.	TIF Number Portability (893-0189-01)
rcausenp	0-127	Specifies the value to be used for the Release Cause field in a REL message sent in the number-ported case.	TIF Number Portability (893-0189-01)

Parameter	Range	Description	Used by TIF Feature
		Note: See the related rcause option for point codes in the Destination table.	
rcausepfx	0-127	Specifies the value to be used for the Release Cause field in a REL message sent in the number-not-ported case. **Note:** See the related rcause option for point codes in the Destination table.	TIF Number Portability (893-0189-01)
rlcopc	on, off	Indicates if the per-OPC rcause option value should be used to override the TIFOPTS rcausenp or rcausepfx option values	TIF Number Portability (893-0189-01)
nptype	rnspdn, any, sp, rn, sprn, all	NP entity type. Specifies the entity type of the DN that is used to indicate that a successful RTDB lookup occurred.	TIF Number Portability (893-0189-01)
nptypecgpn	rnspdn, any, sp, rn, sprn, all	NP entity type of the CgPN. Specifies the entity type of the DN that is used to indicate that a successful RTDB lookup occurred.	TIF Number Portability (893-0189-01)
crprel	0-255	Provides the ISUP Release Cause for message that are determined to be Circular Routed	TIF Number Portability (893-0189-01)
rnrqd	yes, no	Indicates if the Redirection Number parameter shall be included in the Release message when Release handling is indicated	TIF Number Portability (893-0189-01)

Parameter	Range	Description	Used by TIF Feature
nsaddldata	yes, no	Indicates that the Calling Party's Category data value must match before Calling Party number substitution can occur.	TIF Number Substitution (893-0225-01)
nspublic	0-255	Non-zero value indicates that a Calling Party number is Public.	TIF Number Substitution (893-0225-01)
snscgpndflt	1-32 hexadecimal digits, none	Digits to used in Calling Number Simple Number Substitution	TIF Simple Number Substitution (893-0240-01)
matchseq	dn, nptype	Determines the RTDB lookup mechanism. TIF NP, TIF ASD, and TIF GRN support matchseq=nptype. TIF NS supports matchseq=dn. **Note:** Used only during upgrade, for backward compatibility.	TIF features requiring RTDB lookup: TIF Number Portability 893-0189-01 TIF Additional Subscriber Data 893-0245-01 TIF Generic Routing Number 893-0255-01 TIF Number Substitution 893-0225-01

EAGLE 5 ISS NPP Commands

The `ent/chg/dlt/rtrv-npp-as` commands are used to enter, change, delete, and display NPP Action Sets that contain various Service Actions, Conditioning Actions, and Formatting Actions.

The `ent/chg/dlt/rtrv-npp-srs` commands are used to create, change, delete, and display NPP Service Rule Sets for calling services.

The `chg/rtrv-npp-serv` commands are used to change and display the On/Off status for NPP Services, Delimiter values to use in formatting the outgoing digit string, and the FNAI Class mapping values for the outgoing NAI, and display the Service Action precedence values. An NPP Service is any EAGLE 5 ISS feature or function that uses NPP to process digit strings.

Refer to the *Numbering Plan Processor (NPP) Overview* manual for descriptions of the NPP components: Service Actions, Conditioning Actions, Formatting Actions, Action Sets, Rules, and Service Rule Sets. See the TIF and TIF feature descriptions in this manual for the NPP components used by TIF and each feature.

TIF Test Tool Commands

The TIF Test Tool is used to send a test message to a specified TIF service to verify the call flow behavior when the message information is injected into the call path without affecting live traffic. Refer to *TIF Test Tool* on page 86 for a description of the TIF Test Tool.

`chg/rtrv-isup-msg` commands are used with the TIF Test Tool to enter, change, and display ISUP test messages in the TSTMSG table.

The `tst-msg` command invokes the test for the specified ISUP test message from the TSTMSG table, and displays the results.

Refer to the *Commands Manual* for a complete description of the TIF Test Tool commands.

Maintenance Commands

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

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

Table 18: 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 subsystem operating status, CPU usage, and Service Module card status. When the loc parameter is specified, the command displays detailed card traffic statistics.
rept-stat-mps	Displays the overall status of the 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 DSM/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 databases. It reports database exception status such as corrupted, incoherent, or inconsistent, as well as providing the birth dates and levels. It shows the status of the PDB and RTDB databases when an EPAP-based feature is enabled.

Command	Description
rept-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	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 alarms on the Service Module card ports. The commands allow both Port A and Port B to be specified.
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. 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.

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.

The `ent-trace` command can be used to trace MSUs sent to Service Module cards that are running the VSCCP application. The EAGLE 5 ISS traps MSUs that meet the specified tracing criteria, which include DN, some point codes, Entity ID, and message verification and message processing errors.

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

For TIF, the `ent-trace` command can trace any MSU that is screened with the TIF, TIF2, or TIF3 Gateway Screening Stop Action. The trace output can be in standard format and in a brief format similar to the TIF Test Tool information (see *TIF Test Tool* on page 86). For full-format test output, the TIF Test Tool should be used.

Chapter

5

TIF Feature Configuration

Topics:

This chapter provides procedures for configuring the TIF features for use in the EAGLE 5 ISS.

Introduction

This chapter describes the EAGLE 5 ISS configuration of the TIF features.

The EAGLE 5 ISS configuration of each TIF feature consists of the following tasks:

- Verify that the GTT feature is on and that the EAGLE 5 ISS contains DSM cards or E5-SM4G cards, or both, running the VSCCP application. See *Adding a Service Module Card* on page 72.
- Verify that the Gateway Screening feature is on and that the EAGLE 5 ISS contains up to 8 TSM cards running the GLS application. See *Provisioning Gateway Screening for TIF* on page 75.
- Enable each TIF feature. See *Enabling TIF Features* on page 75.
- Provision Gateway Screening stop actions for TIF. See *Provisioning Gateway Screening for TIF* on page 75.
- Provision TIF options. See *Provisioning the TIF Options* on page 78.
- Provision NPP Action Sets, Service Rule Sets, and Services. See *Provisioning NPP for TIF* on page 80 .
- Turn on each TIF Feature. See *Turning On TIF Features* on page 81.
- Turn on Gateway Screening in linksets. See *Turning On Gateway Screening for Linksets* on page 82.

Provisioning Service Module Cards

EPAP-based features that perform RTDB lookup require "Service Module cards" running the VSCCP application.

Any of the following cards can be used as Service Module cards running the VSCCP application in the system:

- DSM 4G – a DSM card with 4 gigabytes of memory
- E5-SM4G - an EPM-based card with 4 gigabytes of memory

This section contains a procedure for adding Service Module cards to the system.

Adding a Service Module Card

This procedure uses the `ent-card` command to add Service Module cards to the database, to support the Global Title Translation (GTT) feature, the Enhanced Global Title Translation (EGTT) feature, and EPAP-based features that require RTDB lookup.

CAUTION: Refer to the *Dimensioning Guide for EPAP Advanced DB Features Technical Reference* for important information on the dimensioning rules and the DSM database capacity requirements.

A Service Module card can be inserted only in an odd/even numbered pair of empty card slots of an EAGLE 5 ISS shelf. Slots 09 and 10 of each shelf contain an HMUX card or a HIPR card. A Service Module cannot be inserted in slots 09 and 10. Service Module cards can be inserted in the control shelf, but only in slots 01, 03, 05, 07, and 11. A Service Module card occupies two card slots, so the even-numbered card slot to the right of the odd-numbered slot where the Service

Module card has been inserted must be empty. The Service Module card is connected to the network through the odd-numbered card slot connector.

Table 19: Service Module Card Locations

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

The shelf to which the card is to be added must already be provisioned in the database. This can be verified with the `rtrv-shlf` command. If the shelf is not in the database, refer to the procedure for adding a shelf in the *Database Administration Manual – System Management*.

The card cannot be added to the database if the specified card location already has a card assigned to it.

The system can contain a maximum of 25 Service Module cards for EPAP-based features.

Note: This manual contains brief descriptions of the commands that are used in these procedures to configure EPAP-based features. Refer to the *Commands Manual* for complete descriptions of the commands that are used in this procedure. The complete descriptions include all valid parameter values and output examples.

1. Verify that the GTT feature is on. Enter the `rtrv-feat` command.

   If the GTT feature is on, the GTT = on field appears in the command output.

   Note: The `rtrv-feat` command output contains other fields that are not used by this procedure. To see all the fields displayed by the `rtrv-feat` command, refer to the `rtrv-feat` command description in the *Commands Manual*.

   - If the GTT feature is on, shown by the entry GTT = on in the `rtrv-feat` command output, continue with
   - If the GTT feature is off, shown by the entry GTT = off in the `rtrv-feat` command output, use the procedures in the *Database Administration Manual - GTT* to turn on the GTT feature. Then continue with

2. 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 or are not HMUX or HIPR card locations) could 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

;
```

3. If an E5-SM4G card is being added, verify that card locations 09 and 10 contain HIPR cards in the shelf where the E5-SM4G card will be installed.

   Enter the `rept-stat-gpl:gpl=hipr` command to list the installed HIPR cards in the system.

   - If the shelf contains HIPR cards, continue with *Step 4* on page 74.
   - If the shelf does not contain HIPR cards, refer to the *Installation Manual - EAGLE 5 ISS* to install HIPR cards in the shelf. Continue with *Step 4* on page 74.

   Note: Cards should be distributed throughout the system for proper power distribution. Refer to the *Installation Manual - EAGLE 5 ISS* for the shelf power distribution.

4. Verify that the Service Module card has been physically installed into the proper location.

   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 *Maintenance Unsolicited Alarm and Information Messages* manual before proceeding with this procedure.

5. Add the Service Module card to the database, using the `ent-card` command.
   `ent-card:loc=1301:type=dsm:appl=vsccp`

6. Verify the temperature threshold settings for an E5-SM4G card by performing the "Changing the High-Capacity Card Temperature Alarm Thresholds" procedure in the *Database Administration Manual - SS7*.

7. Verify the changes by entering the `rtrv-card` command with the card location specified.
   `rtrv-card:loc=1102`

```
    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
;
```

8. 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.
```

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

10.

Provisioning Gateway Screening for TIF

Refer to the *Database Administration Manual - Gateway Screening* for descriptions and procedures to provision GLS cards, stop actions, linkset options, and the Gateway Screening feature.

The Gateway Screening feature must be turned on before any TIF features can be enabled in the system. The following functions and components of the Gateway Screening feature are used by TIF:

- GLS cards

  Up to 8 TSM cards running the GLS application must be installed and provisioned for the Gateway Screening feature.

- Stop Actions TIF, TIF2, and TIF3

  The provisioned Gateway Screening Stop Action for TIF must have the same name as the TIF service that calls NPP for processing. The Stop Action must be the last Stop Action in the Stop Action Set. See *TIF Services That Call NPP* on page 13 and *Protocol Handling* on page 15 for more information.

- Gateway Screening linkset options

  The options determine whether Gateway Screening is on or off for the linkset, and how MSUs are handled when Gateway Screening is on for the linkset. The options need to be turned on for the TIF features after all other TIF configuration is complete.

Enabling TIF Features

This procedure is used to enable TIF features in the EAGLE 5 ISS.

Each TIF feature must be enabled using its feature part number and a feature access key.

- TIF Number Portability - Part Number 893018901
- TIF SCS Forwarding - Part Number 893022201
- TIF Number Substitution - Part Number 893022501
- TIF Simple Number Substitution - Part Number 893024001
- TIF Additional Subscriber Data - Part Number 893024501
- TIF Generic Routing Number - Part Number 893025501

Note: Each feature 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 the feature and received the feature access key, contact your Tekelec Sales Representative or Account Representative.

When a TIF feature is enabled, it is permanently enabled. The TIF features cannot be temporarily enabled.

CAUTION: The TIF Number Portability feature, the TIF Number Substitution feature, the TIF Additional Subscriber Data feature, and the TIF Generic Routing Number feature cannot be enabled if the LNP feature is on. Enter the `rtrv-ctrl-feat` command to verify whether or not the LNP feature is on. If the LNP feature is on,

CAUTION

shown with a quantity greater than zero for the LNP ported TNs field in the command output, this procedure cannot be performed for the features.

Before a TIF feature can be enabled, the following conditions must exist in the system:

- For TIF features that require RTDB lookup, Service Module cards running the VSCCP application must be configured in the system. If there are no Service Module cards present in the EAGLE 5 ISS, the cards must be added before the TIF feature can be enabled and turned on. See *Adding a Service Module Card* on page 72.

  CAUTION: Refer to the *Dimensioning Guide for EPAP Advanced DB Features Technical Reference* for important information on the dimensioning rules and the Service Module card database capacity requirements.

- The database must contain a valid and locked serial number for the EAGLE 5 ISS. The system is shipped with a serial number in the database, but the serial number is not locked. The serial number can be changed, if necessary, and locked after the system is on-site.
- The GTT feature must be turned on.
- The Gateway Screening feature must be turned on.

Provisioning of TIF options and other information can be done after the feature is enabled and before the feature is turned on.

After a TIF feature has been enabled and database provisioning is complete, the TIF feature status must be set to on (the feature must be "turned on") See *Turning On TIF Features* on page 81.

1. Verify that the GTT feature and the Gateway Screening (GWS) feature are on. Enter the `rtrv-feat` command. If the GTT feature is on, the GTT = on field appears in the command output. If the Gateway Screening feature is on, the GWS = on field appears in the command output.

   Note: The `rtrv-feat` command output contains other fields that are not used by this procedure. To see all the fields displayed by the `rtrv-feat` command, refer to the `rtrv-feat` command description in the *Commands Manual*.

   Note: After the GTT feature or GWS feature has been turned on with the `chg-feat` command, it cannot be turned off.

   - If the GTT and GWS features are on, shown by the entries GTT = on and GWS = on in the `rtrv-feat` command output in step 1, continue with *Step 2* on page 76.
   - If the GTT feature is off, shown by the entry GTT = off in the `rtrv-feat` command output in step 1, use the procedures in the *Database Administration Manual - Global Title Translation* to turn on the GTT feature.
   - If the Gateway Screening feature is off, shown by the entry GWS = on in the `rtrv-feat` command output in step 1, use the procedures in the *Database Administration Manual - Gateway Screening* to turn on the Gateway Screening feature.

2. 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 09-08-29 16:40:40 EST  EAGLE5 41.0.0
   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            ----
;
```

If the `rtrv-ctrl-feat` output shows a LNP ported TNs quantity entry, this procedure cannot be performed for the TIF Number Portability feature, the TIF Number Substitution feature, the TIF ASD feature, and the TIF GRN feature.

If the entry for the TIF feature that you want to enable appears in the `rtrv-ctrl-feat` output with status on, performing this procedure is not necessary.

3. Verify that the system serial number is correct and locked. Enter the `rtrv-serial-num` command to display the system serial number and the lock status.

   - If the serial number is correct and locked, continue with
   - If the serial number shown in the output is not correct, enter the correct serial number into the database, using the `ent-serial-num` command without the lock parameter. Enter the `rtrv-serial-num` command again to verify that the correct serial number is entered.

     ```
     ent-serial-num:serial=<system serial number>
     ```

     ```
     rtrv-serial-num
     ```

   - If the serial number is correct but is not locked, lock the serial number. Enter the `ent-serial-num` command, specifying the serial number shown in the `rtrv-serial-num` command output and the lock=yes parameter.

     ```
     ent-serial-num:serial=<system serial number>:lock=yes
     ```

4. Enable the TIF feature, by entering the `enable-ctrl-feat` command and specify the part number and feature access key for the feature.
   ```
   enable-ctrl-feat:partnum=<893xxxxx>:fak=<feature access key>
   ```

   Note: The feature access key is provided by Tekelec when the feature is purchased. If you do not have the controlled feature part number or the feature access key for a TIF feature, contact your Tekelec Sales Representative or Account Representative.

   When the 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 08-08-29 16:40:40 EST  EAGLE5 41.0.0
      The following features have been permanently enabled:
      Feature Name              Partnum    Status  Quantity
      HC-MIM SLK Capacity       893012707  on            64
      TIF Number Portability    893018901  off         ----
      TIF SCS Forwarding        893022201  off         ----
      TIF Number Substitution   893022501  off         ----
      TIF Simple Number Subst.  893024001  off         ----
      TIF ASD                   893024501  off         ----
      TIF GRN                   893025501  off         ----
      E5-SM4G Throughput Cap    893019101  on          ----
   ;
   ```

5. 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.
   ```

Provisioning the TIF Options

This procedure is used to provision the configuration options for TIF and TIF features. At least one TIF feature must be enabled before TIF options can be provisioned.

1. Verify that each TIF feature is enabled for which options are being provisioned, by entering the `rtrv-ctrl-feat` command.

   If a TIF feature is enabled but has not been turned on, the feature status in the entry is off.

   ```
   rlghncxa03w 09-03-29 16:40:40 EST  EAGLE5 41.0.0
   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          ----
   TIF Number Portability   893018901  off         ----
   TIF Number Substitution  893022501  off         ----
   TIF SCS Forwarding       893022201  off         ----
   TIF Simple Number Subst. 893022101  off         ----
   TIF ASD                  893024501  off         ----
   TIF GRN                  893025501  off         ----
   ;
   ```

   - If a TIF feature is not enabled (the entry does not appear in the output), go to *Enabling TIF Features* on page 75 to enable a TIF feature. Then continue with *Step 2* on page 78.
   - If a TIF feature is enabled, continue with *Step 2* on page 78.

2. Display the current settings of the TIF options, using the `rtrv-tifopts` command.

   ```
   tekelecstp 09-03-04 07:53:46 EST  EAGLE 41.0.0

   TIF OPTIONS
   --------------------
   IAMCGPN      = dn
   NPFLAG       = none
   RCAUSENP     = 0
   RCAUSEPFX    = 0
   NPTYPE       = sprn
   NPTYPECGPN   = sprn
   ACLEN        = 0
   SPLITIAM     = none
   CONDCGPN     = none
   CRPREL       = 31
   RNRQD        = yes
   DFLTRN       = none
   DLMA         = none
   DLMB         = none
   DLMC         = none
   SNSCGPNDFLT  = ANY
   MATCHSEQ     = dn
   RLCOPC       = off
   NSADDLDATA   = yes
   NSPUBLIC     = 5
   ;
   ```

3. Change the TIF options to the desired settings, by entering the `chg-tifopts` command with at least one of the option parameters specified.

Refer to *EAGLE 5 ISS TIF Options Commands* on page 63 in this manual and to the `chg-tifopts` command description in the *Commands Manual* for valid parameter values, input examples, and rules for entering the command correctly.

4. Verify the changes, by entering the `rtrv-tifopts` command.

```
tekelecstp 09-03-04 07:53:46 EST  41.0.0

TIF OPTIONS
--------------------
IAMCGPN      = dn
NPFLAG       = nm
RCAUSENP     = 0
RCAUSEPFX    = 0
NPTYPE       = sprn
NPTYPECGPN   = sprn
ACLEN        = 3
SPLITIAM     = none
CONDCGPN     = none
CRPREL       = 15
RNRQD        = yes
DFLTRN       = none
DLMA         = none
DLMB         = none
DLMC         = none
SNSCGPNDFLT  = ANY
MATCHSEQ     = dn
RLCOPC       = on
NSADDLDATA   = yes
NSPUBLIC     = 5
;
```

5. 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.
```

Provisioning the Destination-based Options for TIF

This procedure is used to provision the point codes and destination-based configuration options for TIF and TIF features. At least one TIF feature must be enabled before destination-based options can be provisioned.

1. Verify that each TIF feature is enabled for which options are being provisioned, by entering the `rtrv-ctrl-feat` command.

If a TIF feature is enabled but has not been turned on, the feature status in the entry is off.

```
rlghncxa03w 09-03-29 16:40:40 EST  EAGLE5 41.0.0
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          ----
TIF Number Portability  893018901  off         ----
TIF Number Substitution 893022501  off         ----
```

```
    TIF SCS Forwarding         893022201   off            ----
    TIF Simple Number Subst.   893022101   off            ----
    TIF ASD                    893024501   off            ----
    TIF GRN                    893025501   off            ----
;
```

- If a TIF feature is not enabled (the entry does not appear in the output), go to *Enabling TIF Features* on page 75 to enable a TIF feature. Then continue with *Step 2* on page 80.
- If a TIF feature is enabled, continue with *Step 2* on page 80.

2. Display the currently provisioned point codes and destination-based options, using the `rtrv-dstn` command.

3. Enter new point codes and options using the `ent-dstn` command, or change the destination-based options to the desired settings using the `chg-dstn` command.

    Refer to the procedures in the *Database Administration Manual - SS7* for configuring point codes destination-based options in the Destination table.

    Refer to *EAGLE 5 ISS TIF Options Commands* on page 63 in this manual and to the `ent-dstn` and `chg-dstn` command descriptions in the *Commands Manual* for valid parameter values, input examples, and rules for entering the commands correctly.

4. Verify the changes, by entering the `rtrv-dstn` command.

5. 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.
```

Provisioning NPP for TIF

Refer to the *Numbering Plan Processor (NPP) Overview* manual and the *Commands Manual*, and see the TIF and TIF feature descriptions in this manual for the required information and procedures to provision NPP components for TIF services.

NPP provisioning is performed in the following sequence for the components that are used for the specified TIF service.

1. Provision the FNAI mnemonic values required for filter matches on the NAI values for the service, using the `chg-npp-serv` command.

2. Provision the NPP Action Sets with the Conditioning Actions, Service Actions, Formatting Actions, and outgoing NAI value that are to be used by TIF and the enabled TIF features, using the `ent-npp-as`.command.

3. Provision the Service Rule Sets (Rules that specify the filter values and Action Sets) that are to be used by TIF and the enabled TIF features. Enter the `ent-npp-srs` command.

4. Provision any delimiter values that are used in the outgoing digit string formatting. Enter the `chg-npp-serv` command.

5. Change the service Status to On to allow NPP processing for the specified service. Enter the `chg-npp-serv:srvn=<service name>:status=on` command.

Turning On TIF Features

Before a TIF feature can be turned on, the feature must be enabled in the EAGLE 5 ISS.

Provisioning of TIF options and other information can be done after the feature is enabled and before the feature is turned on.

After a TIF feature has been enabled and database provisioning is complete, the TIF feature status must be set to on (the feature must be "turned on"). MSUs will not be processed by the TIF feature until the feature is turned on.

This procedure is used to turn on TIF features in the EAGLE 5 ISS. Each TIF feature must be turned on using its feature part number.

- TIF Number Portability - Part Number 893018901
- TIF SCS Forwarding - Part Number 893022201
- TIF Number Substitution - Part Number 893022501
- TIF Simple Number Substitution - Part Number 893024001
- TIF Additional Subscriber Data - Part Number 893024501
- TIF Generic Routing Number - Part Number 893025501

After some TIF features are enabled and turned on, they cannot be turned off again. Other TIF features can be turned on and off after they are enabled.

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 09-03-29 16:40:40 EST  EAGLE5 41.0.0
    The following features have been permanently enabled:
    Feature Name              Partnum    Status  Quantity
    HC-MIM SLK Capacity       893012707  on            64
    TIF Number Portability    893018901  off        ----
    TIF SCS Forwarding        893022201  off        ----
    TIF Number Substitution   893022501  off        ----
    TIF Simple Number Subst.  893024001  off        ----
    TIF ASD                   893024501  off        ----
    TIF GRN                   893025501  off        ----
    E5-SM4G Throughput Cap    893019101  on         ----
;
```

If the entry for the TIF feature that you want to turn on appears in the `rtrv-ctrl-feat` output with status on, performing this procedure is not necessary.

2. Turn on the TIF feature, by entering the `chg-ctrl-feat` command.
`chg-ctrl-feat:partnum=<893xxxxxx>:status=on`

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

```
    rlghncxa03w 08-08-29 16:40:40 EST  EAGLE5 40.0.0
    The following features have been permanently enabled:
    Feature Name              Partnum    Status  Quantity
    HC-MIM SLK Capacity       893012707  on            64
    TIF Number Portability    893018901  on         ----
    TIF SCS Forwarding        893022201  on         ----
```

```
      TIF Number Substitution   893022501   on            ----
      TIF Simple Number Subst.  893024001   on            ----
      TIF ASD                   893024501   on            ----
      TIF GRN                   893025501   on            ----
      E5-SM4G Throughput Cap    893019101   on            ----
;
```

3. 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.
```

Turning On Gateway Screening for Linksets

The linkset gwsa, gwsm, and gwsd parameters must be set to on to turn on Gateway Screening
for each linkset that will be screened for TIF and the TIF features.

Refer to the procedures in *Database Administration Manual - Gateway Screening* for turning on
Gateway Screening for a linkset.

Turning Off TIF Features

Before a TIF feature can be turned on and off, the feature must be enabled in the EAGLE 5 ISS.

After some TIF features are enabled, they can be turned on and off in the EAGLE 5 ISS.

This procedure is used to turn off the TIF features that can be turned off in the EAGLE 5 ISS. Each
TIF feature must be turned off using its feature part number.

- TIF Additional Subscriber Data - Part Number 893024501
- TIF Generic Routing Number - Part Number 893025501
- TIF Number Substitution - Part Number 893022501

Note: MSUs will not be processed by a feature when the feature is turned off in the system.

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 09-03-29 16:40:40 EST  EAGLE5 41.0.0
    The following features have been permanently enabled:
    Feature Name             Partnum    Status  Quantity
    HC-MIM SLK Capacity      893012707  on            64
    TIF Number Portability   893018901  on          ----
    TIF SCS Forwarding       893022201  on          ----
    TIF Simple Number Subst. 893024001  on          ----
    TIF Number Substitution  893022501  on          ----
    TIF ASD                  893024501  on          ----
```

```
    TIF GRN                     893025501  on            ----
    E5-SM4G Throughput Cap      893019101  on            ----
;
```

If the entry for the TIF feature that you want to turn on appears in the `rtrv-ctrl-feat` output with status off, performing this procedure is not necessary.

If the status of the TIF feature in the output is on, continue with *Step 2* on page 83.

2. Turn off the TIF feature, by entering the `chg-ctrl-feat` command.
   `chg-ctrl-feat:partnum=<893xxxxxx>:status=off`

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

```
    rlghncxa03w 09-03-29 16:40:40 EST  EAGLE5 41.0.0
    The following features have been permanently enabled:
    Feature Name              Partnum    Status  Quantity
    HC-MIM SLK Capacity       893012707  on            64
    TIF Number Portability    893018901  on          ----
    TIF SCS Forwarding        893022201  on          ----
    TIF Number Substitution   893022501  off         ----
    TIF Simple Number Subst.  893024001  on          ----
    TIF ASD                   893024501  off         ----
    TIF GRN                   893025501  off         ----
    E5-SM4G Throughput Cap    893019101  on          ----
;
```

3. 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.
```

Activating the E5-SM4G Throughput Capacity Feature

The E5-SM4G Throughput Capacity feature provides up to 75,000 transactions per second when the maximum number of E5-SM4G cards are installed in the EAGLE 5 ISS and one or more EPAP-based features are enabled and turned on.

The E5-SM4G Throughput Capacity feature must be enabled using the E5-SM4G Throughput Capacity feature part number 893019101 and the 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 feature must be purchased before you can receive the feature access key to use to enable the E5-SM4G Throughput Capacity feature. If you are not sure if you have purchased the E5-SM4G Throughput Capacity feature and received the feature access key, contact your Tekelec Sales Representative or Account Representative.

After the 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.

Before the E5-SM4G Throughput Capacity feature can be enabled, the following conditions must exist in the system:

- The E5-SM4G Throughput Capacity feature requires 25 E5-SM4G cards running the VSCCP application to be configured in the system. This feature increases the processing capacity of SCCP traffic for an EAGLE 5 ISS processing EPAP-based traffic to 75,000 transactions per second. If there are no E5-SM4G cards present in the EAGLE 5 ISS, they must be added before the E5-SM4G Throughput Capacity feature can be enabled and turned on. See *Adding a Service Module Card* on page 72.

CAUTION: Refer to the *Dimensioning Guide for EPAP Advanced DB Features Technical Reference* for important information on the dimensioning rules and the DSM database capacity requirements.

- HIPR cards must be installed in card locations 09 and 10 in all shelves that contain E5-SM4G cards.
- The database must contain a valid and locked serial number for the EAGLE 5 ISS. The system is shipped with a serial number in the database, but the serial number is not locked. The serial number can be changed, if necessary, and locked after the system is on-site.
- The GTT feature must be turned on.

After the E5-SM4G Throughput Capacity feature has been enabled, the E5-SM4G Throughput Capacity feature status must be set to on (the feature must be "turned on").

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

```
    rlghncxa03w 08-08-29 16:40:40 EST  EAGLE5 39.2.0
    The following features have been permanently enabled:
    Feature Name             Partnum    Status  Quantity
    HC-MIM SLK Capacity      893012707  on            64
    ATINP                    893022101  on         ----
    E5-SM4G Throughput Cap   893019101  on         ----
;
```

- If the `rtrv-ctrl-feat` output shows that the E5-SM4G Throughput Capacity feature is enabled and its status is on, no further action is necessary.
- If the E5-SM4G Throughput Capacity feature is enabled, and its status is off, go to step *Step 8* on page 86.

2. Verify that the GTT feature is on. Enter the `rtrv-feat` command. If the GTT feature is on, the GTT = on field appears in the command output.

- If the GTT feature is on, shown by the entry GTT = on in the `rtrv-feat` command output, go to *Step 4* on page 85.
- If the GTT feature is off, shown by the entry GTT = off in the `rtrv-feat` command output, continue with *Step 3* on page 85.

Note: The GTT feature must be purchased before turning it on. If you are not sure whether you have purchased the GTT feature, contact your Tekelec Sales Representative or Account Representative.

After the Global Title Translation (GTT) feature has been turned on with the `chg-feat` command, it cannot be turned off.

3. Turn the GTT feature on, by entering the following command.

    `chg-feat:gtt=on`

    Refer to the *Database Administration Manual - Global Title Translation* for more information about turning on and using the GTT feature.

4. Verify the number of E5-SM4G cards that are provisioned in the database using the `rept-stat-gpl:gpl=sccphc` command.

    - If the required number of E5-SM4G cards (25) are provisioned in the database, continue with *Step 5* on page 85.
    - If the required number of E5-SM4G cards are not provisioned in the database, go to *Adding a Service Module Card* on page 72 to add the required number of E5-SM4G cards to the database. Then continue with *Step 5* on page 85.

5. Verify that HIPR cards are installed on all the EAGLE 5 ISS shelves that contain E5-SM4G cards. Enter the `rept-stat-gpl:gpl=hipr` command.

    ```
    tekelecstp 06-12-06 13:24:56 EST   EAGLE 37.0.0
    GPL Auditing   ON

    GPL          CARD      RUNNING             APPROVED        TRIAL
    HIPR         1109      126-002-000         126-002-000     126-003-000
    HIPR         1110      126-002-000         126-002-000     126-003-000
    HIPR         1209      126-002-000         126-002-000     126-003-000
    HIPR         1210      126-002-000         126-002-000     126-003-000
    HIPR         1309      126-002-000         126-002-000     126-003-000
    HIPR         1310      126-002-000         126-002-000     126-003-000
    Command Completed.
    ;
    ```

    - If HIPR cards are installed in the correct shelves, continue with *Step 6* on page 85.
    - If HIPR cards are not installed on all the correct shelves, refer to the procedures in the *Installation Manual - EAGLE 5 ISS* to install the HIPR cards. Once the HIPR cards have been installed, continue with *Step 6* on page 85.

6. Verify that the system serial number is correct and locked. Enter the `rtrv-serial-num` command to display the system serial number and the lock status.

    - If the serial number is correct and locked, continue with *Step 7* on page 85.
    - If the serial number shown in the output is not correct, enter the correct serial number into the database, using the `ent-serial-num` command without the lock parameter. Enter the `rtrv-serial-num` command again to verify that the correct serial number is entered.

        `ent-serial-num:serial=<system serial number>`

        `rtrv-serial-num`

    - If the serial number is correct but is not locked, lock the serial number. Enter the `ent-serial-num` command, specifying the serial number shown in the `rtrv-serial-num` command output and the lock=yes parameter.

        `ent-serial-num:serial=<system serial number>:lock=yes`

7. Enable the E5-SM4G Throughput Capacity feature by entering the `enable-ctrl-feat` command.

```
enable-ctrl-feat:partnum=893019101:fak=<E5-SM4G Throughput Capacity
feature access key>
```

The value for the feature access key is provided by Tekelec. If you do not have the feature access key for the E5-SM4G Throughput Capacity feature, contact your Tekelec Sales Representative or Account Representative.

Note: If you do not want to turn the E5-SM4G Throughput Capacity feature on at this time, go to .

8. Turn the E5-SM4G Throughput Capacity feature on with the `chg-ctrl-feat` command, specifying the E5-SM4G Throughput Capacity feature part number 893019101 and the status=on parameter.
```
chg-ctrl-feat:partnum=893019101:status=on
```

After this feature is turned on, it cannot be turned off.

9. Verify the changes by entering the `rtrv-ctrl-feat` command with the E5-SM4G Throughput Capacity feature part number 893019101.
```
rtrv-ctrl-feat:partnum=893019101
```

```
    rlghncxa03w 08-08-29 16:40:40 EST  EAGLE5 39.2.0
    The following features have been permanently enabled:
    Feature Name              Partnum    Status  Quantity
    E5-SM4G Throughput Cap    893019101  on          ----
;
```

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

These 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.
```

TIF Test Tool

The TIF Test Tool can be used to send provisioned ISUP messages to a TIF service to test the call flow for a TIF feature. The test message is used to modify the internal data structure of the service and to study the call flow behaviour when the message in injected into the call path. The test message is never sent out to the network.

The Test Tool provides the following capabilities:

- Define up to 10 ISUP test messages in the TSTMSG table.
- Invoke TIF and NPP to process the a test message.
- Generate a report of the actions taken and the results of the test.

The Test Tool can be invoked as follows:

- After initial provisioning of TIF and NPP, before Gateway Screening is turned on for the linksets, to verify the provisioning
- During TIF feature operation, to quickly debug an issue
- After turning off Gateway Screening for a linkset, to debug an issue or test provisioning changes

The following information can be configured for each test message:

Table 20: TIF Test Tool Parameters

Parameter		Range	Default
Called Party Digits	CDPNDGTS	0-32 hexadecimal digits	1234567890
Called Party NAI	CDPNNAI	0-127	0
Calling Party Digits	CGPNDGTS	0-32 hexadecimal digits	1234567890
Calling Party NAI	CGPNNAI	0-127	0
Calling Party Category	CGPNCAT	0-255	0
Active	ACTIVE	No, Yes	No
NM Bits	NMBITS	0-3	0

The `chg-isup-msg` command is used to configure the parameter values for each ISUP test message. The command must specify the message number (one of up to 10 messages) for the message that is being configured.

The `rtrv-isup-msg` command displays the configured messages in the ISUP Message table. Configured information for all messages or for one specified message number can be displayed.

The `tst-msg` command invokes the test. The command must specify the prot=isup parameter, the message number for the test, the TIF service (TIF, TIF2, or TIF3), and the mode for displaying the results (full, brief, debug). The most complete and accurate test result information is provided when debug mode is used.

Note: The specified message must be set to `active=yes` before the test is invoked for the message.

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

Chapter

6

Maintenance

Topics:

This chapter describes the maintenance information that is available from the EAGLE 5 ISS for the TIF features. The information includes status, alarms (UAMs), and information messages (UIMs).

Hardware Requirements

TIF features require Service Module cards (DSM cards or E5-SM4G cards) running the VSCCP application. The EAGLE 5 ISS can be equipped with from 1 to 25 Service Module cards to support TIF and EPAP-based features.

TIF features require up to 8 TSM cards running the GLS application for use by the Gateway Screening feature.

EPAP Status and Alarms

Because EPAP has no direct means of accepting user input or displaying output messages on EAGLE 5 ISS terminals, 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* on page 90 and *DSM Status Requests* on page 91. Each message type is discussed in the following sections.

EPAP 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 forwarded to the EPAP A Device Control Block (DCB), where it is 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 forwarded to the EPAP B DCB, where it is 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. The EPAP must ensure that no more than one maintenance block per second is sent to the primary Service Module card if the only reason is to report a change in congestion status.

- 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 utilized by the RTDB.

DSM Status Requests

When the EPAP needs to know the status of a Service Module card, it sends a DSM status request to that Service Module card. Because status messages are sent over UDP, the EPAP broadcasts the DSM status request (to all Service Module cards) and each Service Module card returns its status to the EPAP.

DSM Status Reporting to the EPAP

The sections that follow describe the DSM status reporting for the EPAP.

DSM Status Messages – When Sent

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 database, for example, if the Service Module card determines that the RTDB needs to be downloaded (for instance, if the database is totally corrupted), or if a craftsperson requests that the database be reloaded.
- The Service Module card starts receiving database downloads or database updates. When a Service Module card starts downloading the RTDB or accepting database 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.

DSM Status Messages Fields

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.

  Refer to the *Dimensioning Guide for EPAP Advanced DB Features Technical Reference* for important information on the dimensioning rules and the Service Module card database capacity requirements.

- **Load Mode Status**. This indicator indicates whether or not 80% of the IS-NR (In-Service Normal) LIMs have access to SCCP services.

Alarms

Refer to the *Unsolicited Alarms and Information Messages* manual for descriptions and corrective procedures for EAGLE 5 ISS related alarms (UAMs). Refer to the *MPS Platform Software and Maintenance Manual - EAGLE 5 ISS with T1000 AS* for descriptions and corrective procedures for MPS-related alarms.

TIF UIMs

Refer to the *Unsolicited Alarms and Information Messages* manual for descriptions of EAGLE 5 ISS UIMs.

UIM 1407 is issued when a message that is not ISUP is received by a TIF, TIF2, or TIF3 Stop Action.

UIM 1408 is issued when a TIF modified message is too large to route.

Table 21: TIF UIMs

UIM #	Message Text	UIM Format	Output Group
1407	`Unexpected SI in TIF Stop Action`	I6 (MTP Data Dump)	GWS
1408	`TIF: Modified MSU too large to route`	I15 (RPT_SCCP_INV_MSG)	APSS

The UIMs listed in *Table 22: Existing ISUP Decode Errors* on page 92 are used to handle ISUP decode and encode errors.

Table 22: Existing ISUP Decode Errors

Protocol Type	Error Description	UIM #	UIM Text
ISUP	IAM Decode Error (such as length or, missing parameter; the message is routed without modification)	1369	ISUP IAM decode failed
ISUP	IAM Called Party Decode Error, such as missing Called Party digits. The message is routed without modification.	1370	ISUP IAM Cld Pty decode failed
ISUP	Problem encoding IAM or SAM, Unknown DPC in REL	1371	ISUP encode failed

EPAP System Status Reports

This section describes the following EPAP status reporting:

- System status
- EPAP-based feature status
- DSM memory capacity status
- Loading mode support status

System Status Reporting

The `rept-stat-sys` command and the `rept-stat-sccp` command report the status of the Service Module cards running the VSCCP application. EPAP-based feature statistics are reported in the `rept-stat-sccp` command. Refer to the *Commands Manual* for descriptions of the commands and their output .

MPS Status Reporting

The `rept-stat-mps` command reports the status of the MPS system, particularly the provisioning system. Refer to the *Commands Manual* for examples of the `rept-stat-mps` command output.

DSM Memory Capacity Status Reporting

As mentioned in the *DSM Status Reporting to the EPAP* on page 91, the Service Module card sends a message to the EPAP containing the amount of memory on the Service Module board. The EPAP determines whether the DSM has enough memory to store the RTDB and sends an ACK or NACK back to the Service Module card indicating whether or not the Service Module card has an adequate amount of memory. Refer to the *Dimensioning Guide for EPAP Advanced DB Features Technical Reference* for important information on the dimensioning rules and the DSM database capacity requirements.

The `rept-stat-mps:loc=xxxx` command shows the amount of memory used by the RTDB as a percent of available Service Module card memory.

Loading Mode Support Status Reporting

The OAM application determines whether or not the system is in an unstable loading mode because it knows the state of all LIM and Service Module cards in the system. When the loading mode is unstable, the `rept-stat-sys` command reports the existence of the unstable loading mode and the specific conditions that caused it. See *EPAP Application Data Loading* on page 93 for more details.

Code and Application Data Loading

In general, administrative updates can occur while a Service Module card is loading. The Service Module card should also remain in an in-transition state if the STP portion of the database has completed loading and is waiting for the RTDB to download.

DSM Code Loading

The EAGLE 5 ISS OAM performs code loading of the Service Module card.

EPAP Application Data Loading

In order to support both RTDB and EAGLE 5 ISS data loading, the VSCCP GPL verifies its hardware configuration during initialization to determine if it has the capacity to support the RTDB.

The VSCCP GPL Application Data Loader (ADL) registers all tables for loading, independent of EPAP-based feature provisioning and main board and applique hardware configuration. As a result, load requests are always identical. During loading, multiple Service Module card load

requests are combined into a single download, reducing the overall download time. The Service Module card card stores or discards RTDB table data based on whether or not it has RTDB-capable hardware for EPAP-based features.

The OAM, on the other hand, downloads or sets memory boundaries for feature configuration options and service selector tables only if an EPAP-based feature is provisioned. When an EPAP-based feature is not provisioned, the OAM does not attempt to read these tables from disk. Instead, empty tables (tables without entries) are downloaded. All other tables requested for loading are read from disk and downloaded routinely.

80% Threshold of Support

Loading mode is based on the ability of the system to provide SCCP service to at least 80% of the LIMs.

VSCCP Capacity

An insufficient number of Service Module cards that are in an IS-NR or OOS-MT-DSBLD state relative to 80% of the number of provisioned LIMs is called a "failure to provide adequate SCCP capacity."

Insufficient SCCP Service

It is also possible for LIM cards or Service Module cards to be inhibited or to have problems that prevent them from operating normally. If enough Service Module cards are out of service, it may not be possible for the remaining IS-NR Service Module cards to service at least 80% of the number of IS-NR LIM cards. This is called "insufficient SCCP service." When this occurs, some of the LIM cards are denied SCCP service. It is possible to inhibit LIMs to bring the ratio back to 16:1 or better.

Conditions That Create an Unstable Loading Mode
Current system implementation interrupts and stops card loading upon execution of an STP database `chg` command. Loading mode support denies the execution of EAGLE 5 ISS database `chg` commands when the system is in an unstable loading mode. An unstable loading mode exists when any of the following conditions are true:

- The system's maintenance baseline has not been established.

- Less than 80% of the number of LIMs provisioned are in an IS-NR or OOS-MT-DSBLD state.

- The number of IS-NR and OOS-MT-DSBLD Service Module cards is insufficient to service at least 80% of all provisioned LIMs.

- Insufficient SCCP service occurs when an insufficient number of IS-NR Service Module cards are available to service at least 80% of the number of IS-NR LIMs.

- LIM cards are being denied SCCP service and any Service Module cards are in an abnormal state (OOS-MT-DSBLD, IS-ANR).

Actions Taken When the System is in an Unstable Loading Mode

- No effect on RTDB downloads or updates.

  Unstable loading mode has no impact on RTDB downloads or the stream of RTDB updates.

- The `rept-stat-sys` command reports unstable loading mode.

When the loading mode is unstable, the `rept-stat-sys` command reports the existence of the unstable loading mode and the specific trigger that caused it.

- No EAGLE 5 ISS database updates allowed.

When in an unstable loading mode, the EAGLE 5 ISS does not accept database updates. When updates are rejected, the reason is given as: E3112 Cmd Rej: Loading Mode unstable due to SCCP service is deficient.

The `inh-card` and `alw-card` commands can be used to alter SCCP service levels to achieve the 80% threshold. This can be repeated for each card until the system is able to supply SCCP services to at least 80% of the IS-NR LIM cards. The remaining 20% LIM or supporting Service Module cards may remain out of service until the stream of database updates ceases. This stream of updates can be temporarily interrupted to allow the remaining 20% of the system to come in service.

The force option must be used to execute commands that would put the system in unstable loading mode. If executing the `ent-card` command or `inh-card` command would cause the system to enter an unstable loading mode, use the force option in the command.

Once an EAGLE 5 ISS database has been loaded, that database can be updated (as long as the system is not in an unstable loading mode). However, if an database update comes in during EAGLE 5 ISS database loading, the Service Module card stops the current loading, issues a class 01D7 obit, and reboots. The obit is shown in the following example.

Figure 23: Obit Message for Abort of Card Loading

```
tekelecstp 97-04-08 12:29:04 EAGLE 35.0.0
------------------------------------------------------------------------
     Card 1317   Module RADB_MGR.C  Line  337  Class 01d7
        Card 1317    Module RADB_MGR.C  Line  337  Class 01d7
        Register Dump :
            EFL=00000246    CS =0058         EIP=0000808d    SS =0060
            EAX=000a6ff3    ECX=000a0005     EDX=00000000    EBX=000a6fa0
            ESP=00108828    EBP=0010882c     ESI=001f1e10    EDI=00000000
            DS =0060        ES =0060         FS =0060        GS =0060


        Stack Dump :
        [SP+1E]=001f     [SP+16]=0000     [SP+0E]=000a     [SP+06]=0010
        [SP+1C]=1e10     [SP+14]=0004     [SP+0C]=6fa0     [SP+04]=8850
        [SP+1A]=0010     [SP+12]=001f     [SP+0A]=0004     [SP+02]=0001
        [SP+18]=886c     [SP+10]=4928     [SP+08]=7ec3     [SP+00]=504b


        User Data Dump :

        14 02 fa ed 01 01 1d 01 5a 01 00                        ........Z..

     Report Date:97-04-08  Time:12:29:04
```

Glossary

A

AC

    Alternating Current

    Application Context

    Authentication Center

ADL

    Application Data Loader

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.

ASD

    Additional Subscriber Data

    Additional data that is associated with a subscriber (DN) or a range of subscribers.

C

CC

    Country Code

CgPN

    Calling party number

CIC

    Carrier Identification Code

    A 4-digit code that controls the routing applied to a message.

C

CRP

Circular Route Prevention

A G-Port MNP feature that detects instances of circular routing caused by incorrect information in one or more of the network number portability databases. If a circular route has been detected, a message will be generated by the EAGLE 5 ISS and returned to the originator.

D

DCB

Device Control Block

DEFCC

Default Country Code

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.

DTA

Database Transport Access

A feature in the EAGLE 5 ISS that encapsulates specific MSUs into the data portion of SCCP within a new SS7 MSU and sends the new MSU to the destination using global title translation. The EAGLE 5 ISS uses gateway screening to determine which MSUs are used by the DTA feature.

E

E

ELAP   EAGLE Local Number Portability
                                         Application Processor

EPAP   EAGLE Provisioning Application
                                         Processor

G

GRN   Generic Routing Number

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.

GWS   Gateway Screening

                                         Used at gateway STPs to limit
                                         access into the network to
                                         authorized users. A gateway STP
                                         performs inter-network routing
                                         and gateway screening functions.
                                         GWS controls access to nonhome
                                         SS7 networks. Only an MSU that
                                         matches predefined criteria in the
                                         EAGLE 5 ISS's database is allowed
                                         to enter the EAGLE 5 ISS.

I

IAM   Initial Address Message

ISUP   ISDN User Part

<div align="center">

I

</div>

ITU   International Telecommunications
                                         Union

<div align="center">

L

</div>

LIM   Link Interface Module

                                         Provides access to remote SS7, IP
                                         and other network elements, such
                                         as a Signaling Control Point (SCP)
                                         through a variety of signaling
                                         interfaces (DS0, MPL, E1/T1 MIM,
                                         LIM-ATM, E1-ATM, IPLIMx,
                                         IPGWx). The LIMs consist of a
                                         main assembly and possibly, an
                                         interface appliqué board. These
                                         appliqués provide level one and
                                         some level two functionality on SS7
                                         signaling links.

<div align="center">

M

</div>

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.

MSU   Message Signaling 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.

M

- The length indicator which indicates the number of bytes the message contains.

- The type of message and the priority of the message in the 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.

N

NAI

Nature of Address Indicator

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

NM

Network Management

The execution of the set of functions required for controlling, planning, allocating, deploying, coordinating and monitoring the resources of a telecommunications network, including performing functions such as initial network planning, frequency allocation, predetermined traffic routing to support load balancing, cryptographic key distribution authorization, configuration management, fault management, security management, performance management, and

N

accounting management. Note:
Network management does not
include user-terminal equipment.

NP   Number Plan

NPP   Numbering Plan Processor

Provides the flexible service
application behavior that satisfies
the needs of customers resident
in complex signaling networks.
It is used for number
conditioning, RTDB lookup, and
outgoing number formatting.

O

OPC   Originating Point Code

P

PDB   Provisioning Database

R

REL   Release

RN   Routing Number

RTDB   Real Time Database

Rule   An association between a Filter
                                      and an Action Set.

S

SAM   Subsequent Address Message

SCCP   Signaling Connection Control Part

SCRC   SCCP Routing Control

S

Service Action Handler   Service-specific function
                                              associated with a Service Action.

SI   Service Indicator

SLS   Signaling Link Selector

SP   Service Provider

                                              Signaling Point

U

UAM   Unsolicited Alarm Message.

UIM   Unsolicited Information Message

Index

A

C

D

E

F