



RIM Message Transfer from BSC or RNC to eNodeB

This chapter describes how the SGSN transfers RIM messages to/from an MME (eNodeB) via GTPv1 protocol. It also provides details about RIM messages transferred to/from an MME (eNodeB).

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Feature Description

RIM message transfer is one of the standards-based RAN Information Management procedures supported by the SGSN.

RAN Information Management (RIM)

RIM procedures provide a generic mechanism for the exchange of arbitrary information between RAN nodes. The RAN information is transferred via the SGSN core network node(s). In order to make the RAN information transparent for the core network, the RAN information is included in a RIM container that shall not be interpreted by the core network nodes.

The RAN information is transferred in RIM containers from the source RAN node to the destination RAN node by use of messages. The SGSN independently routes and relays each message carrying the RIM container.

In pre-15.0 releases, the SGSN supported RIM messages from BSS/RNC to another BSS/RNC belonging to a different or the same SGSN over GTPv1 protocol. Now, the SGSN also supports transfer of RIM messages to/from an MME (eNodeB) via GTPv1 protocol.

The SGSN uses existing CLI to enable the RIM transfer functionality. Whether or not the RIM message goes from/to BSC/RNC to/from BSC/RNC or to/from eNodeB is determined by the addressing. To transfer RIM messages to the MME (eNodeB),

- requires RIM functionality be enabled for the SGSN.
- requires the DNS server be configured to respond to a TAI-based DNS query

OR

- requires the MME (eNodeB) address be added to the SGSNs Call Control Profile

Relationships to Other Feature or Products

For this feature to work properly, the peer-MME for the eNodeB must also support RIM message handling.

How It Works

RIM Addressing

All the messages used for the exchange of RAN information contain the addresses of the source and destination RAN nodes. An eNodeB is addressed by tracking area identity (TAI) + eNodeB Identity (enbId).

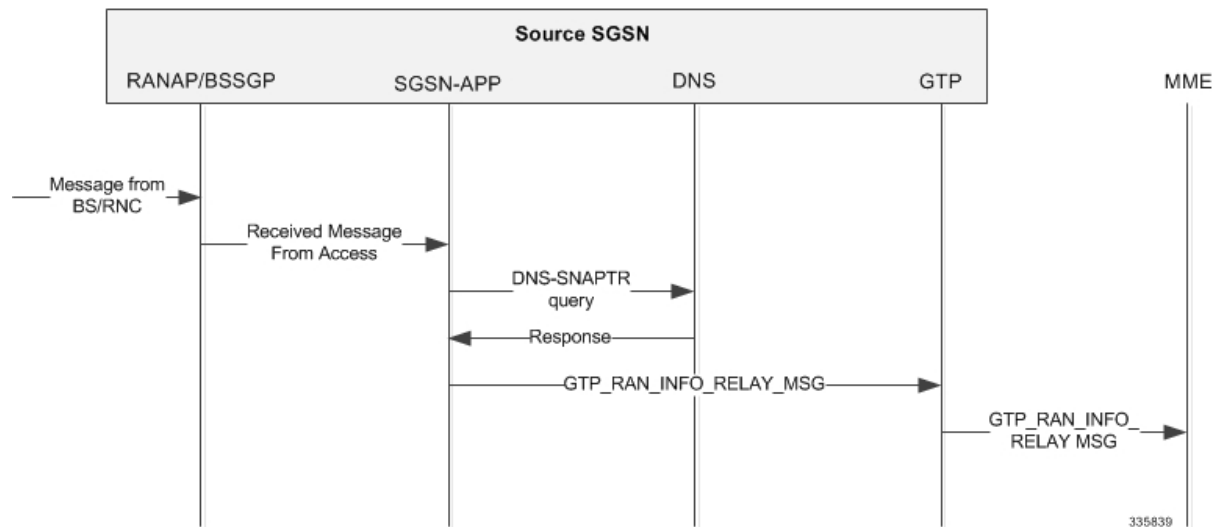
The source RAN node sends a message to its SGSN including the source and destination addresses. From the destination address, the SGSN shall decide whether or not it is connected to the destination RAN node. If the destination address is that of an eNodeB, then the SGSN uses the destination address to route the message, encapsulated in a GTPv1 message, to the correct MME via the Gn interface.

The MME connected to the destination RAN node decides which RAN node to send the message based on the destination address or the RIM routing address.

Call Flows - Transmitter of GTP RIM Msg

The following call flow illustrates how the SGSN behaves as the transmitter of GTP RIM messages.

Figure 1: Transmitting RIM Message



In the above illustration, the RIM message is transferred to the peer SGSN as follows:

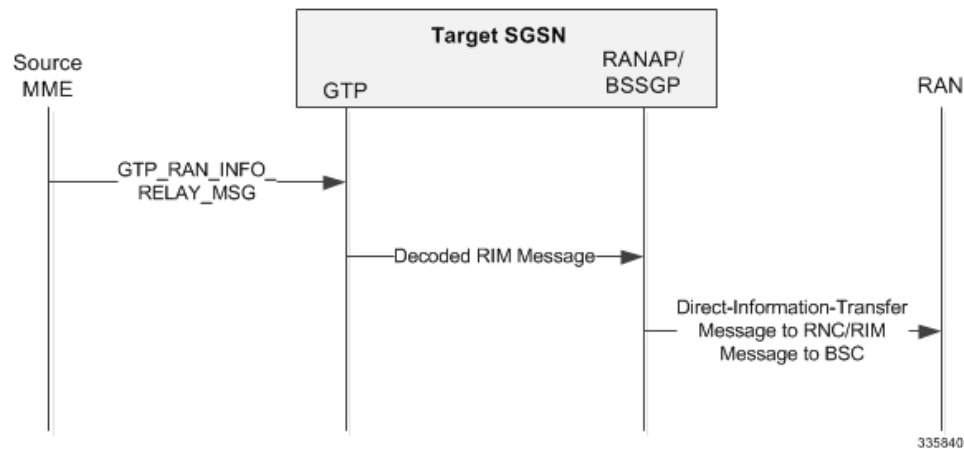
1. Upon receiving a RIM message from the network access BSS/RNC, the SGSN determines the RIM routing address type. If the message indicates that the target is an eNodeB, then SGSN searches for a locally configured MME address.

2. If a locally configured MME address is not available, then a DNS-SNAPTR query will be initiated to determine the MME address.
3. On receiving the DNS response and upon getting a valid MME address, an appropriate GTP API would be invoked.
4. On invocation of this API the GTP module will encode the RAN info relay message (as per TS 29.060) and dispatch the PDU to the peer MME.

Call Flows - Receiver of GTP RIM Msg

The following call flow illustrates how the SGSN behaves as the receiver of GTP RIM messages.

Figure 2: Receiving a GTP RIM Message



In this case, the SGSN has to decode the incoming GTP message correctly and forward the RIM message to the destination RNC/BSS.

1. SGSN would decode the received GTP RAN info relay message and construct a RANAP or BSSGP RIM message.
2. Appropriate actions would be taken to forward the RIM message to the destination RNC/BSS.

RIM Application

The RIM application processes the decoded RIM PDU from the access application. The routing area identifier (RAI) -- comprised of the mcc, mnc, rac -- is extracted from the destination address and is used to decide if the target routing area (RA) is local. If the RAI is locally available, the PDU is forwarded to either the RANAP or BSSGP stack based on the RIM routing address discriminator field.

The SGSN has a global list of local RAs. Each RA in turn has a list of RNCs and NSEIs that control it. If the destination RA is local, the list of NSEIs which serve the RAI is fetched. Each NSEI is searched for a matching cell id in the cellid-list. The PDU is then forwarded to the NSEI when signaling the BVCI.

If the RNC Id is in the destination cell identifier, then the IuPS service serving the local RAI is identified. The PDU is encoded in a RIM container and forwarded to the corresponding RANAP stack instance of that IuPS service.

If the eNodeB Id is in the destination cell identifier, then the PDU will be sent to the GTP app using the appropriate event.

The peer-MME address is resolved using the SGSN's local configuration or a DNS query for the TAI present in the destination address. For a successful DNS response, the PDU is encoded in a GTP RIM container and forwarded to the peer-MME. The SGTP service used will be the default SGTP service associated with the GPRS service or the SGSN service under which the source BSS/RNC was present. The RIM app drops a PDU if the DNS response fails. There will no retransmission or state-maintenance for the RIM PDU at the GTP-app.

Standards Compliance

The SGSN's RIM message transfer from/to eNodeB functionality complies with the following standards:

- 3GPP TS 29.060 version 11
- 3GPP TS 23.003 version 11
- 3GPP TS 25.413 version 11
- 3GPP TS 48.018 version 11
- 3GPP TS 24.008 version 11

Configuring RIM Msg Transfer to or from eNodeB

To enable successful RIM message transfer to/from an eNodeB, the following must be included in the SGSN's configuration:

- Configuring RIM functionality to work on SGSN
- Associating previously configured SGTP and IuPS services
- Configuring the peer-MME's address, in *one or both* of two ways
 - Configuring the peer-MME address locally
 - Configuring the DNS server

Configuring RIM Functionality

The following command sequences are used to enable RAN information management (RIM) functionality on the SGSN. The order in which these two configurations are performed is not significant.

The first command sequence enables RIM for the entire SGSN (global level).

```
configure
sgsn-global
  ran-information-management
end
```

The second command sequence associates the RNC configuration, the part of the IuPS service configuration governing the SGSN communication with any RNC, needs to have the RIM functionality enabled.

```
configure
context context_name
  iups-service service_name
    rnc id rnc_id
    ran-information-management
  end
```

Associating Previously Configured SGTP and IuPS Services

The SGTP service configuration is a mandatory part of the SGSN's setup (refer to Configuring an SGTP Service in the SGSN Administration Guide), so an SGTP service configuration must already exist. The SGTP service is needed to send and/or receive GTPv1 protocol messages.

It is also a good idea to associate the IuPS service for the SGSN service to use for communication with the RAN.

The following illustrates the minimum configuration required to associate the SGTP and IuPS services for the RIM message transfers:

```
configure
context context_name
sgsn-service service_name
  associate sgtp-service service_name context context_name
  ran-protocol iups-service service_name
end
```

Configuring the peer-MME's address - Locally

Use the Call Control Profile to define the peer-MME address.

Use the tac keyword to configure the tracking area code (TAC) of the target eNodeB that maps to the peer-MME address. For RIM message transfer, you also need to configure the Gn interface. The following is an example of the configuration to use:

```
configure
call-control-profile profile_name
  peer-mme tac tac_value prefer local address ip_address interface gn
end
```

Where:

- tac_value can be an entry from 1 to 65535.
- ip_address is the standard format address for either IPv4 or IPv6.
- gn is the interface selection used for RIM message transfer.

Configuring the peer-MME's address - for DNS Query

If using a DNS query to determine the peer-MME RIM address, then the DNS server must be pre-configured to respond to a TAI-based DNS query in the following format:

```
tac-lb<TAC-low-byte>.tac-hb<TAC-high-byte>.tac.epc.mnc<MNC>.mcc<MCC>.3gppnetwork.org
```

Monitoring and Troubleshooting RIM Msg Transfer

The show command statistics illustrated below, can be used to monitor or troubleshoot this functionality. Note that the selected output is only a portion of the information displayed by the command.

```
show gmm-sm statistics verbose
```

show gmm-sm statistics verbose

```
show gmm-sm statistics verbose
...
Ranap Procedures:
  Direct Transfer Sent:    0    Direct Transfer Rcvd:    0
```

show gmm-sm statistics verbose | grep RIM

```
show gmm-sm statistics verbose | grep RIM
...
RIM Message Statistics:
RIM Messages dropped:
  due to RIM disabled in SGSN:          0    due to RNC not Capable:    0
  due to RIM Routing Address not present: 0    due to RNC does not exist: 0
```

show sgtpc statistics verbose

```
show sgtpc statistics verbose
...
RAN info Relay Msg:
Total messages received:          0    Total messages sent:    0
Total messages dropped:           0
  due to DNS failure:              0
  due to RIM disabled in SGSN:     0
  due to Invalid Routing Addr:     0
```

show bssgp statistics verbose

```
show bssgp statistics verbose
...
RIM Messages
RAN Information messages received
RAN Information messages transmitted
RAN Information Request messages received
RAN Information Request messages transmitted
RAN Information ACK messages received
RAN Information ACK messages transmitted
RAN Information Error messages received
RAN Information Error messages transmitted
RAN Information Appln Error messages received
RAN Information Appln Error messages transmitted
RIM messages dropped
  due to RIM disabled in SGSN
  due to destination BSC not RIM capable
  due to destination cell does not exist
  due to invalid destination address
```