

Short Message Service

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Feature Summary and Revision History

Summary Data

Applicable Product(s) or Functional Area	MME
Applicable Platform(s)	• ASR 5500 • UGP • VPC-DI • VPC-SI
Feature Default	Disabled - Configuration Required
Related Changes in This Release	Not Applicable
Related Documentation	• *Command Line Interface Reference* • *MME Administration Guide* • *Statistics and Counters Reference*

Revision History

Revision Details	Release
The supports for SMS over SGd interface for EPS only Attach feature is introduced.	21.20.19

Revision Details	Release
"New sub traffic type SMS added under traffic PS to configure Heuristic paging" was introduced in release 21.11. With this release, this feature is also applicable to release 21.8.9.	21.8.9
New sub traffic type SMS added under traffic PS to configure Heuristic paging.	21.11
First introduced.	21.8

Feature Description

The Short Message Service (SMS) is a means of sending messages of limited size to and from GSM/UMTS/EPS devices. SMS is a Store and Forward service, where messages are first sent to an entity called the Short Message Service Center (SMSC) and then forwarded to the recipient instead of transmitting directly to the destination.

If the recipient is not connected, the message is saved in the SMSC and when the receiver becomes available, the network will contact the SMSC and forward the SMS. Thus, a GSM/UMTS/EPS PLMN supports the transfer of short messages between service centers and UEs.

SMS is delivered over LTE through the following methods:

- **SMS over SGs**: The LTE UE device sends and retrieves circuit switched (CS) based SMS messages through the SGs interface. This method is already supported by the MME.
- **SMS over IP**: SIP based SMS messages are carried through IMS. The SMS to be transmitted is encapsulated in the SIP message. This method is not supported in this release.
- **SMS in MME**: MME delivers SMS services over the SGd interface to the SMSC. This method is intended for networks that do not deploy GERAN or UTRAN. SMS in MME is supported for Combined EPS Attach and EPS only Attach (NBIoT users only).

How It Works

The SGd interface enables the transfer of short messages between the MME and the SMSC using Diameter protocol. SCTP is used as the transport protocol.

The Short Message Control Protocol (SM-CP) and Short Message Relay Protocol (SM-RP) are traditional SMS protocols between MSC/VLR and UE. The SMS will be sent by the MME bypassing the MSC/VLR.

SM-CP transmits the SMS and protects against loss caused by changing the dedicated channel. SM-RP manages the addressing and references.

With the new interface configuration towards SMSC, MME will setup an SCTP association with the peer SMSC and the Diameter capability exchange will be performed.

Limitations

This section lists the known limitations for the SMS feature:

- MME will attempt to fallback to the SGs mode if SGd and SGs are enabled and if HSS rejects SMS in MME. This functionality is not supported in this release.
- Multiple SMSC service association is not supported. Only one endpoint will be associated with an MME service. If multiple SMSC services are required, then the SMS router must be used.
- The Serving Node Identity AVP is not supported in the Alert-Service-Centre-Request command. Hence SMSC needs to perform the "Send Routing Info for SM" procedure to retrieve the address of the new serving node from the HSS.
- Sending or processing of the "Pending MT Short Message Indication" flag under Forward Relocation Request will not be supported.
- Sending and processing of "MME number for MT SMS" and "MME Identifier for MT SMS" under Forward Relocation Request/Response are not supported.
- SMS will not be processed when the MME common procedure is ongoing.
- Notify Request to HSS for each UE due to removal of SMSC service is not supported.
- Notify Request to HSS is not supported if UE does an IMSI Detach.
- Delete Subscription Data Request from HSS is not supported for MO/MT SMS.
- CDR generation is not supported.

Flows

This section describes the call flows related to the SMS feature.

Obtaining UE capability for SMS

Combined Attach: If the UE requests "SMS-only" in the Additional Update Type IE of combined attach and the network accepts the Attach Request for EPS services and "SMS-only", the network will indicate "SMS-only" in the Additional Update Result IE. If the SMS services are provided by SGd in the MME, the network will provide a TMSI and non-broadcast LAI in the Attach Accept message.

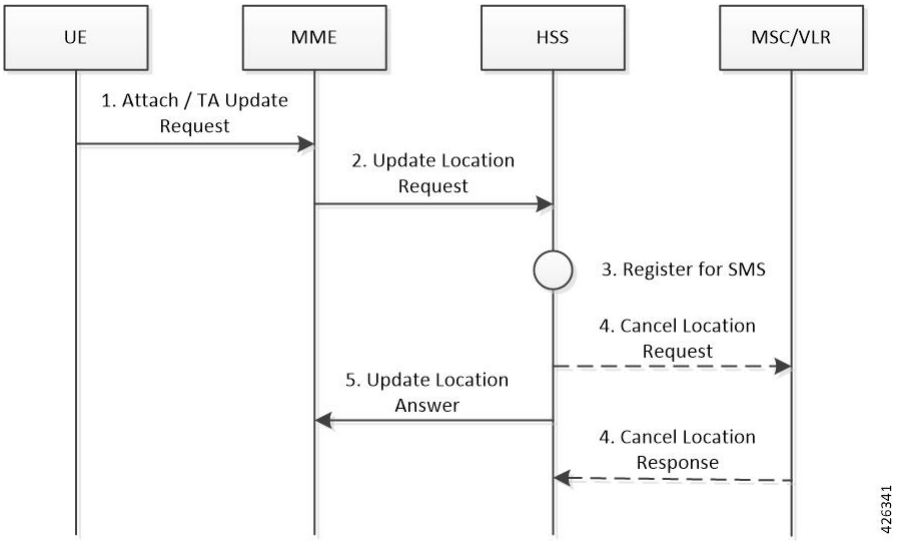
EPS Attach:To support the SMS-only handling option for NBIOT users, the MME must accept the Attach Request. The Attach Request must be associated with an Attach Type of "EPS Attach", or a "TAU Request" with an Update Type of "TA Updating" with an SMS-only indication in the Additional Update IE.

SMS Capability with HSS

A UE supporting SMS in MME needs to perform a registration with the HSS.

The following call flow illustrates the request for registration with the HSS.

Figure 1: SMS Capability with HSS

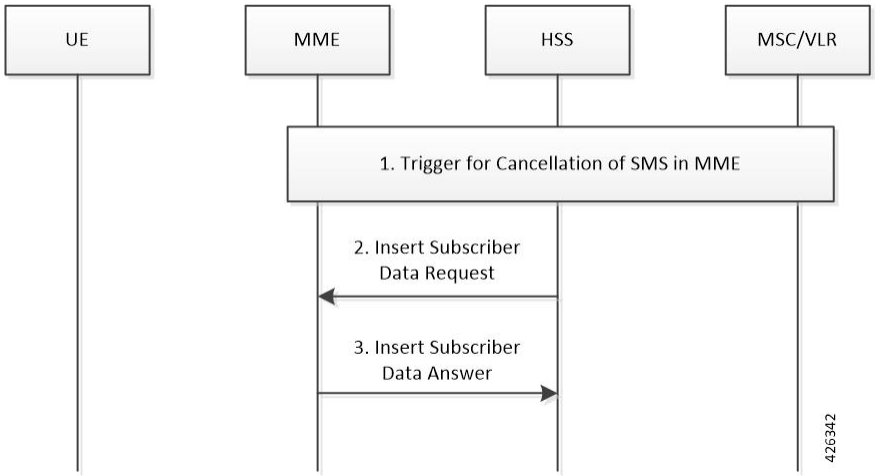


Step	Description
1	The UE initiates combined Attach Update or combined TAU/LAU to an MME.
2	The MME sends an Update Location Request message to the HSS with the following data: • SMS bit set in Feature-List in Supported-Features AVP. The Feature-List ID will be set to 2. • "SMS-only" indication bit set in ULR-Flags AVP. • MME address for MT-SMS routing in MME-Number-for-MT-SMS AVP. • "SMS-only" indication set in SMS-Register-Request AVP.
3	HSS registers the UE for SMS support in MME.
4	If the HSS accepts to register the MME identity as an MSC identity for terminating SMS services, then the HSS cancels the MSC/VLR registration from the HSS.
5	For successful registrations, HSS sends a Location Update Answer (indication that the MME has registered for SMS) message to the MME. HSS sets the "MME Registered for SMS" bit in ULA-Flags AVP.

HSS-initiated Removal of Registration for SMS

The following procedure is applied when the HSS needs to indicate to the MME that it is no longer registered for SMS.

Figure 2: Removal of Registration for SMS

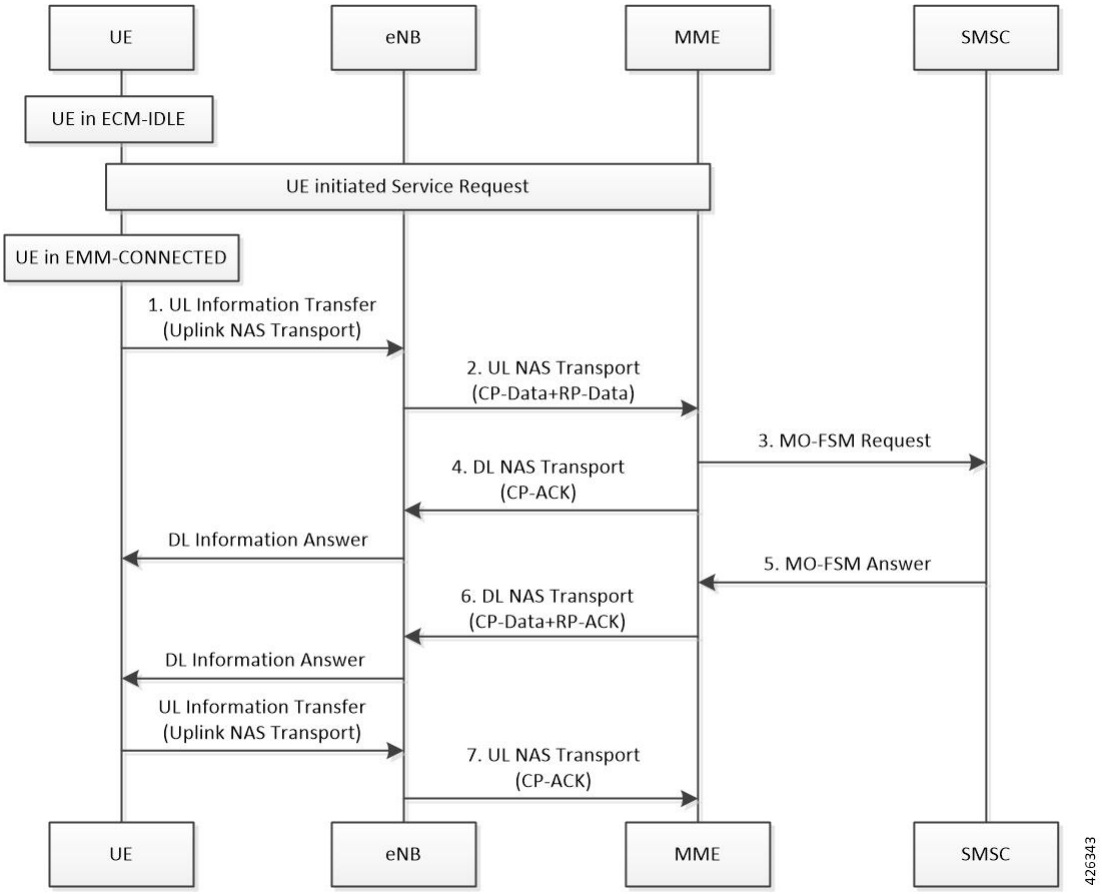


Step	Description
1	An event will trigger the cancellation of the MME being registered for SMS. For example, removal of the SMS subscription for the UE, CS location update, and so on.
2	The HSS sends an Insert Subscriber Data Request (Remove SMS registration) message to the MME to inform that it is no more registered for SMS in MME.
3	The MME sets the "MME Registered for SMS" parameter as not registered for SMS and the "SMS Subscription Data" is considered by the MME as invalid. It acknowledges with an Insert Subscriber Data Answer message to the HSS.

MO Forward Short Message Procedure

The MO Forward Short Message procedure is used between the serving MME and the SMSC to forward mobile originated short messages from a mobile user to a service center. MME checks the SMS related subscription data and forwards the short message.

Figure 3: MO Forward Short Message Procedure



Step	Description
1	The UE sends mobile originated SMS to MME in the Uplink NAS Transport message.
2	MME will encapsulate the SMS in CP-DATA+RP-DATA.
3	The message will be encoded into MO-Forward-Short-Message-Request (OFR) message and sent to SMSC.
4	MME acknowledges the received SMS by sending CP-ACK to UE in the Downlink NAS Transport message.
5	SMSC processes the received OFR message and responds backs with MO-Forward-Short-Message-Answer (OFA) message to MME.
6	MME forwards the acknowledgement from SMSC in CP-DATA+RP-ACK to UE.
7	UE acknowledges the SMS delivery by sending CP-ACK to MME in the Uplink NAS Transport message.

MT Forward Short Message Procedure

The MT Forward Short Message procedure is used between the SMSC and the serving MME to forward mobile terminated short messages.

- When receiving the MT Forward Short Message Request, the MME checks if the user is known.

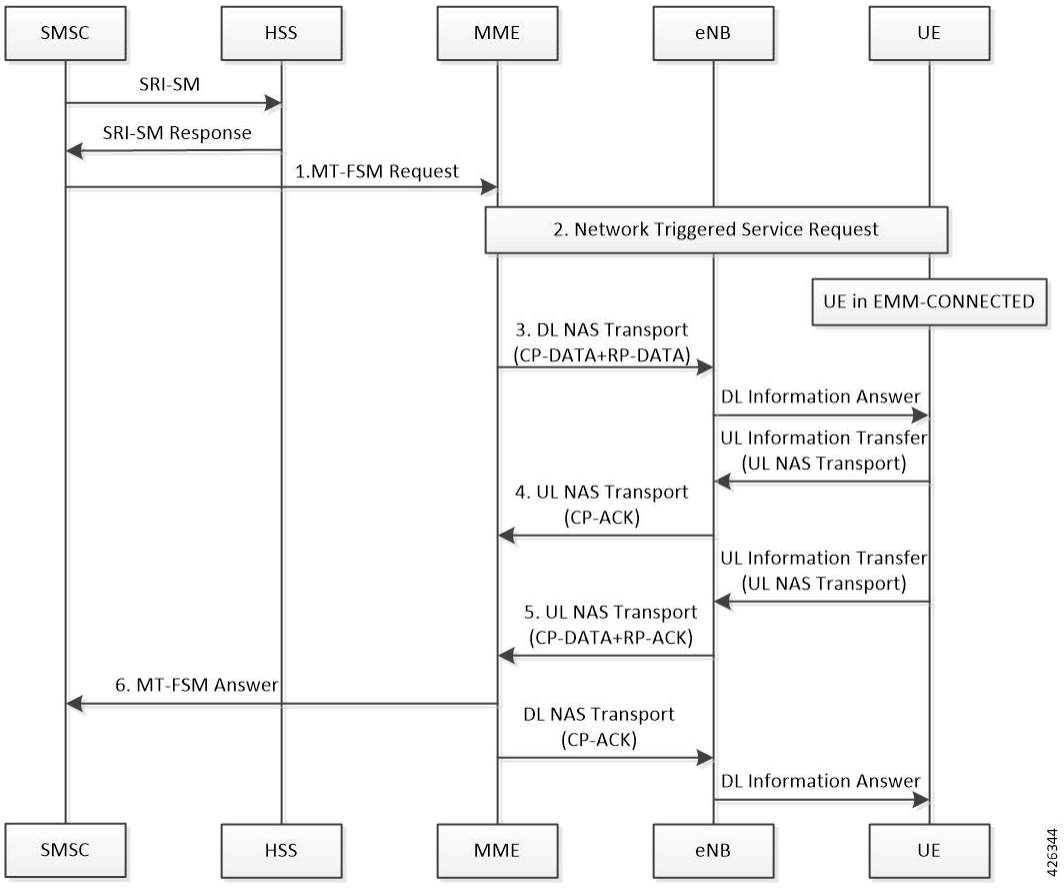
  If it is an unknown user, an Experimental-Result-Code set to DIAMETER_ERROR_USER_UNKNOWN is returned.

- The MME attempts to deliver the short message to the UE.

  If the delivery of the short message to the UE is successful, the MME returns a Result-Code set to DIAMETER_SUCCESS.

- If the UE is not reachable via the MME, the MME sets the MNRF flag and returns an Experimental-Result-Code set to DIAMETER_ERROR_ABSENT_USER.
- If the delivery of the mobile terminated short message failed because the memory capacity exceeded, UE error, or UE not SM equipped, the MME returns an Experimental-Result-Code set to DIAMETER_ERROR_SM_DELIVERY_FAILURE with a SM Delivery Failure Cause indication.

Figure 4: MT Forward Short Message

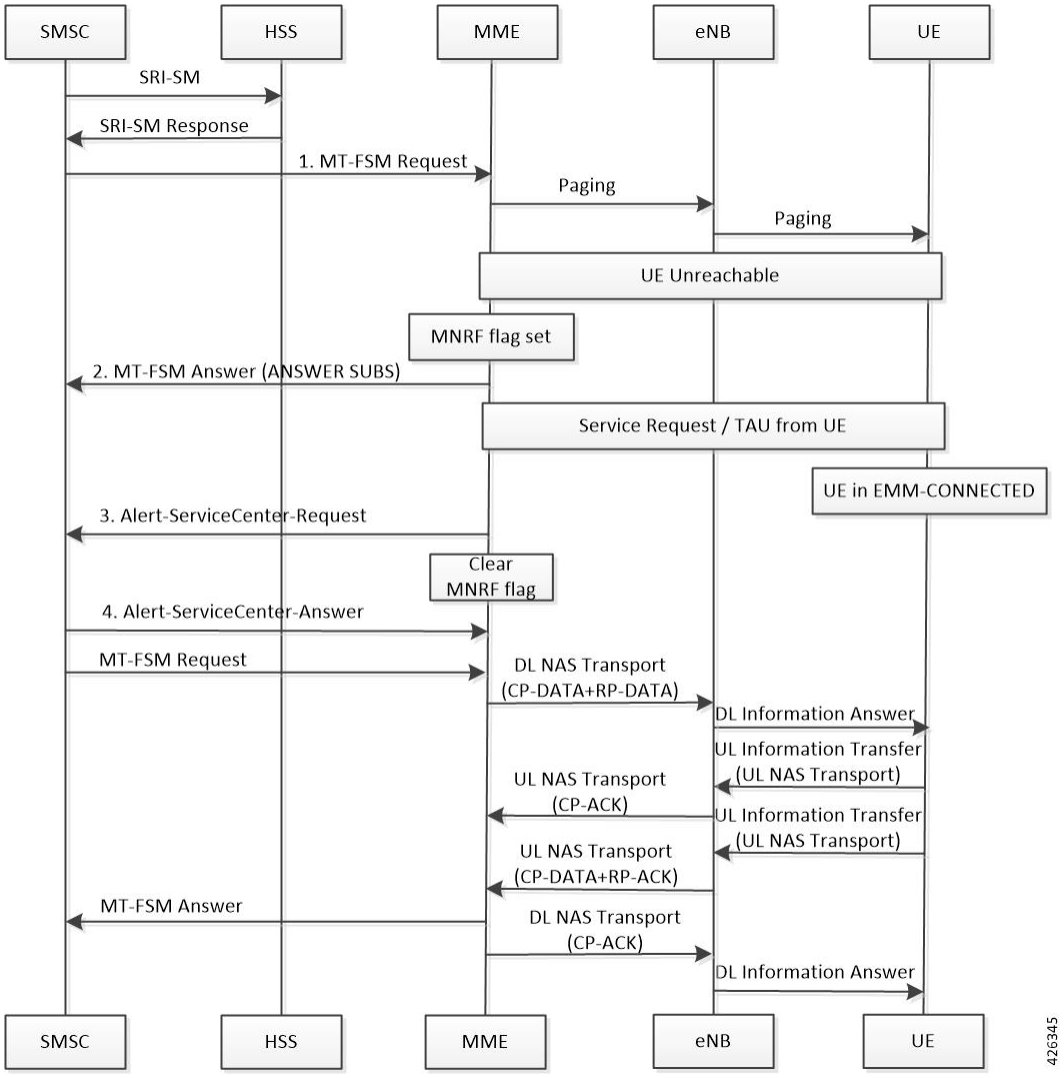


Step	Description
1	The SMSC sends mobile terminated SMS to MME in the MT-Forward-Short-Message-Request (TFR) message.
2	If the UE is in IDLE mode then MME initiates paging and establishes an S1AP connection provided UE replies with paging response.
3	Once the UE is in CONNECTED mode, MME forwards the SMS in CP-DATA+RP-DATA to UE using the Downlink NAS Transport message.
4	The UE acknowledges the received message by sending CP-ACK in the Uplink NAS Transport message.
5	The UE processes the received SMS and sends CP-DATA+RP-ACK to MME.
6	The MME sends the MT-Forward-Short-Message-Answer (TFA) command to SMSC and forwards CP-ACK to the UE in the Downlink NAS Transport message.

MT Forward Short Message Procedure (UE Unreachable)

The MT Forward Short Message procedure is used between the SMSC and the serving MME to forward mobile terminated short messages for an UE that is unreachable.

Figure 5: MT Forward Short Message Procedure (UE Unreachable)



Step	Description
1	The SMSC sends mobile terminated SMS to MME in the MT-Forward-Short-Message-Request (TFR) message.
2	If the UE is paged but is not reachable, MME sets the MNRF flag and sends the MT-Forward-Short-Message-Answer (TFA) message with Subscriber-absent cause to the SMSC.
3	When the UE becomes available and gets connected to the core network, MME clears the MNRF flag. MME sends the Alert-Service-Centre-Request (ALR) message to SMSC to inform that UE is reachable and that SMS delivery can be re-attempted. This is controlled by the **mme sgd send message alr trigger mnrf** CLI command and disabled by default.

Step	Description
4	The SMSC responds with the Alert-Service-Centre-Answer (ALA) command to the MME and then follows the route procedure of sending MT SMS to UE.
5	Also, the Notify Request to HSS will be sent with alert reason "user available". This is controlled by the **mme s6a send message nor trigger mnrf** CLI command and enabled by default.

MT Forward Short Message Procedure (UE Memory Unavailable)

This procedure is used between the SMSC and the serving MME to forward mobile terminated short messages for an UE that has unavailable memory.

Step	Description
1	The SMSC sends mobile terminated SMS to MME in the MT-Forward-Short-Message-Request (TFR) message, but UE memory is full and returns the RP Error with cause code "Memory capacity exceeded". MME sets the MNRF flag and sends the MT-Forward-Short-Message-Answer (TFA) message with cause code "SM Delivery Failure" and failure cause "Memory capacity exceeded" to SMSC.
2	Once the UE memory is available, it will send RP-SMMA message to MME. MME clears the MNRF flag and sends the Alert-Service-Centre-Request (ALR) message to SMSC to inform that UE memory is available and the SMS delivery can be re-attempted. This is controlled by the **mme sgd send message alr trigger mnrf** CLI command and disabled by default.
3	The SMSC responds with the Alert-Service-Centre-Answer (ALA) command to the MME and then follows the route procedure of sending MT SMS to UE.
4	The Notify Request to HSS will also be sent with alert reason "user memory available". This is controlled by the **mme s6a send message nor trigger mnrf** CLI command and enabled by default.

MT Forward Short Message Procedure (UE Moves due to HO)

This procedure is used between the SMSC and the serving MME to forward mobile terminated short messages for an UE that moves due to handover.

Step	Description
1	While the MNRF flag is set due to UE unreachable or UE memory unavailable, UE may do a handover (HO) and move to another MME or SGSN.
2	Since the MNRF flag was set, MME will send the Alert-Service-Centre-Request (ALR) message to SMSC to inform that UE has moved to another MME or SGSN. This is controlled by the **mme sgd send message alr trigger mnrf** CLI command and disabled by default.
3	The SMSC responds with the Alert-Service-Centre-Answer (ALA) command to the MME and then follows the route procedure of sending MT SMS to UE.

Step	Description
4	The Notify Request to HSS will also be sent with alert reason "user memory available". This is controlled by the **mme s6a send message nor trigger mnrf** CLI command and enabled by default.

Important This procedure has the following limitations:

- New Serving Node Identity AVP is not supported and SMSC needs to perform the "Send Routing Info for SM" procedure to retrieve the new serving node's address from the HSS.
- Sending or processing of the "Pending MT Short Message Indication" flag under Forward Relocation Request will not be supported.

Standards Compliance

The SMS feature complies with the following standards:

- 3GPP TS 23.040 version 12.2.0: Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Technical realization of the Short Message Service (SMS)
- 3GPP TS 24.011 version 12.0.0: Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Point-to-Point (PP) Short Message Service (SMS) support on mobile radio interface
- 3GPP TS 24.301 version 13.12.0: Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3
- 3GPP TS 24.301 version 15.1.0: Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3
- 3GPP TS 29.272 version 12.11.0: Evolved Packet System (EPS); Mobility Management Entity (MME) and Serving GPRS Support Node (SGSN) related interfaces based on Diameter protocol
- 3GPP TS 29.272 version 15.2.0: Evolved Packet System (EPS); Mobility Management Entity (MME) and Serving GPRS Support Node (SGSN) related interfaces based on Diameter protocol
- 3GPP TS 29.338 version 13.4.0: Diameter based protocols to support Short Message Service (SMS) capable Mobile Management Entities (MMEs)
- 3GPP TS 29.338 version 14.3.0: Diameter based protocols to support Short Message Service (SMS) capable Mobile Management Entities (MMEs)

Configuring SMS Support

This section provides information on the CLI commands to configure the SMSC service for SMS support in MME.

Creating and Configuring SMSC Service

Use the following configuration to enable the SMSC service and configure the parameters in SMSC service to support MO/MT SMS delivery between SMSC, MME, and UE.

```
configure
   context context_name
      smsc-service smsc_svc_name
         diameter { dictionary standard | endpoint endpoint_name }
         mme-address mme_address
         tmsi tmsi_value non-broadcast mcc mcc_value mnc mnc_value lac lac_value
         default diameter dictionary
         no { diameter endpoint | mme-address | tmsi }
         end
```

NOTES:

- **context** *context_name*: Creates or specifies an existing context and enters the Context Configuration mode. *context_name* specifies the name of a context entered as an alphanumeric string of 1 to 79 characters.
- **smsc-service** *smsc_svc_name*: Creates and configures an SMSC Peer service to allow communication with SMSC peer. *smsc_svc_name* specifies the name of the SMSC service as an alphanumeric string of 1 to 63 characters.

  Entering this command in the Context mode results in the following prompt:

  [context_name]host_name(config-smsc-service)#
- **diameter { dictionary standard | endpoint** *endpoint_name* **}**: Configures the Diameter interface to be associated with the SMSC service.
  - **dictionary standard**: Configures the standard SGd dictionary.
  - **endpoint** *endpoint_name*: Enables Diameter to be used for accounting and specifies which Diameter endpoint to use. *endpoint_name* must be an alphanumeric string of 1 to 63 characters.
- **mme-address** *mme_address*: Configures the MME address to send SMS on the SGd interface. *mme_address* specifies the MME address (ISDN identity) as an integer from 1 to 15.
- **tmsi** *tmsi_value* **non-broadcast mcc** *mcc_value* **mnc** *mnc_value* **lac** *lac_value*: Configures the TMSI to be sent to UE. *tmsi_value* specifies the 4-byte M-TMSI as an integer from 1 to 4294967295.
  - **non-broadcast**: Configures the non-broadcast Location Area Identifier (LAI).
  - **mcc** *mcc_value*: Configures the mobile country code (MCC) portion of non-broadcast LAI for the SMSC service as an integer from 100 through 999.
  - **mnc** *mnc_value*: Configures the mobile network code (MNC) portion of non-broadcast LAI for the SMSC service as a 2- or 3-digit integer from 00 through 999.
  - **lac** *lac_value*: Configures the location area code (LAC) value as an integer from 1 to 65535.
- **default**: Configures the standard Diameter SGd dictionary by default.
- **no**: Disables the specified configuration.

Verifying the Configuration

Use the following command to verify the configuration for all SMSC services or a specified SMSC service:

show smsc-service { all | name *smsc_svc_name* **| statistics { all | name** *smsc_svc_name* **| summary } }**

Configuring MME Preference for SMS

Use the following configuration to configure the MME preference for SMS and SMSC address.

```
configure
  call-control-profile profile_name
    sms-in-mme { preferred [ smsc-address smsc_address ] | smsc-address
smsc_address | subscribe { eps-only-attach } [ notify ue ] }
    no sms-in-mme { preferred [ smsc-address ] | smsc-address | subscribe
 { eps-only-attach } [ notify ue ] }
    default sms-in-mme { subscribe { eps-only-attach } [ notify ue ] }
    end
```



Note When the **sms-in-mme subscribe eps-only-attach** command is enabled, the SC Address AVP between the MME and SMSC is handled as per 3gpp release 15.

NOTES:

- **call-control-profile** *profile_name*: Creates an instance of a call control profile. *profile_name* specifies the name of a call control profile entered as an alphanumeric string of 1 to 64 characters.
- **sms-in-mme**: Configures the SMS capability (SGd interface for SMS) in MME.
- **preferred**: Configures the SMS preference in MME.
- **smsc-address** *smsc_address*: Configures the SMSC address (ISDN identity) for the MME to send SMS on the SGd interface. *smsc_address* must be an integer from 1 to 15.
- **subscribe [notify ue]**: Enables the Subscription Request for SMS services (via SGd) to HSS for all users.
  - **notify**: Configures the notification to be sent to the users.
  - **ue**: Sends SMS-Only indication to UE in Attach/TAU Accept message (only if HSS accepts SMS Registration for SGd).
- **default**: Restores the default configuration, which is to enable the Subscription Request for SMS services (via SGd) to HSS for all users.
- **no**: Deletes the specified configuration.
- **eps-only-attach**: Configures support for SMS over SGd for Eps only Attach.

Associating SMSC Service with MME Service

Use the following configuration to associate an SMSC service with the MME service.

```
configure
  context context_name
    mme-service service_name
      associate smsc-service smsc_svc_name [ context ctx_name ]
      end
```

NOTES:

- **context** *context_name*: Creates or specifies an existing context and enters the Context Configuration mode. *context_name* specifies the name of a context entered as an alphanumeric string of 1 to 79 characters.
- **mme-service** *service_name*: Creates an MME service or configures an existing MME service in the current context. *service_name* specifies the name of the MME service as an alphanumeric string of 1 to 63 characters.
- **associate smsc-service** *smsc_svc_name*: Associates an SMSC service with the MME service. *smsc_svc_name* specifies the name for a pre-configured SMSC service to associate with the MME service as an alphanumeric string of 1 to 63 characters.
- **context** *ctx_name*: Identifies a specific context name where the named service is configured. If this keyword is omitted, the named service must exist in the same context as the MME service. *ctx_name* must be an alphanumeric string of 1 to 63 characters.

Configuring Alert SC Request on SGd interface

Use the following configuration to control sending the Alert SC Request (ALR) on SGd interface.

The user sends the Alert SC Request on SGd interface to SMSC in the event of user availability to received SMS (if user moved to active state from idle or user's memory is available). It is also sent if the user did a handover to the new MME/SGSN and any MT SMS was pending for the user.

```
configure
  call-control-profile profile_name
    [ no ] mme sgd send message alr trigger mnrf
    end
```

NOTES:

- **call-control-profile** *profile_name*: Creates an instance of a call control profile. *profile_name* specifies the name of a call control profile entered as an alphanumeric string of 1 to 64 characters.
- **mme**: Configures MME capability.
- **sgd**: Configures MME capability on SGd interface.
- **send**: Configures MME capability to send on SGd interface.
- **message**: Configures MME capability to send message on SGd interface.
- **alr**: Configures MME capability to send Alert SC Request (ALR) on SGd interface.
- **trigger**: Configures trigger to send the message.
- **mnrf**: Sends message to trigger MNRF flag on SGd interface (SMS in MME).
- **no**: Disables sending the ALR on SGd interface.
- This command is disabled by default.

Verifying the Configuration

Use the following command to verify whether Alert SC Request (MME SGd Message Options) is enabled or disabled:

```
show call-control-profile full all
```

Configuring Notify Request on S6a Interface

Use the following configuration to control sending the Notify Request (NOR) on S6a interface.

The user sends the Notify Request on S6a interface to HSS in the event of user availability to received SMS (user moved to active state from idle or user's memory is available).

```
configure
  call-control-profile profile_name
    [ no ] mme s6a send message nor trigger mnrf
    end
```

NOTES:

- **call-control-profile** *profile_name*: Creates an instance of a call control profile. *profile_name* specifies the name of a call control profile entered as an alphanumeric string of 1 to 64 characters.
- **mme**: Configures MME capability.
- **s6a**: Configure MME capbility on S6a interface.
- **send**: Configures MME capability to send on S6a interface.
- **message**: Configures MME capability to send message on S6a interface.
- **nor**: Configures MME capability to send Notify Request (NOR) on S6a interface.
- **trigger**: Configures trigger to send the message.
- **mnrf**: Sends message to trigger MNRF flag on S6a interface (SMS in MME).
- **no**: Disables sending the NOR on S6a interface.
- This command is enabled by default.

Verifying the Configuration

Use the following command to verify whether Notify Request (MME S6a Message Options) is enabled or disabled:

```
show call-control-profile full all
```

Configuring Queue Timers

Use the following configuration to configure the MT Queue, TC1N, TR1N, and TR2N timers.

```
configure
  context context_name
    mme-service mme_svc_name
      emm { mt-queue-timeout mtq_timer | tc1n-timeout tc1n_timer |
```

```
tr1n-timeout tr1n_timer | tr2n-timeout tr2n_timer }
       default emm { mt-queue-timeout | tc1n-timeout | tr1n-timeout |
tr2n-timeout }
       end
```

NOTES:

- **context** *context_name*: Creates or specifies an existing context and enters the Context Configuration mode. *context_name* specifies the name of a context entered as an alphanumeric string of 1 to 79 characters.
- **mme-service** *service_name*: Creates an MME service or configures an existing MME service in the current context. *service_name* specifies the name of the MME service as an alphanumeric string of 1 to 63 characters.
- **mt-queue-timeout** *mtq_timer*: Configures the timer to hold MT SMS in MT queue. MT SMS will be present in the queue while the previous SMS is being processed. The timer expiry will return error to SMSC for an absent subscriber. *mtq_timer* specifies the timeout in seconds, as an integer from 1 to 300.

  Default: 30 seconds
- **tc1n-timeout** *tc1n_timer*: Configures the retransmission timer to send CP SMS data to UE for MO/MT scenario. *tc1n_timer* specifies the timeout in seconds, as an integer from 1 to 20.

  Default: 5 seconds
- **tr1n-timeout** *tr1n_timer*: Configures the wait time to receive RP-Ack from UE for MT SMS, before sending error to SMSC. *tr1n_timer* specifies the timeout in seconds, as an integer from 1 to 300.

  Default: 30 seconds
- **tr2n-timeout** *tr2n_timer*: Configures the wait time to send RP-Ack to UE for MO SMS, before sending protocol error to UE. *tr2n_timer* specifies the timeout in seconds, as an integer from 1 to 300.

  Default: 30 seconds
- **default**: Resets the specified timer timeout to the default value.

Verifying the Configuration

Use the following command to verify the configuration for TC1N, TR1N, TR2N, and MT Queue timeout:

```
show mme-service [ all | name service_name ]
```

Configuring CP Data Retransmissions

Use the following configuration to configure the maximum number of retransmissions of CP data for MO or MT SMS scenario in MME.

```
configure
  context context_name
    mme-service service_name
      [ default ] cp-data-max-retransmissions num_retrans
      end
```

NOTES:

- **context** *context_name*: Creates or specifies an existing context and enters the Context Configuration mode. *context_name* specifies the name of a context entered as an alphanumeric string of 1 to 79 characters.

- **mme-service** *service_name*: Creates an MME service or configures an existing MME service in the current context. *service_name* specifies the name of the MME service as an alphanumeric string of 1 to 63 characters.
- **cp-data-max-retransmissions** *num_retrans*: Configures the number of times CP Data for SMS is retransmitted. *num_retrans* must be an integer from 1 to 10.
- **default**: Sets the default value to 2.

Verifying the Configuration

Use the following command to verify the count for maximum retransmissions of CP Data:

```
show mme-service [ all | name service_name ]
```

Configuring Heuristic paging for PS-SMS traffic via MME

Use the following configuration to configure Heuristic paging for PS-SMS traffic via MME.

```
configure
  context context_name
    lte-policy
      paging-map LTE_paging_map_name
        precedence map_precedence traffic-type ps sms paging-profile
LTE_paging_profile_name
      end
```

NOTES:

- **sms**: Configures paging profile for SMS via SGd.

Important For more information on Heuristic paging see *Heuristic and Intelligent Paging* section of *MME Administration Guide*.

Monitoring and Troubleshooting

This section provides information on the show commands and bulk statistics available for the SMS Support feature.

Show Commands and/or Outputs

This section provides information regarding show commands and their outputs for the SMS Support feature.

show call-control-profile full all

The output of this command includes the following fields:

- SMS in MME — Displays the configured value (preferred / not-preferred) for SMS in MME.
- SMSC Address — Displays the configured SMSC address.

- Send SMS Subscription Request to HSS — Indicates whether the SMS Subscription Request to HSS is enabled or disabled.
- Send SMS Subscription Notification to UE — Indicates whether the SMS Subscription Notification to UE is enabled or disabled.
- MME S6a Message Options:
  - Notify Req (Trigger : MNRF flag) — Indicates whether the MNRF flag trigger for Notify Request is enabled or disabled.
- MME SGd Message Options:
  - Alert SC Request (Trigger : MNRF flag) — Indicates whether the MNRF flag trigger for Alert SC Request is enabled or disabled.

show mme-service all

The output of this command includes the following fields:

- SMSC Context — Displays the name of the context in which SMSC service is configured.
- SMSC Service — Displays the name of the SMSC service associated with the MME service.
- TC1N Timeout — Displays the timeout duration configured for the TC1N timer. This timer can be configured to any value between 1 and 20 seconds. By default, it is 5 seconds.
- TR1N Timeout — Displays the timeout duration configured for the TR1N timer. This timer can be configured to any value between 1 and 300 seconds. By default, it is 30 seconds.
- TR2N Timeout — Displays the timeout duration configured for the TR2N timer. This timer can be configured to any value between 1 and 300 seconds. By default, it is 30 seconds.
- MT Queue Timeout — Displays the timeout duration configured for the MT Queue timer. This timer can be configured to any value between 1 and 300 seconds. By default, it is 30 seconds.
- CP Data Max Retransmissions Count — Displays the number of times CP Data for SMS is retransmitted.

show mme-service session full all

The output of this command includes the following fields:

- SMS Capability Information:
  - SGd Enabled — Displays Yes or No to indicate whether SGd is enabled or not.
  - MS Not Reachable — Displays Yes or No to indicate whether MS Not Reachable is enabled or not.
  - MS Memory Capacity Exceeded — Displays Yes or No to indicate whether MS memory capacity has exceeded.

show mme-service statistics

The output of this command includes the following fields:

- Paging Initiation for PS SMS Events:

- Attempted — The total number of ECM statistics-related PS SMS Paging Initiation events that were attempted.
- Success — The total number of ECM statistics-related PS SMS Paging Initiation events that were successful.
- Failures — The total number of ECM statistics-related PS SMS Paging Initiation events that failed.
- Success at Last n eNB — The total number of ECM statistics-related PS SMS Paging Initiation events that succeeded at the last known eNodeB.
- Success at Last TAI — The total number of ECM statistics-related PS SMS Paging Initiation events that succeeded at an eNodeB in the TAI from which the UE was last heard.
- Success at TAI List — The total number of ECM statistics-related PS SMS Paging Initiation events that succeeded at an eNodeB in all TAIs present in the TAI list assigned to the UE.

- NB-IoT with SMS:
  - Attach Requests Rcvd — The total number of EPS Attach Requests received for NB-IoT subscribers with SMS option.

show smsc-service name <smsc_svc_name>

The output of this command includes the following fields:

- Service name — Displays the name of the configured SMSC service.
- Context — Displays the name of the configured context.
- Status — Displays the status of the SMSC service.
- Diameter endpoint — Displays the configured Diameter endpoint name.
- Diameter dictionary — Displays the configured Diameter dictionary.
- Tmsi — Displays the configured TMSI value.
- Non-broadcast-Lai — Displays the configured non-broadcast MCC, MNC, and LAC values.
- MME-address — Displays the configured MME address.

show smsc-service statistics all

The output of this command includes the following fields:

- Session Stats:
  - Total Current Sessions — Displays the total number of current SMSC sessions.
  - Sessions Failovers — Displays the number of SMSC session failovers.
  - Total Starts — Displays the total number of SMSC session starts.
  - Total Session Updates — Displays the total number of SMSC session updates.
  - Total Terminated — Displays the total number of terminated SMSC sessions.

- Message Stats:
  - Total Messages Rcvd — Displays the total number of messages received.
  - Total Messages Sent — Displays the total number of messages sent.
  - OF Request — Displays the total number of OF requests.
  - OF Answer — Displays the total number of OF answers.
  - OFR Retries — Displays the total number of OFR retries.
  - OFR Timeouts — Displays the total number of OFR timeouts.
  - OFA Dropped — Displays the total number of OFA dropped.
  - TF Request — Displays the total number of TF requests.
  - TF Answer — Displays the total number of TF answers.
  - TFR Retries — Displays the total number of TFR retries.
  - TFA Timeouts — Displays the total number of TFA timeouts.
  - TFA Dropped — Displays the total number of TFA dropped requests.
  - AL Request — Displays the total number of AL requests.
  - AL Answer — Displays the total number of AL answers.
  - ALR Retries — Displays the total number of ALR retries.
  - ALR Timeouts — Displays the total number of ALR timeouts.
  - ALA Dropped — Displays the total number of ALA dropped.
- Message Error Stats:
  - Unable To Comply — Displays the total number of message errors containing the result code "Unable To Comply".
  - User Unknown — Displays the total number of message errors containing the result code "User Unknown".
  - User Absent — Displays the total number of message errors containing the result code "User Absent".
  - User Illegal — Displays the total number of message errors containing the result code "User Illegal".
  - SM Delivery Failure — Displays the total number of message errors containing the result code "SM Delivery Failure".
  - User Busy for MT SMS — Displays the total number of message errors containing the result code "User Busy for MT SMS".
  - Other Errors — Displays the total number of message errors containing the result code "Other Errors".
- Bad Answer Stats:
  - Auth-Application-Id — Displays the absence or unexpected value in Auth-Application-Id AVP.

- Session-Id — Displays the absence or unexpected value in Session-Id AVP.
- Origin-Host — Displays the absence of Origin-Host AVP.
- Origin Realm — Displays the absence of Origin-Realm AVP.
- Parse-Message-Errors — Displays the total number of parse errors in the message.
- Parse-Mscc-Errors — Displays the total number of parse errors in MSCC AVP.
- Miscellaneous — Displays the total number of other miscellaneous errors.

show smsc-service statistics summary

The output of this command includes the following fields:

- SMSC Session Stats:
  - Total Current Sessions — Displays the total number of current SMSC sessions.
  - Sessions Failovers — Displays the total number of SMSC session failovers.
  - Total Starts — Displays the total number of SMSC session starts.
  - Total Session Updates — Displays the total number of SMSC session updates.
  - Total Terminated — Displays the total number of terminated SMSC sessions.

show sms statistics mme-only verbose

The output of this command includes the following fields:

SMS Statistics:

Session Statistics:

- MO SMS (In Progress) — The total number of mobile originated (MO) SMS messages that are waiting in the MME to be delivered.
- MT SMS (In Progress) — The total number of mobile terminated (MT) SMS messages that are waiting in the MME to be delivered.
- MT SMS (In Queue) — The total number of mobile terminated SMS messages in the queue.
- SMMA (In Progress) — The total number of procedures for retrieval of available SMS memory in progress.
- MO-SMS Attempted — The total number of mobile originated SMS messages that are attempted to be delivered by the network.
- MO-SMS Successful — The total number of mobile originated SMS messages that are successfully delivered by the network.
- MT-SMS Attempted — The total number of mobile terminated SMS messages that are attempted to be delivered by the network.
- MT-SMS Successful — The total number of mobile terminated SMS messages that are successfully delivered by the network.

- SMMA Attempted — The total number of procedures for retrieval of available SMS memory attempted.
- SMMA Successful — The total number of procedures for retrieval of available SMS memory successful.

Message Statistics:

- CP Layer Messages:
  - CP Data (Tx) — The total number of protocol data units sent during connection setup.
  - CP Data (Rx) — The total number of protocol data units received during connection setup.
  - CP Ack (Tx) — The total number of Ack messages sent during connection setup.
  - CP Ack (Rx) — The total number of Ack messages received during connection setup.
  - CP Error (Tx) — The total number of protocol errors during connection setup in Tx message.
  - CP Error (Rx) — The total number of protocol errors during connection setup in Rx message.
- CP Error Cause Stats:
  - Network Failure (Tx)/(Rx) — The total number of protocol errors during connection setup due to network failure in Tx/Rx message.
  - Congestion (Tx)/(Rx) — The total number of protocol errors during connection setup due to congestion in Tx/Rx message.
  - Invalid TID (Tx)/(Rx) — The total number of protocol errors during connection setup due to invalid transaction ID (TID) in Tx/Rx message.
  - Invalid Semantic (Tx)/(Rx) — The total number of protocol errors during connection setup due to invalid semantics in Tx/Rx message.
  - Invalid Mand Info (Tx)/(Rx) — The total number of protocol errors during connection setup as mandatory information in Tx/Rx message is invalid.
  - Invalid Msg Type (Tx)/(Rx) — The total number of protocol errors during connection setup due to invalid Tx/Rx message type.
  - Invalid Prot State (Tx)/(Rx) — The total number of protocol errors during connection setup as protocol state in Tx/Rx message is invalid.
  - Invalid IE (Tx)/(Rx) — The total number of protocol errors during connection setup as information element in Tx/Rx message is invalid.
  - Protocol Error (Tx)/(Rx) — The total number of protocol errors during connection setup as protocol error in Tx/Rx message.
  - Undefined Cause (Tx)/(Rx) — The total number of protocol errors during connection setup due to unspecified error in Tx/Rx message.
- Message Drop Counters:
  - CP Data — The total number of CP data packets dropped during connection setup.
    - Retransmission Drops — The total number of data packets dropped during retransmission.
    - Unknown TID Drops — The total number of data packets dropped during connection setup due to unknown transaction ID (TID).

- Invalid TID Drops — The total number of data packets dropped during connection setup due to invalid transaction ID (TID) received.

- CP Ack — The total number of CP acknowledgement messages dropped during connection setup.
  - CP-ACK Drop for Invalid TID Rcvd — The total number of CP-Ack messages dropped during connection setup due to invalid transaction ID (TID) received.

- CP Error — The total number of CP data packets dropped during connection setup due to error in connection.
  - CP-ERR Drop for Invalid TID Rcvd — The total number of CP-ERR messages dropped during connection setup due to invalid transaction ID (TID) received.

- RP Layer Messages:
  - RP Data (Tx) — The total number of protocol data units sent during message relay.
  - RP Data (Rx) — The total number of protocol data units received during message relay.
  - RP Ack (Tx) — The total number of Ack messages sent during message relay.
  - RP Ack (Rx) — The total number of Ack messages received during message relay.
  - RP Error (Tx) — The total number of protocol errors during message relay in Tx message.
  - RP Error (Rx) — The total number of protocol errors during message relay in Rx message.
  - RP SMMA (Rx) — The total number RP SMMA messages received.

- RP Error Cause Stats:
  - Unassigned Number (Tx) — The total number of protocol errors sent during message relay due to unassigned protocol number.
  - Opr. Determined Barring (Tx) — The total number of protocol errors sent during message relay due to operator determined barring.
  - Call Barred (Tx) — The total number of protocol errors sent during message relay due to call barring.
  - Reserved (Tx) — The total number of protocol errors sent during message relay due to reserved resources.
  - SM Transfer Rejected (Tx) — The total number of protocol errors sent during message relay due to session manager transfer rejection.
  - Destination Out Of Order (Tx) — The total number of protocol errors sent during message relay due to out of order on destination.
  - Unidentified Subscriber (Tx) — The total number of protocol errors sent during message relay due to unidentified subscriber.
  - Facility Rejected (Tx) — The total number of protocol errors sent during message relay due to facility rejection.
  - Unknown Subscriber (Tx) — The total number of protocol errors sent during message relay due to unknown subscriber.

- Network Out Of Order (Tx) — The total number of protocol errors sent during message relay due to out-of-order network.
- Temporary Failure (Tx) — The total number of protocol errors sent during message relay due to temporary failure in network.
- Congestion (Tx) — The total number of protocol errors sent during message relay due to congestion in network.
- Not Subscribed (Tx) — The total number of protocol errors sent during message relay as this service is not subscribed by subscriber.
- Not Implemented (Tx) — The total number of protocol errors sent during message relay as this service is not yet implemented.
- Interworking Error (Tx) — The total number of protocol errors sent during message relay due to interworking error between two networks or technology.
- Resource Un-available (Tx) — The total number of protocol errors sent during message relay as resources are not available.
- Memory Capacity Exceeded (Rx) — The total number of protocol errors received during message relay as capacity is exceeded.
- Invalid Reference Number (Tx)/(Rx) — The total number of protocol errors during message relay as invalid reference in Tx/Rx message.
- Invalid Semantic (Tx)/(Rx) — The total number of protocol errors during message relay due to invalid semantics in Tx/Rx message.
- Invalid Mandatory Info (Tx)/(Rx) — The total number of protocol errors during message relay as mandatory information in Tx/Rx message is invalid.
- Invalid Message Type (Tx)/(Rx) — The total number of protocol errors during message relay due to invalid Tx/Rx message type.
- Invalid Protocol State (Tx)/(Rx) — The total number of protocol errors during message relay as protocol state in Tx/Rx message is invalid.
- Invalid IE (Tx)/(Rx) — The total number of protocol errors during message relay as information element in Tx/Rx message is invalid.
- Protocol Error (Tx)/(Rx) — The total number of RP ERROR messages sent/received with the cause Protocol Error in the message header.
- Undefined Error (Tx)/(Rx) — The total number of protocol errors during message relay due to unspecified error in Tx/Rx message.

- Message Drop Counters:
  - RP Data — The total number of RP data packets dropped during message relay.
  - RP Ack — The total number of RP acknowledgement messages dropped during message relay.
  - RP Error — The total number of RP data packets dropped during message relay due to error in connection.

- RP Decode Failures — The total number of messages dropped during message relay due to invalid transaction ID (TID) received.

General Statistics:

- Concatenated MO SMS — The total number of concatenated mobile originated SMS messages.
- CP Timer Expiry — The total number of events when timer expired during connection setup.
- TR1N Timer — The total number of events when TR1N timer expired during mobile terminated SMS is in wait state for RP-ACK.
- TR2N Timer — The total number of events when TR2N timer expired during mobile terminated SMS is in wait state to send RP-ACK.
- CP Data Retrans — The total number of protocol data units retransmitted during connection setup.
- RP Msg Encode Fail — The total number of message encoding failures during message relay.
- CP Data Tx Fail — The total number of protocol data units with Tx messages failed during connection setup.
- CP Data Inv TID — The total number of protocol data units with invalid transaction ID (TID) during connection setup.
- Max Retrans Reached — The total number of events when retransmission limit is exhausted during connection setup.
- SMSC Addr Restricted — The total number of SMSC addresses restricted.
- MO SMSC Addr Restricted — The total number of mobile originated SMSC addresses restricted.
- MT SMSC Addr Restricted — The total number of mobile terminated SMSC addresses restricted.
- CP-DATA No Cp Ack Rx — The total number of mobile terminated messages failed as no acknowledgement is received during connection setup.
  - Release Indication Waiting MO CP-ACK Delivery — The total number of release indications waiting to be transferred between network and MS for mobile originated control protocol acknowledgement messages that are being delivered.
  - Release Indication Waiting MO CP-DATA Delivery — The total number of release indications waiting to be transferred between network and MS for mobile originated control protocol data messages that are being delivered.
  - Release Indication Waiting MO CP-ERR Delivery — The total number of release indications waiting to be transferred between network and MS for mobile originated control protocol error messages that are being delivered.
  - Release Indication Waiting MT CP-DATA Delivery — The total number of release indications waiting to be transferred between network and MS for mobile terminated control protocol data messages that are being delivered.
  - Release Indication Waiting MT CP-ACK Delivery — The total number of release indications waiting to be transferred between network and MS for mobile terminated control protocol acknowledgement messages that are being delivered.

- Release Indication Waiting MT CP-ERR Delivery — The total number of release indications waiting to be transferred between network and MS for mobile terminated control protocol error messages that are being delivered.

- MT-SMS Failures:
  - IMSI Record Not Found — The total number of mobile terminated messages failed as IMSI record is not available.
  - Busy Subscriber — The total number of mobile terminated messages failed due to busy subscriber.
  - Detached Subscriber — The total number of mobile terminated messages failed due to detached subscriber.
  - MT Queue Full — The total number of mobile terminated messages failed as messaged queue was full.

Bulk Statistics

This section provides information on the bulk statistics supported for the SMS feature.

MME Schema

The following SMS feature related bulk statistics are available in the MME schema.

Bulk Statistics	Description
ps-sms-paging-init-events-attempted	The total number of PS SMS Paging Initiation events that were attempted.
ps-sms-paging-init-events-success	The total number of PS SMS Paging Initiation events that were successful.
ps-sms-paging-init-events-failures	The total number of PS SMS Paging Initiation events that failed.
ps-sms-paging-last-enb-success	The total number of PS SMS Paging Initiation events that succeeded at the last known eNodeB.
ps-sms-paging-last-tai-success	The total number of PS SMS Paging Initiation events that succeeded at an eNodeB in the TAI from which the UE was last heard.
ps-sms-paging-tai-list-success	The total number of PS SMS Paging Initiation events that succeeded at an eNodeB in all TAIs present in the TAI list assigned to the UE.

MME-SMS Schema

The following SMS feature related bulk statistics are available in the MME-SMS schema.

Bulk Statistics	Description
mo-sms-in-progress	The total number of mobile originated (MO) SMS messages that are waiting in the MME to be delivered.
mt-sms-in-progress	The total number of mobile terminated (MT) SMS messages that are waiting in the MME to be delivered.
mt-sms-in-queue	The total number of mobile terminated SMS messages in the queue.
sms-memory-available-in-progress	The total number of procedures for retrieval of available SMS memory in progress.
mo-sms-attempted	The total number of mobile originated SMS messages that are attempted to be delivered by the network.
mo-sms-successful	The total number of mobile originated SMS messages that are successfully delivered by the network.
mt-sms-attempted	The total number of mobile terminated SMS messages that are attempted to be delivered by the network.
mt-sms-successful	The total number of mobile terminated SMS messages that are successfully delivered by the network.
sms-memory-available-attempted	The total number of procedures for retrieval of available SMS memory attempted.
sms-memory-available-successful	The total number of procedures for retrieval of available SMS memory successful.
conn-prot-data-tx	The total number of protocol data units sent during connection setup.
conn-prot-data-rx	The total number of protocol data units received during connection setup.
conn-prot-ack-tx	The total number of Ack messages sent during connection setup.
conn-prot-ack-rx	The total number of Ack messages received during connection setup.
conn-prot-error-tx	The total number of protocol errors during connection setup in Tx message.
conn-prot-error-rx	The total number of protocol errors during connection setup in Rx message.
conn-prot-error-nwt-fail-tx	The total number of protocol errors during connection setup due to network failure in Tx message.
conn-prot-error-nwt-fail-rx	The total number of protocol errors during connection setup due to network failure in Rx message.

Bulk Statistics	Description
conn-prot-error-congestion-tx	The total number of protocol errors during connection setup due to congestion in Tx message.
conn-prot-error-congestion-rx	The total number of protocol errors during connection setup due to congestion in Rx message.
conn-prot-error-invalid-tid-tx	The total number of protocol errors during connection setup due to invalid transaction ID (TID) in Tx message.
conn-prot-error-invalid-tid-rx	The total number of protocol errors during connection setup due to invalid transaction ID (TID) in Rx message.
conn-prot-error-invalid-semantic-tx	The total number of protocol errors during connection setup due to invalid semantics in Tx message.
conn-prot-error-invalid-semantic-rx	The total number of protocol errors during connection setup due to invalid semantics in Rx message.
conn-prot-error-invalid-mand-info-tx	The total number of protocol errors during connection setup as mandatory information in Tx message is invalid.
conn-prot-error-invalid-mand-info-rx	The total number of protocol errors during connection setup as mandatory information in Rx message is invalid.
conn-prot-error-invalid-msg-type-tx	The total number of protocol errors during connection setup due to invalid Tx message type.
conn-prot-error-invalid-msg-type-rx	The total number of protocol errors during connection setup due to invalid Rx message type.
conn-prot-error-invalid-prot-state-tx	The total number of protocol errors during connection setup as protocol state in Tx message is invalid.
conn-prot-error-invalid-prot-state-rx	The total number of protocol errors during connection setup as protocol state in Rx message is invalid.
conn-prot-error-invalid-ie-tx	The total number of protocol errors during connection setup as information element in Tx message is invalid.
conn-prot-error-invalid-ie-rx	The total number of protocol errors during connection setup as information element in Rx message is invalid
conn-prot-error-protocol-error-tx	The total number of protocol errors during connection setup as protocol error in Tx message.
conn-prot-error-protocol-error-rx	The total number of protocol errors during connection setup as protocol error in Rx message.

Bulk Statistics	Description
conn-prot-error-undefined-cause-tx	The total number of protocol errors during connection setup due to unspecified error in Tx message.
conn-prot-error-undefined-cause-rx	The total number of protocol errors during connection setup due to unspecified error in Rx message.
conn-prot-data-dropped	The total number of data packets dropped during connection setup.
conn-prot-ack-dropped	The total number of Ack messages dropped during connection setup.
conn-prot-error-dropped	The total number of data packets dropped during connection setup due to error in connection.
conn-prot-inval-tid-rcvd	The total number of messages dropped during connection setup due to invalid transaction ID (TID) received.
relay-prot-data-tx	The total number of protocol data units sent during message relay.
relay-prot-data-rx	The total number of protocol data units received during message relay.
relay-prot-ack-tx	The total number of Ack messages sent during message relay.
relay-prot-ack-rx	The total number of Ack messages received during message relay.
relay-prot-err-tx	The total number of protocol errors during message relay in Tx message.
relay-prot-err-rx	The total number of protocol errors during message relay in Rx message.
relay-prot-err-unassigned-num	The total number of protocol errors during message relay due to unassigned protocol number.
relay-prot-err-opr-determ-barring	The total number of protocol errors during message relay due to operator determined barring.
relay-prot-err-call-barred	The total number of protocol errors during message relay due to call barring.
relay-prot-err-reserved	The total number of protocol errors during message relay due to reserved resources.
relay-prot-err-sm-transfer-rej	The total number of protocol errors during message relay due to session manager transfer rejection.

Bulk Statistics	Description
relay-prot-err-dest-out-of-order	The total number of protocol errors during message relay due to out of order on destination.
relay-prot-err-unidentified-subs	The total number of protocol errors during message relay due to unidentified subscriber.
relay-prot-err-facility-rej	The total number of protocol errors during message relay due to facility rejection.
relay-prot-err-unknown-subs	The total number of protocol errors during message relay due to unknown subscriber.
relay-prot-err-netwk-out-of-order	The total number of protocol errors during message relay due to out-of-order network.
relay-prot-err-temp-fail	The total number of protocol errors during message relay due to temporary failure in network.
relay-prot-err-congestion	The total number of protocol errors during message relay due to congestion in network.
relay-prot-err-not-subscribed	The total number of protocol errors during message relay as this service is not subscribed by subscriber.
relay-prot-err-not-implemented	The total number of protocol errors during message relay as this service is not yet implemented.
relay-prot-err-interworking-err	The total number of protocol errors during message relay due to interworking error between two networks or technology.
relay-prot-err-res-unavail	The total number of protocol errors during message relay as resources are not available.
relay-prot-err-mem-capacity-exceed	The total number of protocol errors during message relay as capacity is exceeded.
relay-prot-err-inval-ref-num-tx	The total number of protocol errors during message relay as invalid reference in Tx message.
relay-prot-err-inval-ref-num-rx	The total number of protocol errors during message relay as invalid reference in Rx message.
relay-prot-err-inval-semantic-tx	The total number of protocol errors during message relay due to invalid semantics in Tx message.
relay-prot-err-inval-semantic-rx	The total number of protocol errors during message relay due to invalid semantics in Rx message.
relay-prot-err-inval-mand-info-tx	The total number of protocol errors during message relay as mandatory information in Tx message is invalid.

Bulk Statistics	Description
relay-prot-err-inval-mand-info-rx	The total number of protocol errors during message relay as mandatory information in Rx message is invalid.
relay-prot-err-inval-msg-type-tx	The total number of protocol errors during message relay due to invalid Tx message type.
relay-prot-err-inval-msg-type-rx	The total number of protocol errors during message relay due to invalid Rx message type.
relay-prot-err-inval-prot-state-tx	The total number of protocol errors during message relay as protocol state in Tx message is invalid.
relay-prot-err-inval-prot-state-rx	The total number of protocol errors during message relay as protocol state in Rx message is invalid.
relay-prot-err-inval-ie-tx	The total number of protocol errors during message relay as information element in Tx message is invalid.
relay-prot-err-inval-ie-rx	The total number of protocol errors during message relay as the information element in Rx message is invalid.
relay-prot-err-protocol-error-rx	The total number of RP ERROR messages sent with the cause Protocol Error in the message header.
relay-prot-err-protocol-error-tx	The total number of protocol errors during message relay when there are protocol errors in the transmitted message.
relay-prot-err-unidentified-error-tx	The total number of protocol errors during message relay due to unspecified error in Tx message.
relay-prot-err-unidentified-error-rx	The total number of protocol errors during message relay due to unspecified error in Rx message.
relay-prot-smma-rx	The total number RP SMMA messages received.
relay-prot-data-dropped	The total number of data packets dropped during message relay.
relay-prot-ack-dropped	The total number of Ack messages dropped during message relay.
relay-prot-error-dropped	The total number of data packets dropped during message relay due to error in connection.
relay-prot-decode-failure	The total number of messages dropped during message relay due to invalid transaction ID (TID) received.
concat-mo-sms	The total number of concatenated mobile originated SMS messages.

Bulk Statistics	Description
conn-prot-timer-expiry	The total number of events when timer expired during connection setup.
tr1n-timer-expiry	The total number of events when TR1N timer expired during mobile terminated SMS is in wait state for RP-ACK.
tr2n-timer-expiry	The total number of events when TR2N timer expired during mobile terminated SMS is in wait state to send RP-ACK.
conn-prot-data-retrans	The total number of protocol data units retransmitted during connection setup.
relay-prot-msg-encode-fail	The total number of message encoding failures during message relay.
conn-prot-data-tx-fail	The total number of protocol data units with Tx messages failed during connection setup.
conn-prot-data-inval-tid	The total number of protocol data units with invalid transaction ID (ID) during connection setup.
conn-prot-max-retrans-reached	The total number of events when retransmission limit is exhausted during connection setup.
mt-fail-no-db-rec	The total number of mobile terminated messages failed as database record is not available.
mt-fail-conn-prot-data-no-ack-rcvd	The total number of mobile terminated messages failed as no acknowledgement is received during connection setup.
mt-fail-fwd-busy-subs	The total number of mobile terminated messages failed due to busy subscriber.
mt-fail-fwd-detached-subs	The total number of mobile terminated messages failed due to detached subscriber.
mt-fail-mt-queue-full	The total number of mobile terminated messages failed as messaged queue was full.
eps-attach-nbiot-with-sms	The total number of EPS Attach requests received for NB-IoT subscribers with SMS option.