Short Message Service

This chapter describes the Short Message Service (SMS) feature in the following topics:

- Feature Summary and Revision History, page 1
- Feature Description, page 2
- How It Works, page 2
- Configuring SMS Support, page 9
- Monitoring and Troubleshooting, page 11

Feature Summary and Revision History

Summary Data

<table>
<thead>
<tr>
<th>Applicable Product(s) or Functional Area</th>
<th>MME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicable Platform(s)</td>
<td></td>
</tr>
<tr>
<td>• ASR 5500</td>
<td></td>
</tr>
<tr>
<td>• VPC-DI</td>
<td></td>
</tr>
<tr>
<td>• VPC-SI</td>
<td></td>
</tr>
</tbody>
</table>

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
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**: SMS in MME delivers SMS services over the SGd interface to the SMSC. This method is intended for networks that do not deploy GERAN or UTRAN. This method is supported in this release.

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

The SMS feature has the following limitations:

- Queueing multiple MT messages per subscriber is not supported.
- SMS will not be processed when the MME common procedure is ongoing.
- Authentication procedure on receiving MO or MT SMS is not supported.
• Collision scenarios such as context release while processing the SMS is not supported.
• Abort indication from MME application while processing the SMS is not supported.
• MNRF flag in MME is not supported.
• Long SMS is not supported.
• Multiple SMSC-service association is not supported.
• Mapping the SMSC-address to a Diameter endpoint is not supported.
• TC1N, TR1N, TR2N, and MT QUEUE timers are set to default values of 5 seconds, 30 seconds, 30 seconds, and 30 seconds respectively. The configurable timer values under SMSC service are not supported.
• Heuristics paging for SGd SMS is not supported.
• Statistics for SGd triggered paging are not supported.
• SMSC service statistics are supported but the statistics will not be pegged in this release.

Flows

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

Obtaining UE capability for SMS

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.

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**

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The UE initiates combined Attach Update or combined TAU/LAU to an MME.</td>
</tr>
</tbody>
</table>
| 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**

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>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.</td>
</tr>
<tr>
<td>2</td>
<td>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.</td>
</tr>
<tr>
<td>3</td>
<td>The MME sets the &quot;MME Registered for SMS&quot; parameter as not registered for SMS and the &quot;SMS Subscription Data&quot; is considered by the MME as invalid. It acknowledges with an Insert Subscriber Data Answer message to the HSS.</td>
</tr>
</tbody>
</table>
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**

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The UE sends mobile originated SMS to MME in the Uplink NAS Transport message.</td>
</tr>
<tr>
<td>2</td>
<td>MME will encapsulate the SMS in CP-DATA+RP-DATA.</td>
</tr>
<tr>
<td>3</td>
<td>The message will be encoded into MO-Forward-Short-Message-Request (OFR) message and sent to SMSC.</td>
</tr>
<tr>
<td>4</td>
<td>MME acknowledges the received SMS by sending CP-ACK to UE in the Downlink NAS Transport message.</td>
</tr>
</tbody>
</table>
### 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.

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>SMSC processes the received OFR message and responds backs with MO-Forward-Short-Message-Answer (OFA) message to MME.</td>
</tr>
<tr>
<td>6</td>
<td>MME forwards the acknowledgement from SMSC in CP-DATA+RP-ACK to UE.</td>
</tr>
<tr>
<td>7</td>
<td>UE acknowledges the SMS delivery by sending CP-ACK to MME in the Uplink NAS Transport message.</td>
</tr>
</tbody>
</table>
• 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**

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

The SMS feature complies with the following standards:

- 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 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 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.

### Configuring SMSC Service

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

```
configure
core
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:**

- `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 through 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.

---

### Step

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>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.</td>
</tr>
</tbody>
</table>
* 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 through 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.

**Verifying the Configuration**

Use the following command to verify the configuration for all SMSC services or 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 }
    no sms-in-mme { preferred [ smsc-address ] | smsc-address }
  end
NOTES:

  * sms-in-mme { preferred [ smsc-address smsc_address ] | smsc-address smsc_address }: 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.

  * no*: Deletes the specified configuration.

**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:

• **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 through 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 through 63 characters.

---

**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 following new fields are added to the output of this command:

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

**show mme-service all**

The following new fields are added to the output of this command to display the SMSC statistics.

• 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.

**show smsc-service name <smsc_svc_name>**

The following fields are added to the output of this command:

• 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.
Show Commands and/or Outputs

• 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 following fields are added to the output of this command:

• 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 following fields are added to the output of this command:

• 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.