In this call flow we will look at how a terminating SMS is handled in GSM. Setting up a terminating SMS session is a multi-step process.

1. Interrogate the MSC to locate the subscriber
2. Setting SMS session setup and acquiring radio resources
3. Sending the SMS.
4. Releasing the session and associated radio resources.

**Paging Procedure**

The network pages the MS with the standard paging procedure.

**MAP SEND INFO FOR MT SMS**

**MAP/SEND ROUTING INFO FOR SM**

**MAP/D PROVIDE ROAMING NUMBER**

**MAP/D PROVIDE ROAMING NUMBER Result**

**MAP/C SEND ROUTING INFO FOR SM ACK**

**MAP FORWARD SHORT MESSAGE**

**Short Message Transfer**

Received as SMS message for transfer to a destination number.

**Mobile Number, Short message data, Send status report**

Once the GMSC has been identified, SC forwards the Short Message to it.

**Destination Mobile Number, Short message data, Send status report**

The SMS-GMSC requests routing information for the GSM subscriber from HLR.

The HLR has identified that the subscriber is currently being served by the Maryland MSC. The HLR then asks the Maryland MSC to assign a temporary roaming phone number to the subscriber.

The MSRN is then passed to the HLR.

HLR passes the MSRN to the GMSC.

The GMSC uses the MSRN to route the SMS call to Maryland MSC VLR.

The MSC requests the subscriber related information for mobile terminated SMS.
### Component Interfaces (GSM Mobile Terminated GSM)

<table>
<thead>
<tr>
<th>Cell</th>
<th>Mobile Network</th>
<th>EventStudio System Designer 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobile Station</td>
<td>Base Stations</td>
<td>VLR</td>
</tr>
<tr>
<td>GSM Mobile</td>
<td>BSS</td>
<td>HLR</td>
</tr>
<tr>
<td></td>
<td>Mobile Switching Center</td>
<td>SMS-GMSC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Service Center</td>
</tr>
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Now the MSC VLR needs to locate the subscriber in the location area. Since the location area might spawn several cells, a paging mechanism is used to locate the subscriber. The MSC uses a TMSI (Temporary Mobile Subscriber Identify) to address the mobile phone. The TMSI is used so as to protect the privacy of the called subscriber. Note that, the BSSMAP PAGING message will be sent to all the BSCs that handle the Maryland Location Area.

All cells in the location area will broadcast the Page message on the Paging Channel (PCH). All mobile phones listen to this channel every few seconds. The mobile is located in the Bethesda cell. It receives this page message.

### Begin RR Connection Establishment

**RR CHANNEL REQUEST**

**RR IMMEDIATE ASSIGNMENT**

**RR SABM + MM CM SERVICE REQUEST**

**RR UA**

**SCCP CONNECTION REQUEST + CM SERVICE REQUEST**

RR connection establishment is triggered by sending the Channel Request message. This message requests the Base Station System (BSS) for allocation for radio resources for the RR connection setup. The mobile now waits for an assignment on the Access Grant Channel (AGCH). At this point the mobile is listening to the AGCH for a reply.

The BSS transmits the radio resource assignment to the Mobile via the AGCH channel. The message also contains the time and frequency corrections. The time corrections allow the mobile to time its transmissions so that they reach the BSS only in the specified slot. The frequency corrections correct for the Doppler shift caused by the mobile's motion.

This is the first message that is sent after tuning to the channel. The Mobile initiates a LAPm connection with the BSC by sending a Set Asynchronous Balanced Mode (SABM) message. The service request message meant for the MSC is also sent in this message.

The BSS replies with Unnumbered Acknowledge (UA) to complete the LAPm setup handshake.

The BSS receives the RR Page Response message from the mobile and forms a "BSSMAP COMPLETE LAYER 3 INFORMATION". The BSS then piggybacks the message on the SCCP connection request message.

The MSC forwards the request to the VLR.
**Component Interfaces (GSM Mobile Terminated GSM)**

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<td>SMS-GMSC</td>
<td>Service Center</td>
</tr>
</tbody>
</table>

**LEG: Initiate Authentication Procedure**

1. **Obtain the tuple of (RAND, SRES, Kc)**
   - MM AUTHENTICATION REQUEST
   - MM AUTHENTICATION RESPONSE

2. **Enable Ciphering**
   - MAP SET CIPHERING MODE
   - MAP PROCESS ACCESS RESPONSE
   - MAP SEND INFO FOR MT SMS ACK
   - BSSMAP CIPHER MODE COMMAND
   - RR CIPHERING MODE COMMAND
     - mode = CLEAR
   - RR CIPHERING MODE COMPLETE
     - mode = CIPHERED
   - BSSMAP CIPHER MODE COMPLETE

3. **SMS sent from SC to Mobile**
   - SM RL DATA Req
   - SM RL DATA Req
   - SMS Deliver
   - The Service Center (SC) now sends the SMS to the GMSC.
   - The GMSC now sends the SMS to the MSC.
### Component Interfaces (GSM Mobile Terminated GSM)

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#### MM Connection Establishment

<table>
<thead>
<tr>
<th>Event</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CP-DATA</td>
<td>The SMS content is being carried in CP-DATA message sent from the MSC to the Mobile. The SMS payload is carried in the RPDU contained in the RPDATA.</td>
</tr>
<tr>
<td>CP-ACK</td>
<td>The CP-DATA is now acknowledged from the Mobile to the MSC.</td>
</tr>
<tr>
<td>CP-ACK</td>
<td>Mobile confirms the delivery of the SMS.</td>
</tr>
<tr>
<td>CP-DATA</td>
<td>This message signals to the GMSC that the SMS has been delivered to the terminating mobile.</td>
</tr>
<tr>
<td>SM-RL-REPORT-nd</td>
<td>The SMS Delivery report is now forwarded to the SC.</td>
</tr>
</tbody>
</table>

#### RR Connection Release

<table>
<thead>
<tr>
<th>Event</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BSSMAP CLEAR COMMAND</td>
<td>Call release has been completed, now the RR connection is released by the MSC.</td>
</tr>
<tr>
<td>RR CHANNEL RELEASE</td>
<td>The BSS initiates RR release with the mobile.</td>
</tr>
<tr>
<td>BSSMAP CLEAR COMPLETE</td>
<td>The BSS informs the MSC that the RR connection has been released.</td>
</tr>
<tr>
<td>RR DISC</td>
<td>The mobile sends a disconnect message to release the LAPm connection.</td>
</tr>
</tbody>
</table>

The BSC initiates a LAPm connection with the Mobile by sending a Set Asynchronous Balanced Mode (SABM) message.

The Mobile replies with Unnumbered Acknowledge (UA) to complete the LAPm setup handshake.

On successful transmission over Radio Connection CP-ACK is sent.

The CP-DATA is now acknowledged from the Mobile to the MSC.

Mobile confirms the delivery of the SMS.
The BSS replies with an Unnumbered Acknowledge message.