This scenario describes the call setup for a GSM originating call. A mobile user calling a landline subscriber is covered here.

**Begin RR Connection Establishment**

Call-related information needs to be transported from the mobile phone to the Mobile Switching Center (MSC). This requires the establishment of a Radio Resource (RR) connection to MSC. The first phase of the call setup just sets up this RR connection.

**RR CHANNEL REQUEST**

The RR connection establishment is triggered by sending the Channel Request message. This message requests the Base Station System (BSS) for allocation of 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.

**Note:** The RR CHANNEL REQUEST is sent on a Random Access Channel (RACH). This is a slotted aloha channel that can be used at random, without any coordination between the mobiles. Any mobile can transmit on this channel whenever it wishes. If two mobiles transmit on the channel at the same time, their messages will be lost in a collision. The mobiles will detect the collision via a timeout and retransmit the message after a random back off.

**RR IMMEDIATE ASSIGNMENT**

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.

**RR SABM + MM CM SERVICE REQUEST**

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.

**RR UA**

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

**SCCP CONNECTION REQUEST + MM CM SERVICE REQUEST**

The BSS receives the CM Service Request message from the mobile and forms a "BSSMAP COMPLETE LAYER 3 INFORMATION". The BSS then piggybacks the message on the SCCP connection request message.

**Enable Ciphering**

Since the subscriber has been successfully authenticated, the MSC initiates ciphering of the data being sent on the channel. The channel is ciphered so as to protect the call from eavesdropping.

**BSSMAP CIPHER MODE COMMAND**

The BSS sends the CIPHERING MODE COMMAND to the mobile. The mobile will be able to receive this message as the transmission from the BSS is still in clear.

**RR CIPHERING MODE COMPLETE**

Ciphering has already been enabled, so this message is transmitted with ciphering. The BSS will receive this message as it is already expecting ciphered data in the receive direction.

**BSSMAP CIPHER MODE COMPLETE**

BSS replies back to the MSC, indicating that ciphering has been successfully enabled.

**RR Connection Establishment Completed**

At this point, a connection has been setup between the Mobile and the MSC. From this point onward, the BSS is just acting as a conduit for transporting the signaling messages between the Mobile and the MSC.
Call Setup

**CC SETUP**
- Dialed Digits

**CC CALL PROCEEDING**
- The Mobile sends the setup message to establish a voice call. The message contains the dialed digits and other information needed for call establishment.
- The mobile is informed that the call setup is in progress.

**Mode Modify**

**BSSMAP ASSIGNMENT REQUEST**
- Voice circuit
- MSC informs the BSS about the allocated voice circuit. The call is also switched from signaling to voice.
- The BSS notifies the Mobile about the changeover to voice mode.
- Mobile acknowledges.

**RR CHANNEL MODE MODIFY**
- The BSS responds back to the MSC.

**RR CHANNEL MODE MODIFY ACKNOWLEDGE**
- The BSS informs the BSSMAP about the allocated voice circuit.
- The call is switched from signaling to voice.

**BSSMAP ASSIGNMENT COMPLETE**
- The BSS responds back to the MSC.

**ISUP INITIAL ADDRESS MESSAGE**
- SS7, Dialed Digits
- The MSC routes the call and sends the call towards the called subscriber.
- The PSTN indicates to the MSC that it has received all the digits and the called subscriber is being rung.
- The MSC informs the mobile that the called subscriber is being alerted via a ring.
- The called subscriber answers the call.

**CC ALERTING**
- The MSC informs the mobile that the called subscriber is being rung.

**ISUP ADDRESS COMPLETE MESSAGE**
- SS7
- The PSTN indicates to the MSC that it has received all the digits and the called subscriber is being rung.

**ISUP ANSWER**
- SS7
- The called subscriber answers the call.

**CC CONNECT**
- The MSC informs the mobile that the call has been answered.
- Acknowledge the receipt of **CC CONNECT**.

**Conversation**

**Speech**
- The call has entered the conversation phase. The speech path has been setup between the mobile subscriber and the land-line subscriber.

**Call Release**

**CC DISCONNECT**
- LEG: Mobile initiates call release
- The mobile sends the disconnect message to the MSC.
- The MSC initiates release on the PSTN side.

**ISUP RELEASE**
- SS7
- The MSC informs the Mobile that it has initiated call release
- The MSC informs the PSTN that the call release has been completed.
- The PSTN informs that call release has been completed at its end.
- Mobile indicates that the call has been released.

**ISUP RELEASED**
- SS7
- The MSC informs the Mobile that it has initiated call release.
- The PSTN informs that call release has been completed at its end.
- Mobile indicates that the call has been released.

**ISUP RELEASE COMPLETE**
- SS7
- The PSTN indicates that call release has been completed at its end.

**CC RELEASE COMPLETE**
- Mobile indicates that the call has been released.

**RR Connection Release**

**BSSMAP CLEAR COMMAND**
- Call release has been completed, now the RR connection is released by the MSC.
- The BSS initiates RR release with the mobile.
- The BSS informs the MSC that the RR connection has been released.
- The mobile sends a disconnect message to release the LAPm connection.
- The BSS replies with an Unnumbered Acknowledge message.