LEG: GSM Mobile Originated Call

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

Send Button

.. presses the Send button

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

RACH

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.

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

AGCH, Radio_Resource = (TCH, Frequency, Timeslot), Time Correction, Frequency Correction

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 it's 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.

Apply the time and frequency corrections

Adjust the frequency and timing based on the advice from the BSS. This step is required so that transmissions from the mobile reach the base station at the precise time and with the correct frequency.

Tune to the frequency and timeslot

The mobile detunes from the AGCH and tunes to the specified radio channel.

RR SABM + MM CM SERVICE REQUEST

TCH, SAPI = 0

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

TCH, SAPI = 0

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

LEG: Skip Authentication Procedure

Enable Ciphering

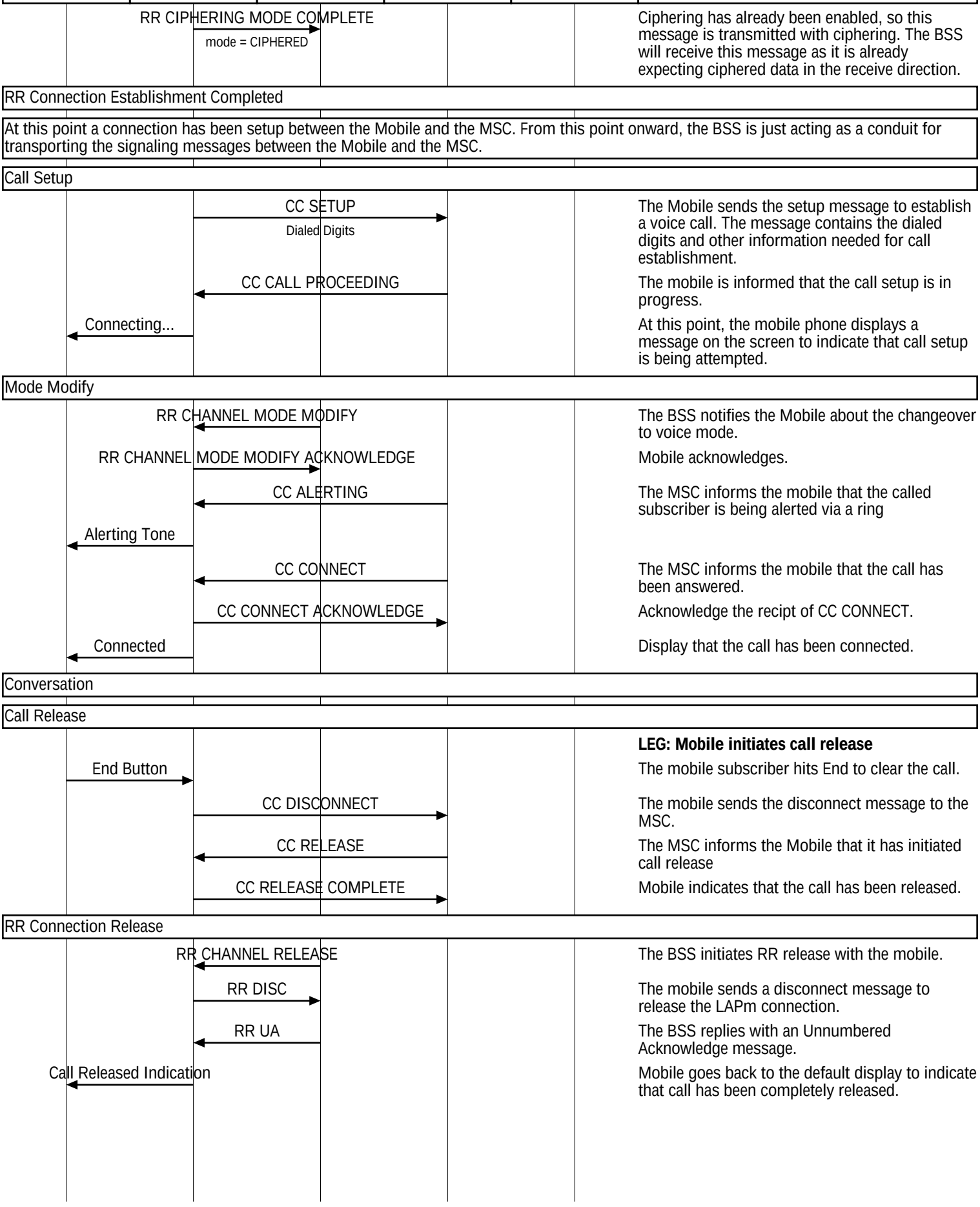
RR CIPHERING MODE COMMAND

mode = CLEAR

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.

Enable ciphering for received and transmitted data

As a second step, the Mobile receives the message and enables ciphering in transmit and receive directions. This action will result in all BSS data being received in error. (The BSS is still transmitting data in clear.)


RR CIPHERING MODE COMPLETE
mode = CIPHERED
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.
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
The Mobile sends the setup message to establish a voice call. The message contains the dialed digits and other information needed for call establishment.
CC CALL PROCEEDING
The mobile is informed that the call setup is in progress.
Connecting...
At this point, the mobile phone displays a message on the screen to indicate that call setup is being attempted.
Mode Modify
RR CHANNEL MODE MODIFY
The BSS notifies the Mobile about the changeover to voice mode.
RR CHANNEL MODE MODIFY ACKNOWLEDGE
Mobile acknowledges.
CC ALERTING
The MSC informs the mobile that the called subscriber is being alerted via a ring
Alerting Tone
CC CONNECT
The MSC informs the mobile that the call has been answered.
CC CONNECT ACKNOWLEDGE
Acknowledge the recipt of CC CONNECT.
Connected
Display that the call has been connected.
Conversation
Call Release
LEG: Mobile initiates call release
End Button
The mobile subscriber hits End to clear the call.
CC DISCONNECT
The mobile sends the disconnect message to the MSC.
CC RELEASE
The MSC informs the Mobile that it has initiated call release
CC RELEASE COMPLETE
Mobile indicates that the call has been released.
RR Connection Release
RR CHANNEL RELEASE
The BSS initiates RR release with the mobile.
RR DISC
The mobile sends a disconnect message to release the LAPm connection.
RR UA
The BSS replies with an Unnumbered Acknowledge message.
Call Released Indication
Mobile goes back to the default display to indicate that call has been completely released.