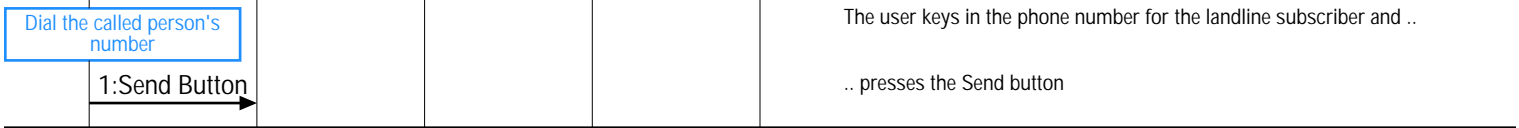


| GSM Call Flow (GSM Originating Call) | | | | | |
|--------------------------------------|--------|----------------|---------|---------------|---------------------------------|
| Cell | | Mobile Network | | Fixed Network | EventStudio System Designer 4.0 |
| Mobile Station | | Base Stations | NSS | PSTN | |
| User | Mobile | BSS | MSC VLR | PSTN | 23-Feb-07 06:54 (Page 1) |

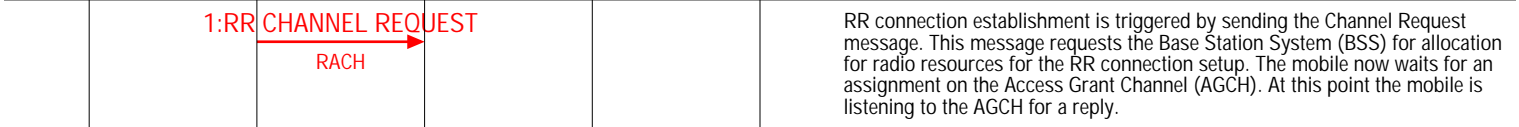
LEG: GSM Mobile Originated Call

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

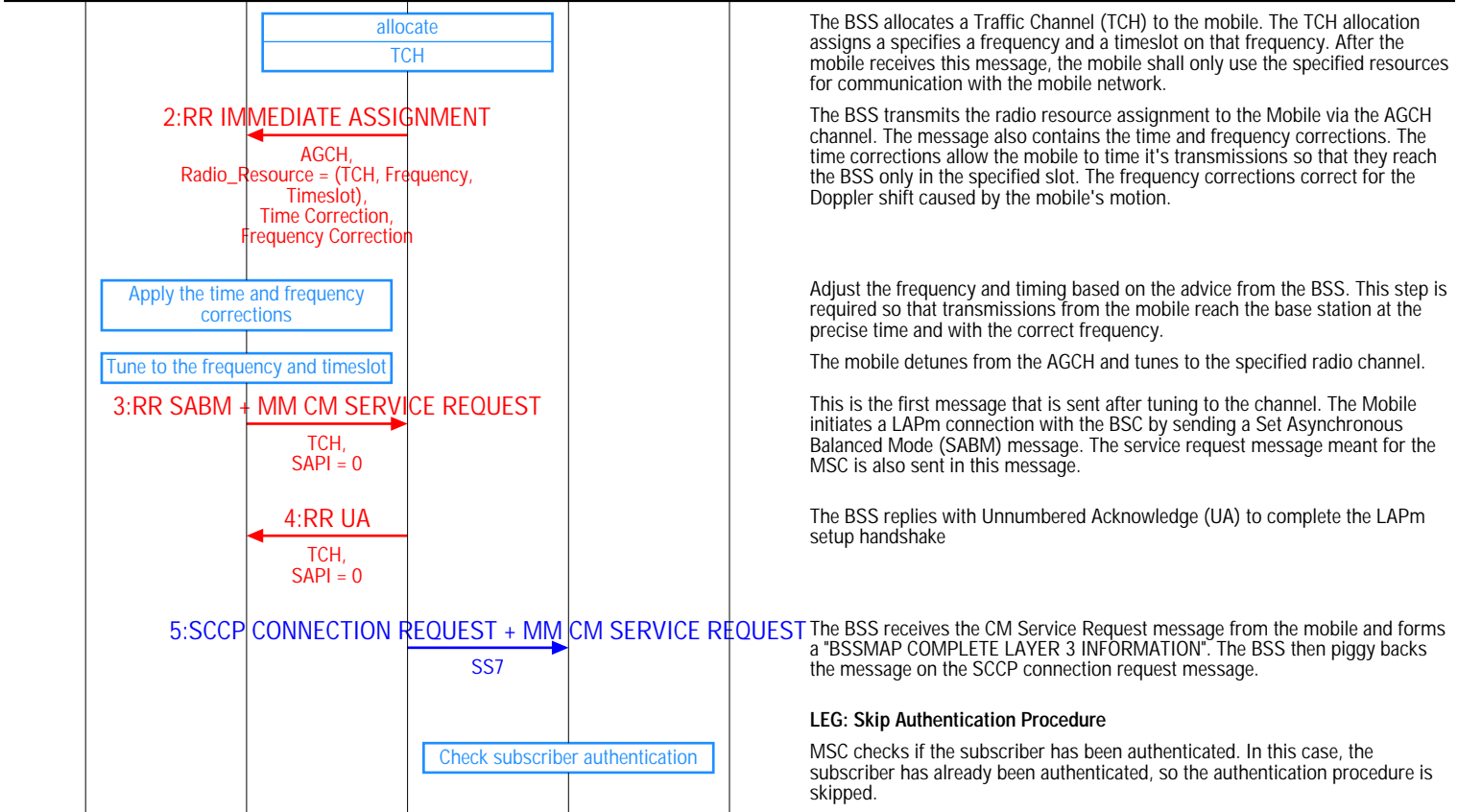


Begin RR Connection Establishment

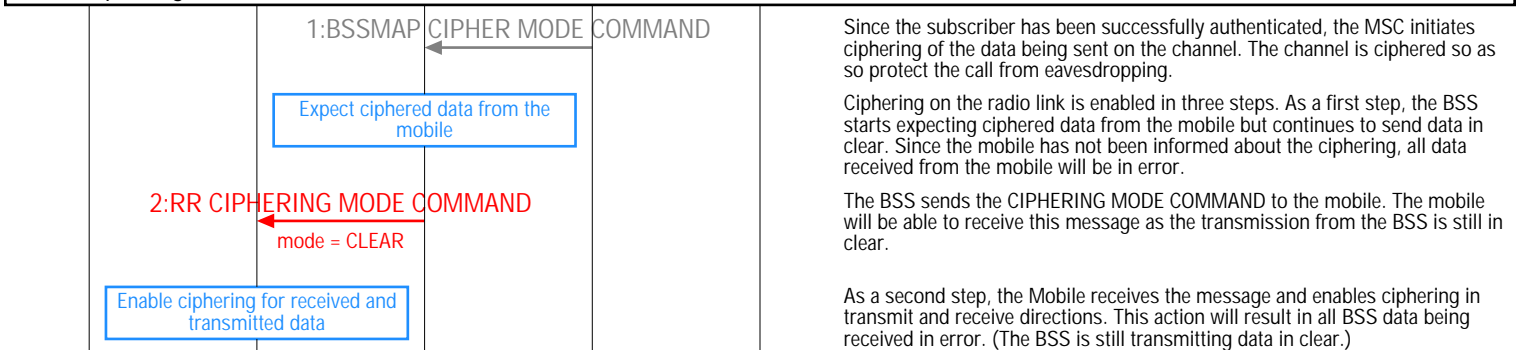
Call related information needs to be transported from the mobile phone to the Mobile Switching Center (MSC). This requires the establishment of a Radio Resource (RR) connection to MSC. The first phase of the call setup just sets up this RR connection.



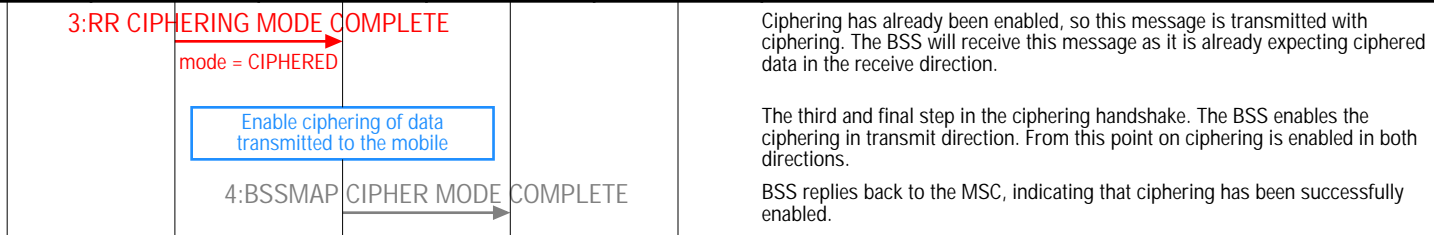
Note: The RR CHANNEL REQUEST is sent on a Random Access Channel (RACH). This is a slotted aloha channel that can be used at random, without any coordination between the mobiles. Any mobile can transmit on this channel whenever it wishes. If two mobiles transmit on the channel at the same time, their 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.



Enable Cipherng



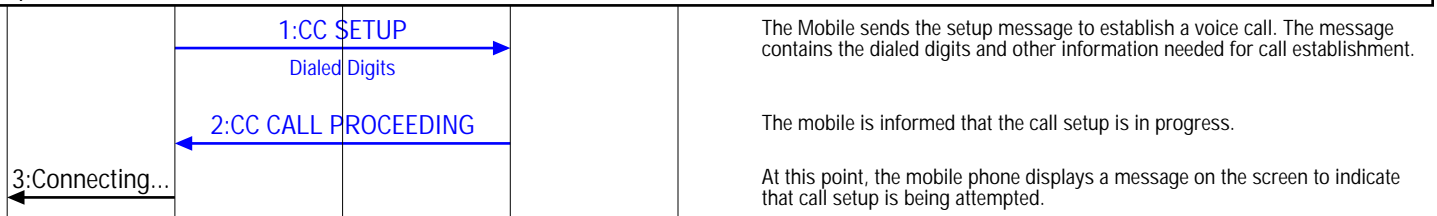
| GSM Call Flow (GSM Originating Call) | | | | |
|--------------------------------------|--------|----------------|---------|---------------|
| Cell | | Mobile Network | | Fixed Network |
| Mobile Station | | Base Stations | NSS | PSTN |
| User | Mobile | BSS | MSC VLR | PSTN |
| EventStudio System Designer 4.0 | | | | |
| 23-Feb-07 06:54 (Page 2) | | | | |



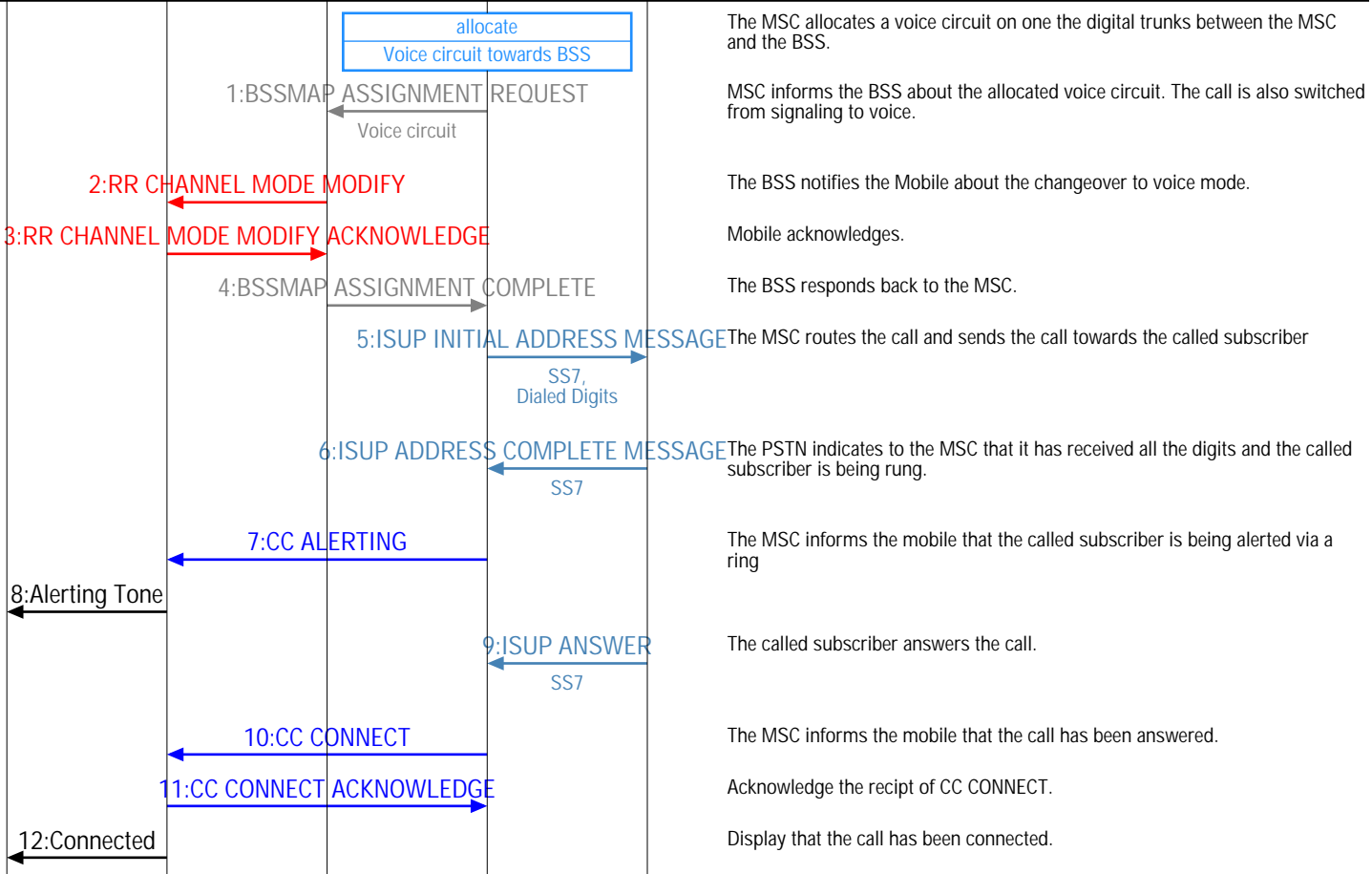
RR Connection Establishment Completed

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.

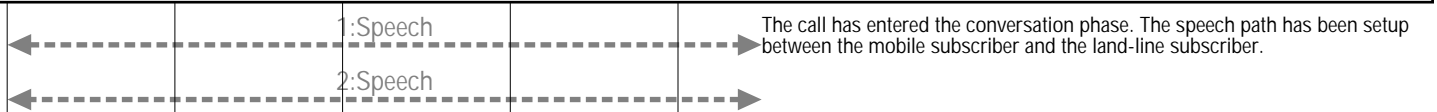
Call Setup



Mode Modify



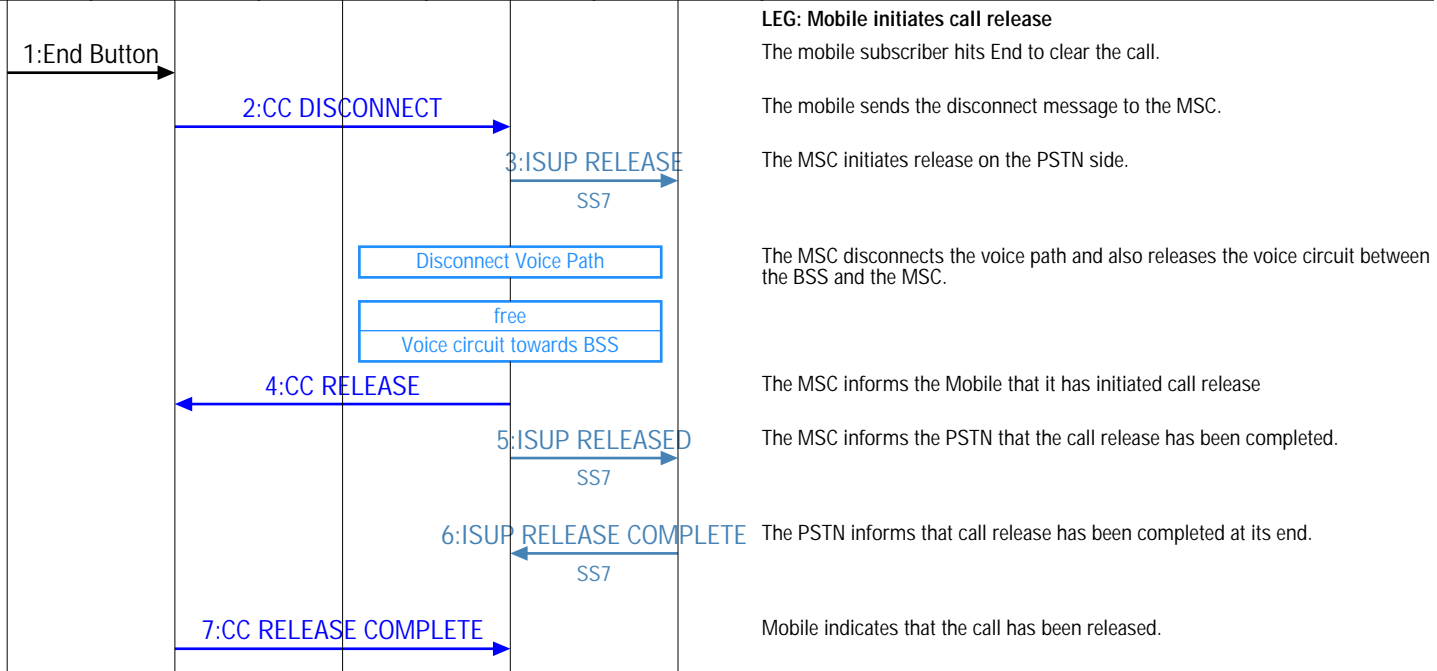
Conversation



Call Release

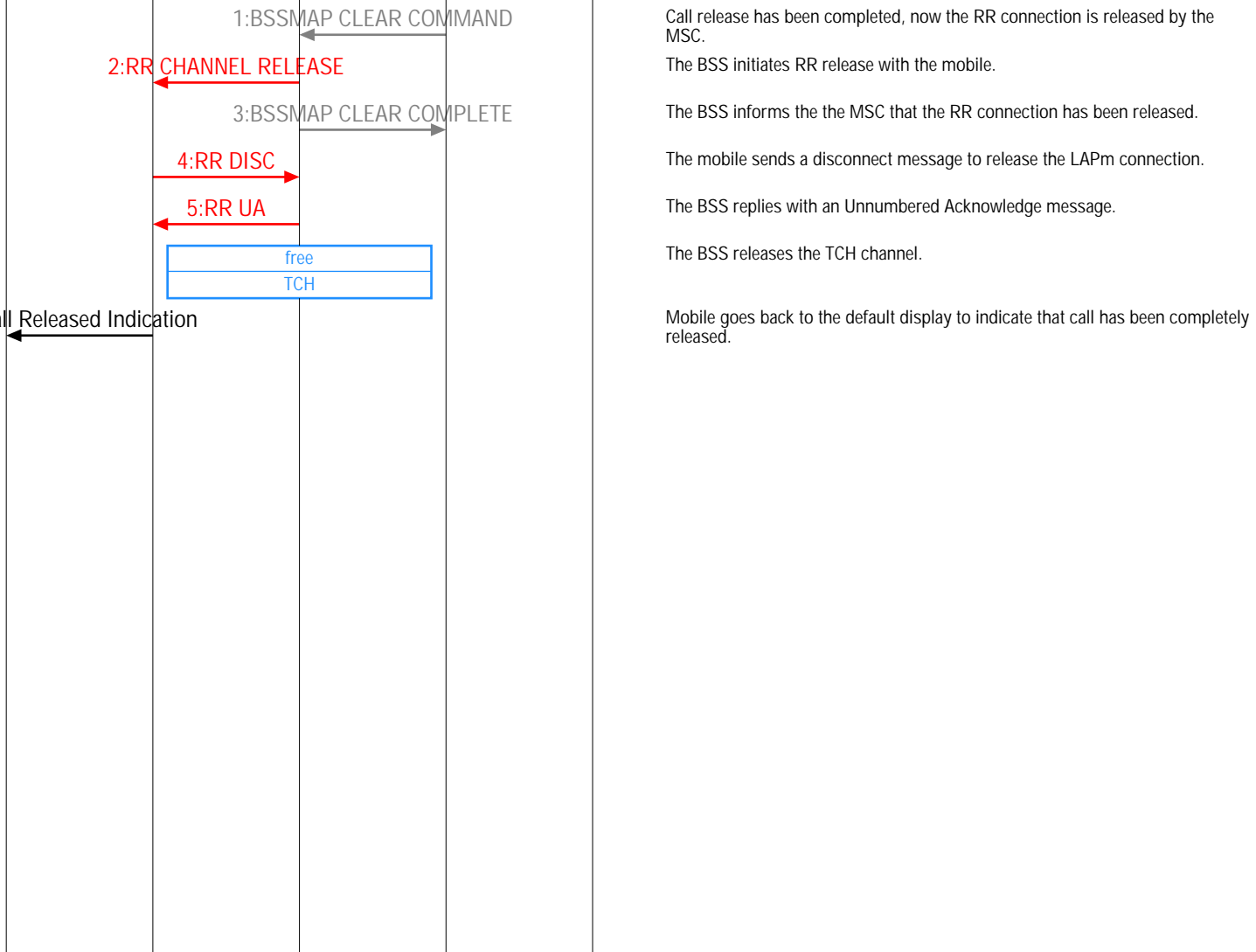
GSM Call Flow (GSM Originating Call)

| | | | | | |
|----------------|--------|----------------|---------|---------------|---------------------------------|
| Cell | | Mobile Network | | Fixed Network | EventStudio System Designer 4.0 |
| Mobile Station | | Base Stations | NSS | PSTN | |
| User | Mobile | BSS | MSC VLR | PSTN | 23-Feb-07 06:54 (Page 3) |



LEG: Mobile initiates call release
 The mobile subscriber hits End to clear the call.
 The mobile sends the disconnect message to the MSC.
 The MSC initiates release on the PSTN side.
 The MSC disconnects the voice path and also releases the voice circuit between the BSS and the MSC.
 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.

RR Connection Release



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 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.
 The BSS releases the TCH channel.
 Mobile goes back to the default display to indicate that call has been completely released.

| GSM Call Flow (Mobile Terminated Call) | | | | | |
|--|--------|----------------|---------|---------------|---------------------------------|
| Cell | | Mobile Network | | Fixed Network | EventStudio System Designer 4.0 |
| Mobile Station | | Base Stations | NSS | PSTN | |
| User | Mobile | BSS | MSC VLR | PSTN | 23-Feb-07 06:54 (Page 4) |

LEG: GSM Mobile Terminated Call

1: BSSMAP PAGING

2: RR PAGING REQUEST TYPE 1

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.

1: 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.

allocate

TCH

2: RR IMMEDIATE ASSIGNMENT

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

The BSS allocates a Traffic Channel (TCH) to the mobile. The TCH allocation assigns a specifies a frequency and a timeslot on that frequency. After the mobile receives this message, the mobile shall only use the specified resources for communication with the mobile network.

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.

3: RR SABM + RR PAGING RESPONSE

TCH,
SAPI = 0

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

4: RR UA

TCH,
SAPI = 0

5: 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 piggy backs the message on the SCCP connection request message.

SS7

LEG: Initiate Authentication Procedure

Obtain the tuple of (RAND, SRES, Kc)

6: MM AUTHENTICATION REQUEST

RAND

7: MM AUTHENTICATION RESPONSE

SRES

Enable Ciphering

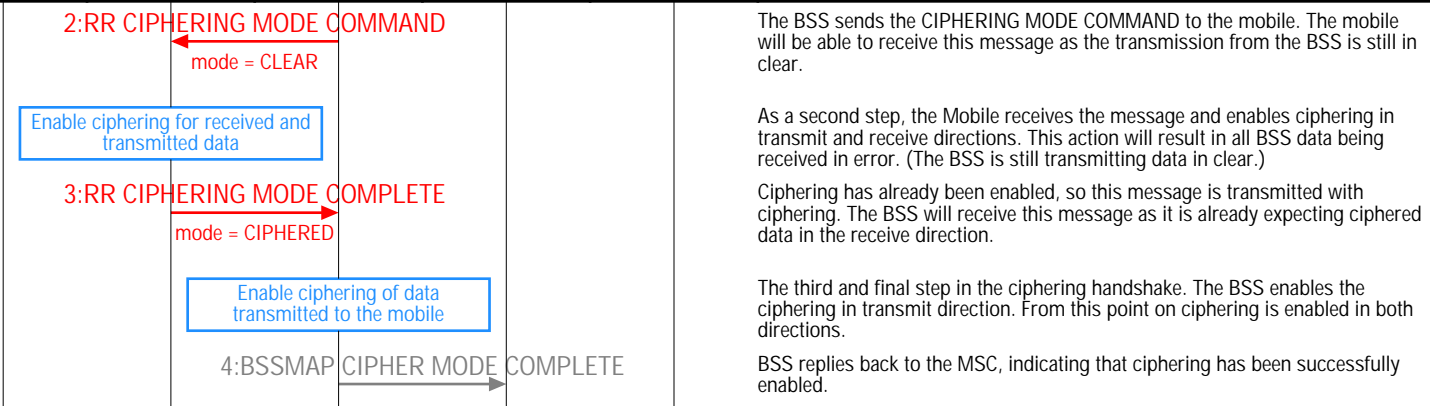
1: BSSMAP CIPHER MODE COMMAND

Expect ciphered data from the mobile

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.

Ciphering on the radio link is enabled in three steps. As a first step, the BSS starts expecting ciphered data from the mobile but continues to send data in clear. Since the mobile has not been informed about the ciphering, all data received from the mobile will be in error.

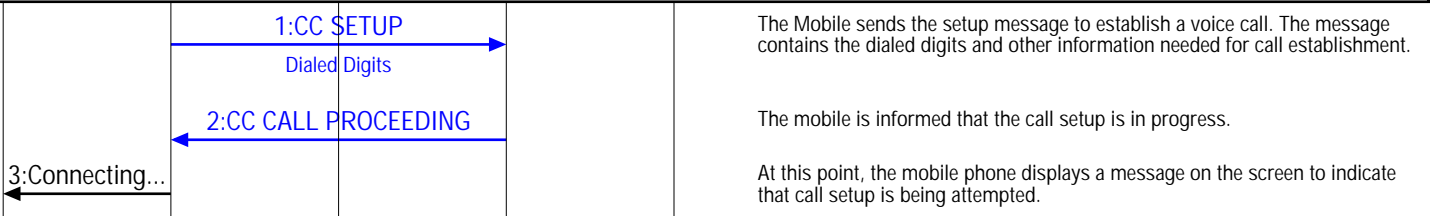
| GSM Call Flow (Mobile Terminated Call) | | | | |
|--|--------|----------------|---------|---------------|
| Cell | | Mobile Network | | Fixed Network |
| Mobile Station | | Base Stations | NSS | PSTN |
| User | Mobile | BSS | MSC VLR | PSTN |
| EventStudio System Designer 4.0 | | | | |
| 23-Feb-07 06:54 (Page 5) | | | | |



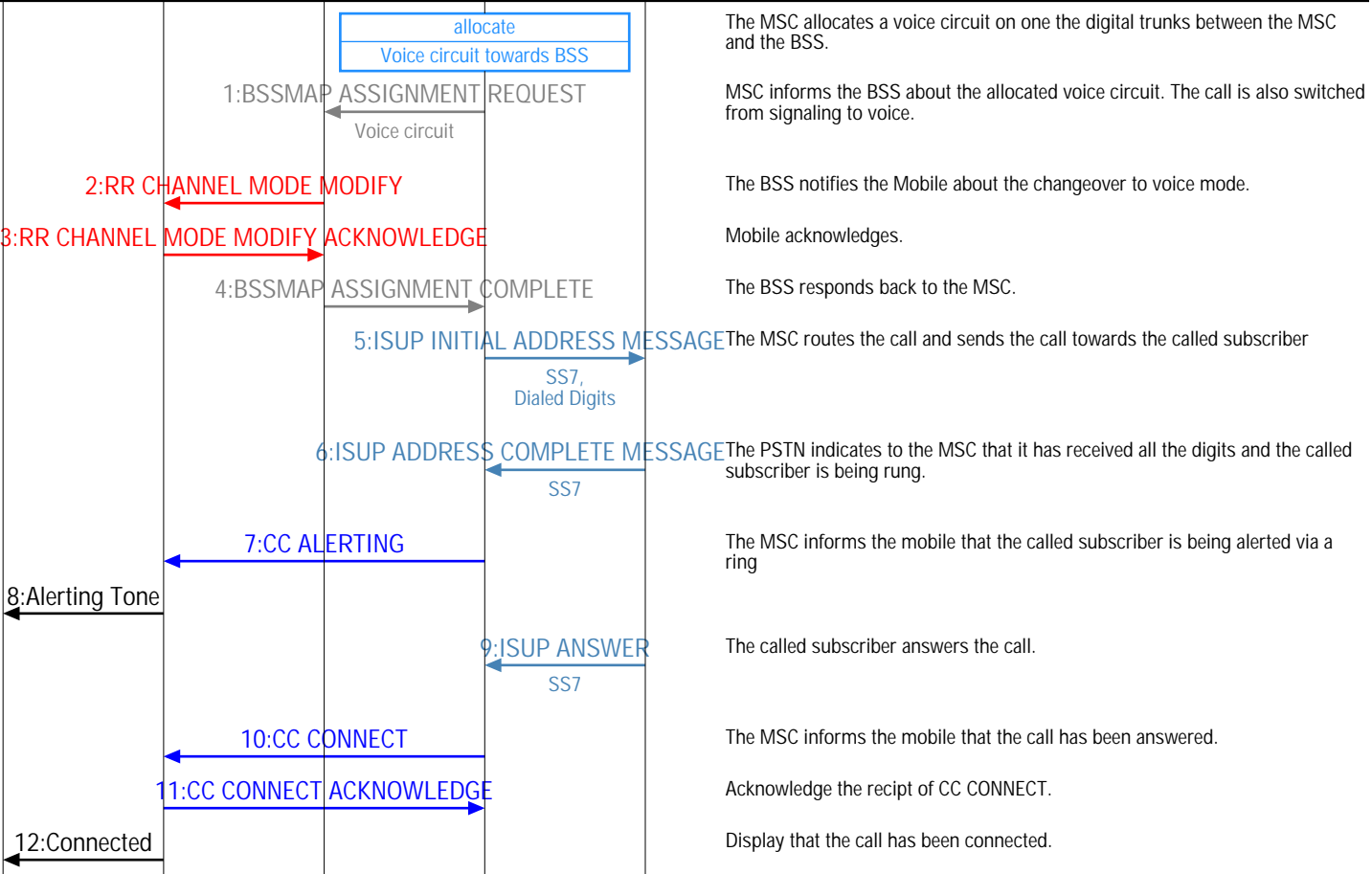
RR Connection Establishment Completed

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

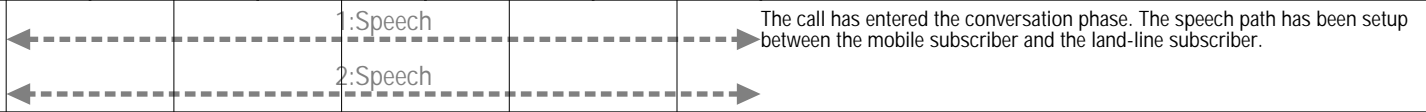


Mode Modify

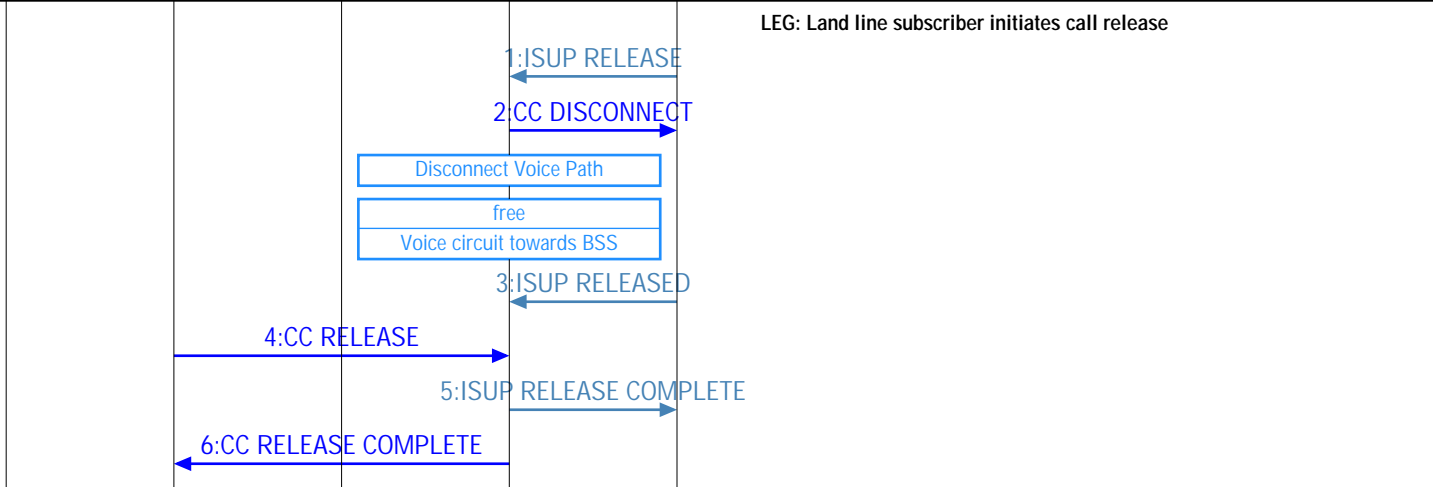


Conversation

| GSM Call Flow (Mobile Terminated Call) | | | | | |
|--|--------|----------------|---------|---------------|---------------------------------|
| Cell | | Mobile Network | | Fixed Network | EventStudio System Designer 4.0 |
| Mobile Station | | Base Stations | NSS | PSTN | |
| User | Mobile | BSS | MSC VLR | PSTN | 23-Feb-07 06:54 (Page 6) |



Call Release



RR Connection Release

