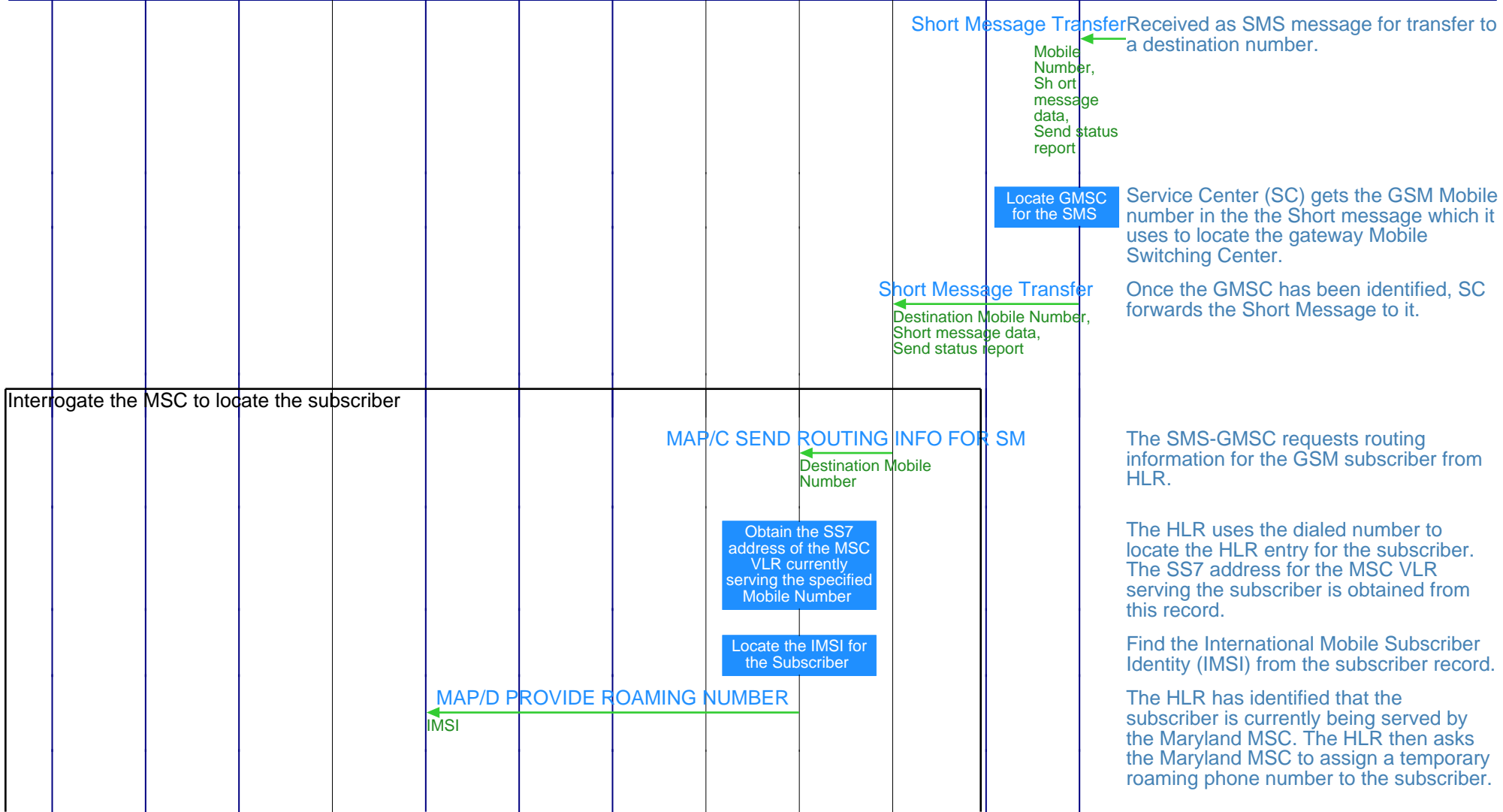


GSM Mobile Terminating SMS Call Flow (GSM Mobile Terminated GSM)

Cell			Mobile Network								EventStudio System Designer 6		
Mobile Station			Base Stations	NSS								21-Jan-14 16:59 (Page 1)	
GSM Mobile			BSS	Mobile Switching Center			VLR	HLR	SMS-GMSC	Service Center			
Mobile	SM-RL-Mob	CM-Sub-Mo	BSS	MSC	CM-Sub-MS	SM-RL-MS	VLR	HLR	SMS-GMSC	SM-TL-SC	SC		

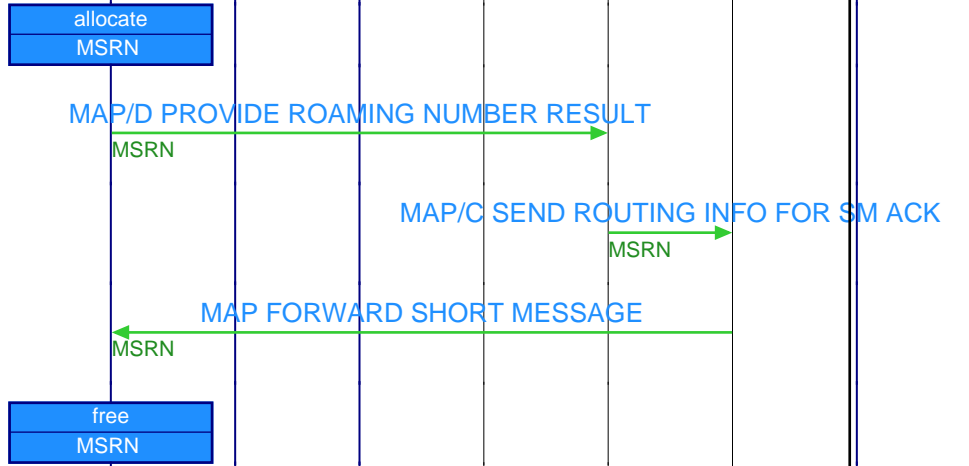
In this call flow we will look at how a terminating SMS is handled in GSM. Setting up a terminating SMS session is a multi-step process.

- (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.



GSM Mobile Terminating SMS Call Flow (GSM Mobile Terminated GSM)

Cell			Mobile Network									EventStudio System Designer 6		
Mobile Station			Base Stations	NSS									21-Jan-14 16:59 (Page 2)	
GSM Mobile			BSS	Mobile Switching Center			VLR	HLR	SMS-GMSC	Service Center				
Mobile	SM-RL-Mob	CM-Sub-Mo	BSS	MSC	CM-Sub-MS	SM-RL-MS	VLR	HLR	SMS-GMSC	SM-TL-SC	SC			



The Maryland VLR allocates a temporary roaming phone number (MSRN -Mobile Station Roaming Number)

The MSRN is then passed to the HLR.

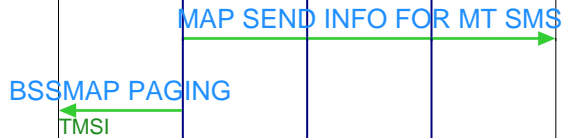
HLR passes the MSRN to the GMSC.

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

The Maryland MSC VLR receives the SMS call. At this point, the MSRN is marked free and may be reassigned for other calls.

Paging Procedure

The network pages the MS with the standard paging procedure.



Multicast RR PAGING REQUEST (TMSI) to all the cells that serve the subscriber's location area



The MSC requests the subscriber related information for mobile terminated SMS.

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.

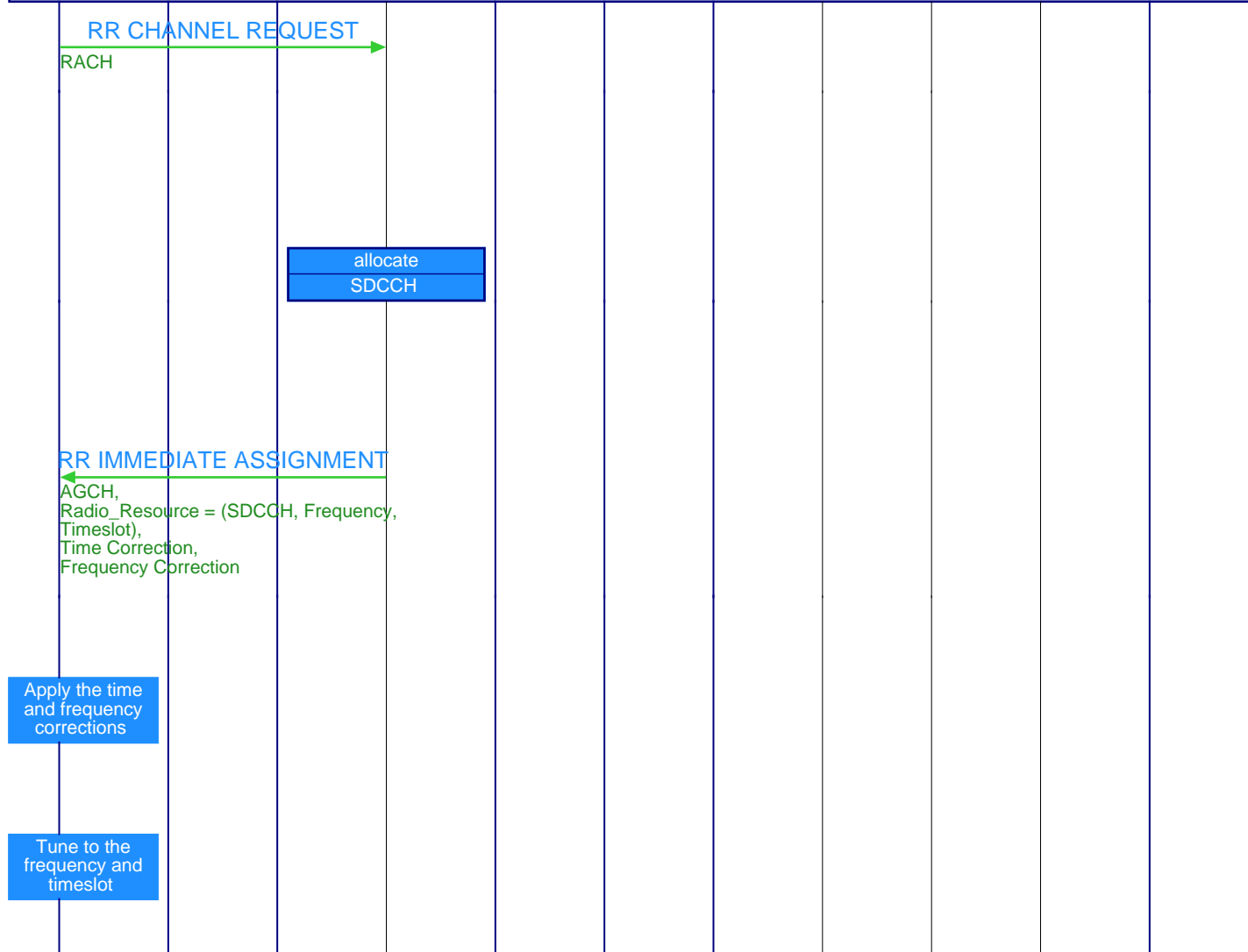
The Maryland BSC receives the page message. The BSC will send the Page message to all the cells that serve the subscriber's location area.

All cells in the location area will broadcast the Page message on the Paging Channel (PCH). All mobile phones listen

GSM Mobile Terminating SMS Call Flow (GSM Mobile Terminated GSM)												
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Mobile Station			Base Stations	NSS								
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Mobile	SM-RL-Mob	CM-Sub-Mo	BSS	MSC	CM-Sub-MS	SM-RL-MS	VLR	HLR	SMS-GMSC	SM-TL-SC	SC	

to this channel every few seconds. The mobile is located in the Bethesda cell. It receives this page message.

Begin RR Connection Establishment



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 allocates a Stand-alone Dedicated Control Channel (SDCCH) to the mobile. The SDCCH allocation assigns a specific 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 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.

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.

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

GSM Mobile Terminating SMS Call Flow (GSM Mobile Terminated GSM)												
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RR SABM + MM CM SERVICE REQUEST

SDCCH, RR PAGING RESPONSE

RR UA
SDCCH

SCCP CONNECTION REQUEST + CM SERVICE REQUEST

SS7, RR PAGING RESPONSE

MAP PROCESS ACCESS REQUEST

Obtain the tuple of (RAND, SRES, Kc)

Obtain the tuple of (RAND, SRES, Kc)

MM AUTHENTICATION REQUEST
RAND

MM AUTHENTICATION RESPONSE
SRES

Enable Ciphering

MAP SET CIPHERING MODE

MAP PROCESS ACCESS RESPONSE

MAP SEND INFO FOR MT SMS ACK

BSSMAP CIPHER MODE COMMAND

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 piggy backs the message on the SCCP connection request message.

The MSC forwards the request to the VLR.

LEG: Initiate Authentication Procedure

VLR initiates ciphering.

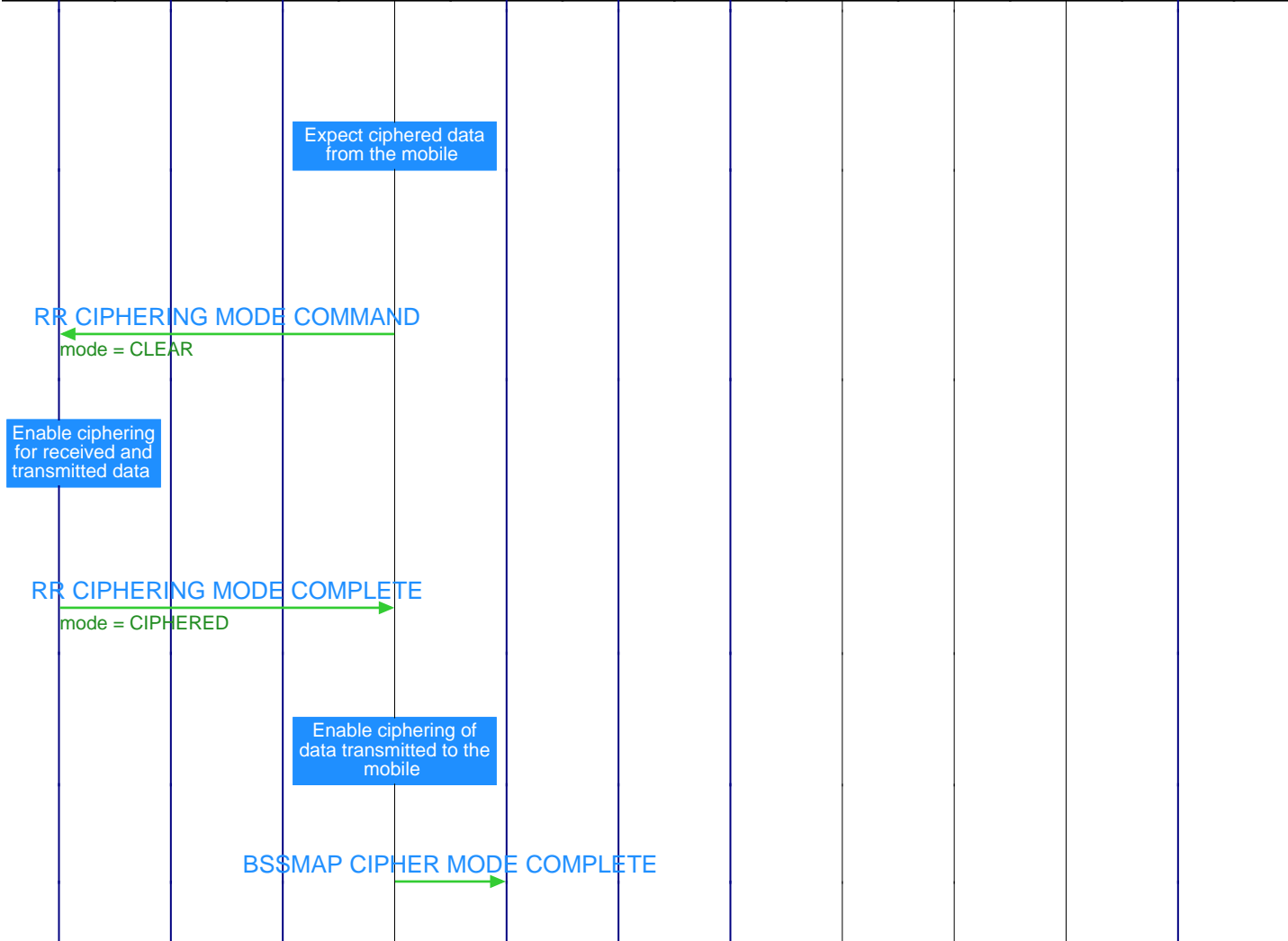
At this point the VLR responds back to the MSC. This message is a response to the "MAP PROCESS ACCESS REQUEST" that was received earlier.

Finally, VLR acknowledges "MAP SEND INFO FOR MT SMS".

Since the subscriber has been successfully authenticated, the MSC

GSM Mobile Terminating SMS Call Flow (GSM Mobile Terminated GSM)

Cell			Mobile Network									EventStudio System Designer 6	
Mobile Station			Base Stations	NSS									
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Mobile	SM-RL-Mob	CM-Sub-Mo	BSS	MSC	CM-Sub-MS	SM-RL-MS	VLR	HLR	SMS-GMSC	SM-TL-SC	SC	21-Jan-14 16:59 (Page 5)	



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.

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.

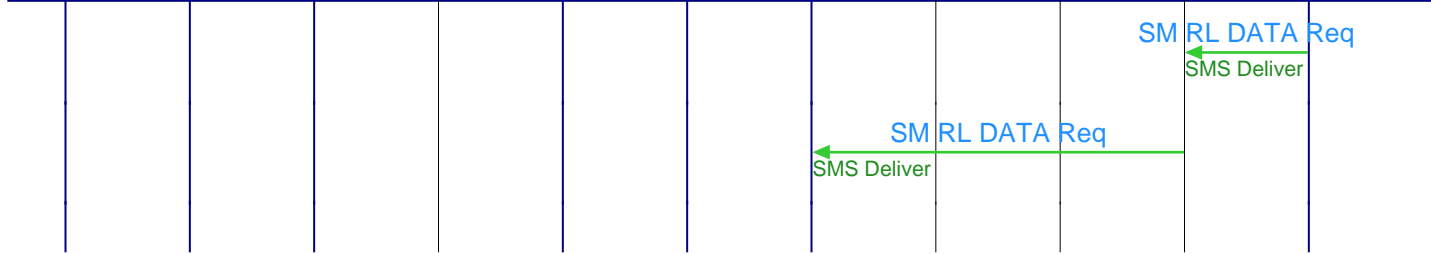
As a second step, the Mobile receives the message and enables ciphering in transmit and receive directions. This action will result in all BSS data being received in error. (The BSS is still transmitting data in clear.)

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.

The third and final step in the ciphering handshake. The BSS enables the ciphering in transmit direction. From this point on ciphering is enabled in both directions.

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

SMS sent from SC to Mobile

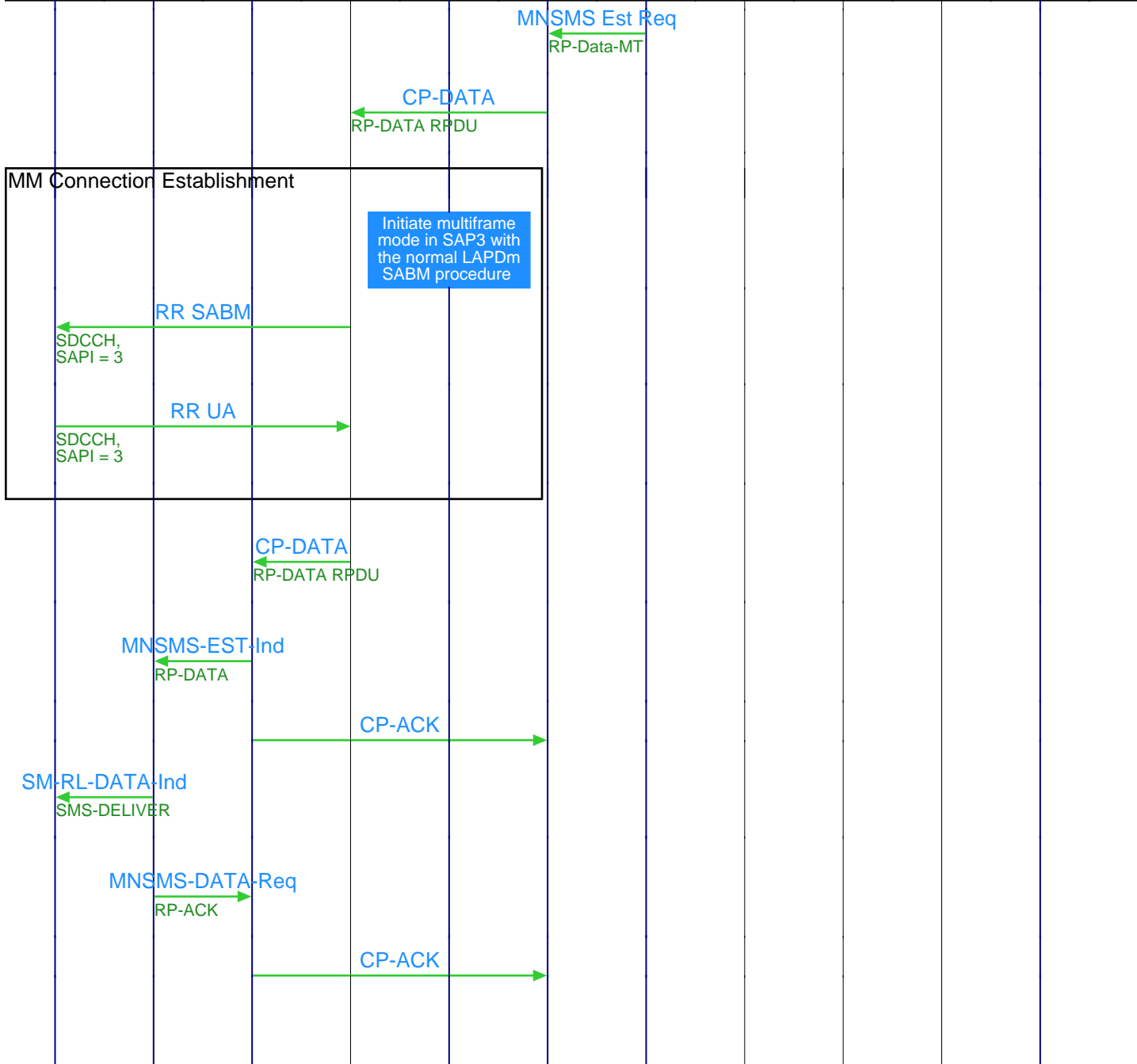


The Service Center (SC) now sends the SMS to the GMSC.

The GMSC now sends the SMS to the MSC.

GSM Mobile Terminating SMS Call Flow (GSM Mobile Terminated GSM)

Cell			Mobile Network									EventStudio System Designer 6		
Mobile Station			Base Stations	NSS									21-Jan-14 16:59 (Page 6)	
GSM Mobile			BSS	Mobile Switching Center			VLR	HLR	SMS-GMSC	Service Center				
Mobile	SM-RL-Mob	CM-Sub-Mo	BSS	MSC	CM-Sub-MS	SM-RL-MS	VLR	HLR	SMS-GMSC	SM-TL-SC	SC			



The RL layer requests an MM connection to the mobile for sending the RP-DATA.

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

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.

The CM-Sub layer on the Mobile passes the message to the relay layer. The RP-DATA is passed in this interaction.

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

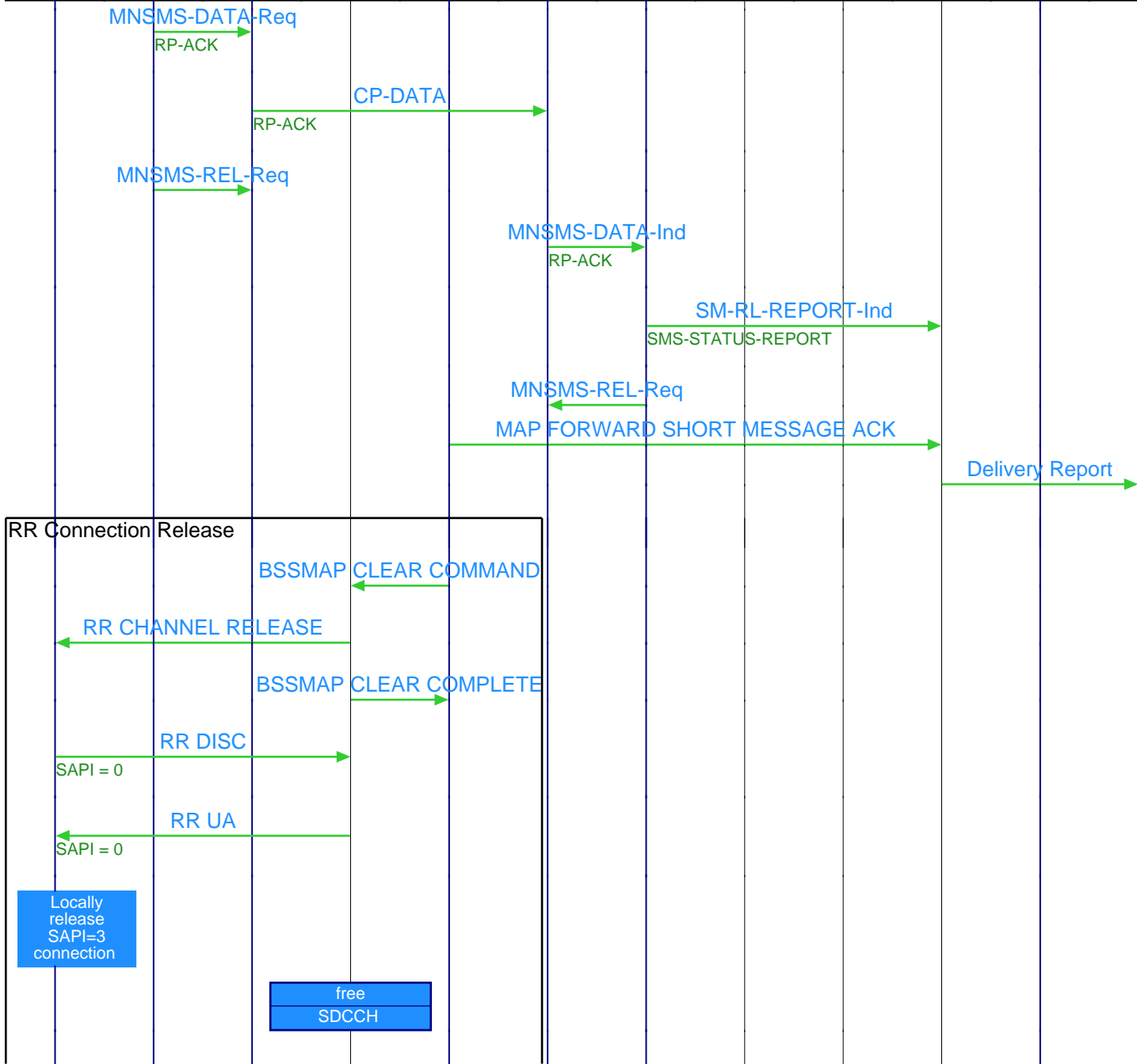
SM-RL-DATA-Ind is a message used by SM-RL to pass SMS-DELIVER TPDU and the associated RP-DATA to SM-TL at the Mobile.

Acknowledging the SMS.

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

GSM Mobile Terminating SMS Call Flow (GSM Mobile Terminated GSM)

Cell			Mobile Network									EventStudio System Designer 6
Mobile Station			Base Stations	NSS								
GSM Mobile			BSS	Mobile Switching Center			VLR	HLR	SMS-GMSC	Service Center		
Mobile	SM-RL-Mob	CM-Sub-Mo	BSS	MSC	CM-Sub-MS	SM-RL-MS	VLR	HLR	SMS-GMSC	SM-TL-SC	SC	21-Jan-14 16:59 (Page 7)



Mobile sends a message to acknowledge the receipt of the SMS.

Mobile confirms the delivery of the SMS.

Now the Mobile initiates the release of the MM connection.

The RP-ACK received from the mobile is delivered to the SM-RL layer of MSC.

This message signals to the GMSC that the SMS has been delivered to the terminating mobile.

MSC initiates the MM connection release

The SMS Delivery report is now forwarded to the SC.

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.

The network releases the SDCCH with the RR Channel Release message. This implies a closure of the MM sub-layer and

