

3GPP LCS Workshop
London, England
January 11th – 12th 2001

LCS 010003



*GSM LCS Overview
Assisted GPS Perspective*

January 11, 2001

- Key GSM LCS Specifications
- Modes of Operation
- Network Reference Model
- Interfaces and Protocols
- Call Flows
 - High Level
 - End-to-End
- Broadcast
- Ls / Lb Open Interface

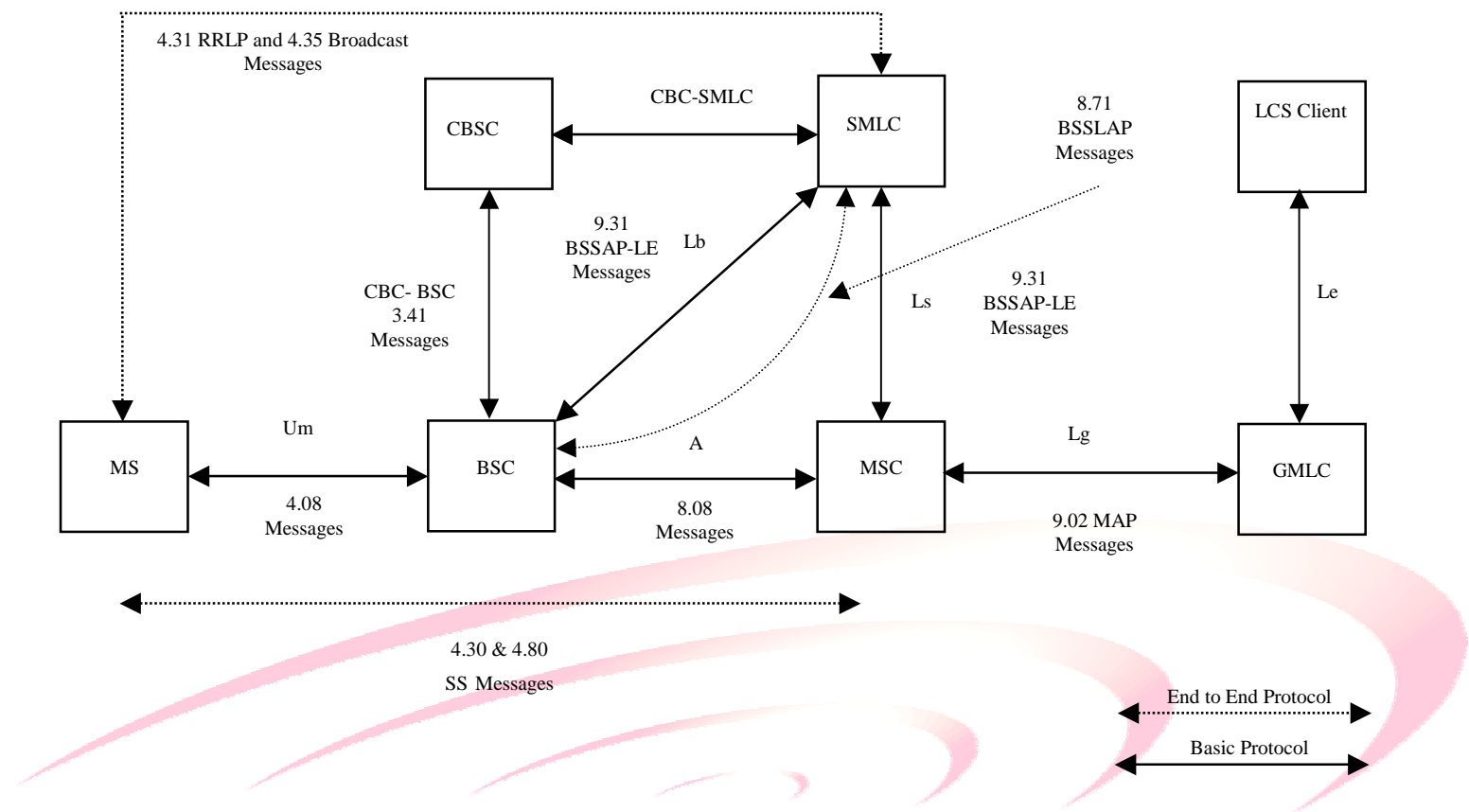
Key GSM LCS Standards

- Stage 1 – GSM 02.71
 - Functionality and Service Description
- Stage 2 – GSM 03.71
 - Network Reference Model
 - Call Flows
 - Positioning Technologies
- Stage 3 – Multiple Specifications
 - New Specifications
 - GSM 04.31 RRLP and GSM 04.35 Broadcast
 - GSM 08.71 and GSM 09.31 SMLC Interfaces
 - GSM 04.30 Supplementary Services (MO-LR)
 - Modified Specifications
 - GSM 03.41, GSM 04.08, GSM 04.80, GSM 08.08, GSM 09.02

Modes of Operation

- MS- Assisted GPS
 - MS-Assisted GPS is defined as an implementation where assistance data is provided to the MS, by the SMLC, such that the MS can acquire GPS satellite signals and determine their corresponding pseudorange measurements. These time-stamped satellite pseudoranges are returned to the SMLC, where the location estimate is then calculated.
- MS-Based GPS
 - MS-Based GPS is defined as an implementation where assistance data is provided to the MS, by the SMLC, such that the MS can calculate its own location estimate.

Network Reference Model



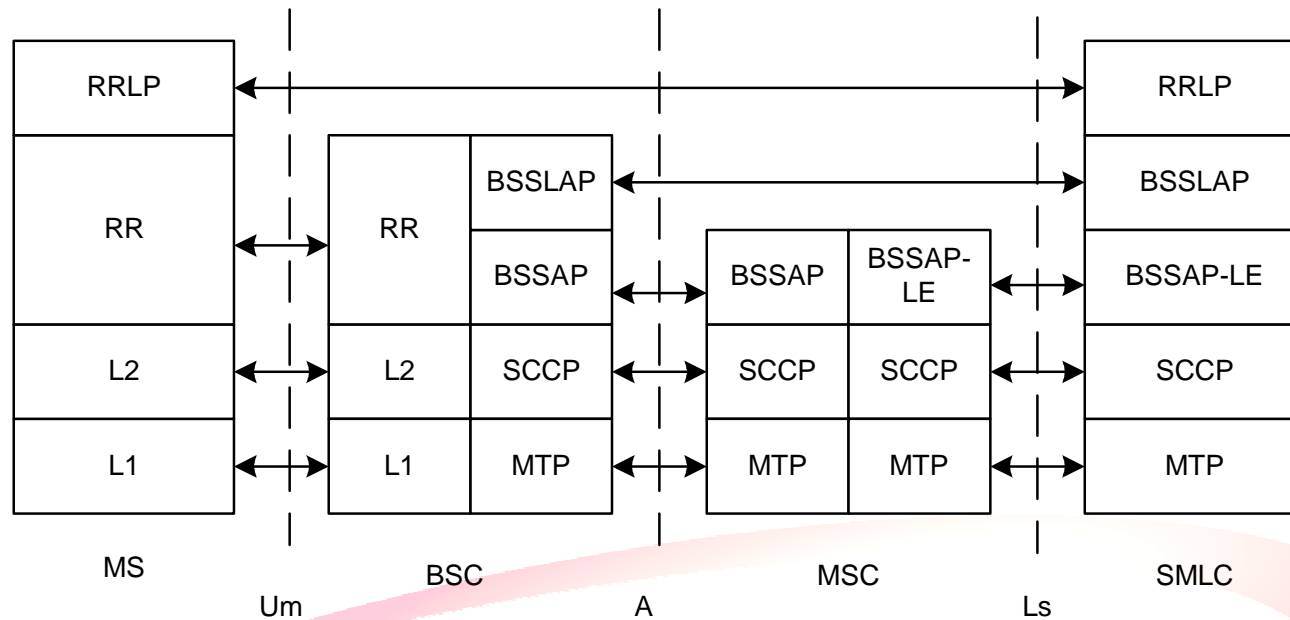
Interfaces and Protocols (1)

- Um – GSM 04.08
 - New RR Message
 - Application Information Message
 - Carries RRLP Messages
- A – GSM 08.08
 - Essentially a Pipe
- Lg – GSM 09.02
 - New Map Messages
 - MAP Subscriber Location Report
 - MAP Provide Subscriber Location
- Le – Not specified, API suggested in GSM 02.71
 - J-STD-036 in North America defines one instance of Le

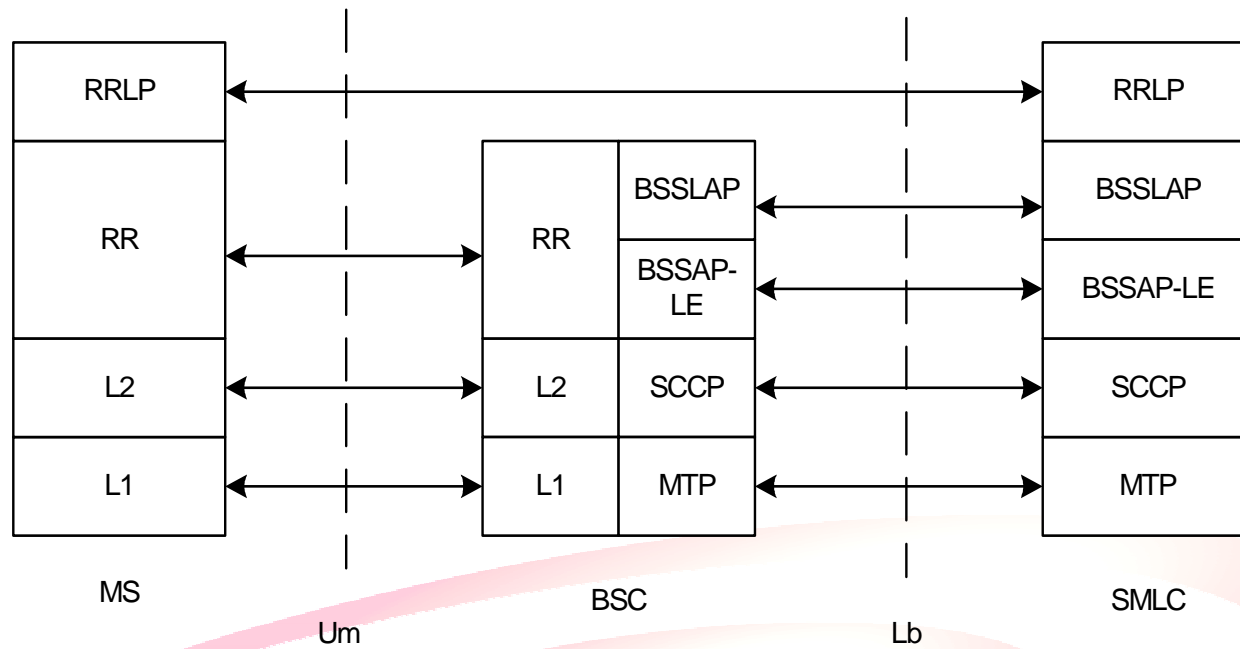
Interfaces and Protocols (2)

- Lb / Ls – GSM 09.31
 - Ls implies NSS based SMLC, Lb implies BSS based SMLC
 - Protocol referred to as BSSAP-LE
 - Perform Location Request / Response
 - Connection Oriented Information
 - Carries RRLP Messages
- BBSLAP – GSM 08.71
 - End-to-End protocol between BSC and SMLC
 - Carries radio specific data such as TA
- RRLP – GSM 04.31
- Broadcast – GSM 04.35

NSS Based SMLC Protocol Stacks



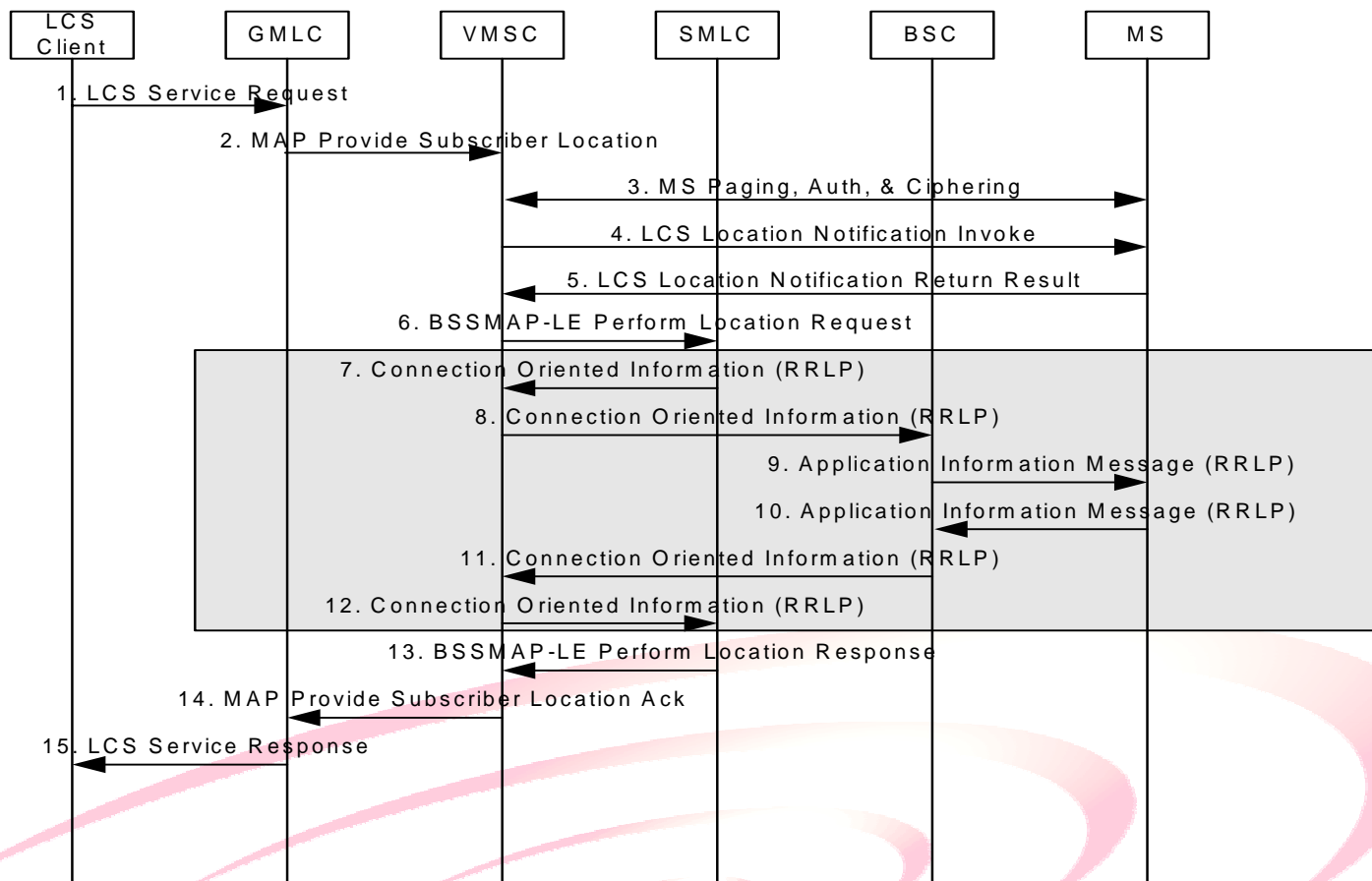
BSS Based SMLC Protocol Stacks



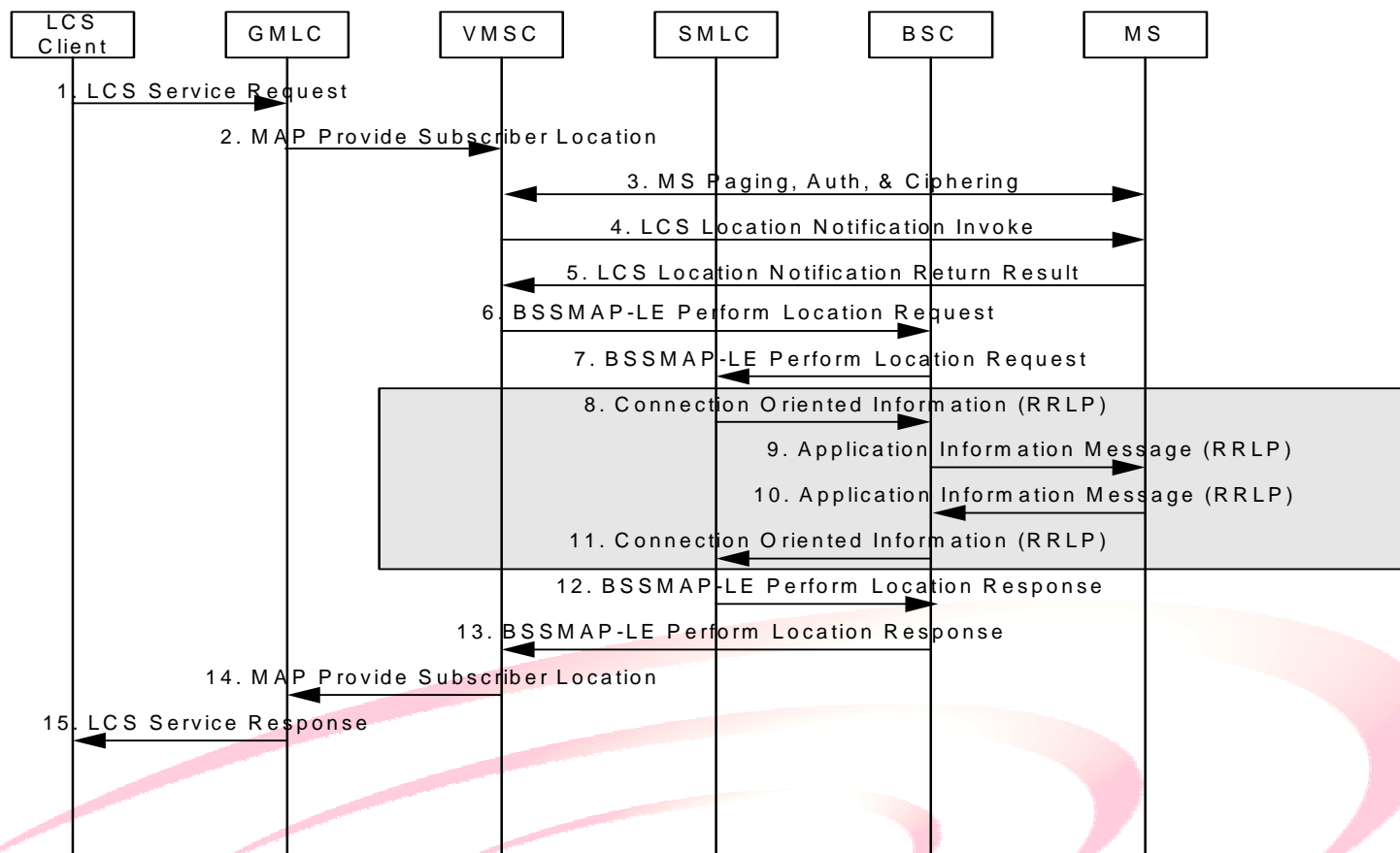
MT Call Flows

- All MT Call Flows are requests for the MS's current location
- Supplementary Service mechanisms used for user notification
- SMLC invoked via a Perform Location Request
 - Contains: Request Type (location estimate), Cell ID, Priority, QoS, Classmark, etc
- SMLC then sends an RRLP Measure Position Request Message to MS
 - Contains:
 - Instructions regarding mode of operation
 - MS-Assisted or MS-Based preference
 - Some amount of assistance data

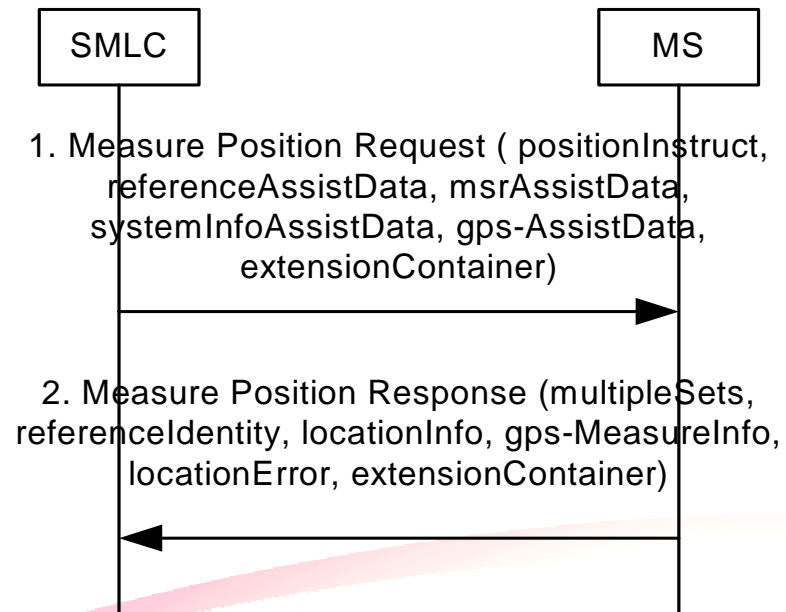
MT Call Flow – NSS Based SMLC



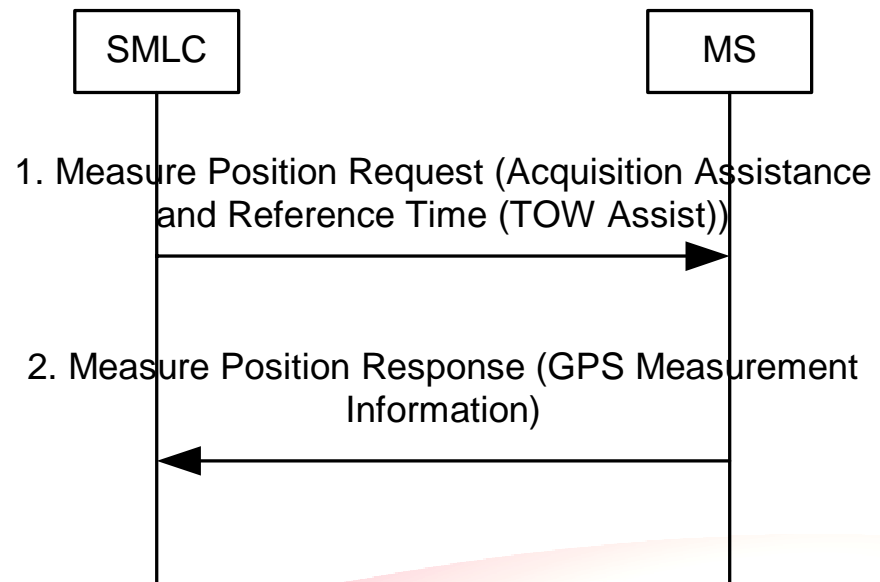
MT Call Flow – BSS Based SMLC



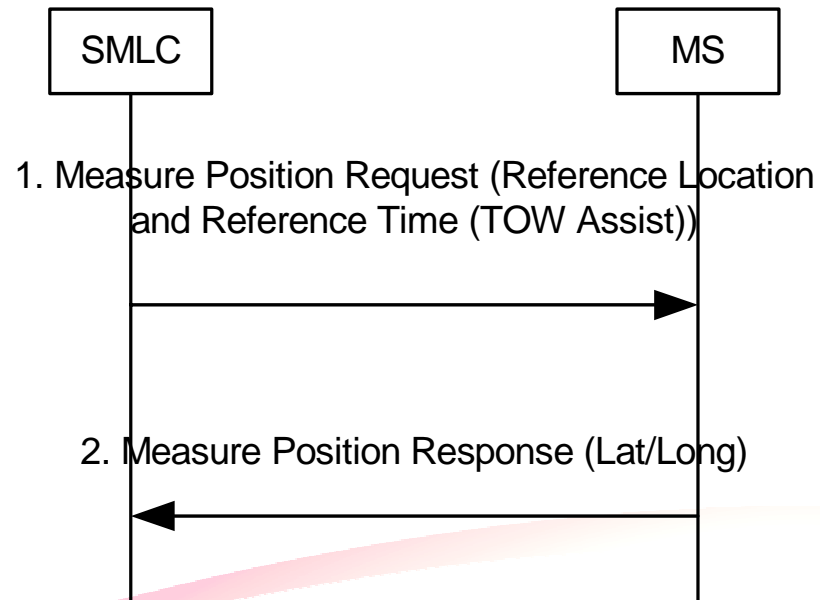
RRLP Level Generic End-to-End MT Call Flow



RRLP Level MS-Assisted MT Call Flow



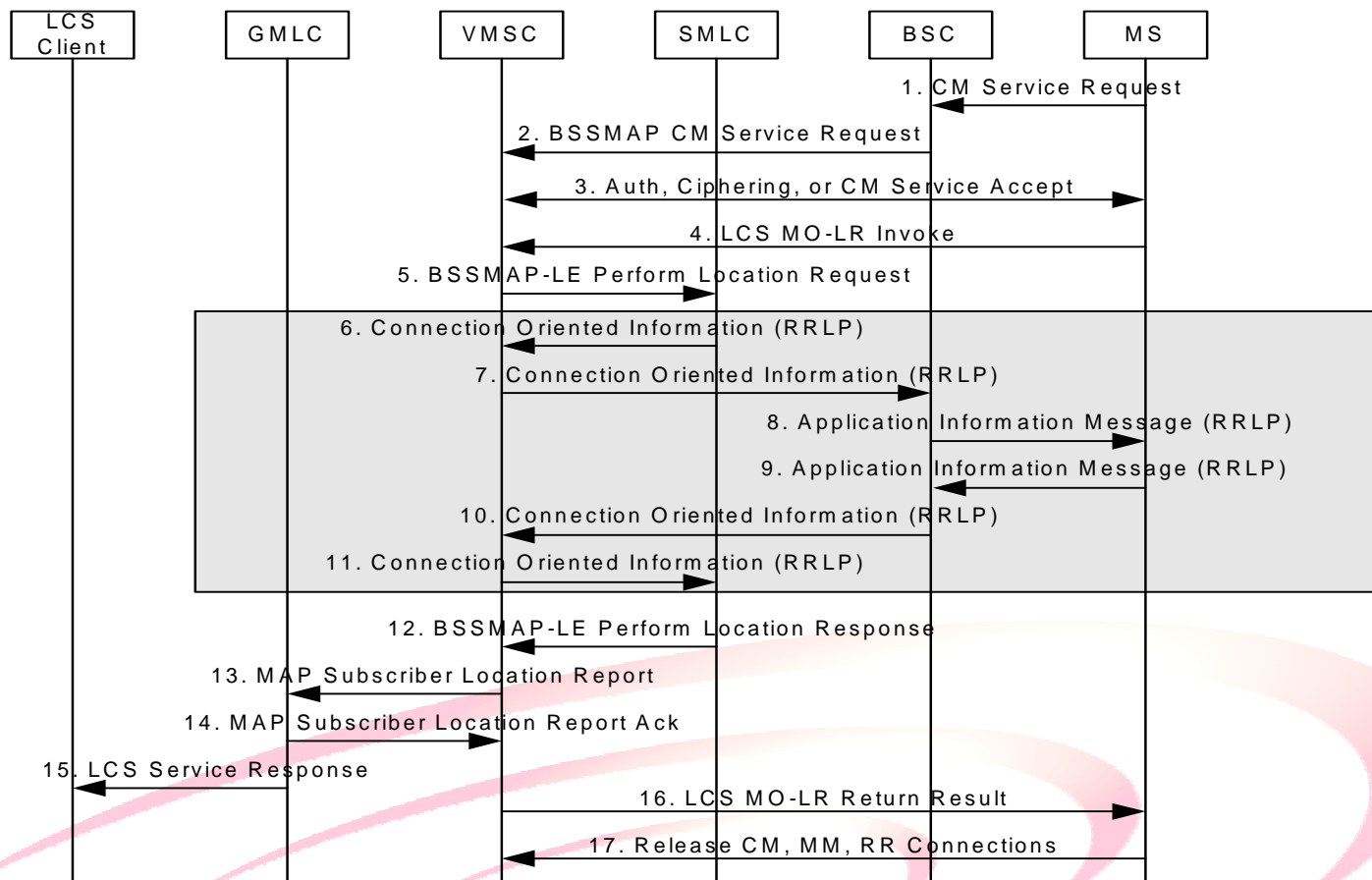
RRLP Level MS-Based MT Call Flow



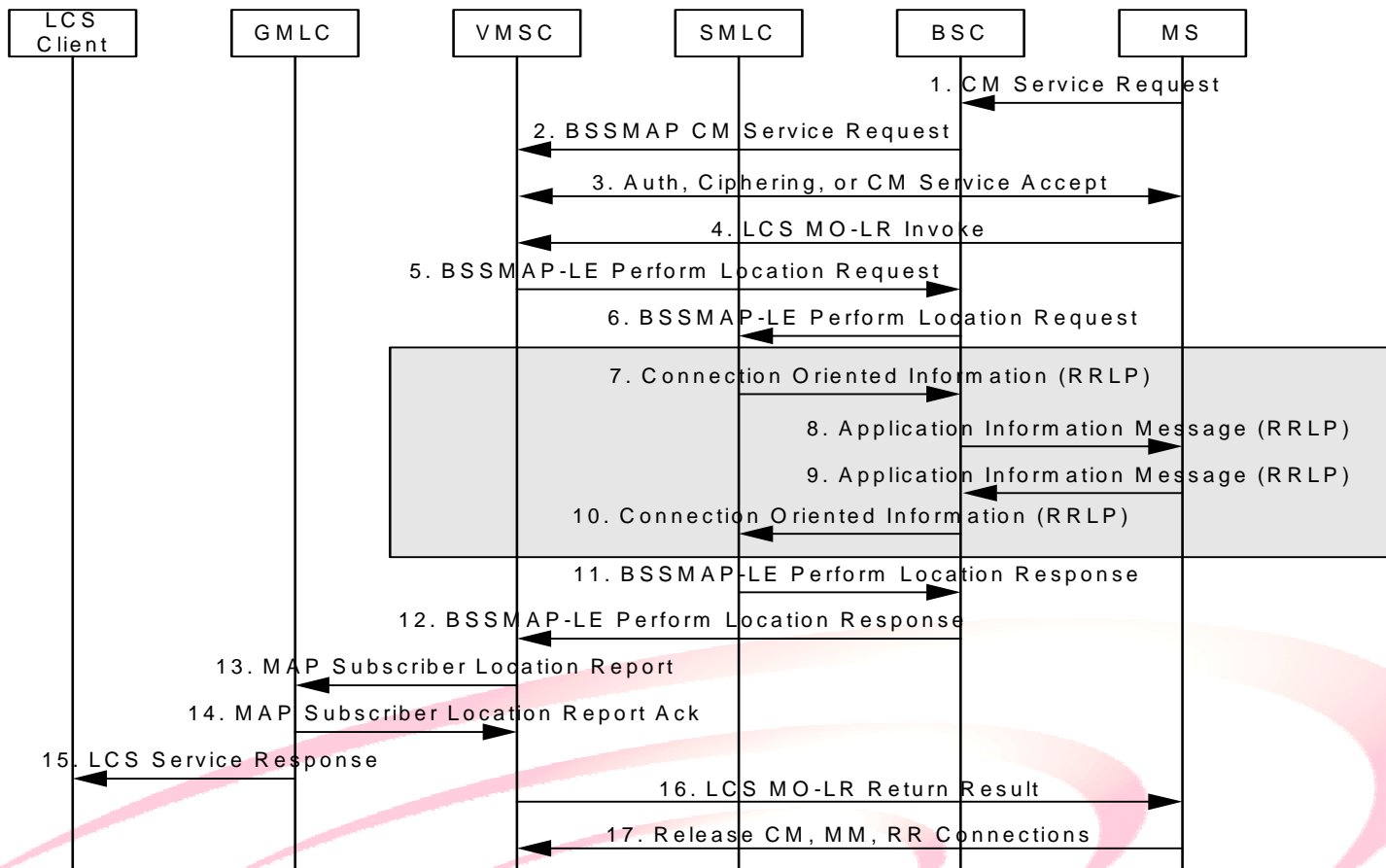
MO Call Flows

- Unlike MT Call Flows not all call flows are requests for the MS's current location
- SMLC invoked via a Perform Location Request
 - Contains: Request Type, Cell ID, Priority, QoS, Classmark, etc
- There are three types of MO Call Flows
 - The MS can request:
 - Location Estimate
 - Assistance Data
 - Ciphering Keys
- Supplementary Service mechanisms used to specify service request and to return location estimate if requested

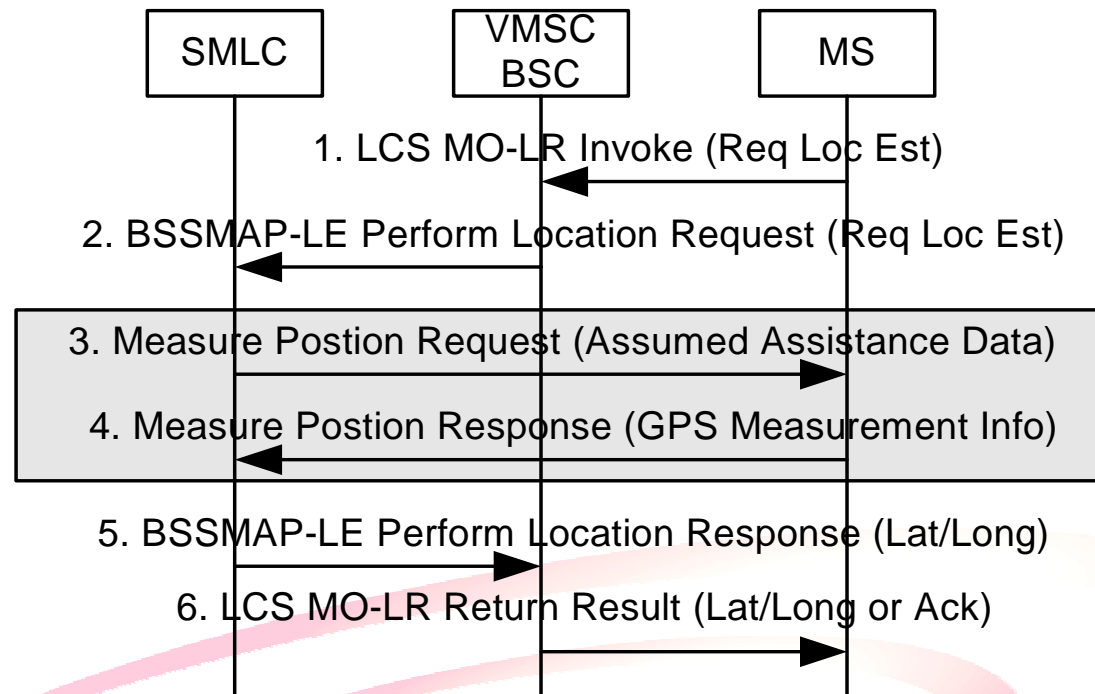
MO Call Flow – NSS Based SMLC



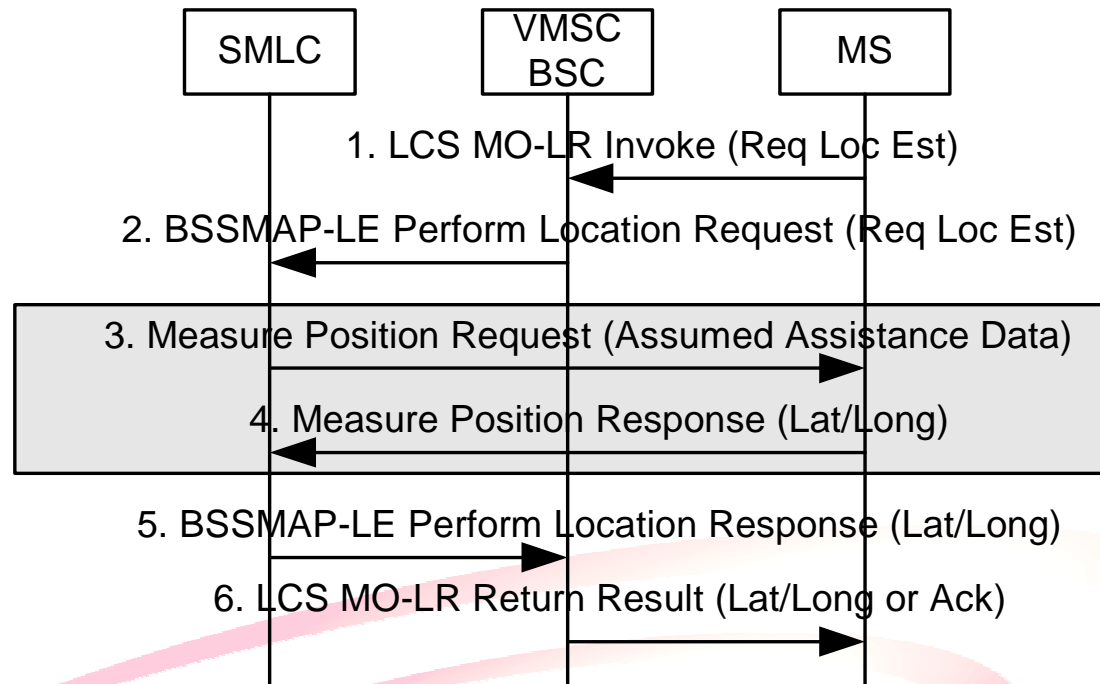
MO Call Flow – BSS Based SMLC



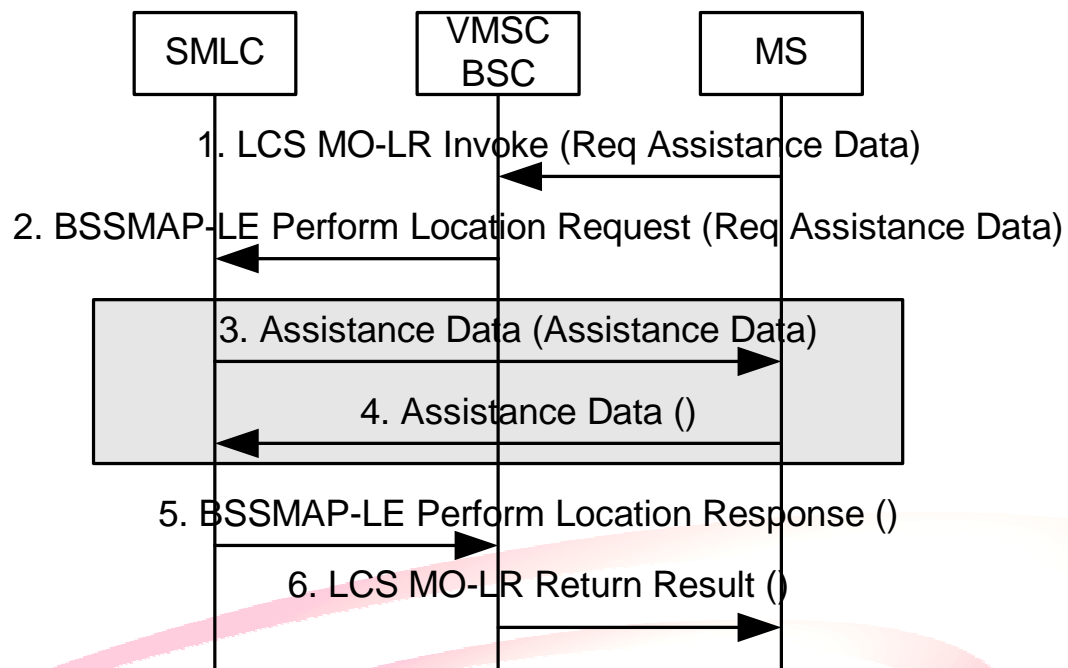
Location Estimate MO Call Flow – MS-Assisted



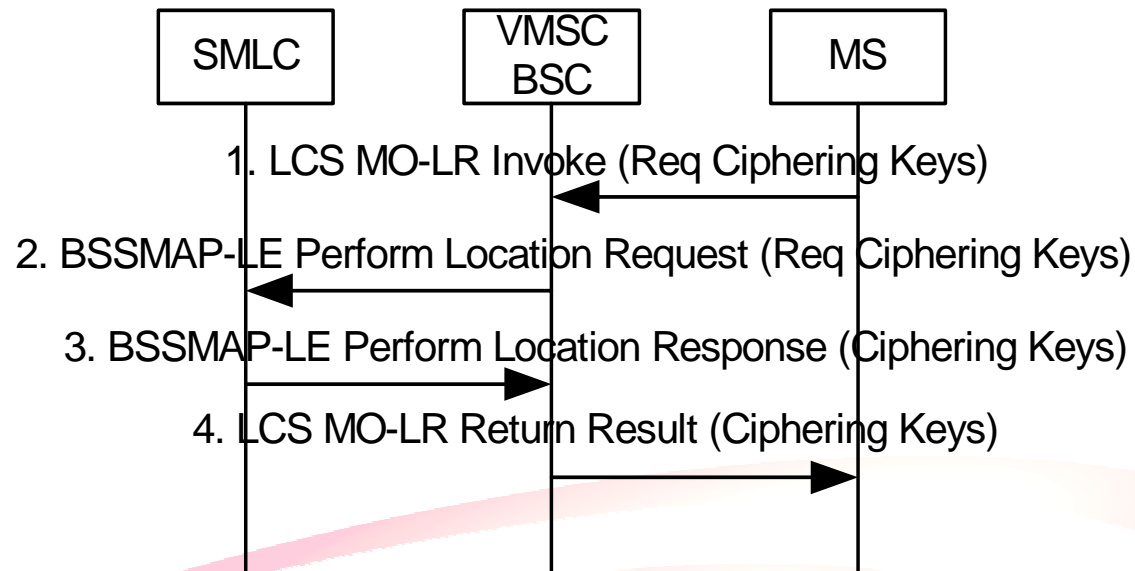
Location Estimate MO Call Flow – MS-Based



Assistance Data MO Call Flow



Ciphering Keys MO Call Flow

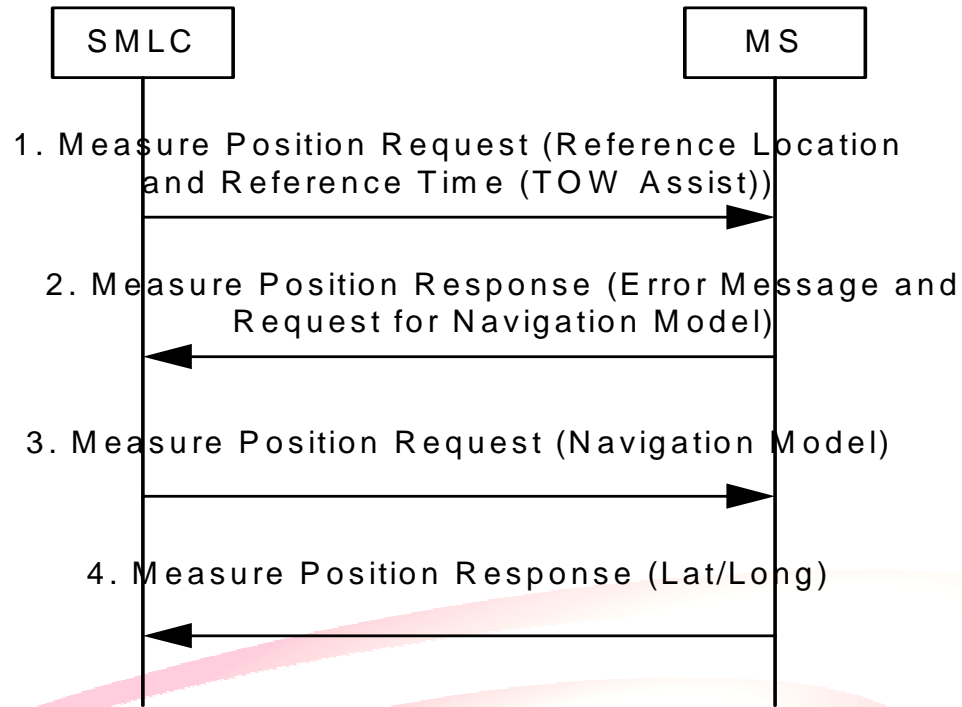


Incomplete Assistance Data

- In cases where the SMLC initially sends incomplete assistance data to the MS, the MS can request an explicit set of assistance data
- The SMLC will then repeat the Measure Position Request message with the requested assistance data



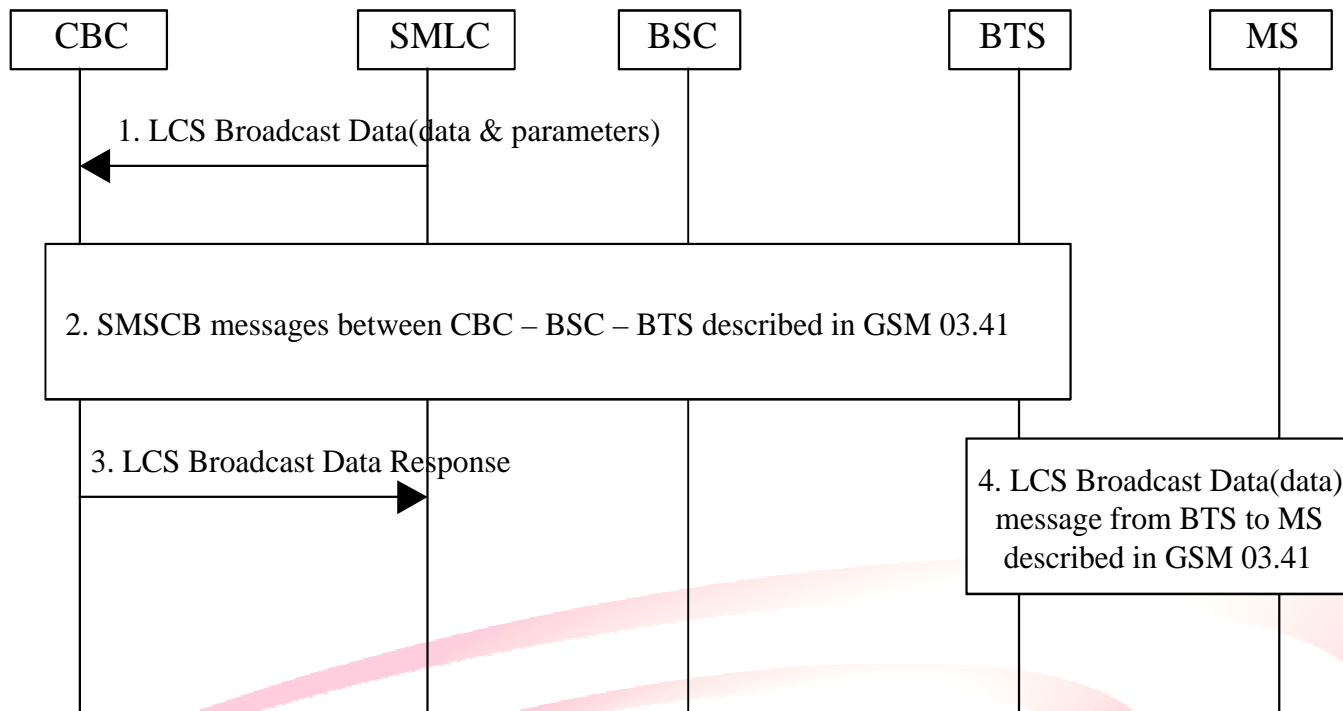
Incomplete Assistance Data Call Flow



Broadcast

- There are three types of broadcast GPS assistance data:
 - Differential GPS corrections (including Reference Time and Reference Location),
 - Ephemeris and clock correction, and
 - Almanac and other data.
- The call flow is generic for both MS-Based and MS-Assisted implementations
- The GPS Assistance Data Broadcast Message is created in the SMLC and the whole message is transferred from the SMLC to the MS

Broadcast Call Flow



Ls / Lb Open Interface

- BSSAP-LE Messages
 - Perform Location Request / Response
 - Connection Oriented Information
- Perform Location Request specifies request type
 - Location Estimate
 - Assistance Data
 - Ciphering Keys
- Connection Oriented Information Message
 - Contains a BSSLAP Message, which contains the RRLP Message
 - BSSLAP messages also carry radio specific information such as TA

Perform Location Request



Information element	Type / Reference	Presence	Format	Length in octets
Message type	Message Type	M	V	1
Location Type	Location Type	M	TLV	4
Cell Identifier	Cell Identifier	M	TLV	3-10
Classmark Information Type 3	Classmark Information Type 3	O	TLV	2-n
LCS Client Type	LCS Client Type	O	TLV	3
Chosen Channel	Chosen Channel	O	TLV	2-n
LCS Priority	LCS Priority	O	TLV	3
LCS QoS	LCS QoS	O	TLV	6
GPS Assistance Data	GPS Assistance Data	O	TLV	3-n
BSSLAP APDU	APDU	O	TLV	2-n



Perform Location Response



Information element	Type / Reference	Presence	Format	Length in octets
Message type	Message Type	M	V	1
Location Estimate	Geographic Location	C	TLV	2-22
Positioning Data	Positioning Data	O	TLV	2-n
Deciphering Keys	Deciphering Keys	O	TLV	10-n
LCS Cause	LCS Cause	O	TLV	3



Connection Oriented Information

Information element	Type / Reference	Presence	Format	Length in octets
Message type	Message Type	M	V	1
BSSLAP APDU	APDU	M	TLV	3-n
Segmentation	Segmentation	C	TLV	3