



Vodafone Terminal Capability Definition

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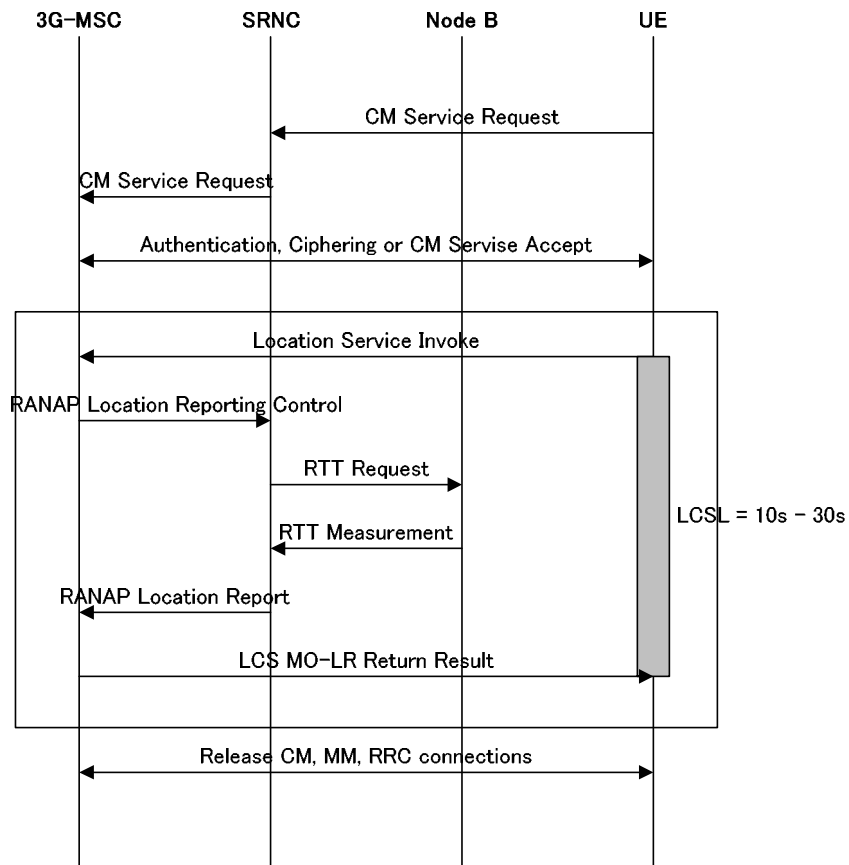
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1 Location Request by UE Activation in UMTS area

The handset shall comply with 3GPP [TS23171] to cope with CS-MO-LR(Circuit Switched Mobile Originating Location Request).

Figure 1.1 and 1.2 illustrate general sequences:



Note: For details about the shaded part, refer to 1.2

Figure. 1.1 CS-MO-LR Sequence (informative)

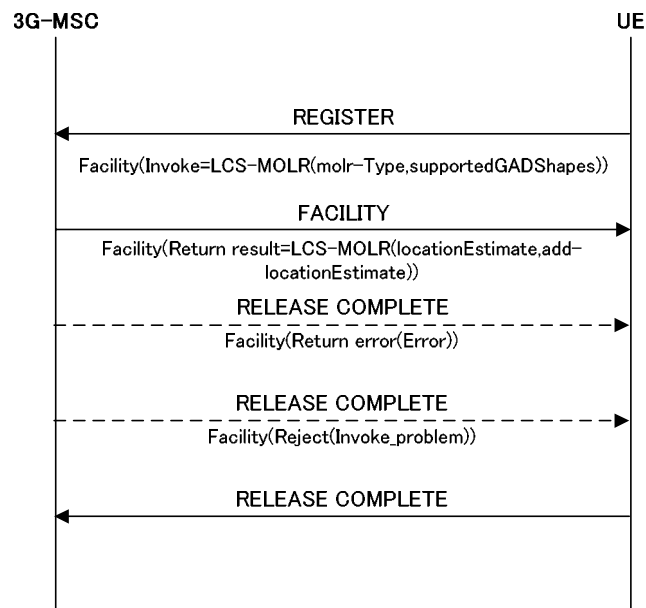


Figure 1.2 LCS MO-LR Supplementary service Sequence (informative)

1.1 CM Service Request

"Supplementary Service Activation" shall be set to "CM service type" in CM service request.

1.2 Authentication,Ciphering or CM Service Accept

0 "LCS value added location request notification capability not supported" shall be set to the value of parameter LCS VA CAP of Mobile Station Class Mark 2 IE sent by handsets to network.

1.3 Location Service Invoke(LCS-MOLRArg)

Handsets shall send a REGISTER message that includes LCS-MOLR invoke component to network when locating by MO-LR.

Table 1.1 illustrates details about the identifiers that should be set by handsets to LCS-MOLRArg.

Identifiers		Comment
molr-Type	locationEstimate	Only locationEstimate shall always be set
	assistanceData	This parameter shall not be set in any time
	deCipherringkey	This parameter shall not be set in any time
locationMethod		This parameter shall not be set in any time
lcs-Qos		This parameter shall not be set in any time
lcsClientExternalID		This parameter shall not be set in any time
mlc-Number		This parameter shall not be set in any time
gpsAssistanceData		This parameter shall not be set in any time
supportedGADShapes	ellipsoidPoint	To be set as a Support shape
	ellipsoidPointWithUncertaintyCircle	To be set as a Support shape
	ellipsoidPointWithUncertaintyEllipse	To be set as a Support shape
	Polygon	To be set as a Support shape
	ellipsoidPointWithAltitude	Not to be set as a Support shape
	ellipsoidPointWithAltitudeAndUncertaintyElipsoid	Not to be set as a Support shape
	ellipsoidArc	To be set as a Support shape

Table 1.3.1 lcs-MOLRArg (normative)

1.4 LCS MO-LR Return Result(LCS-MOLRRes)

When receiving the result of location by MO-LR in a normal way, handsets receive a FACILITY message that includes LCS-MOLR return result component. Table 1.4.1 illustrates details about LCS-MOLRRes handsets receive.

Should a handset receive decipheringKeys in Table 1.4.1, which is not used, the upper application shall be informed that the location has failed and an error message shall be displayed.

As location allows Single MO-LR only, handsets shall send RELEASE COMPLETE each time they receive LCS-MOLRRes in order not to move to Multiple MO-LR.

Identifiers	Comment
locationEstimate	Contains location result excluding Polygon in the size of 1 – 20 Octets. For details, refer to [TS23032]
decipheringKeys	This parameter is not to be used.
Add-LocationEstimate	Contains location result by Polygon in the size of 1 – 90 Octets. For details, refer to [TS23032]

Table 1.4.1 lcs-MOLRRes (normative)

1.4.1 Behavior after Location Estimate is Received

Handsets shall receive all Shapes defined in [TS23032] normally.

Table 1.4.1.1 illustrates the Shapes that should be supported:

Shapes
Ellipsoid Point
Ellipsoid point with uncertainty circle
Ellipsoid point with uncertainty Ellipse
Polygon
Ellipsoid point with altitude
Ellipsoid point with altitude and uncertainty Ellipsoid
Ellipsoid Arc

Table 1.4.1.1 Type of Shape (informative)

Latitude/longitude information obtained through location is sent to handsets in degrees in WGS84 format

The latitude is coded with 24 bits: 1 bit of sign and a number between 0 and $2^{23}-1$ coded in binary on 23 bits. The longitude, expressed in the range -180° , $+180^{\circ}$, is coded as a number between -2^{23} and $2^{23}-1$, coded in 2's complement binary on 24 bits.

Handsets shall receive in the format described in [TS23032(7.3)] Shape description, convert the latitude/longitude information of 1Point into degrees/minutes/seconds(1/100 second is mandatory), and then hand it over to the upper application.

When a positioning accuracy is required by the upper application, “300m” shall be returned always.

Currently, Ellipsoid point with altitude and Ellipsoid point with altitude and uncertainty Ellipsoid in Table 1.4.1.1 are not to be sent from network, but should a handset receive it, it should be handed over to the upper application in compliance with the following descriptions:

- Ellipsoid Point

Refer to [TS23032(7.3)] Shape description.

Latitude/longitude information of 1Point shown in Octet2 – Octet7 shall be converted into degrees/minutes/seconds(1/100 second is mandatory) and handed over to the upper application.

- Ellipsoid Point with uncertainty Circle

Refer to [TS23032(7.3)] Shape description.

Latitude/longitude information of 1Point shown in Octet2 – Octet7 shall be converted into degrees/minutes/seconds(1/100 second is mandatory) and handed over to the upper application.

- Ellipsoid Point with uncertainty Ellipse

Refer to [TS23032(7.3)] Shape description.

Latitude/longitude information of 1Point shown in Octet2 – Octet7 shall be converted into degrees/minutes/seconds(1/100 second is mandatory) and handed over to the upper application.

- Polygon

Refer to [TS23032(7.3)] Shape description.

Point count to be put in LCS MO-LR Return Result shall be determined by Octet 1 Number of points and the range of 3 - 15Points shall be supported.

How to hand over 1Point from the received multiple Points to the upper application shall comply with the following formula:

$$X_{cp} = \frac{1}{n} \sum_{i=1}^n X_i; \quad Y_{cp} = \frac{1}{n} \sum_{i=1}^n Y_i;$$

X_{cp} : Longitude of a cell center point

Y_{cp} : Latitude of a cell center point

n : Piece counts of cell polygon data

X : Longitude for a piece of cell polygon data

Y : Latitude for a piece of cell polygon data

X_{cp} and Y_{cp} of 1Point obtained by the formula above shall be converted into

degrees/minutes/seconds(1/100 second is mandatory) and handed over to the upper application.

- Ellipsoid Point with Altitude

Refer to [TS23032(7.3)] Shape description.

Latitude/longitude information of 1Point shown in Octet2 – Octet7 shall be converted into degrees/minutes/seconds(1/100 second is mandatory) and handed over to the upper application.

- Ellipsoid Point with altitude and uncertainty ellipsoid

Refer to [TS23032(7.3)] Shape description.

Latitude/longitude information of 1Point shown in Octet2 – Octet7 shall be converted into degrees/minutes/seconds(1/100 second is mandatory) and handed over to the upper application.

- Ellipsoid Arc

Refer to [TS23032(7.3)] Shape description and Figure 1.4.1.2.

1Point located at $r1+1/2r2$ in the direction of $+1/2$ degrees with the North being zero degrees shall be calculated, and the latitude/longitude information shall be handed over to the upper application in degrees/minutes/seconds(1/100 second is mandatory).

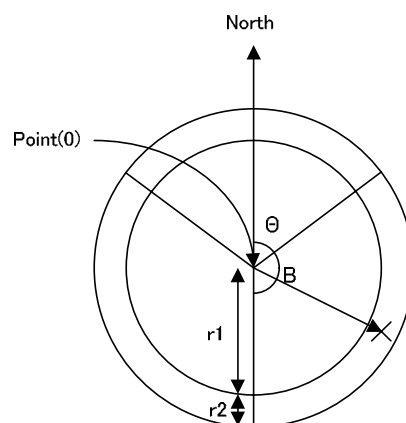


Figure 1.4.1.2 Ellipsoid Arc(normative)

1.5 Return error

When not being able to send back a location result that meets the request from a handset, network shall send back a RELEASE COMPLETE message that includes Return error component to the handset. Table 1.5.1 shows all error types handsets may receive.

When receiving a Return error, handsets shall inform the upper application that the location has failed and a message indicating the fact shall be displayed.

Error types
SystemFailure
UnexpectedDataValue
DataMissing
FacilitynotSupported
SS-SubscriptionViolation
Positionmethodfailure

Table 1.5.1 Return error(normative)

1.6 Reject

Network may send a RELEASE COMPLETE message that includes Reject component to reject a location request. Table 1.6.1 shows all Problem Codes handsets may receive.

When receiving Reject, handsets shall inform the upper application that the location has failed and a message indicating the fact shall be displayed.

Invoke Problem Codes
Duplicate Invoke ID
Unrecognized Operation
Mistyped Parameter
Resource Limitation
Initiating Release
Unrecognized Linked ID
Linked Response Unexpected
Unexpected Linked Operation

Table 1.6.1 Reject(normative)

1.7 LCSL Timer

As shown in Figure 1.1, handsets shall activate LCSL Timer as a timer waiting for ACK from network when sending Location Service Invoke. Table 1.7.1 shows the details.

The Timer value that should be implemented is defined in [TS24080]. As the value should be between 10s and 30s and handset-dependent, 10s is recommended.

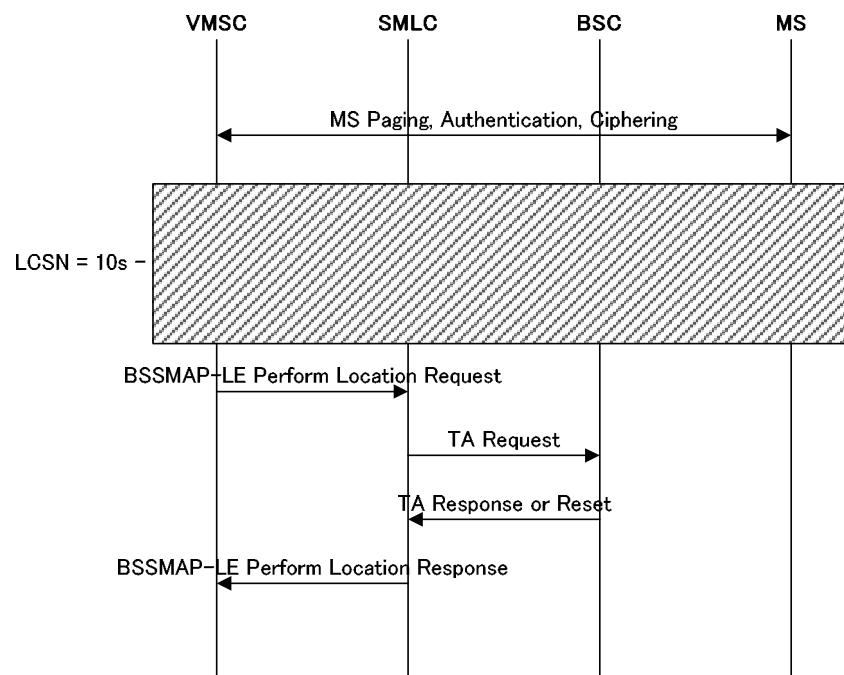
LCSL Timer	Timing to Activate the LCSL Timer	Timing to Stop the LCSL Timer	Behavior when the LCSL Timer Expires
10s – 30s (Suggested value:10s)	When Location Service Invoke is sent	When LCS MO-LR Return Result is received. When a Return error is received. When Reject is received	The upper application shall be informed that the location has failed and an error message shall be displayed after RELEASE COMPLETE is sent

Table 1.7.1 LCSL Timer (normative)

2 Location request with activation of LCS Client in GSM area

The handset shall comply with [TS0371] to cope with CS-MT-LR(Circuit Switched Mobile Terminating Location Request)

Figure 1.1 illustrates general sequences:



Note: The shaded SS Message part is outside application

Figure 1.1 CS-MT-LR Sequence (informative)

2.1 MS Paging, Authentication, Ciphering

0 "LCS value added location request notification capability not supported" shall be set to the value of parameter LCS VA CAP of Mobile Station Class Mark 2 IE to be sent by handsets to network.