**SA3LI#94 S3i240428**

**Amsterdam, NL; July 9-12, 2024**

**Source: Nokia, Nokia Shanghai Bell, Rogers Communications**

**Title: pCR to TR 33.929-7: LI for location acquisition capabilities – Part II (LALS)**

**Document for: Agreement**

**Agenda Item: 9**

**Work Item / Release: LI19**

***Abstract of the contribution:*** *This pCR provides input text to TR 33.929-7 LI for LALS.*

***BACKGROUND***

The TR 33.929-7 provides the implementation guidance for the LI aspects related to the location acquisition capabilities. In this regard, the TR would cover the three capabilities, the illustrations of which are thought to be useful. Those three services are:

* Location only LI reporting.
* LALS.
* Location acquisition.

This pCR provides the input text for the LALS related concepts.

**PROPOSAL**

Incorporate the following to the TR 33.929-7.

# 4 LI for location acquisition capabilities

## 4.1 General

The LI for location acquisition capabilities illustrated in the subsequent clauses include the following three capabilities:

* Location only LI reporting.
* Lawful access location services (LALS).
* Location acquisition.

There are also few other cases that may not need any more illustrations than what have been specified in TS 33.127 [3] and TS 33.128 [4].

For example, with the case referred to as embedded location reporting as defined in TS 33.127 [3], the IRIs delivered to the LEMF as a part of interception performed for other services may include the location if the warrant authorized such location reporting. In this case, the reported location is the location of the target UE.

The location reporting does not apply when the interception is performed for a target non-local ID. When the warrant prohibits the reporting of the location, any information that conveys the location is redacted from the IRI/CC delivered to the LEMF.

In all cases, the scope of the reported location may vary as defined in TS 33.127 [3] and TS 33.128 [4].

## 4.2 Location only LI reporting

\*\*\*\*\* Start of the new text \*\*\*\*

## 4.3 LALS

### 4.3.1 General

The LALS provides LEA a capability to determine the physical location (also called position) of the target. There are two modes of LALS operation supported:

* On-demand location determination, called Target Positioning.
* Location determination synchronized with target interception events, called Triggered Location.

The Target Positioning is invoked by a designated HI1 warrant indicating the LALS service request. There are two options of Target Positioning supported: Immediate Positioning and Periodic Positioning. The former is intended to invoke a single positioning operation on the target, while the latter invokes a series of positioning operations with the periodicity specified in the warrant. There can be multiple intermediate location responses with the either of the two options.

With the Triggered Location, the target position is obtained and reported when certain events (e.g. registration, start/end of PDU session, start/end of IMS session) related to the target are detected and reported in the network in the course of execution of an interception warrant which includes the LALS triggered location option. While the reported interception events may carry the location information, the LALS triggering would enhance the reporting with the target position information, like geo-location, target velocity, etc.

LALS triggered location can be used with location only reporting as well. LALS does not apply to target non-local ID.

### 4.3.2 Overview of the architecture

In order to have the lawful access to the target's location, an LI specific LCS client referred to as LI-LCS Client introduced. The LI-LCS Client, a logical function, interacts with the LCS Server (e.g. GMLC) to obtain the target's location. Neither the present document nor the TS 33.127 [3]/33.128 [4] identify/define the NF that can house LI-LCS Client. The invocation of LALS mentioned in clause 4.3.1 is nothing but the invocation of location determination at the LI-LCS Client.

In order to support the invocation of LALS when certain events related to the target are detected, an LI specific logical function referred to as LALS Triggering Function (LTF) is introduced. The LTF would detect the specific events and invoke the LI-LCS Client for location determination. As defined in TS 33.127 [3], the LTF can be present either in the MDF2 or alongside an IRI-POI in a NF within the CSP domain.

The figure 4.3.2-1 illustrates an overview of the overall architecture for LALS depicting the modes of LALS invocation. All of the LI functions and LI interfaces depicted in figure 4.3.2-1 are defined in TS 33.127 [3] and TS 33.128 [4].



Figure 4.3.2-1: An overview of LALS

In the Target Positioning mode, the LALS is invoked in the LI-LCS Client by the LIPF over LI\_X1. The LI-LCS Client interacts with the LCS Server (e.g. GMLC) to obtain the location either immediately or periodically as instructed by the LIPF. The LCS Server may return the target UE's intermediate location multiple times.

In the Triggered Location mode, the LIPF provisions the LTF for LALS over LI\_X1. The LTF then invokes the LALS in the LI-LCS Client over LI\_T2 when certain events related to the target UE are detected.

With both modes, in support of LALS, the LI-LCS Client shall support the non-LI interface (e.g. Le as shown in figure 4.3.2-1) to the LCS Server (i.e. GMLC). The procedures used by the LCS Server to obtain the location of the target UE are the same as the procedures used to obtain the location of a non-target UE.

Because of the use of non-LI functions and the non-LI interfaces in LALS operations, the LALS comes with a higher risk of detectability and therefore, the LEA and the CSP need to take the following into consideration while employing LALS.

Two categories of detectability that the LI is concerned with are the following:

* Detectability by the target.
* Detectability by unauthorized 3rd parties.

With respect to the LALS, the detectability by the target is dependent on the positioning method used. The level of detectability risk tolerance may vary by jurisdictions and the special circumstances. The TS 33.127 [3] mentions that the involvement of other CSP's networks in fulfilling LALS operations should be avoided. That may restrict the use of LALS to the non-roaming scenario only. To use LALS in a visited network a method is required to avoid any involvement target's HPLMN.

### 4.3.3 Overview of the concepts

#### 4.3.3.1 General

As described in clause 4.3.2, there are two modes of LALS invocation. This clause illustrates those two modes. In all the illustrations, the xIRI/IRI used to report the LALS location reporting is referred to as LALSReport in TS 33.128 [4]. The diagrams do not explicitly show the name of that xIRI/IRI.

#### 4.3.3.2 LALS target positioning mode

In the illustration shown in figure 4.3.3.2-1, LEA issues a warrant on the UE for LALS with immediate or periodic location reporting.



Figure 4.3.3.2-1: LALS target positioning

The LI-LCS Client and the MDF2 are provisioned for LALS (i.e. with the LALS service type). The provisioning of LI-LCS Client includes the additional details needed for the target positioning, e.g. immediate or periodic, with the periodicity if it is the latter. In figure 4.3.3.2-1, P1, P2, P3 and P4 are the provisioning steps.

The LI-LCS Client, based on the parameters received over the LI\_X1 from LIPF, interacts with the LCS Server to obtain the target UE's location. The LCS Server interacts with the other network functions (e.g. AMF) to determine the target UE's location using the generic 3GPP LCS procedures and returns the target UE's location to the LI-LCS Client. In figure 4.3.3.2-1, L1, L2 and L3 are the location determination steps. If requested, the LCS Server may provide the intermediate locations of the target UE to the LI-LCS Client.

The LI-LCS Client generates and delivers the xIRI that carries the target's UE location to the MDF2 upon receiving the target UE's location from the LCS Server. The MDF2 forwards it as an IRI message to the LEMF. In figure 4.3.3.2-1, R1 and R2 are the location reporting steps.

For immediate location reporting, the LI-LCS Client requests the LCS Server for target UE's location as and when the LALS is invoked by the LIPF over LI\_X1. When periodic location reporting is invoked, the LI-LCS Client requests the LCS Server for target UE's location and then continuously repeats the request at the time interval specified in the LI\_X1 task activation. This periodic location reporting continues indefinitely, until deactivated by the LIPF over LI\_X1. The cases are illustrated in figure 4.3.3.2-2 below:



Figure 4.3.3.2-2: Immediate and periodic LALS target positioning

For immediate LALS target positioning, the LI-LCS Client requests the LCS Server for location of the target UE as and when it is provisioned by the LIPF over LI\_X1. The steps L1, L2 and L3 are the location determination steps in figure 4.3.3.2-2. The LI-LCS Client self-deactivates the invocation after the location is obtained and reported.

For periodic LALS target positioning, the LI-LCS Client starts a timer based on the value received from the LIPF over LI\_X1 and at the expiry of the timer, requests LCS Server for location of the target UE and restarts the timer. As shown in figure 4.3.3.2-2, the first request to LCS Server happens when LI-LCS Client is provisioned over the LI\_X1 by the LIPF (as in the case immediate LALS target positioning). The LI-LCS Client repeats the request to the LCS Server on each Timer expiry.

In figure 4.3.3.2-2, the L1, L2 and L3 represent the location determination steps for LALS immediate target positioning and [L1, L2, L3], [L4, L5, L6], [L7, L8, L9] and [L10, L11, L12] represent the location determination steps for LALS periodic target positioning.

#### 4.3.3.3 LALS triggered location mode, LI alongside IRI-POI

In the illustration shown in figure 4.3.3.3-1, LEA issues an interception warrant for the UE with the optional request for LALS triggered location reporting. In this case, the LTF is in the same NF that has an IRI-POI intercepting target events.



Figure 4.3.3.3-1: LALS triggered location, LTF alongside IRI-POI

The IRI-POI and MDF2 are provisioned for interception of one or more service types (service as applicable to the NF having the IRI-POI) on the target UE. In figure 4.3.3.3-1, P1, P2, P3 and P4a are the provisioning steps for target provisioning for such service type(s) interception.

The LTF in the NF (that has an IRI-POI) and the MDF2 are provisioned with the LALS service type. The provisioning of LTF also includes the service types) to which the LALS applies. Furthermore, the provisioning of LTF includes the additional details that may be needed for the location determination.. In figure 4.3.3.3-1, P1, P2, P3 and P4b are the provisioning steps.

The IRI-POI would generate and deliver the xIRIs for the provisioned service type(s) to the MDF2 and the MDF2 would forward those xIRIs as IRI messages to the LEMF. In figure 4.3.3.3-1, the R1a and R2a are those xIRI/IRI reporting steps.

NOTE: The provisioning of MDF2 for LALS and other service type(s) can be combined or an update of the previous one, depending on how the warrant is issued.

When certain events are detected (i.e. particular xIRIs that have the basic location information is generated by the IRI-POI), the LTF (present in the same NF that has the IRI-POI that generated such xIRIs) activates (or invokes) the LALS at the LI-LCS Client over LI\_T2, to supplement such xIRIs with the additional location details. The LTF may include a few parameters (received from LIPF over LI\_X1) that may be needed for location determination in the LI\_T2 trigger. In figure 4.3.3.3-1, P5 represent the step of triggering (viewed as a sort of provisioning).

The LI-LCS Client interacts with the LCS Server to obtain the target UE's location. The LCS Server interacts with the other network functions (e.g. AMF) to determine the target UE's location using the generic 3GPP LCS procedures and returns the target UE's location to the LI-LCS Client. In figure 4.3.3.3-1, L1, L2 and L3 are the location determination steps. If requested, the LCS Server may provide the intermediate locations of the target UE to the LI-LCS Client.

The LI-LCS Client generates and delivers the xIRI that carries the target's UE location to the MDF2 upon receiving the target UE's location from the LCS Server. The MDF2 forwards it as IRI message to the LEMF. In figure 4.3.3.3-1, R1 and R2 are the location reporting steps.

#### 4.3.3.4 LALS triggered location mode, LTF in MDF2

In the illustration shown in figure 4.3.3.4-1, the LEA issues an interception warrant for the UE with the optional request for LALS triggered location reporting. In this case, the LTF is in the MDF2.



Figure 4.3.3.4-1: LALS triggered location, LTF in MDF2

The IRI-POI and MDF2 are provisioned for interception of one or more service types (service as applicable to the NF having the IRI-POI) on the target UE. In figure 4.3.3.4-1, P1, P2, P3 and P4a are the provisioning steps for target provisioning for such service type(s) interception.

The LTF (in the MDF2) and the MDF2 are provisioned with the LALS service type. The provisioning of LTF also includes the service types) to which the LALS applies. Furthermore, the provisioning of LTF includes the additional details that may be needed for the location determination.. In figure 4.3.3.4-1, P1, P2, P3 and P4b are the provisioning steps.

The IRI-POIs would generate and deliver the xIRIs for the provisioned service type(s) to the MDF2 and the MDF2 would forward those xIRIs as IRI messages to the LEMF. In figure 4.3.3.4-1, the R1a and R2b are those xIRI/IRI reporting steps for the intercepted service types.

NOTE: The provisioning of MDF2 for LALS and other service type(s) can be combined or an update of the previous one, depending on how the warrant is issued.

When certain events are detected (i.e. particular xIRIs are received from the IRI-POIs), the LTF activates (or invokes) the LALS at the LI-LCS Client over LI\_T2. The LTF may include a few parameters (received from LIPF over LI\_X1) that may be needed for location determination in the LI\_T2 trigger. In figure 4.3.3.4-1, P5 represent the step of triggering (viewed as a sort of provisioning).

The LI-LCS Client interacts with the LCS Server to obtain the target UE's location. The LCS Server interacts with the other network functions (e.g. AMF) to determine the target UE's location using generic 3GPP LCS and returns the target UE's location to the LI-LCS Client. In figure 4.3.3.4-1, L1, L2 and L3 are the location determination steps. If requested, the LCS Server may provide the intermediate locations of the target UE to the LI-LCS Client.

The LI-LCS Client generates and delivers the xIRI that carries the target's UE location to the MDF2 upon receiving the target UE's location from the LCS Server. The MDF2 forwards the xIRI as an IRI message to the LEMF. In figure 4.3.3.4-1, R1 and R2 are the location reporting steps.

The implementation of LTF in an MDF2 may be more beneficial when the LALS triggering is required for interceptions of various service types. The approach avoids deploying LTF functionality in every NF that has an IRI-POI.

### 4.3.4 LALS triggered location scenarios

#### 4.3.4.1 General

The subsequent clauses illustrate a few LALS triggered location scenarios.

#### 4.3.4.2 Scenario 1: LALS triggered location with data interception – LTF in packet core

The figure 4.3.4.2-1 extends the illustration shown in figure 4.3.3.3-1 when the service type to which the LALS applies is Data.

Figure 4.3.4.2-1: Scenario 1: LALS triggered location with data interception – LTF in packet core

The illustration shown in figure 4.3.4.2-1 is a case of a LALS triggered location with the data interception. The LEA issues an interception warrant for Data and LALS. In the illustration, the IRI-POIs located in AMF, SMF, MME, SGW are provisioned for interception with the service type of Data. The LTF present in the same NFs that have those IRI-POIs are provisioned with the service type of Data and LALS. The MDF2 is provisioned with the service type of Data and LALS. The same XID is used in all three of the LI\_X1 provisions. In figure 4.3.4.2-1, P1, P2, P3, P4a and P4b are the provisioning steps. As per the provisioning, the LALS triggered location is used for Data interception.

The IRI-POIs generate the xIRIs and deliver the same to the MDF2 over the LI\_X2. The MDF2 forwards those xIRIs as IRI messages over LI\_HI2. In figure 4.3.4.2-1, R1a and R2a are those xIRI/IRI reporting steps.

The LTF upon detecting particular xIRIs for the packet data interception (with the same XID) would send a LI\_T2 trigger to the LI-LCS client. In figure 4.3.4.2-1, P5 represent the step of triggering (viewed as a sort of provisioning). The LI-LCS Client interacts with the LCS Server to determine the target's location. In figure 4.3.4.2-1, L1, L2 and L3 are the location determination steps.

The LI-LCS Client generates and delivers the xIRI that carries the target's UE location to the MDF2 upon receiving the target UE's location from the LCS Server. The MDF2 forwards the xIRI as an IRI message to the LEMF. In figure 4.3.4.2-1, R1b and R2b are the location reporting steps.

#### 4.3.4.3 Scenario 2: LALS triggered location with data + voice interception – LTF in MDF2

The figure 4.3.4.3-1 extends the illustration shown in figure 4.3.4.3-1 when the service type to which the LALS applies is Data and Voice.

Figure 4.3.4.3-1: Scenario 2: LALS triggered location with data interception – LTF in MDF2

The illustration shown in figure 4.3.4.3-1 is a case of a LALS triggered location with the Data + Voice interception. The LEA issues an interception warrant for Data, Voice and LALS.

In the illustration, the IRI-POIs located in AMF, SMF, MME, SGW are provisioned for interception with the service type of Data. The IRI-POIs in the IMS (e.g. S-CSCF) are provisioned for the interception with the service type of Voice. The MDF2 is provisioned with the service type of Data, Voice and LALS. The LTF in MDF2 is provisioned with the service type of Data, Voice and LALS. The same XID is used in all the LI\_X1 provisions. In figure 4.3.4.3-1, P1, P2, P3, P4a, P4b and P4c are the provisioning steps. As per the provisioning, the LALS triggered location is used for data interception and voice interception.

The IRI-POIs in packet core generate the xIRIs for packet data interception and deliver the same to the MDF2 over the LI\_X2. The MDF2 forwards those xIRIs as IRI messages over LI\_HI2. In figure 4.3.4.3-1, R1a and R2a are those xIRI/IRI reporting steps.

The IRI-POIs in IMS NFs generate the xIRIs for voice interception and deliver the same to the MDF2 over the LI\_X2. The MDF2 forwards those xIRIs as IRI messages over LI\_HI2. In figure 4.3.4.3-1, R2a and R2b are those xIRI/IRI reporting steps.

The LTF in MDF2 upon detecting the receipt of particular xIRIs (in MDF2) that relate to data and voice interception (with the same XID) would send a LI\_T2 trigger to the LI-LCS client. In figure 4.3.4.3-1, P5 represent the step of triggering (viewed as a sort of provisioning). The LI-LCS Client interacts with the LCS Server to determine the target's location. In figure 4.3.4.3-1, L1, L2 and L3 are the location determination steps.

The LI-LCS Client generates and delivers the xIRI that carries the target's UE location to the MDF2 upon receiving the target UE's location from the LCS Server. The MDF2 forwards the xIRI as an IRI message to the LEMF. In figure 4.3.4.3-1, R1c and R2c are the location reporting steps.

#### 4.3.4.4 Scenario 3: LALS triggered location, two warrant scenario, one with LALS – LTF in MDF2

The figure 4.3.4.4-1 illustrates a case of two intercepts with differing service types active on the target with only one requiring the LALS.

Figure 4.3.4.4-1: Scenario 3 - Two warrants on the target, one requiring LALS – LTF in MDF2

The illustration shown in figure 4.3.4.4-1 is a case where two intercepts are active on the same targe UE. One intercept (from LEA-1) with Data and Voice whereas the second intercept (from LEA-2) is with Data and LALS.

In the illustration, the IRI-POIs located in AMF, SMF, MME, SGW are provisioned for interception with the service type of Data. The IRI-POIs in the IMS (e.g. S-CSCF) are provisioned for the interception with the service type of Voice. The MDF2 is provisioned for the two intercepts with mediation details differentiating the delivery details of the two interceptions. The first one with Data and Voice to LEMF-1 (LIID-1) and the second one with Data and LALS to LEMF-2 (LIID-2). The LTF in MDF2 is provisioned with the service type of Data and LALS. The same XID is used in all the LI\_X1 provisions. In figure 4.3.4.5-1, P1-1, P2-1, P3, P4a, P4b are the provisioning steps for the interception warrant from LEA-1 and P2-1, P2-2, add-on P3 and P4c are the provisioning steps for the interception warrant from LEA-2. The step P3 is a modification of the previous step with the mediation details for LEMF-2.

The IRI-POIs in packet core generate the xIRIs for packet data interception and deliver the same to the MDF2 over the LI\_X2. The MDF2 forwards those xIRIs as IRI messages over LI\_HI2 to LEMF-1 and to LEMF-2. In figure 4.3.4.4-1, R1a and R2-1a and R2-2a are those xIRI/IRI reporting steps.

The IRI-POIs in IMS NF generate the xIRIs for voice interception and deliver the same to the MDF2 over the LI\_X2. The MDF2 forwards those xIRIs as IRI messages over LI\_HI2 to LEMF-1. In figure 4.3.4.4-1, R2a, R2-1b are those xIRI/IRI reporting steps.

The LTF in MDF2 upon detecting the receipt of particular xIRIs (in MDF2) that relate to data interception (with the same XID) would send a LI\_T2 trigger to the LI-LCS client. In figure 4.3.4.4-1, P5 represent the step of triggering (viewed as a sort of provisioning). The LI-LCS Client interacts with the LCS Server to determine the target's location. In figure 4.3.4.4-1, L1, L2 and L3 are the location determination steps.

The LI-LCS Client generates and delivers the xIRI that carries the target's UE location to the MDF2 upon receiving the target UE's location from the LCS Server. The MDF2 forwards the xIRI as an IRI message to the LEMF-2. In figure 4.3.4.4-1, R1c and R2c are the location reporting steps.

\*\*\*\*\* End of the new text \*\*\*\*