Technical Document

EOTD LC CONTROLLER

DESIGN SPEC

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Important Notice

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Notes:

1. Initial version

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List of Figures and Tables

List of References

[ISO 9000:2000] International Organization for Standardization. Quality management systems - Fundamentals and vocabulary. December 2000

0.1 References, Abbreviations, Terms

[TI 7010.801] 7010.801, References and Vocabulary, Texas Instruments

[8443_716_02_EOTD_RRLP.doc]
E-OTD RRLP, Low Level Design specification, Condat AG

[3GPP_04.31] 3rd Generation Partnership Project; Technical Specification Group GSM EDGE Radio Access Network; Location Services (LCS); Mobile Station (MS) – Serving Mobile Location Centre (SMLC); Radio Resource LCS Protocol (RRLP), (V8.8.0 Release 1999)

[C_7010.801] 7010.801, References and Vocabulary, Condat AG

[8443_713_02_EOTD_SystemArchitecture.doc]
E-OTD System Architecture, High level design specification, Condat AG

[CU0239] Cursor Standard Log Format, Issue 1.0, January 2002

1 Introduction

This document defines the functionality of the Location Service Controller and Cursor Bridge in more detail. The overall E-OTD design on a general level is described in [8443_713_02_EOTD_SystemArchitecture.doc]. The RRLP module is described in [8443_716_02_EOTD_RRLP.doc].

A.1 Blockdiagram of the software structure

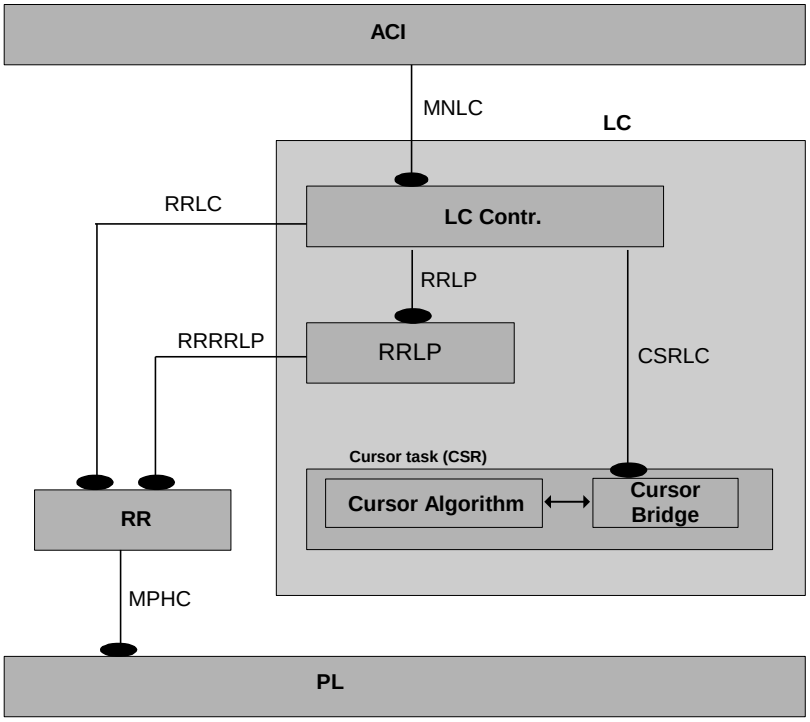


Figure 1: LC details

Figure 1 shows the details of the Location Service module. All positioning calculations and algorithms are based on the Cursor module, provided by CPS. It consists of two parts, the Cursor Algorithm and the Cursor Bridge code. To have a more generic approach for further developments, the LC controller

co-ordinates the positioning requests to the appropriate implementation, e.g. E-OTD or GPS. Condat will develop the LC controller and the RRLP. The Cursor Bridge code is available in source code, representing the interface between the LC controller and the Cursor Algorithm. It is used to exemplify the data handling between the modules but will be adapted to the Condat needs. The Cursor Algorithm module is provided in object code, receiving the correlation data and BTS identifier and calculates precise OTD values. The interface between LC controller and RRLP is primitive based with functional character in order to allow running RRLP in other task context, e.g. RR.

1.1 Service Access Points

The LC Controller block and the RRLP block inside the LC module is assigned to a new task. Following new entities are defined:

LC – for the LC Controller
RRLP – for the new protocol

- with the respective SAP's:
RRRRLP – communication between RR and RRLP.
RRLC – communication between RR and LC controller.
RRLP – communication between LC controller and RRLP
MNLC – communication between LC controller and ACI during test and demonstration.

The definition of these SAP's can be found in [8443_713_02_EOTD_SystemArchitecture.doc].

The Cursor module, i.e. Cursor Bridge and Cursor Algorithm, will not be implemented as a separate entity. Instead it will be implemented as part of the LC Controller.

1.2 Controller

The controller is co-ordinating the different implementations for the Location Service, e.g. E-OTD or GPS. For testing and demonstration purpose SMS-based communication needs to be implemented. This enables E-OTD functionality tests at the CPS test facility side, as there are no RRLP function tests available yet. For instance a new SMS based location request is handled by ACI. ACI forwards the request to the LC controller where a request is passed to RR for starting a single data acquisition request to Layer 1. Layer 1 is performing the acquisition and passing the data over RR back to the LC controller. These data is processed inside the Cursor Algorithm and formatted in one single SMS for distributing to the Test environment over the LC controller and ACI. In case of a real network or RRLP enabled test environment the RRLP module is used instead of the SMS-based approach, the rest of the functionality stays the same

1.3 Cursor module

The Cursor Algorithm is available only in object form where the Cursor Bridge is available in source code and will be adapted to the internal needs. Part of the Cursor Bridge is the SMS formatting module, preparing the processed data inside one SMS for further distribution.

2 LC Controller

2.1 State Machine

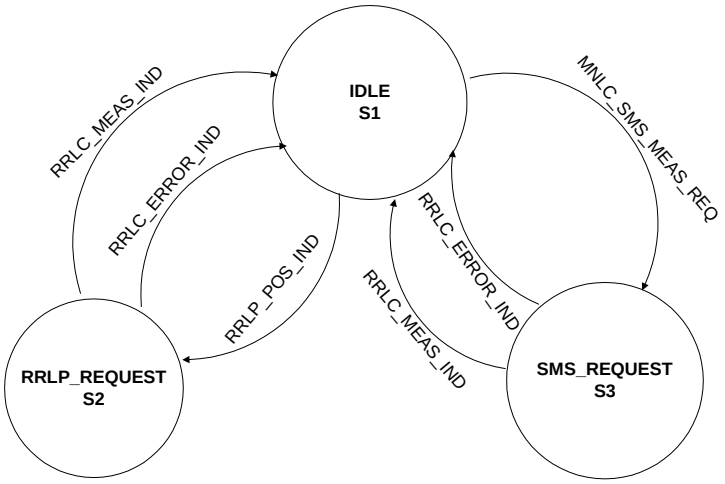


Figure 2: The state machine for LC Controller.

The state machine for the Controller is made of three states: IDLE, RRLP_REQUEST and SMS_REQUEST. Figure 2 gives an overview of the state machine and state transitions. Only events causing a state transition are shown in the figure.

IDLE:
IDLE is the initial state. The state handles periodic measurements arriving unsolicited from RR. The RRLP_REQUEST state is entered at reception of an RRLP_POS_IND if there are no measurements already saved in the algorithm. The SMS_REQUEST state is entered at reception of an MNLC_SMS_MEAS_REQ if there are no measurements already saved in the algorithm.

RRLP_REQUEST:
In this state the Controller is waiting for a RRLC_MEAS_IND with the additional measurements from RR. When this arrives the RRLP_POS_RES is send and the Controller returns to IDLE. If instead an error arrives from RR, for instance in case of the serving BTS is different from the reference BTS, the IDLE state is also entered.

SMS_REQUEST:
In this state the Controller is waiting for a RRLC_MEAS_IND with the additional measurements from RR. When this arrives the MNLC_SMS_MEAS_CNF is send and the Controller returns to IDLE. If instead an error arrives from RR the IDLE state is also entered.

2.2 State / event table

State	State Id Number
IDLE	S1
RRLP_REQUEST	S2
SMS_REQUEST	S3

State / Event	S1	S2	S3
RRLP_POS_IND P1: saved meas. P2: no saved meas.	P1: - P2: S2	-	D
RRLC_ERROR_IND	D	S1	S1
RRLC_MEAS_IND	-	S1	S1
MNLC_SMS_MEAS_REQ P1: saved meas. P2: no saved meas.	P1: - P2: S3	D	-

-: No state change.

D: Discard event.

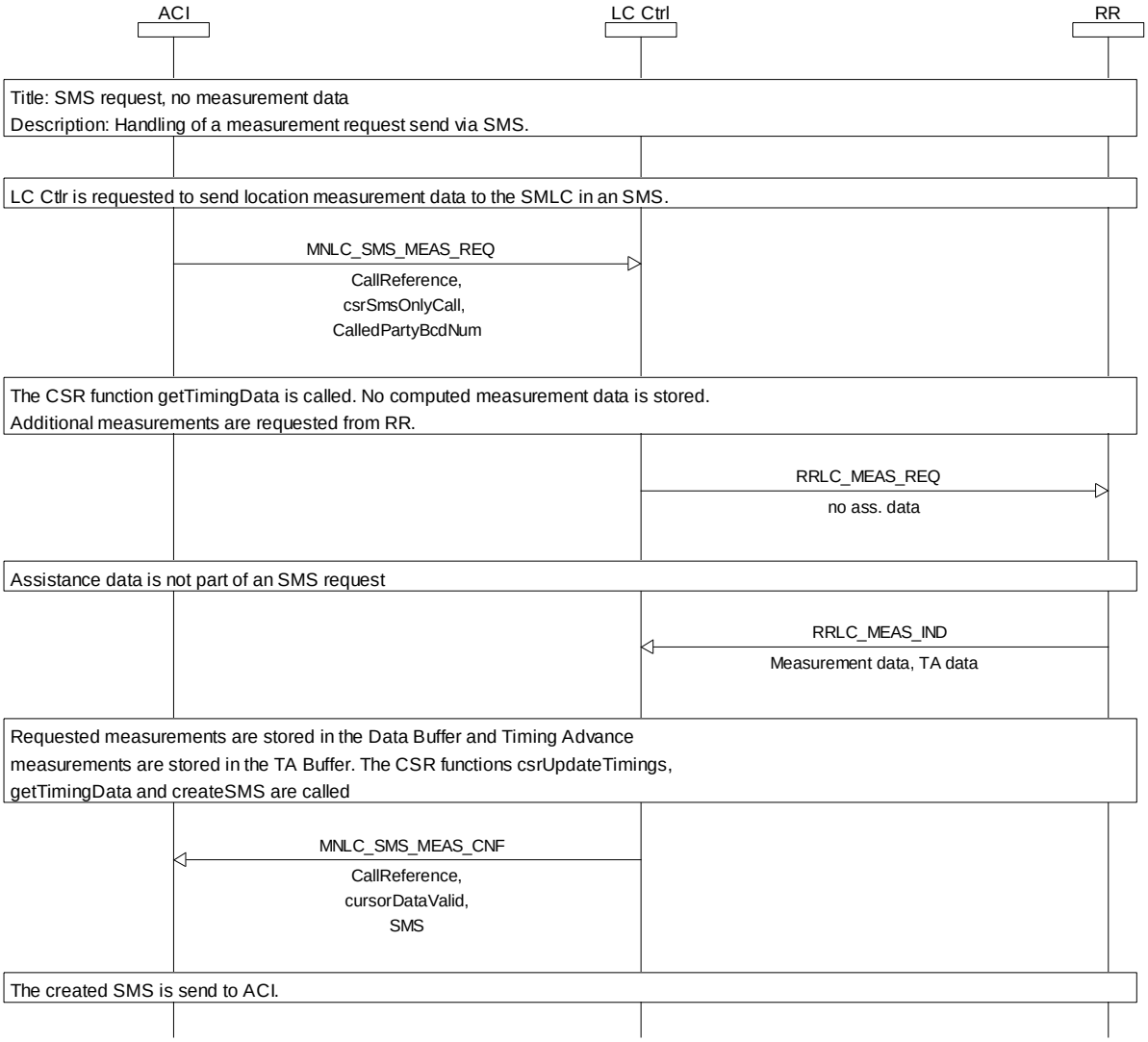
State change; event parameter dependency: PX: X indicating number for parameter dependency.

3 Functionality

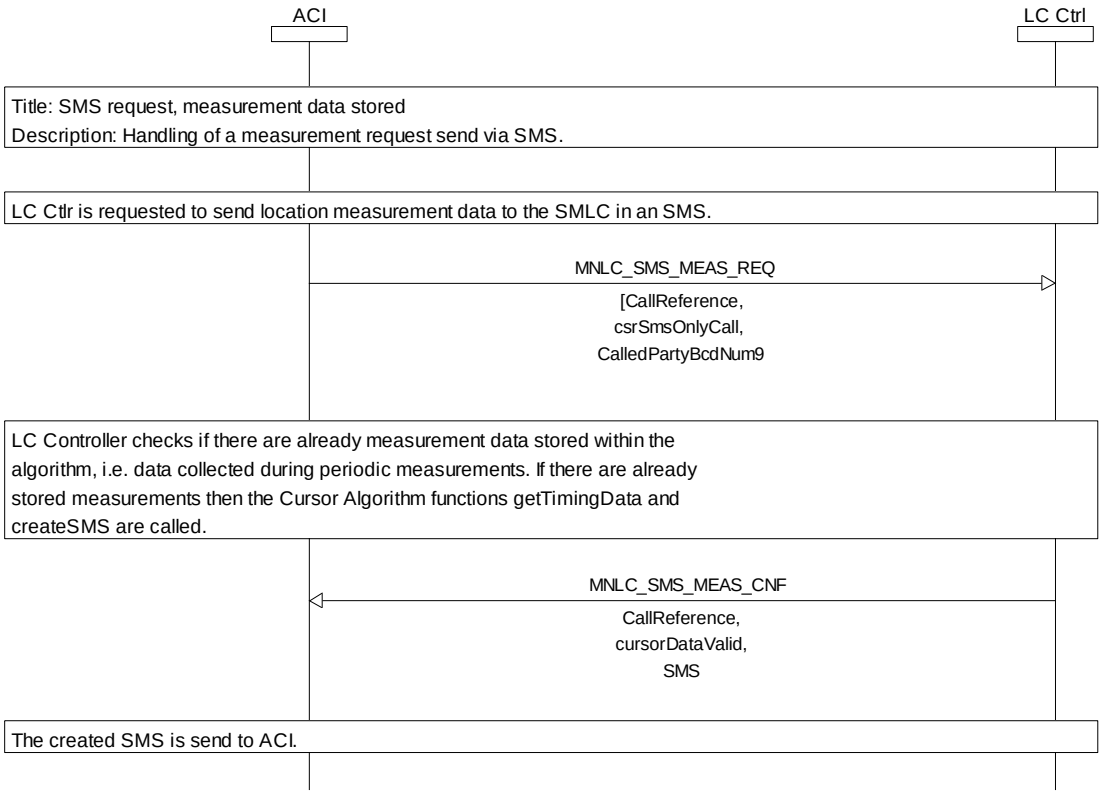
The functionality and behaviour of the Controller are in the following sections described through different scenarios with the help of MSCs.

3.1 SMS request

3.1.1 SMS request, no measurement data

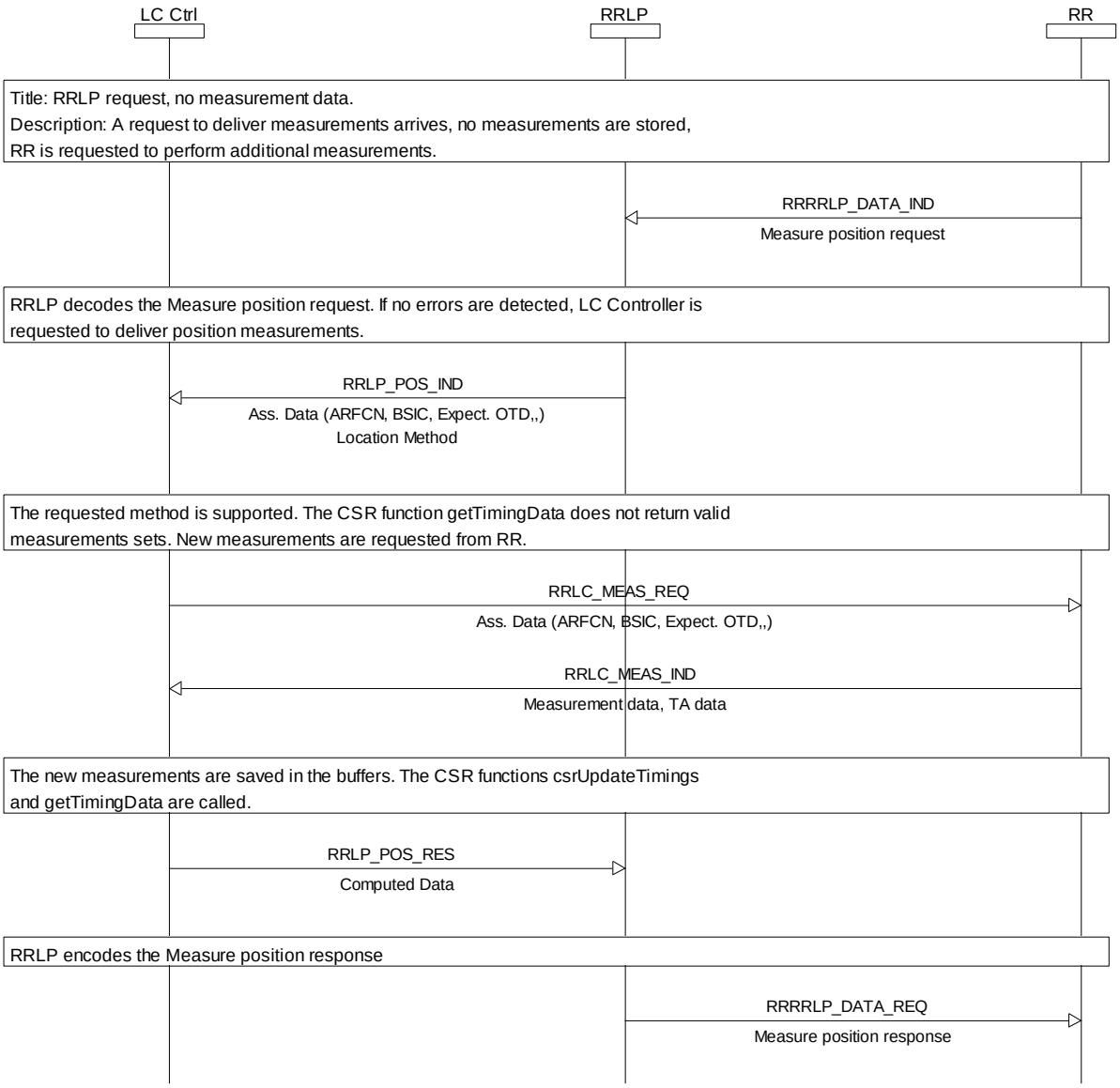


3.1.2 SMS request, measurement data stored.

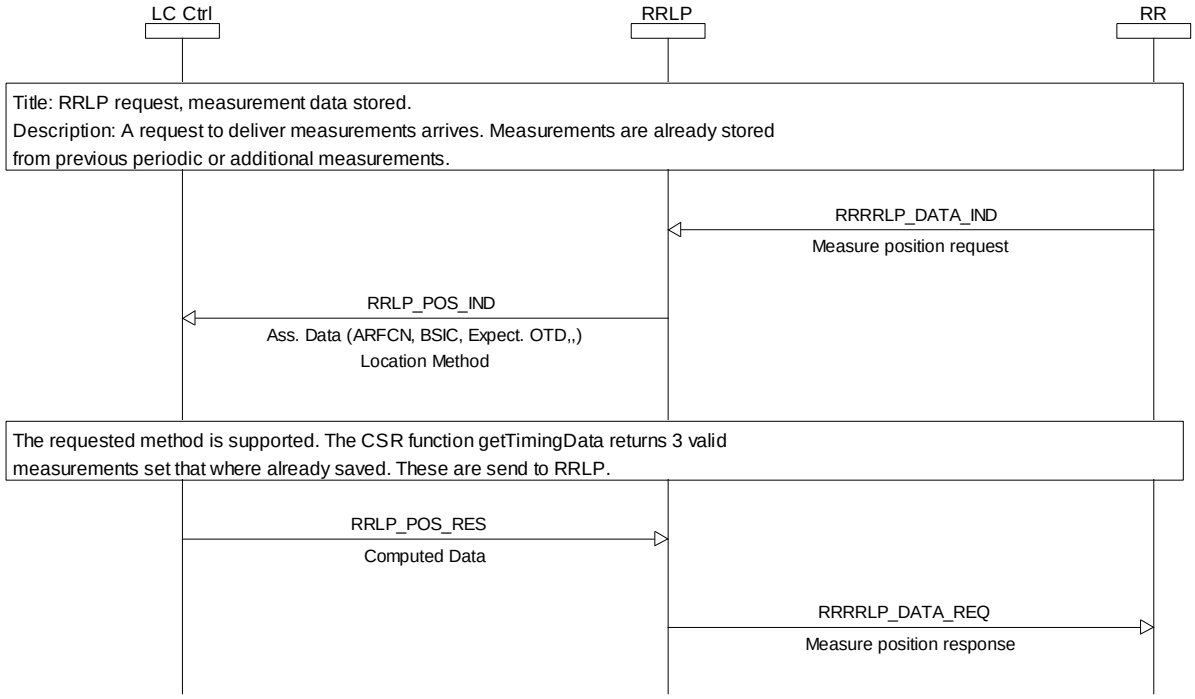


3.2 RRLP request

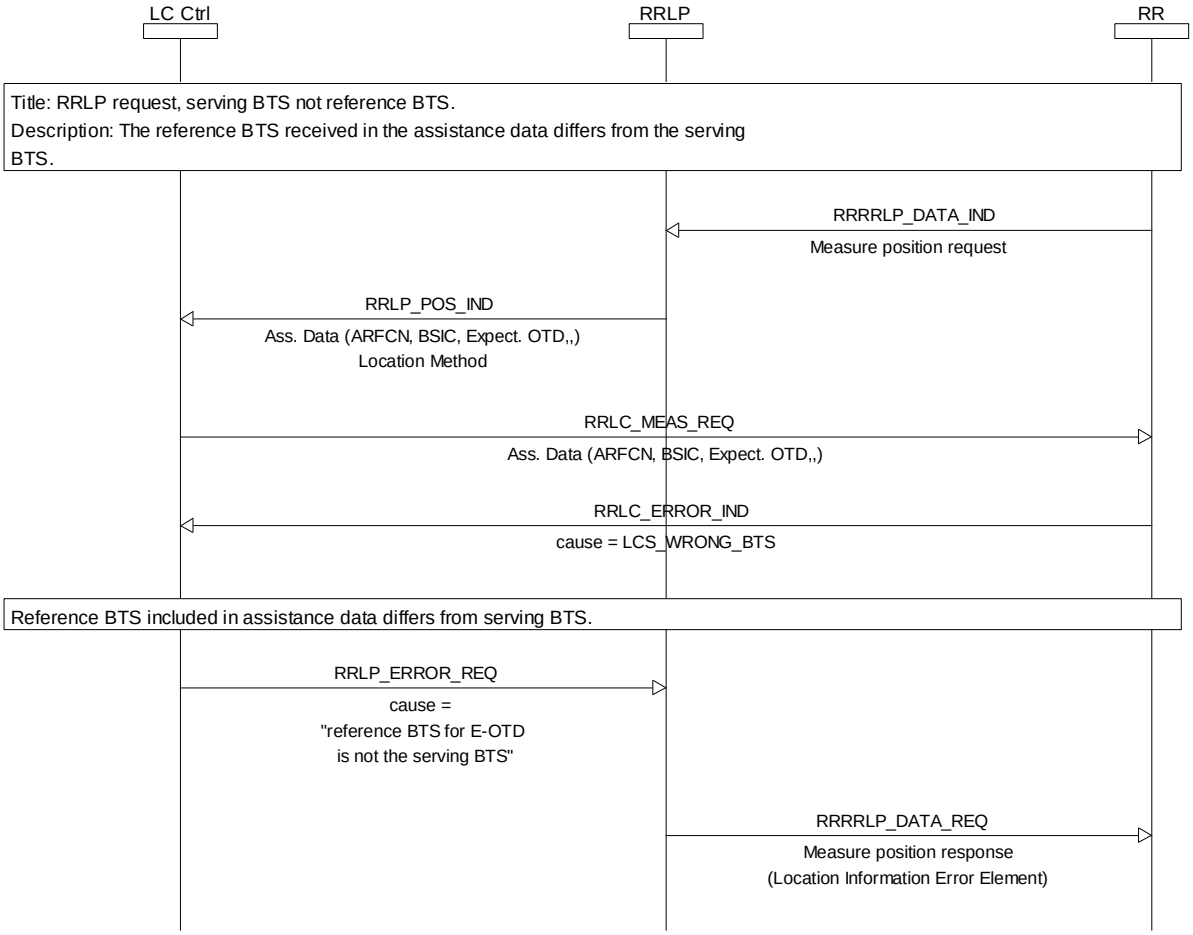
3.2.1 RRLP request, no measurement data



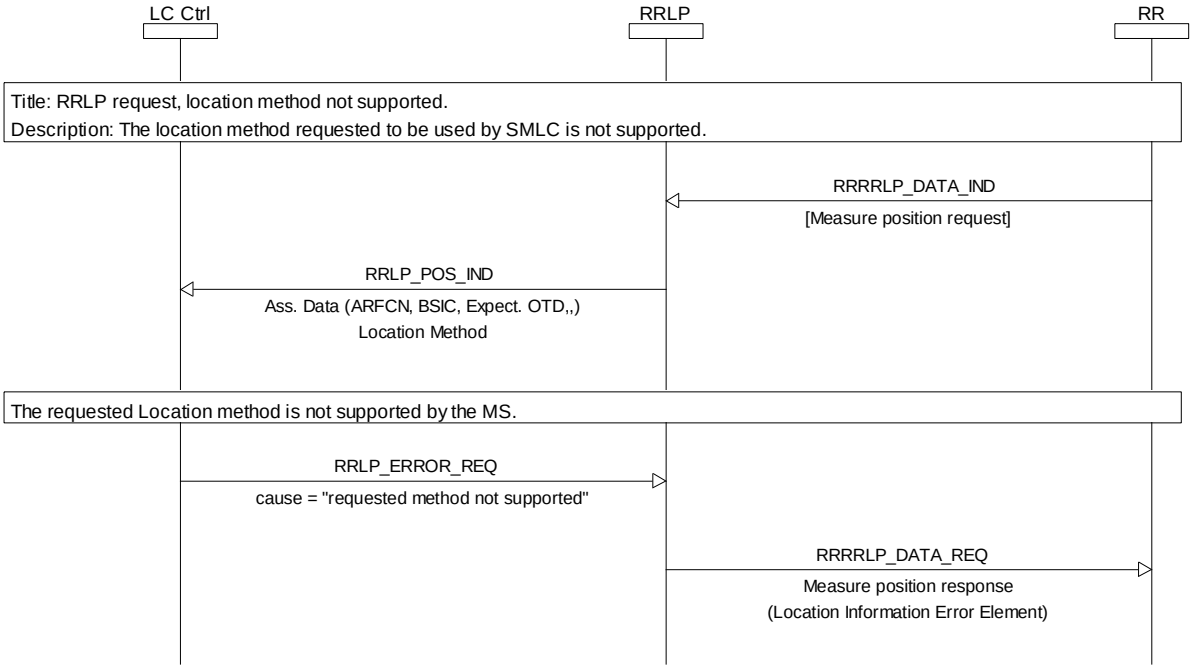
3.2.2 RRLP request, measurement data stored



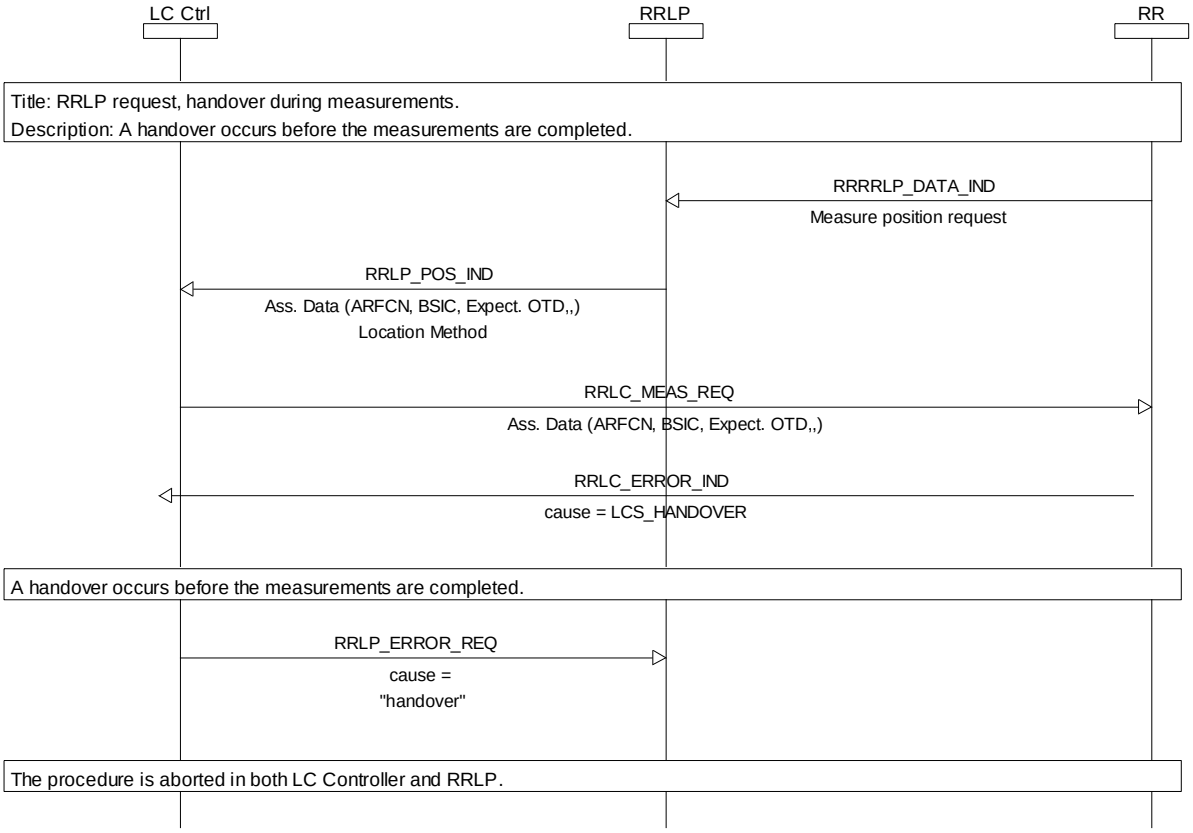
3.2.3 RRLP request, serving BTS not reference BTS



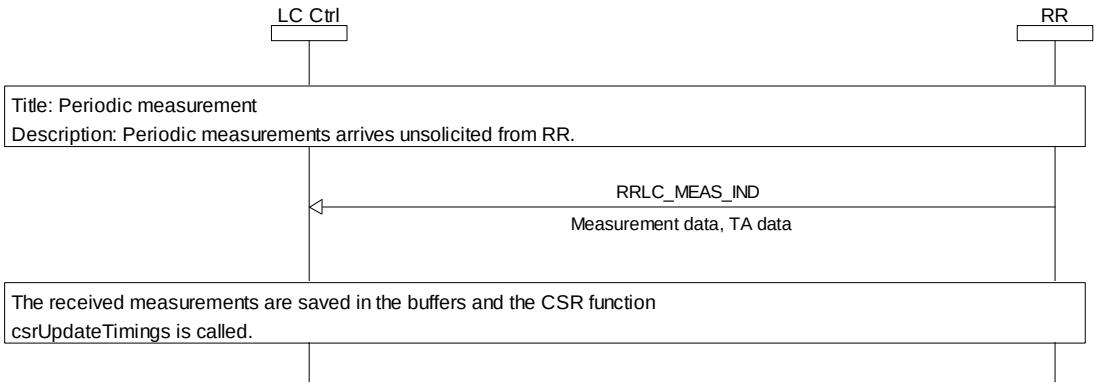
3.2.4 RRLP request, location method not supported



3.2.5 RRLP request, handover during measurements



3.3 Periodic measurement



4 CPS Algorithm

Interface between Controller and CPS Algorithm

Procedures:

CsrUpdateTimings:	This function call is used to update the Algorithm with periodic measurement data (RRLC_MEAS_IND). The CsrUpdateTimings use the input parameter DataBuffer to deliver measurements.
GetTimingData:	This function call is used to get position data from the Algorithm. The position calculation is received in TimingData. TA data is used as input to the Algorithm if it has been received.
CreateSMS:	This function is only used for test. The function call is used to generate a SMS message containing the position calculation with a maximum of 140 bytes in a CPS proprietary format. The message is delivered to the ACI layer.

Global Entity data:

TaBuffer:	TaBuffer is used when the RRLC_MEAS_IND contains the TA data received in a CS setup. The Controller shall copy the TA data to the TaBuffer, which is used as input for the Algorithm. When the Algorithm use the TA data the position calculation is more precise.
DataBuffer:	DataBuffer is used when periodic data (RRLC_MEAS_IND) is received, the controller shall copy the signal to the DataBuffer.
TimingData:	TimingData is used by the Algorithm to deliver position calculations.

Appendices

A. Acronyms

DS-WCDMA	Direct Sequence/Spread Wideband Code Division Multiple Access

B. Glossary

International Mobile Telecommunication 2000 (IMT-2000/ITU-2000)	Formerly referred to as FPLMTS (Future Public Land-Mobile Telephone System), this is the ITU's specification/family of standards for 3G. This initiative provides a global infrastructure through both satellite and terrestrial systems, for fixed and mobile phone users. The family of standards is a framework comprising a mix/blend of systems providing global roaming. <URL: http://www.imt-2000.org/>