

Agenda Item: Ad Hoc 29
Source: Siemens
Title: Work Plan for TDD Location Services
Document for: Discussion

1 Introduction

LCS for the TDD mode is a work item for release 2000. Additional methods have to be specified. This paper proposes how to proceed with location services for the TDD mode.

2 LCS Requirements

According to [1] and [2] basic requirements of location services are:

- Certain accuracy
- Availability in all types of terrestrial radio environments

It is required that a minimum precision of around 50 meters can be achieved [1]. This is motivated by the fact that the accuracy shall be defined by local regulatory requirements. For operation in the U.S. a minimum precision of around 50 meters is required [3].

In addition certain delays between positioning requests and responses should be achieved. Different delays will be required by different applications. Route guiding does require delays in the order of 1s, whereas tourist guides require about 10s response time.

The methods used for location services shall not compromise the radio transmission or the signalling capabilities of the radio system [4].

3 LCS Methods

Different methods may be used for location services [5]. Possible methods used in mobile communications can be categorised into:

- cell id based methods
- methods using the mobile network's air interface
- methods using an air interface different from the mobile network's interface
- hybrid methods

Examples of methods using the mobile network's air interface are methods using OTOA or OTDOA measurements between the UE and NodeBs. GPS is an example for methods using an air interface different from the mobile network's interface.

The methods fulfil different requirements. Table 1 summarises which requirements are fulfilled by the example methods. The table also indicates whether the methods require additional HW or not.

Table 1

	Cell-ID	assisted GPS	OTOA or OTDOA
Accuracy	Few 100m up to several km, depending on cell size	about 20 m	Down to about 20m for 67% of the UEs *, depending on: environment, accuracy of NodeB sync., accuracy of measurements
Environment	Indoor, outdoor	outdoor	In some indoor environments, outdoor, inaccurate positioning if no LOS
Measurement time interval	No measurement required	few seconds **	> several 100ms ***
Additional HW complexity	none	Reduced GPS receiver	low

* simulated accuracies for FDD IPDL methods according to [6,7].

** Typical location update rate of available GPS receivers is about 1s.

*** The estimate is based on the FDD IPDL method. IPs are spaced by at least 5 frames. Several IPs are required per location measurement.

None of the methods by itself does meet the UMTS LCS requirements perfectly. The accuracy of cell id based methods depends on the cell size. GPS does not work in indoor environments. Methods which use the mobile network's air interface will not work in all indoor environments and are inaccurate if the mobile channels do not include LOSs.

4 Conclusion

In order to fulfil the UMTS LCS requirements, several positioning methods must be defined for the TDD mode. Therefore all three above listed methods should be specified for TDD positioning. In particular a method using the mobile network's air interface (OTOA or OTDOA) should be specified as recommended by the work item description [8].

5 Work Plan

For specifying the three location methods, the following work has to be done:

Cell id based methods have already been specified for FDD and TDD in R'99.

Assisted GPS does not depend on the mobile air interface. So, for specifying assisted GPS for the TDD mode, the TDD specifications must only be aligned with FDD specifications. A CR aligning the corresponding GPS related measurements will be proposed at this RAN WG1 meeting #14 [9].

Since TDD and FDD air interfaces are different, mobile air interface based methods cannot be simply aligned between FDD and TDD. Therefore this method should be specified in R'00 for the TDD mode.

To meet the work item time schedule [8], air interface based methods should be proposed until the next RAN1 meeting #15. Corresponding simulation results should also be presented at the meeting. The radio interface based method should be decided at RAN1#15.

6 References

- [1] 3G TS 22.105, V3.8.0, “Services and Service Capabilities (Release 99)”.
- [2] 3G TS 22.071, V3.2.0, “Location Services (LCS); Service Description, Stage 1”.
- [3] FCC 99-245, “Enhanced 911 Emergency Calling Systems”.
- [4] 3G TS 25.305, V3.1.0, “Stage 2 Functional Specification of Location Services in UTRAN (Release 1999)”.
- [5] 3G TS 22.100, V3.6.0, “UMTS phase 1 Release 99”.
- [6] 3GPP TDoc TSGR1#8(99)g88, “Evaluation of IP-DL Positioning Techniques Using Common Simulation Parameters”, source: Ericsson.
- [7] 3GPP TDoc TSGR1#9(99)j09, “Comparison of Time Aligned IPDL and IPDL Positioning Techniques Using Common Simulation Parameters”, source: Motorola.
- [8] 3GPP TDoc TSGRP#7(00)0053, “Work Item Description ‘Support of Location Services in UTRA TDD’”, source: Siemens.
- [9] 3GPP TDoc TSGR1#14(00)0884, “Alignment of TDD measurements with FDD: GPS related measurements”, source: Siemens.