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LCS Architecture

1 Scope

This document outlines the Ericsson view on the proposal to change the agreed LCS architecture.

2 Background

The positioning functionality in UTRAN is integrated in the SRNC according to the R99 specifications. Referencing the architecture in GSM, where the positioning functionality constitutes a separate node (SMLC) with interfaces to the BSS and the Core Network, a number of companies have proposed to change the current UTRAN architecture, see [1]. In this context it should be remembered that positioning was not part of the initial GSM standard architecture and that the separate SMLC node is a consequence of that. In UTRAN, however, the requirement for positioning support was known from the start and the functionality could thus be integrated in the architecture the most suitable way, which eventually led to it being incorporated in the SRNC. A contributing factor to this decision was that the RAN should hide all radio network related functionality from the Core Network.

3 Reasons for keeping the current architecture

3.1 The positioning functionality is very naturally placed in the RNC

The SMLC/RNC gathers measurement information and calculates UE positions based on those measurements. The measurements (e.g. the RTT measurement from the Node-B, the UE RX-Tx time difference from the UE, the SFN-SFN observed time difference from the Node-B or from the LMU etc) are very radio-related and thus the handling of these is properly suited in the RNC. To send these measurements off to some other node would just be to "cross the river for water". One could imagine a similarly awkward solution to open up an interface from the RNC to a separate node that deals with handovers.

There is a stronger tie between positioning functions (SMLC) and other radio related activities (SRNC) in WCDMA than there is in GSM (although also the GSM SMLC would in many cases benefit from being integrated in the BSC). Note e.g. that there is a difference between GSM and WCDMA concerning TA/RTT measurements. In the GSM case the TA values are calculated “automatically” and independently of any positioning requirements since the TA values are needed for the GSM system to work properly. In WCDMA, however, the RTT measurements, actually including the RTT measurement by the Node-B and the UE_Rx_Tx_time_difference measurement by the UE, must be explicitly ordered from the SMLC/SRNC when there is a need to position a mobile. Breaking out the positioning functionality from the SRNC could cause conflicting orders to the UE and the Node-B.

One important positioning function is the determination of positioning method. In WCDMA this choice would be strongly dependent on whether or not the UE is in soft handover mode, since in this case the SMLC/RNC would get RTT measurements from several Node-Bs. The choice would also depend on the possibilities to make a soft handover prior to determining the position. So there is a great coupling between SRNC and SMLC in WCDMA, and thus breaking out the positioning function from the RNC would truly limit the LCS capabilities.

Another example, which highlights the strong ties between positioning functionality and other radio related functionality in the RNC, is when doing OTDOA with IPDL measurements. It would clearly be inappropriate to have a node external to the RNC that makes decisions concerning when the Node-B’s should turn down their power.

3.2 A delay of the LCS standardisation process is not desired

In R99 there is full support for all positioning methods (Cell Id + RTT, OTDOA with/without IPDL and A-GPS) across the Uu interface, and there is also support for the Cell Id + RTT method across all other interfaces. By introducing substantial changes to the LCS architecture there is a big risk of delaying what really is needed: the support for OTDOA with/without IPDL and A-GPS across the Iub and Iur interfaces. Inevitably such delays would cause similar (or longer) delays for the availability of equipment, which could cause both manufacturers and operators revenue losses and negative publicity.

3.3 More interfaces will lead to higher complexity and increased cost

Today UTRAN has two internal interfaces. Given the extensive standardisation work carried out for these interfaces, the proposal to open up yet another one, with more specifications to be written, while maintaining the existing ones, will doubtless create very much work. Also a much more complex system, with an increased operator cost, is the consequence of such a proposal.

4 Reasons for changing the current architecture

The proponents of opening up new interfaces have this far referred to two main arguments, the first one being that there should be commonality between GSM and UMTS and secondly that the operator should have the possibility to reuse its GSM SMLC investments. The first one is difficult to understand since there is no end in itself to have a similar architecture for a new system as an old one, especially if the old system is built as an add-on solution, which was the case for GSM LCS. The second argument is naturally more understandable. It should, however, be noted that the UTRAN positioning methods are different from the GSM methods. Even Assisted GPS, which at first glance may seem RAN independent, is in fact RAN dependent (e.g. the GPS TOW is related to the RAN slot/frame structure). So reusage of GSM SMLC functionality would be possible only to a very limited extent.

5 Conclusion

Ericsson believes that the current LCS architecture is appropriate and that major changes to it may not only delay the LCS standardisation process and make implementation costs soar, but also jeopardize the success of UTRAN LCS.

In order to obtain a fully fledged UTRAN system with support of the three positioning methods: Cell Id + RTT, OTDOA with/without IPDL and Assisted GPS, it is suggested that the LCS standardisation process is finalized by incorporating the necessary additions on the Iub and Iur interfaces, using the current LCS architecture.

6 References

[1] S2-002030 “Work item description for Open Location Services Interfaces in UMTS and GERAN”