
Testing Software for Location Services in Mobile Cellular Networks

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Contents

- **Background and Research Problem**
- **Research Objectives**
- **Research Methodology**
- **Findings of Literature Research**
 - **GSM &UMTS R99 LCS Network Architecture**
 - **Siemens EWSD 2G & 3G MSC/VLR Software**
- **Proposed Test Strategy**
- **Conclusions**
- **Future Work**

Background and Research Problem

- **Work done for the Siemens Information and Communication Mobile (ICM)**
- **ICM produces mobile network nodes based on the EWSD platform**

Research problem:

- **try to make the system testing of the EWSD MSC/VLR software implementing Location Services in a customisation project more efficient**

- **System testing = last phase of software testing performed before product is released to customer**
- **Location Services (LCS) = GSM and UMTS service concept - enables positioning of mobile stations**
- **EWSD software produced in two consecutive software development projects: a common and a customisation project**

Research Objectives

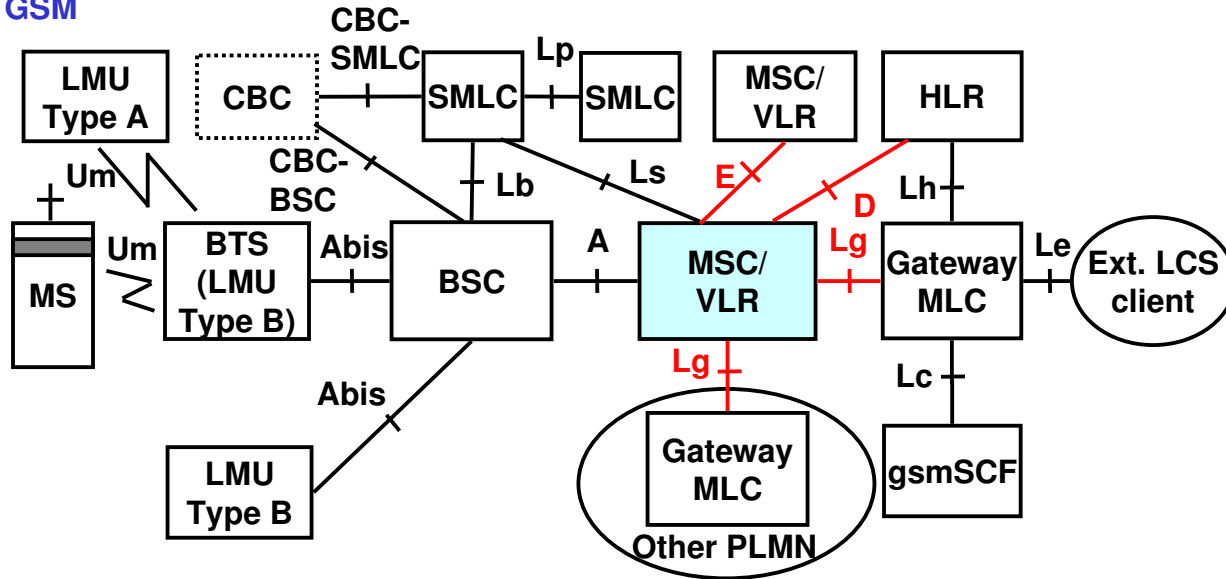
- 1. Propose a common test strategy for the simultaneous system testing of both GSM and UMTS Location Services in a Siemens EWSD customer-specific MSC/VLR software development project**
 - 2. Propose how to improve system testing of Location Services at Siemens**
- Thesis based on Release 1999 specifications and scope limited to the circuit-switched domain**

Research Methodology

- **Literature research of:**
 - **3GPP GSM and UMTS specifications**
 - **Siemens internal specifications and manuals**
 - **Previously performed LCS system tests**
- **Design of test strategy**
- **Practical use of the test strategy in a project**

GSM & UMTS R99 LCS Network Architecture

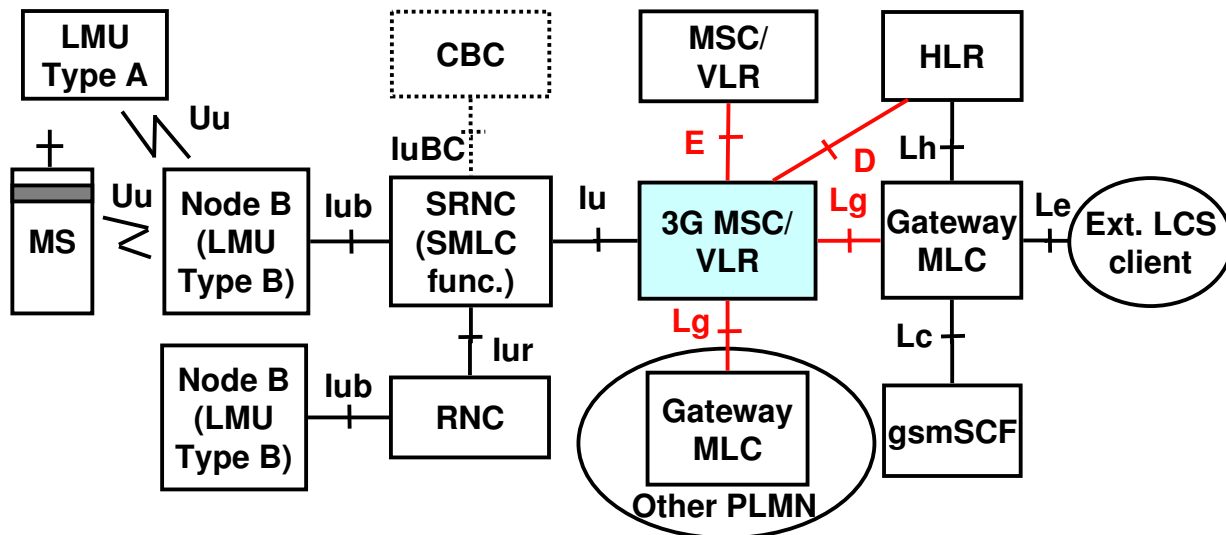
GSM



- Network architectures similar - differences related to radio access networks and the GSM SMLC

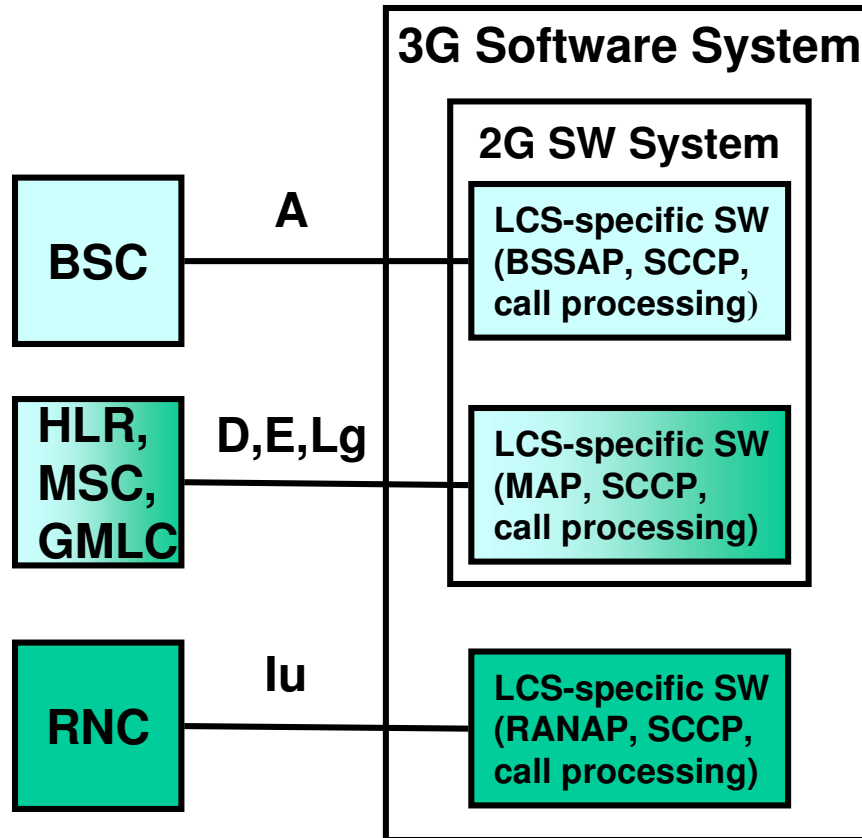
- From a 2G&3G MSC/VLR's point of view

UMTS



- the D, E and Lg interfaces are identical
- the A, Iu and Ls interfaces are system specific

Siemens EWSD 2G & 3G MSC/VLR Software



- **The 3G MSC/VLR software system includes the 2G software system**
 - ➔ **A 3G MSC/VLR can be used to test all GSM and UMTS LCS-specific software**
 - ➔ **Some LCS test cases related to the common GSM and UMTS D, E and Lg interfaces can be tested jointly for both systems**

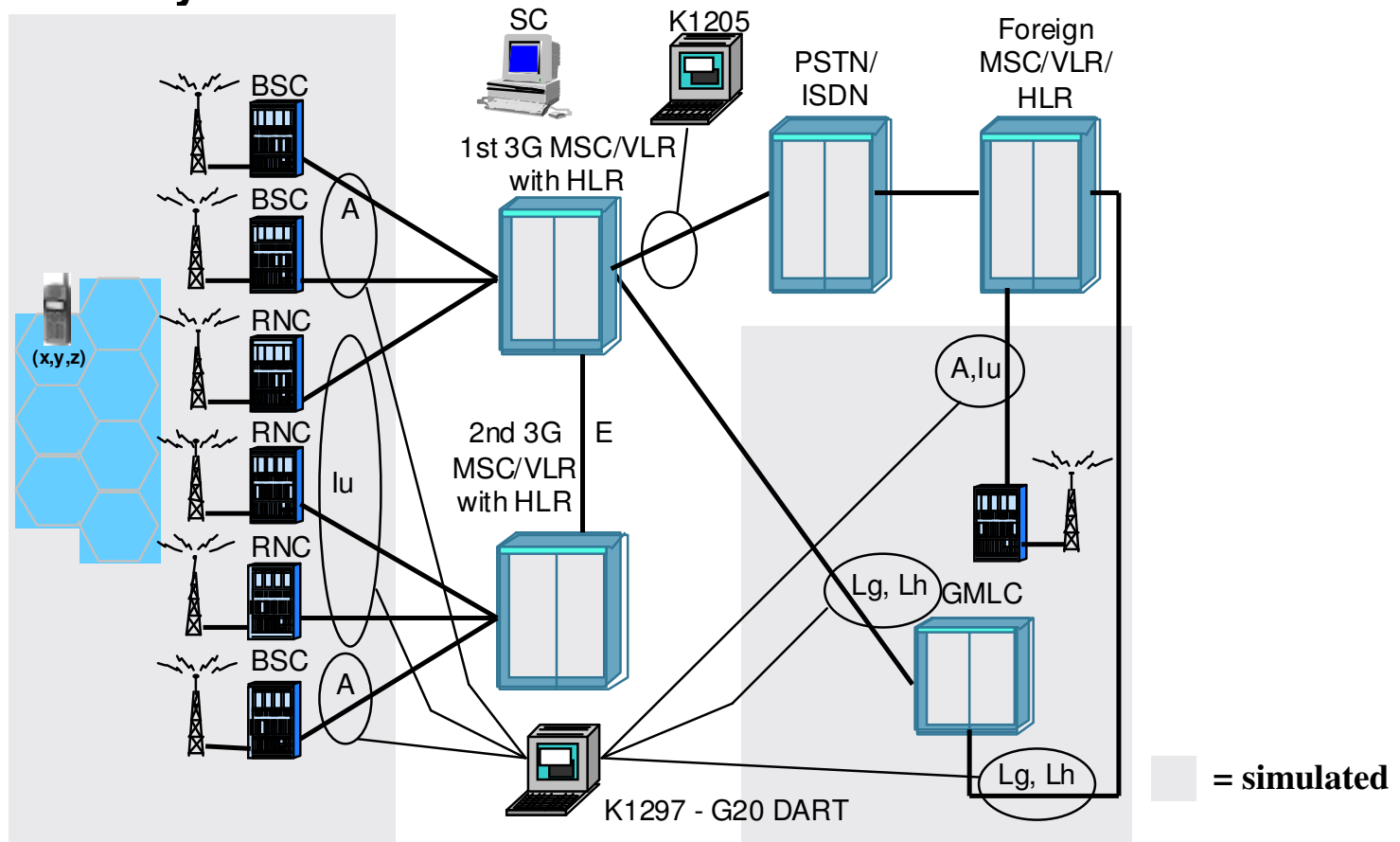
□ = GSM LCS □ = GSM & UMTS LCS □ = UMTS LCS

Proposed common GSM & UMTS LCS MSC/VLR customisation system test strategy (1/2)

- **Siemens Finland test policy restricts tests to function tests-only functionality software quality attribute verified**
- **Fact that some GSM&UMTS LCS tests can be tested jointly utilised to reduce number of test cases (e.g. roaming tests)**
- **Aim of customisation system tests is to establish the software system is fit for customer purposes:**
 - **Test network configuration should correspond to the customer's live network configuration (network architecture, database settings, real HW) as far as possible**
 - **LCS test network configuration limited due to unavailability of LCS-specific network equipment-only fully automated simulation tests possible**

Proposed common GSM & UMTS LCS MSC/VLR customisation system test strategy (2/2)

- Following UMTS test network configuration was proposed for testing 2G & 3G MSC/VLR GSM and UMTS LCS software functionality:



Conclusions

- **Results show**
 - ➔ **possible to rationalise GSM&UMTS LCS system tests and test environment**
- **Only simulated LCS function tests performed, due to**
 - **unavailability of hardware equipment**
 - **Siemens test policy**
 - ➔ **tests not enough to ensure SW is fit for customer use**
- **Recommendations**
 - ➔ **Perform manual testing with real LCS equipment**
 - ➔ **Use also other types of tests: LCS load and stress tests**

Future Work

- **Shown rationalisation benefits only indicative - should be quantitatively measured**
- **Advantage of recommended additional test methods and types of tests should be further studied.**