Testing Software for Location Services in Mobile Cellular Networks

Supervisor: Professor Sven-Gustav Häggman
Instructor: Jarmo Suvinen, Siemens Oy
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

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

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