TTCN-3@Ericsson

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Make sure you have the right tools!
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Ericsson
Technology Leadership

- Ericsson is a world-leading provider of telecommunications equipment to both fixed and mobile networks.
- Headquarters: Stockholm, Sweden
- Employees: 86,500 (May, 2010)
Test Automation is a **key factor** when testing in a complex environment.

Shorter lead time, higher quality and more efficient testing are always goals for test organizations today.
Ericsson history
133 years of continuous INNOVATION

› 1878  From telegraph to telephone
› 1923  From manual to automatic switching
› 1968  From electro mechanics to computer control
› 1981  Mobile communication begins
› 1991  From 1G analog to 2G digital mobile technology
› 1998  Integration of voice and data in mobile networks
› 2000  Moving toward 3G and mobile Internet
› 2001  Sony Ericsson joint venture launched
› 2004  Breakthrough of WCDMA
› 2005  Expanded in IP and fiber transmission
› 2006  Launches of HSPA mobile broadband globally
› 2008  Break-out of mobile broadband and LTE technology
› 2009  ST-Ericsson joint venture launched

Multi-standard radio base station RBS 6000
Early automatic switch
Ericsson drives telecommunication evolution
Test Automation
“Truly Smart Test Automation”
Vision

By providing **state-of-the-art** Test Automation frameworks/tools, methods and processes, we support organizations to exceed their productivity and quality goals. TA will also enable a much higher Test Equipment Utilization by using unattended tests, for example during nights and weekends.
Objective

› Our main objective is to support testers in Ericsson’s I&V activities by providing access to the necessary integrated tools, methods and processes.

› Test Automation is a **key factor** when testing in a complex environment.

› Shorter lead time, higher quality and more efficient testing are always goals for test organizations today.

› Test Automation supports more frequent test runs, mainly regression tests, that are crucial in any incremental development, like Streamline/Agile.
Statement of direction

› To reach the vision there is a number of things we believe are useful in most cases. This means that
  - Use a dedicated Test Automation Team with the right competence:
    › To get attention, focus and long term responsibility
    › Try to avoid a ”one-man-show”
  - The Test Automation Framework must be solid, user friendly and reliable to enable successful deployment
  - ”Keep it simple” - Start in a small scale to prove the concept (A few test cases…)
  - Use an existing framework for automation if possible and Don’t invent the wheel...
  - Only do manual tests where there is a business case (some tests might be too expensive or complicated to automate, pulling boards, cables etc.)
Think more than test case execution...

**Test Automation Frameworks can also be used to:**

› Run *Quality checks*

› Control and program test equipment (for example: Link break generators).

› Create Background Activity Traffic (BAT) and monitor behaviour and performance.

› Measure, calculate and present *Test Equipment Utilization*.

› TCM related activities, for example loading SW on nodes after builds.

› Automation of test management tasks, like reporting of statistics.
Scope

Test Design
- Generate test cases automatically from the requirement documentation, model or database.
- Architecture
- Test Plan
- Management

Test Implementation and preparation
- Test case development
- Check equipment
- Launch of tools
- Test automation

Test Execution
- Run test cases automatically
- Robustness and recovery
- Logging of test results

Test Evaluation
- analyze test results,
- analyze log files,
- make test case statistics (passed, not passed),
- create reports out of log files
- FST
The testing challenge

A lot more to test…

› Telecom represents an ever increasing network complexity

› Test are expected under customer like (load test) behaviour

› Remote testing

› Agile development methods drives more testing (daily test)

› New platforms and processors (multi-core) are non-deterministic
The test tool challenge

Once upon a time…
› Lack of good tools for test automation (true automation)
› Several scripting languages with different logics, capabilities and syntax
› Each tool had its own user interface, formats of logging and configuration
› Tools were stand alone monoliths incapable of communicating

…but now with TTCN-3! 
› One scripting language
› One user interface
› One logging format
› One configuration format
› One tool integration technology
From Titan to TitanSim & Model Based Testing
What is Titan?

› **TTCN-3 Test Design and Execution Environment**
  - Complete tool chain to develop TTCN-3 test suites
  - Test Environment to configure and to execute TTCN-3 test cases
  - Log analyzing tools
  - Provides graphical interfaces for all the tasks above
  - Command line interface for unattended automatic test execution (nightly build and test)

› **A software test tool capable of load**
  - Supports multiple platforms: Solaris, Linux, Windows (over cygwin) and proprietary platforms
  - Load capabilities thanks to an efficient (C/C++) run-time-environment

› **An Ericsson proprietary tool**
  - Not available outside Ericsson
What is TitanSim?

› TitanSim is…
  - SW library written in TTCN-3
  - Like the set of packages in the java domain

› Goal: Provide centrally the most commonly used features to support the development of Performance Test applications

› Provides commonly used features, such as
  - Handling protocol specific data and logic
    › Data definitions, basic protocol functions, etc.
  - Generic data structures with algorithms
    › Hashmaps, Free-Busy Queue, etc
  - Atomic behaviors of protocols that can be used to compose traffic scenarios
    › Currently supports 24 protocols
Traffic Load Simulator

TitanSim
More than just a test tool

Applications
(ready-to-use load tools)

Test Suites
(ETSI SIP CTS, 3GPP benchmark, 3GPP performance)

Libraries
(useful functions, 27 libraries for load)

Servers
11

Protocol emulations
4

Test Ports (adapters)
~70

Protocol support
~200

TTCN-3 Executor
(compilers, RTE, Developer IDEs, Execution GUIs, utilities)
 Deployment in test phases

Network level

System level

Function level

Unit level

Model based testing

Used as one out of several unit (basic) testing techniques

Used in end-2-end testing scenarios

Key usage in load and performance testing

The #1 most used function testing method in Ericsson

TTCN-3@ericsson | Ericsson Internal | EAB/OEP-10:0185 Uen, Rev PA3 | 2010-05-29 | Page 23
Success story
No. of active Titan licenses

The graph shows the number of active Titan licenses over time. The y-axis represents the number of licenses, and the x-axis represents the date. The graph includes three categories: host, user, and host+user. Each category is represented by a different color, allowing for easy comparison over time.
How to get 3000 TTCN users?

› Long **TTCN history** generating high maturity
  - Research even before commercial vendors

› Pushing for the use of a **standard test notation**
  - Easy reuse, competence build-up, a single tool

› Active participation in **ETSI**
  - To grant the Ericsson needs

› In-house **tool development**
  - For fast provisioning, test port development, training, etc

› Dedicated **support group**
  - The Test Competence Centre and local groups

› Reference **network**
  - Truly committed TTCN champions, yearly internal TTCN Conference

› An R&D all **management commitment**
  - Long term granted funding

› Cooperation with external organizations: **Eclipse, NTA Forum** ....
Pushing for the use…

Is TTCN-3 an obvious choice for a test organizations?
In most of the cases **NO**, probably not for the first sight

› Usually no competence about TTCN-3, but JAVA, C…
› Test tool needs to be purchased, not always an easy choice, open source tools for other languages may exist
› Available in house built “good enough” solutions
› Available test series?
Education is an ISSUE

› SW testing is not considered as a career option for a SW engineer “I want something that is creative”
› Usually no separate subject/course about SW testing is available at most of the universities
› TTCN-3 is not a common language for most of the SW engineers
› It is not evident that you can hire test engineers from the street with TTCN3 knowledge, though more and more consultant companies provide such services

The need should be raised from the industry towards the universities

› Within Ericsson there is a dedicated organization called Test Competence Center that is responsible for TTCN-3 education, support and tool development

› Test Competence Center has a cooperation with the Technical University at Budapest, our experts are teaching at the university and providing the possibility of on-the-job trainings for the students.
TTCN-3 Tools & test suites

› Availability of tools is not an issue anymore, you can select tools from different vendors
› More and more standard test suites in TTCN-3

Ericsson’s solution:
› Ericsson’s Test Competence Center provides the toolset for “free” internally
› The reuse of existing solutions is secured (e.g. more than 180 protocol implementations stored centrally and accessible)
› Function and load test frameworks help reuse
› Requirements are handled quickly by using agile methodology in toolset development
Key factors to success story

› Close cooperation with customers

› Architecture & framework supporting reuse

› Financial Model

› Deployment, maintenance & support

› Dedicated organization