TTCN-3@Ericsson

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Make sure you have the right tools!

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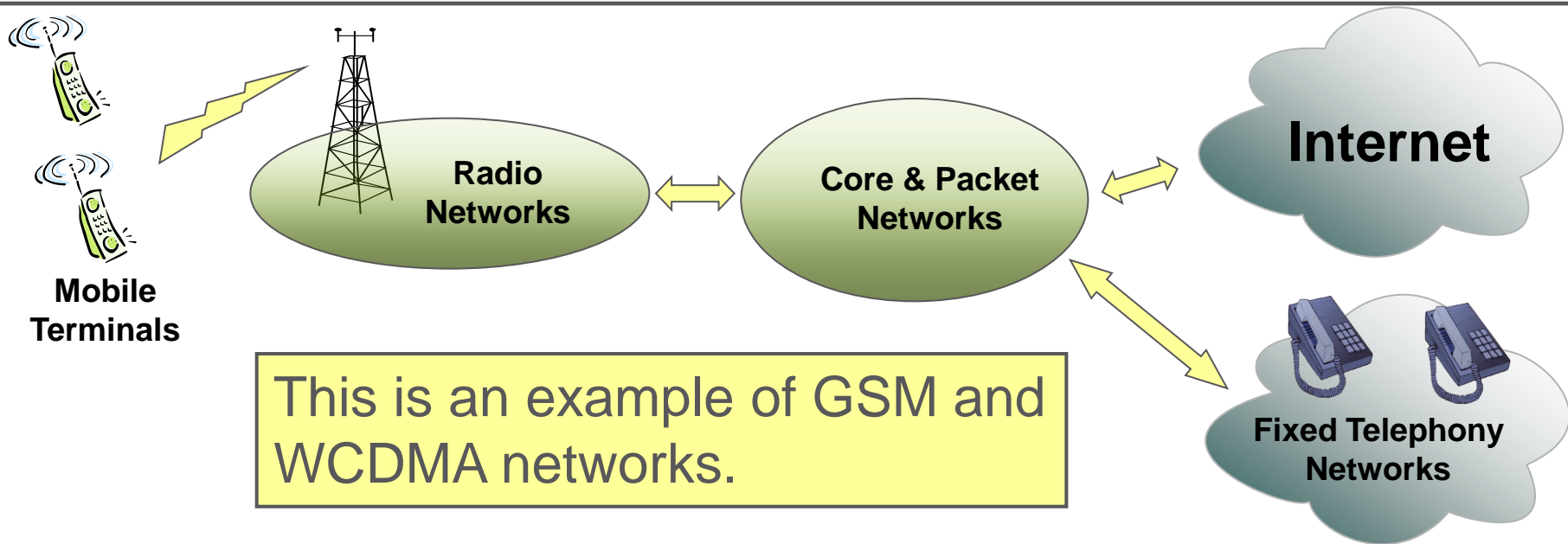
Ericsson

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)*

SUT: Mobile Networks

Mobile Terminals

Radio Networks

Core & Packet Networks

Internet

Fixed Telephony Networks

This is an example of GSM and WCDMA networks.

- *Test Automation is a **<u>key factor</u>** 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
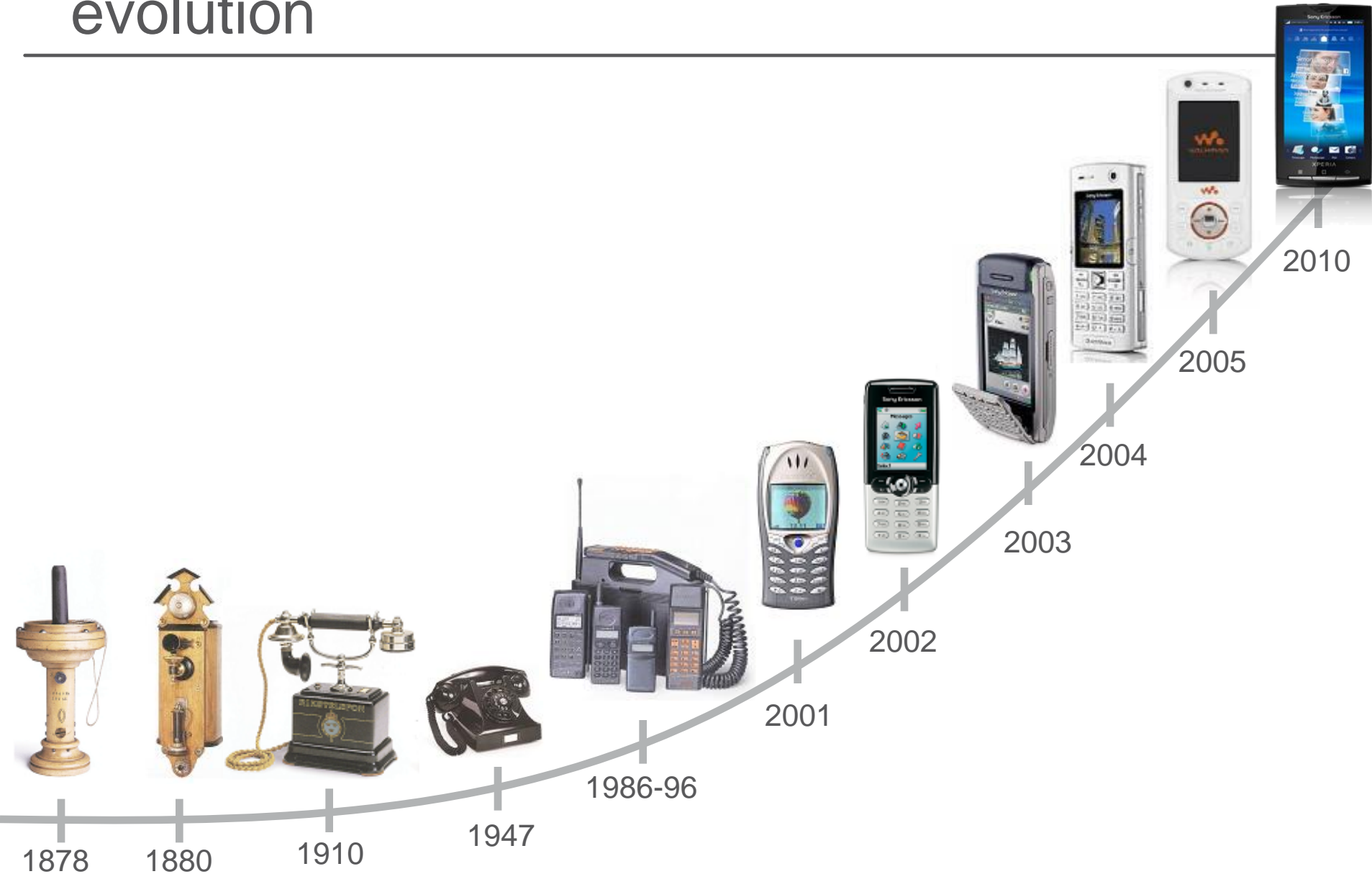- › 2009   ST-Ericsson joint venture launched

Early automatic switch

Multi-standard radio base station RBS 6000

Ericsson drives telecommunication evolution

2010

2005

2004

2003

2002

2001

1986-96

1947

1910

1880

1878

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 **<u>key factor</u>** 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

Test Implementation and preparation

Test Execution

Test Evaluation
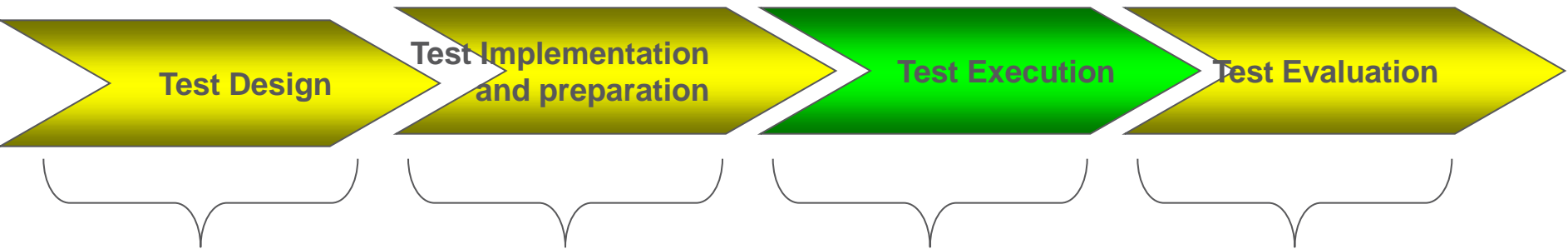
- Generate test cases automatically from the requirement documentation, model or database.

- Architecture

- Test Plan

- Management

- Test case development
- Check equipment
- Launch of tools
- Test automation

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

- 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)

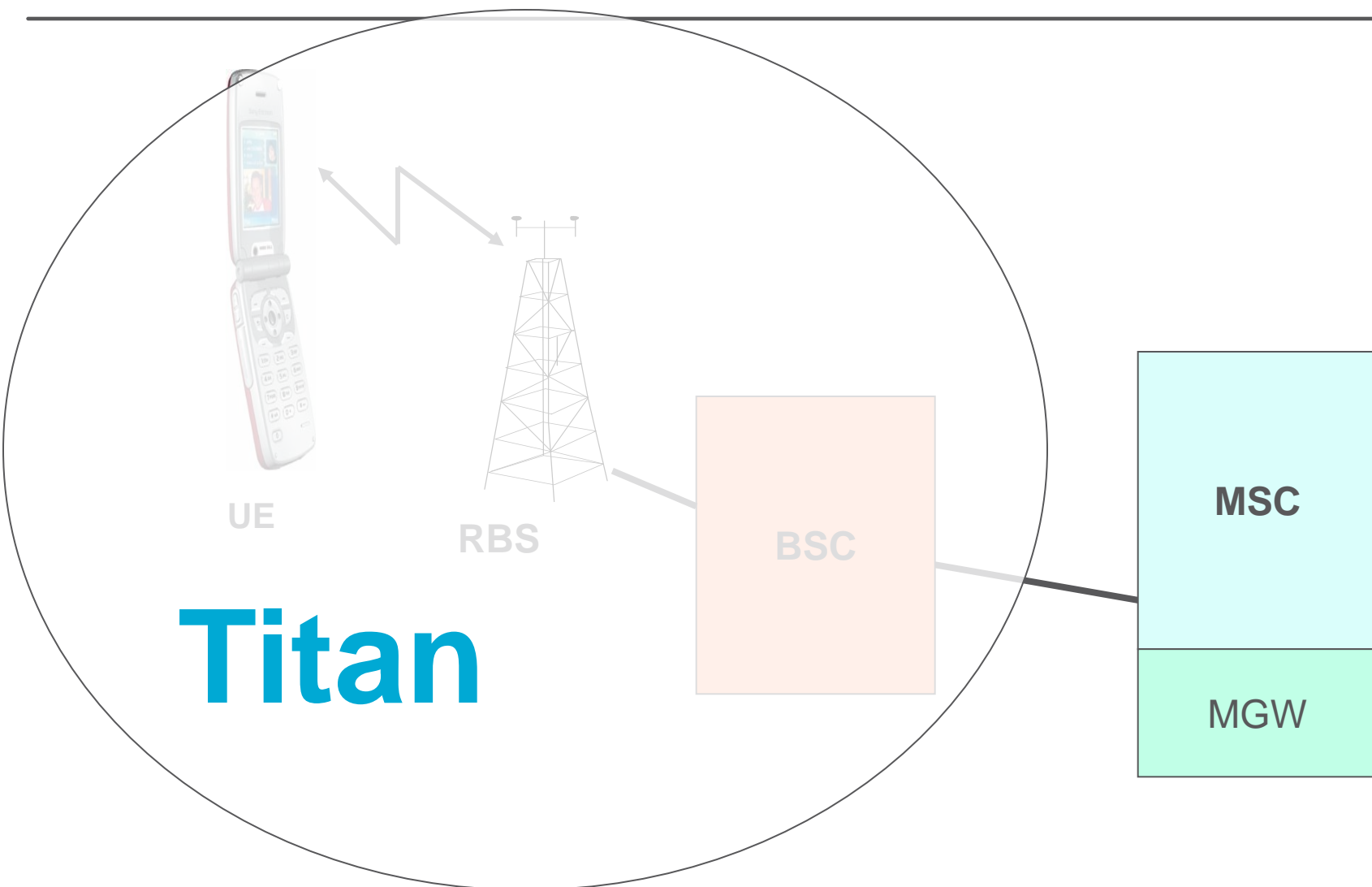› **A software test tool capable of load**

  - 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

Traffic Simulator

Titan

UE RBS BSC MSC MGW

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 <u>Performance Test</u> 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
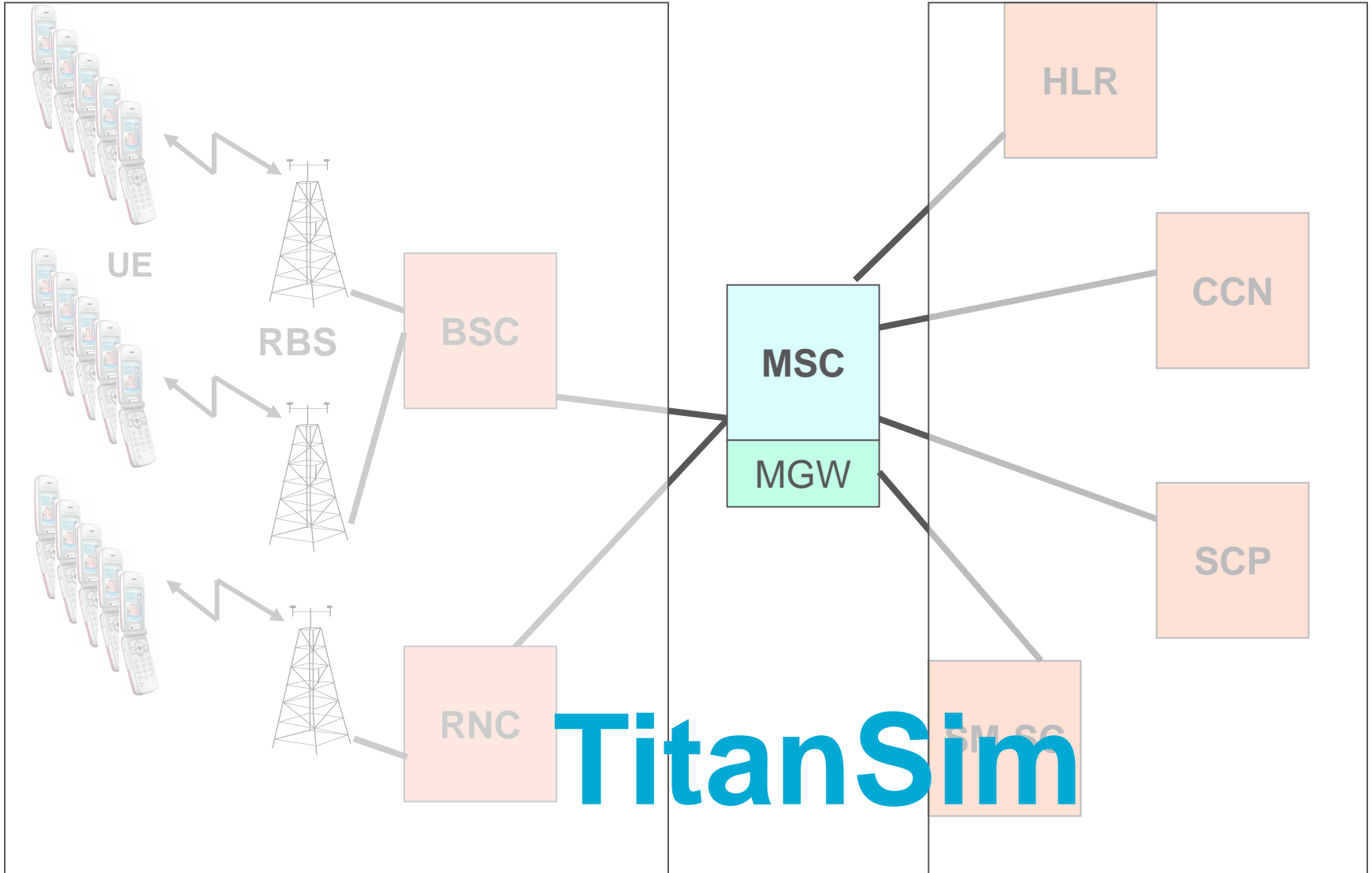
More than just a test tool

Applications
(ready-to-use
load tools)

Test Suites
(ETSI SIP CTS, 3GPP benchmark,
3GPP performance)
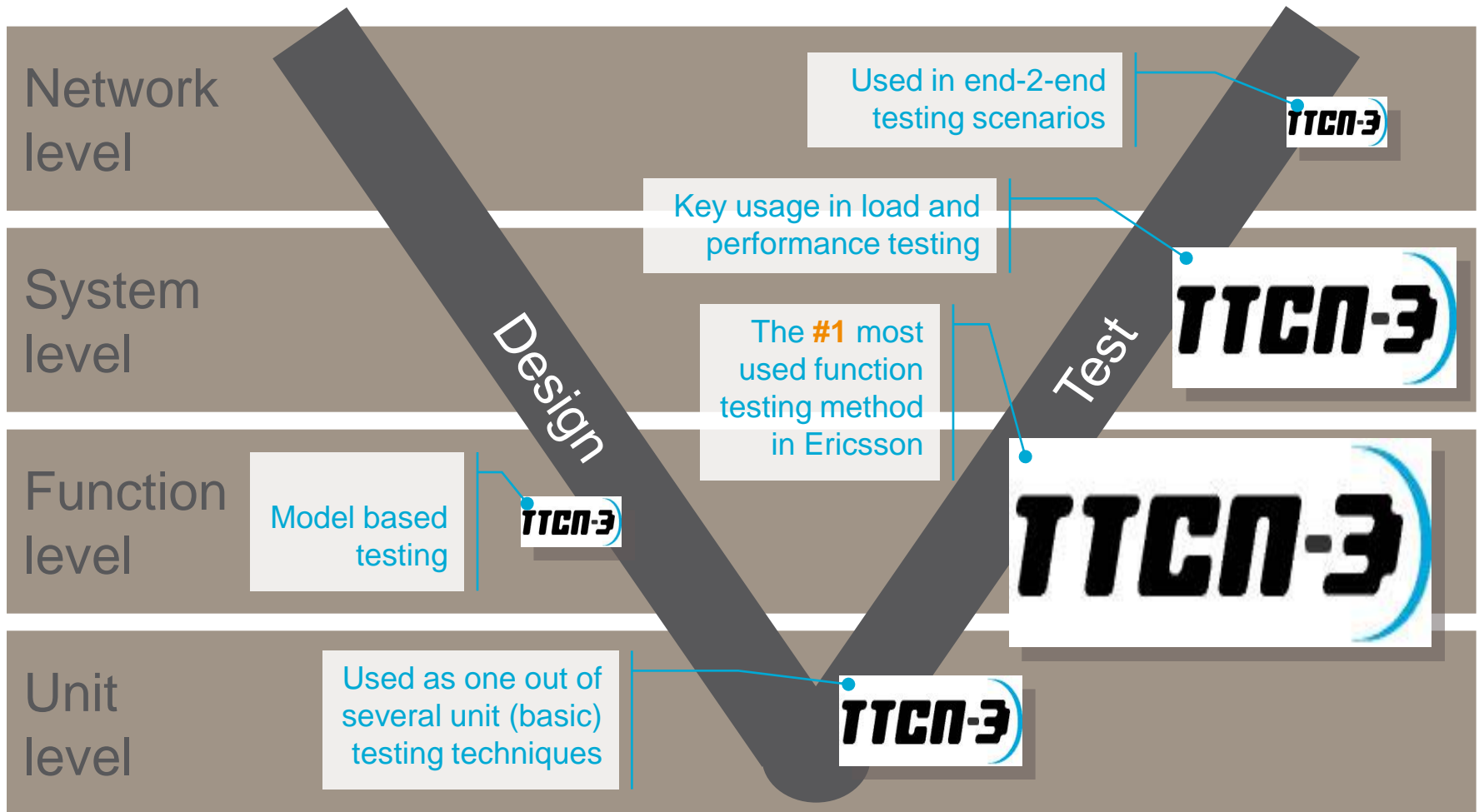
Libraries
(useful functions, 27 libraries for load)

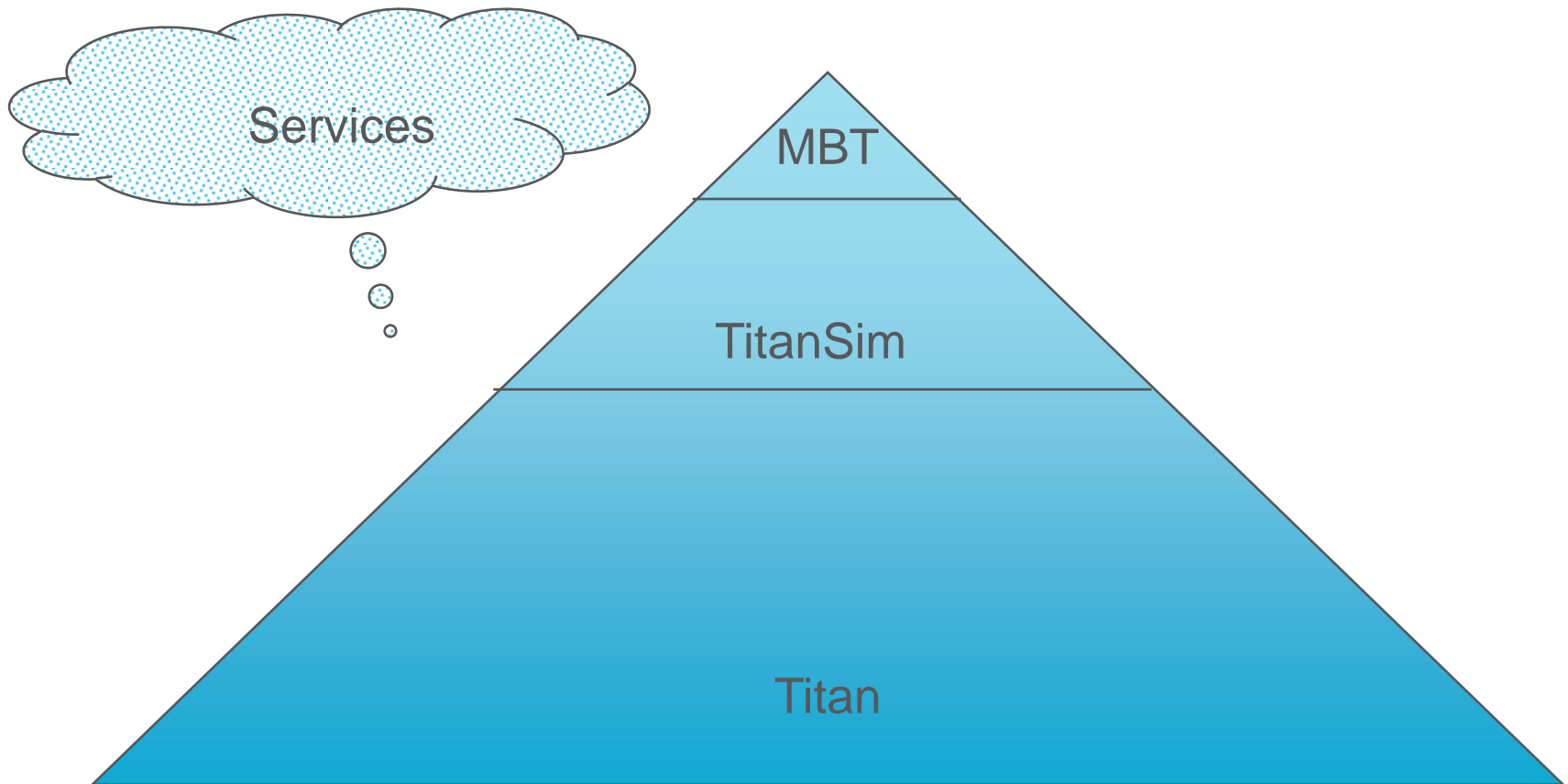**Servers**
11

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

Used in end-2-end testing scenarios

TTCN-3

Key usage in load and performance testing

System level

TTCN-3

The **#1** most used function testing method in Ericsson

Design

Test

Function level

Model based testing

TTCN-3

TTCN-3

Unit level

Used as one out of several unit (basic) testing techniques
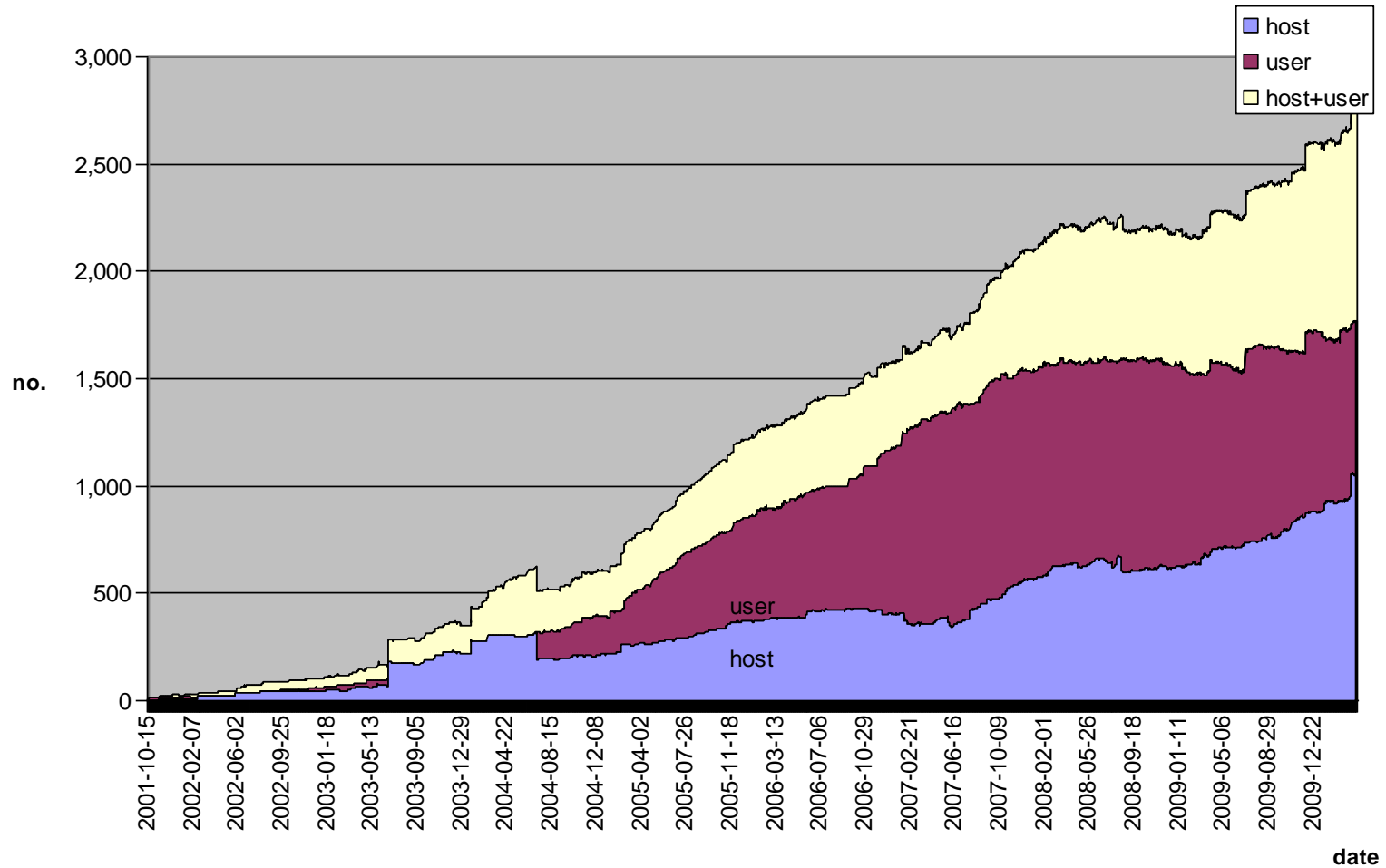
TTCN-3

Titan, TitanSim & MBT

Success story

No. of active Titan licenses

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.
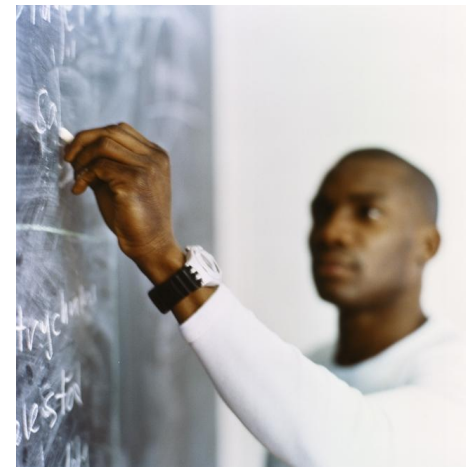
TTCN-3 Tools & test suites

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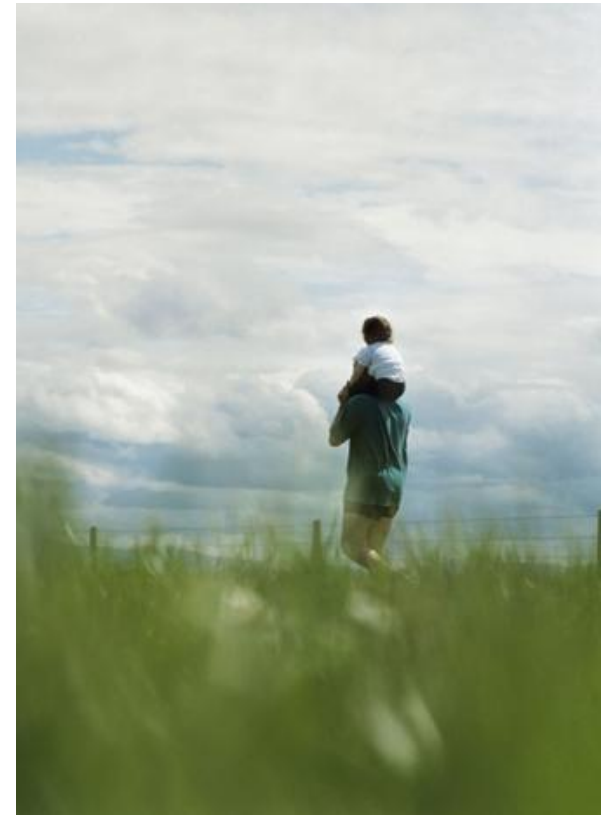
› More and more standard test suites in TTCN-3

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