



AUTOMATION JOURNEY

CHALLENGES AND LIMITS

10th Workshop on System Testing and Validation

Dr. György Réthy, Ericsson

ABOUT MYSELF

- Graduated as Ph.D. in 1991
- > Hungarian Telekom (now T-Com company) 1993-1999
 - Technical coordinator of ISDN intro.
 - ISDN acceptance tests
 - International end-to-end ISDN tests
- > Ericsson R&D in Hungary 1999-
 - Development of components for automated functional testing (RNC)
 - Coordinating conformance test development for 3G switching centers
 - Technical product manager of **Ericsson Test Competence Center**

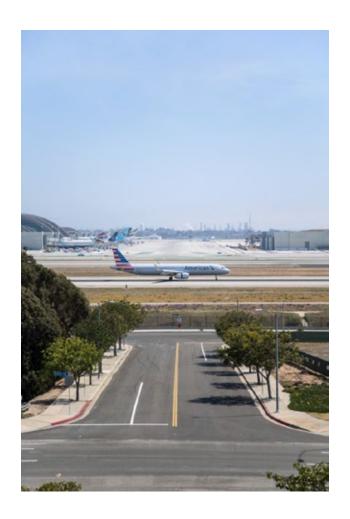


CONTENT



Let's take a short journey in time, looking at the overall status of Test Automation at practitioners,

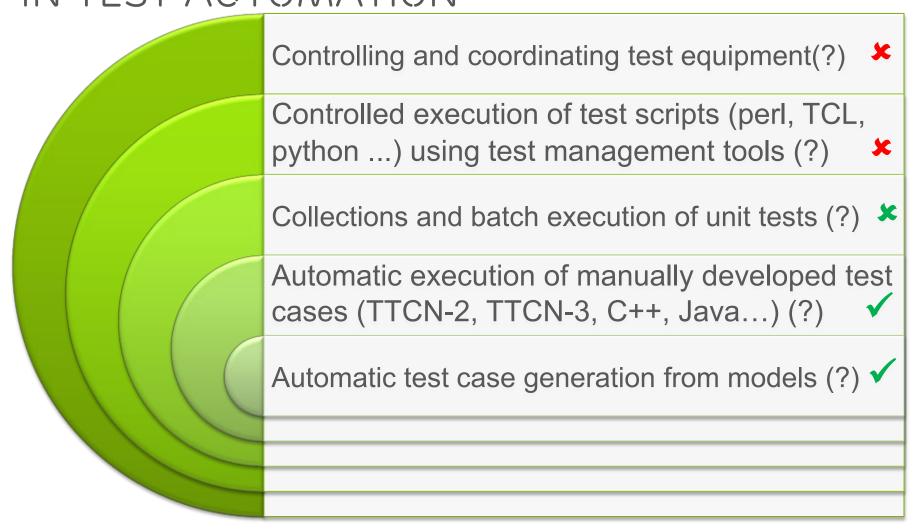
and some related research projects



Note: some statements may not be valid in other industries, like safety-critical systems

WHAT I WILL FOCUS ON? IN TEST AUTOMATION





WHAT I WILL FOCUS ON? IN TEST AUTOMATION





Controlling and coordinating test equipment(?)

Controlled execution of test scripts (perl, TCL, python ...) using test management tools (?)

Collections and batch execution of unit tests (?) *

Automatic execution of manually developed test cases (TTCN-2, TTCN-3, C++, Java...) (?) ✓

Automatic test case generation from models (?) ✓

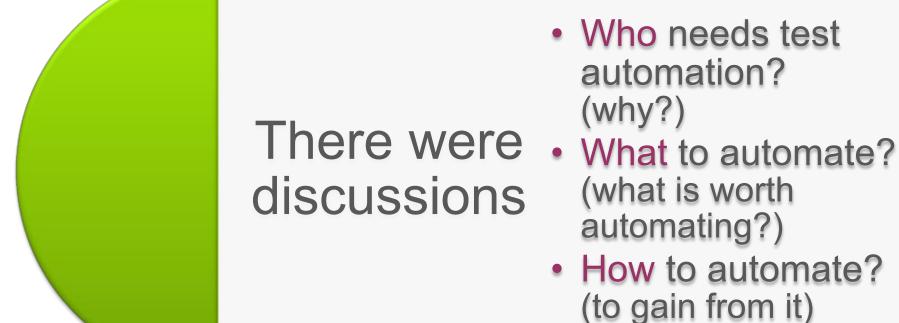


In general, there two aspects:

test execution and
test development

ABOUT A DECADE AGO...





- Who needs test automation? (why?)
- (what is worth automating?)
- How to automate? (to gain from it)

ABOUT A DECADE AGO ...

TEST AUTOMATION

TEST EXECUTION

- Organized execution of test scripts (perl, python etc.)
- Running test cases written for a test automation language/framework
 - -> human interaction was needed at least for test execution preparation
- > The SGSN story
 - 2 weeks / 5 people wereneeded to run regression test"automatically"

TEST DEVELOPMENT

- Mainstream is manual test case development
- Model-based techniques are used by some projects
 - E.g. generating TTCN-2 code from SDL specifications
 - Required considerable human interaction during test generation

ABOUT A DECADE AGO... TEST AUTOMATION TEST EXECUTION TEST DEVELOPMENT

- Organized execution of test scripts (perl, python etc.)
- > Running test cases written
 in a test automation
 language/framework
 -> mostly human interaction
 was needed for SUTOWN
 test environment Set-up
- needed to run regression test
 - "automatically"

- > Mainstream is manual test case development
- Model-based techniques are used by some projects from SDL specifications
 - Required considerable human interaction during test generation

ABOUT A DECADE AGO...

TT-MEDAL (2003 - 2005)

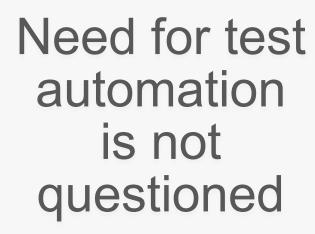


- > European industrial and academic research offensive
- Industrial application of tests and testing methodologies with advanced languages
- > IDL, UML (incl. UTP, eUML), XML, TestFrame, TTCN-3
- Software tool vendors provided general test infrastructure based on TTCN-3.
- Test device vendors proved the applicability and suitability of TTCN-3 technology.



ABOUT 1/2 A DECADE AGO...





- Telecom industry changed to agile development
- Short, incremental development cycles
- Regression testing is a must
- How to automate? (what is the most efficient way?)

ABOUT 1/2 A DECADE AGO...



TEST EXECUTION

- In (unit and) functional testing areas automated test execution is well established
 - Attended
 - Unattended (nightly, weekly)
- "Everyone" is looking for a test automation solution

TEST DEVELOPMENT

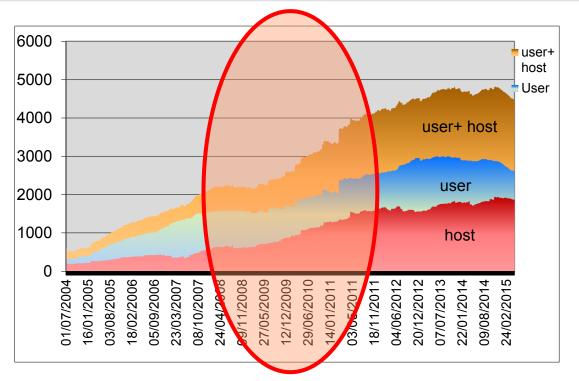
- Mainstream is manual test case development
- Several MBT pilots and trials
- Some products uses MBT as the main test design method

ABOUT 1/2 A DECADE AGO ...



TTC(1-3) is not the only mean of test automation

Still, the figure well illustrates the **firm increase** the need for **test automation** (other factors are e.g. the rising number of products)



No. of TTCN-3 users in Ericsson

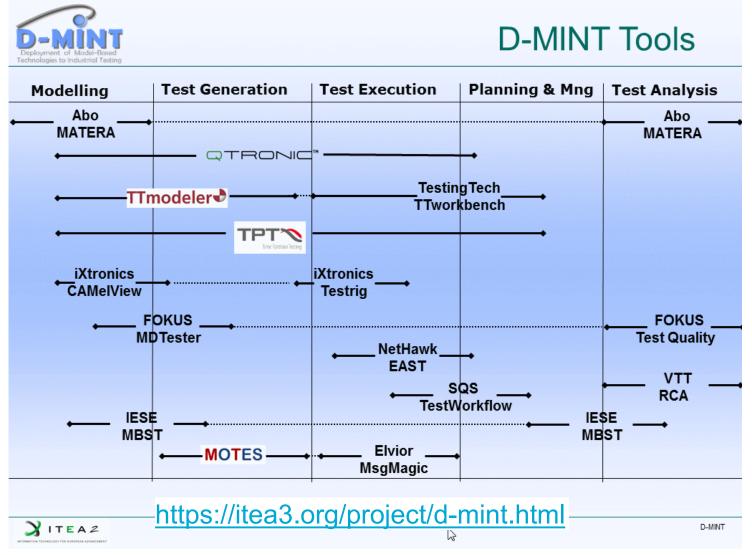
ABOUT ½ A DECADE AGO... D-MINT (2007 - 2009)



- > Deployment of model-based technologies to industrial testing
- > Automated test execution often via TTEII-3)
 - Being the major test middleware
- Demonstrators in industrial domains from street lighting to mobile phones
- Working at higher levels of abstraction with models, rather than actual code, makes it possible to reuse some of these models as the specification



ABOUT ½ A DECADE AGO... TOOLCHAINS LOOKED AT



NOW... SHOULD WE YET TALK ABOUT TEST AUTOMATION AS A SEPARATE DISCIPLINE?



- > Integrated into product development
- > Very similar problems to solve as for SUT code development

Most often referred to as the mean for:

Quality assurance

Quality checking

Productivity



"Word cloud" is created from the article:

Test Automation Benefits and Challenges; Interview with Bernardo Rivas, Microsoft https://airbrake.io/blog/interview/test-automation-benefits-challenges-interview-bernardo-rivas-microsoft

NOW...

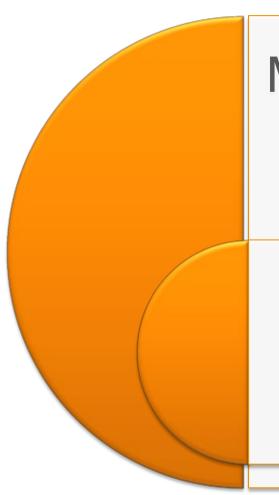


How to speed up the development "pipeline"?

- In telecom agile is running full scale
- Small drops, more often, in deployable quality
- New paradigm: "cloudization" of telecom networks



TEST DEVELOPMENT



Model-based test design (MBT)

- MBT (and UML) is gaining more acceptance
- The major question is now the HOW?
- Number and maturity of tools is increasing
- Free and open source tools are available

High level test case design

- Keyword driven testing/Behaviour driven development (BDD)
- UTP and Test Description Language

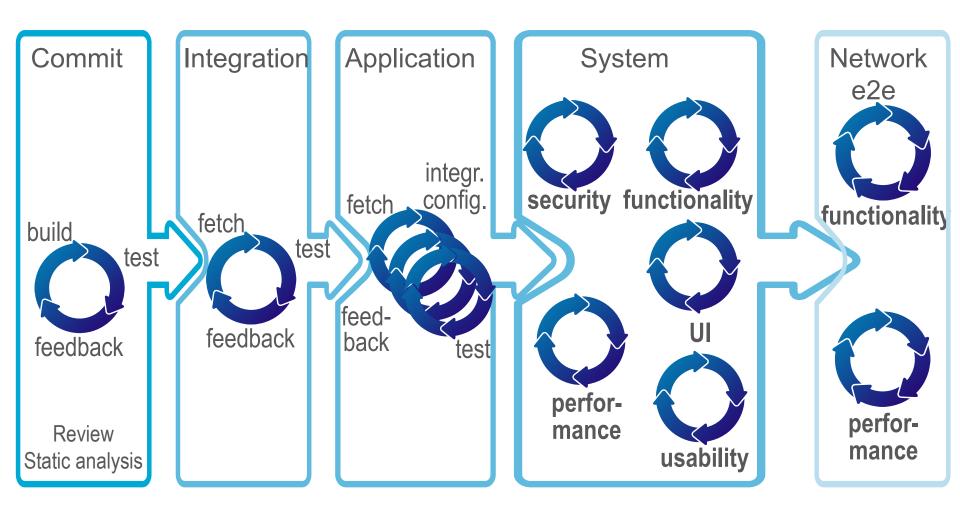
AUTOMATING TEST AUTOMATION





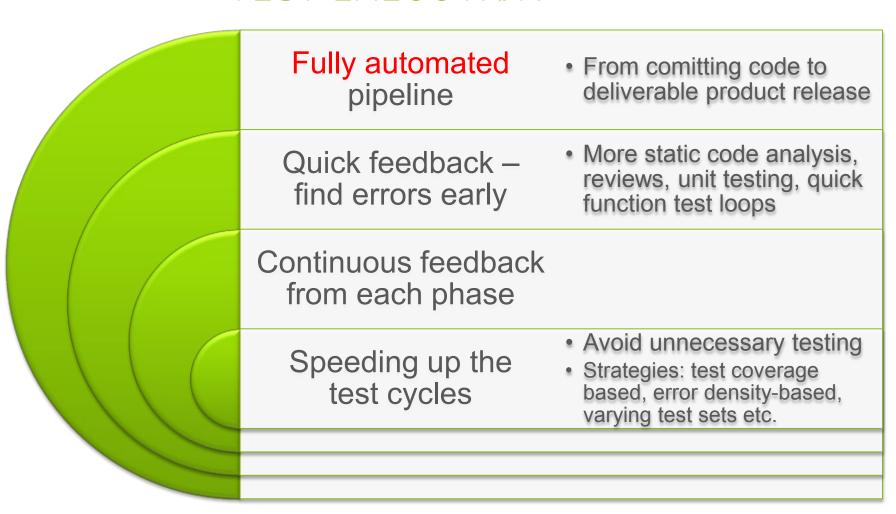
AUTOMATING THE PIPELINE CONTINUOUS INTEGRATION





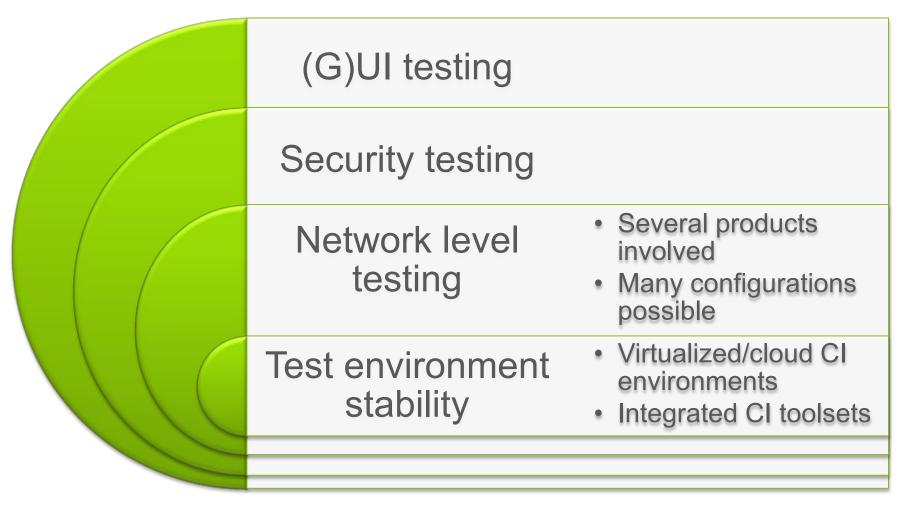
MAIN TARGETS





CHALLENGES: AUTOMATING SOME STEPS





DIAMONDS (2010 - 2013)



- Development and Industrial Application of Multi-Domain Security Testing Technologies
 - Combination of active and passive security testing
 - Fuzz tests (for unknown issues) and functional tests (for security measures)
 - Combination of risk analysis and test generation
- Enabling the early identification of design vulnerabilities and underpinning a focus on the efficient testing of security aspects



MIDAS (2013 - 2015)



- An integrated framework for SOA testing automation that will be available as a Software as a Service (SaaS) on a Cloud infrastructure.
- All the testing activities: test generation, execution, evaluation and scheduling, on the functional, interaction, fault tolerance, security and usage-based testing aspects.
- Approach bases on the MIDAS DSL (domain specific language) based on UML & UTP and includes the generation of executable TTCN-3 from the test models.

CONCLUSIONS



DID WE ARRIVE?

> AUTOMATED TEST EXECUTION

- For the last decade has made good progress from semi-automated test execution to real automation
- Still some challenges exists that will be solved due to urging business needs

> TEST DEVELOPMENT

- Model-based test design techniques, tools has established at many areas
- The swap related to manual test case development is still ahead

> RESEARCH

- Is a forerunner of the changes (of course)
- Aiming removing barriers for wider use of model-based techniques





ERICSSON