

Automated Interoperability Testing with TTCN-3

How to increase efficiency

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Testing

Technologies





Outline

Motivation

- Interoperability testing Who and Why
- □ How to increase the efficiency of interoperability testing
 - Where is the money spend
 - How can we spend the money more efficiently
- Conclusion





Different Types of Testing



(Standardized) Functional Tests (Single IUT)

Interoperability Tests (2+ IUTs) Performance Tests (High, long-lasting load)





Different Types of Testing



(Standardized) Functional Tests (Single IUT)

Interoperability Tests (2+ IUTs) Performance Tests (High, long-lasting load)





Rise of Interoperability Testing

□ Classical conformance testing is becoming too costly

- New approach which checks conformance as part of interoperability testing is showing promising results
- Does not guarantee interoperability of tested products
- Bi-lateral testing and interoperability events are increasingly accepted as a solution to improve interoperability
 - ➢ ETSI interoperability test specifications & <u>Plugtests™</u> for a wide range of technologies including IMS, HDMI, IP, VoIP, RFID, grid, etc
 - > OMA interoperability test specifications & Testfests for enablers
 - WiMax network infrastructure interoperability testbed
 - > Over 700.000 hits with Google, more than 1,3 million hits with Yahoo





Interoperability Testing Today

□ Interoperability testing means different things to different people

- Attend an event
- Test whatever with whoever whenever you want (ad-hoc)
- Scheduled test sessions (attempting to cover all possible pairings of different participating products)
- Execution of agreed test list in each test session
- Validation of execution traces against standards
- > As well as various combinations of the above
- Majority of interoperability testing and validation is performed manually
 - Labor intensive
 - Does not scale
 - Error prone
 - Frequently inconsistent





Break-Down of Test Effort today





Test Effort spent at ETSI 1st IMS Plugtest 2007

Background information

- Event assessing IMS core network interoperability at network-tonetwork (NNI) interface
- Agreed test list with 23 different interoperability tests
- > 6 IMS core networks tested all against each other
- > 30 recorded test sessions (A -> B as well as B -> A)
- 482 test execution traces to be evaluated (SIP message flows)
- > 4 days time for test execution, recording, and evaluation

□ The testing effort

- > 180 h of interoperability testing (46%)
- > 204 h of manual validation of execution traces (54%)
- Sums up to total effort of 384 h (100%) related to testing
 - 48 pd

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Break-Down of Test Effort today









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Reuse: key for increasing efficiency

- □ Reuse of test code across different types of testing
- Reuse of information between
 - > System architects
 - > Developers
 - > Testers
 - > Managers
- **Reuse of test system artifacts**
- □ Reuse of know-how

> Use TTCN-3 as a common test language during different phases!





How to Profit from TTCN-3







Recommendations to increase testing efficiency

- □ Automate the interoperability trace checking with TTCN-3
 - Reduces cost+time & increases consistency of results!
- □ Reuse constructs from existing test frameworks
 - Profit from investments already made
- □ Use industrial grade test automation tools
 - Benefit from well accepted processes, workflows and tools

A TTCN-3 allows to minimize validation effort for interoperability testing!



One example implementation – TT trace player

- Uses files to configure IP information of equipment monitored in test session
- Import of PCAP trace and validation integrated in TTCN-3 tool
- Implements test system for standardized IMS interoperability trace checking tests
- Successfully used for trace analysis in 2nd ETSI IMS Plugtests 2008

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Example trace checking test execution log

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What did we gain?







What did we gain?







What did we gain?







STF 370 – Automating interoperability testing

- ETSI STF investigating use of TTCN-3 for automating interoperability testing of distributed systems
 - Case study selected to be IMS core network testing
 - Funded in part by European Commission
 - **>** Builds on results from TTCN-3 tool development for 2nd IMS Plugtest
 - Started in 2009 and expected to finish in 2010

Output includes

- ETSI guide on a methodology for automated IOT
- **ETSI** technical specification on application of it to IMS domain
- TTCN-3 tests implementing standardized ETSI IMS interoperability test descriptions
- > TTCN-3 codec and adapter implementations for a test system
- > Validation and report for using TTCN-3 tool in upcoming IMS Plugtest
- > White paper on STF experiences & lessons learned





Conclusions

- Interoperability testing is an accepted way to reduce interoperability problems
- Manual interoperability testing is time consuming and error prone and therefore expensive
- ❑ Automation of interoperability trace checking can reduce the costs up to 50% as compared to manual validation
 - Standardized test framework
 - > Off-the-shelf TTCN compilers
- □ Standards, tools and the people are available today





Road ahead

- Reduce cost even more by further optimizing the TTCN-3 test design for interoperability trace checking
 - Based on feedback from first use at 2nd IMS Plugtest
 - > Note that previous test system was build in only 10 days!
- Align existing test framework with new ETSI automated methodology
- □ Next application of this is at 3rd ETSI IMS Plugtest in Lannion FR

www.etsi.org/plugtests/IMS IPTV

- □ Apply these concepts also in other domains
 - Grid
 - > WiMax
 - > HL7 (eHealth)





THANK YOU!

Questions?

