



TTCN-3 applicability to remote embedded testing of electronics

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TTCN-3 User Conference 2008
June 3 – 6, 2008, Madrid, Spain



Presentation outline

- Introduction
 - Approach to remote embedded testing
- Theoretical part
 - UTCS proposal
- Experimental part
 - TTCN-3 and UTCS
- Discussion
 - Conclusions



Figure: Juha Häkkinen, University of Oulu



Introduction

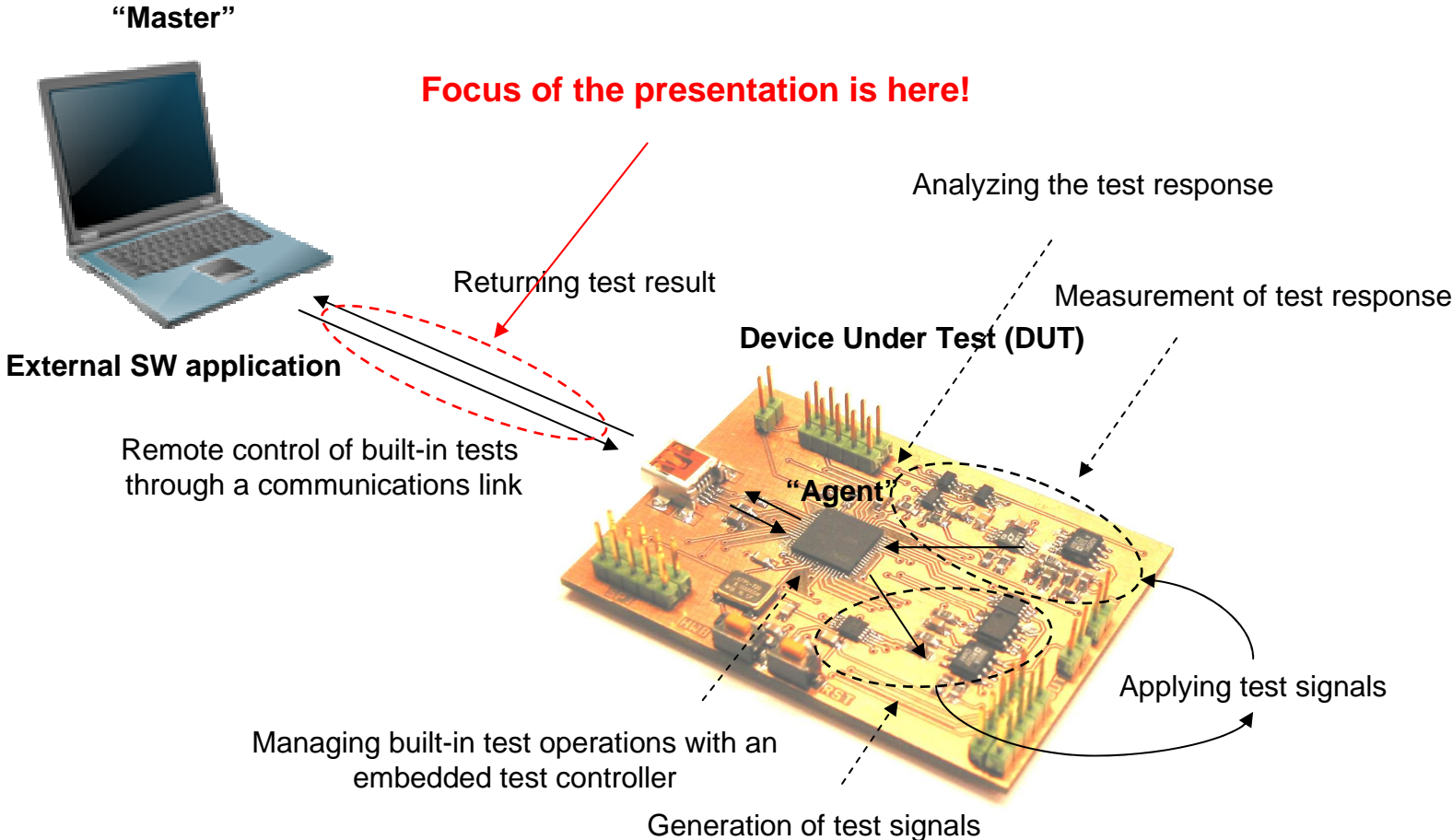
- Research group areas of interests:
 - Measurements of passive component values
 - Bus / data signals monitoring
 - Test architecture design and implementation
 - Proactive diagnostics
 - Reliability of solder interconnections
 - MEMS characterization
 - Test communication

http://www.ee.oulu.fi/research/oemlab/index_eng.html





Introduction



Original figure: Jari Hannu, University of Oulu

Introduction

- Problem:
Test interfaces or test control methods use to be specific solutions
- Need:
To develop a method which
 - Can be used to test a device
 - Has ability to move test results
 - Has applicability to multiple systems





Introduction

- Proposal for a generally applicable test communication method
 - Uses general purpose test message set
 - Runs device-specific embedded test operations
 - Utilizes already existing communication links
- *Universal Test Communication Standard (UTCS)*

<http://www.ntcforum.org/index.php?689>





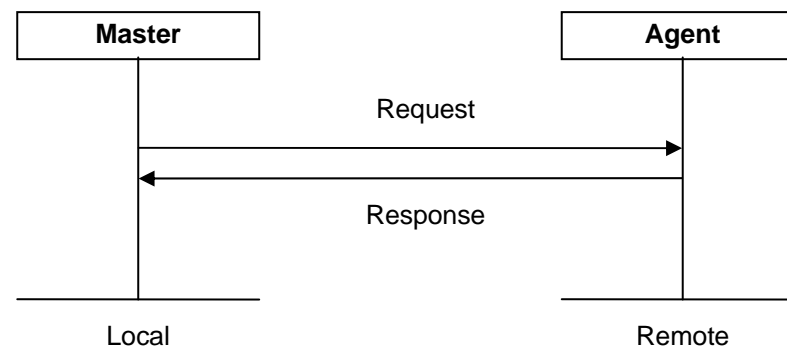
Experimental part

- UTCS specifies:
 - A high level architecture
 - Test communication or test control procedure
 - Operations to be performed between two devices
- UTCS does **not** specify
 - A new test description language
 - Any embedded test solutions
 - Any particular application



Theoretical part

- UTCS high level architecture:
 - Master ↔ Agent relationship
 - Message-based communication
 - Request / Response type messages
 - Asynchronous



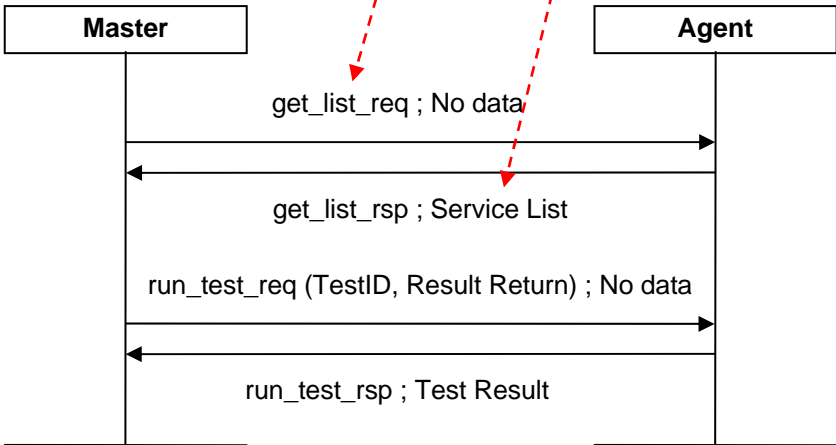
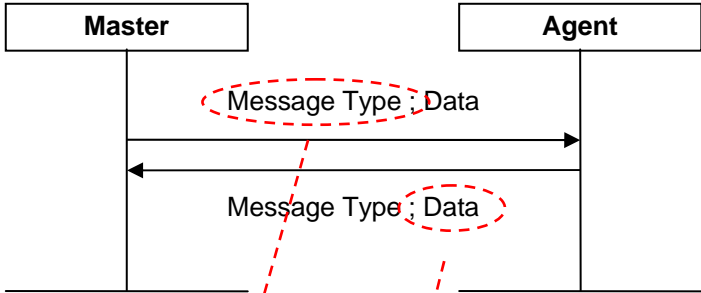


Theoretical part

UTCS Message Field	Description
Length of Message	Defines the length of UTCS message
Destination	Identifies the destination of message
Source	Identifies the source of message
Message Type	Defines the message type
Data	Contains the actual test data

UTCS Message Type	Description
get_list	Retrieves a service list*
run_test	Runs a built-in test structure
get_result	Retrieves a stored test result
get_mode	Retrieves a mode
set_mode	Changes a mode
get_parameter	Retrieves a test parameter
set_parameter	Changes a test parameter
test_abort	Aborts a running test

* A device-specific service list may contain information on built-in test solutions, stored test results, modes and test parameters





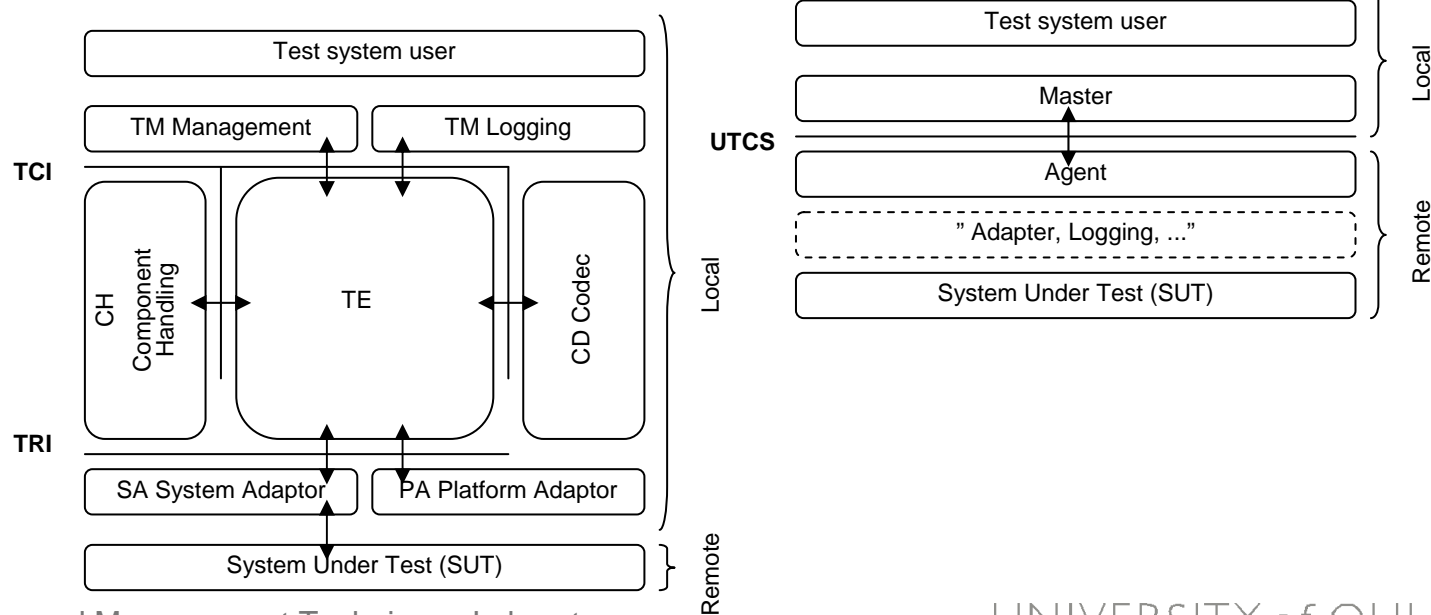
Theoretical part

- Existing solutions related to UTCS at some level:
 - OBSAI RP1 Test Messages
 - System JTAG
 - OMA Diagnostics and Monitoring Requirements
 - ...
 - *TTCN-3 specifications?*



Experimental part

- TCI defines the interaction between TE and TMC
- TRI consists of operations to implement communication with SUT
- UTCS specifies operations to be performed between Master and Agent



Experimental part

- High level comparison between TTCN-3 and UTCS

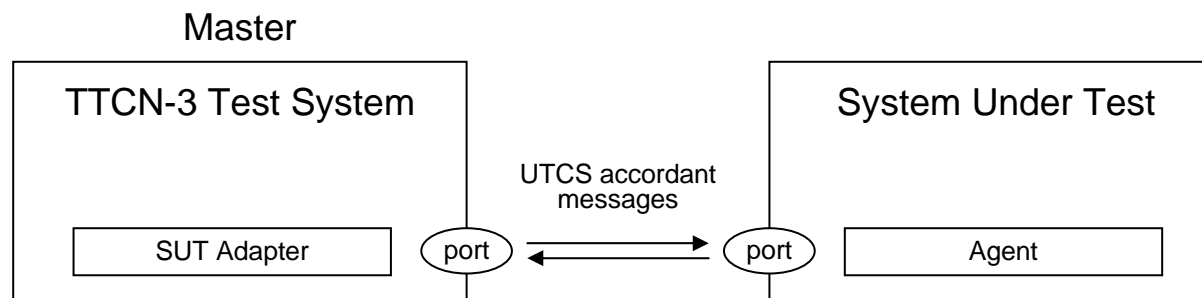
TTCN-3	UTCS
Internationally standardized testing language	Proposal for “general purpose test interface”
No specific application or interface	No specific language or application
Ability to specify/create/describe tests	Does not specify any test but utilizes existing ones
A test system is needed for test execution	Master, Agent and embedded test structures needed
Interfaces are defined as a set of operations independent of target language	Test communication procedure consists of set of operations

- Is there a possibility to combine these two?



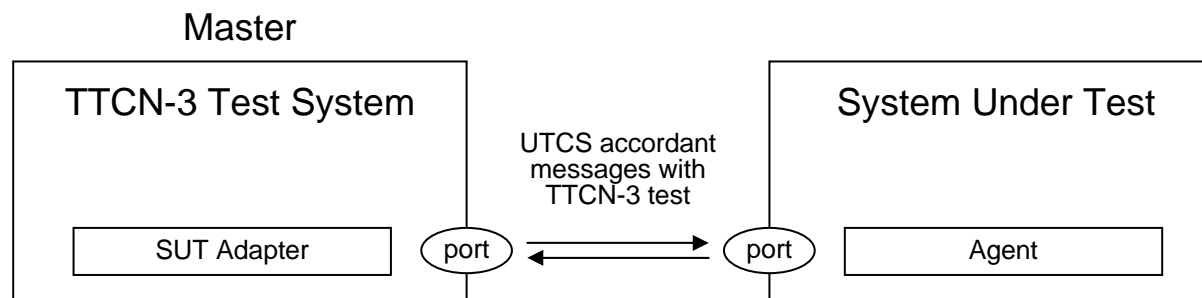
Experimental part

- 1st approximation to combine TTCN-3 and UTCS
 - Define TTCN-3 types corresponding to the UTCS test messages
 - Implement an SA that allows to transport UTCS accordant messages



Experimental part

- 2nd approximation to combine TTCN-3 and UTCS
 - Describe a test with TTCN-3 and utilize UTCS message data field to transport test data
 - Use UTCS as an interface to the DUT





Discussion

- Why to use UTCS if we already have existing solutions?
 - Provides a generally applicable approach for remote embedded testing purposes
 - Is not dependent on any communication links, languages or embedded test structures
 - Service list offers useful information on the embedded testing capabilities



Discussion

- UTCS offers the possibility to life-cycle view testing
 - Same tests and test procedures available through the whole device life-cycle from simulation to field tests



Figure: Tapio Koivukangas, Nokia



Discussion

- UTCS should **not** be used, because...
 - The scope is too large to handle with a single approach?
 - It comprises a competing interface to already existing solutions?
 - Devices become even more complex because of the add-ons?





Discussion

- What would be the expected benefit of using TTCN-3 and UTCS together?
 - Platform independent solution
 - Use of general purpose UTCS approach as an interface to the DUT
 - Possibility to run several types of tests within the same procedure



Discussion

- UTCS should **not** be used together with TTCN-3, because...
 - There is no added value to utilize UTCS approach in your application
 - There is an easier way to construct UTCS messages in your application than with TTCN-3
 - *Shooting a fly with a cannon?*



Discussion

- TTCN-3 applicability for remote embedded testing of electronics?
 - With the introduced UTCS approach TTCN-3 can be utilized also for this purpose
 - The benefits are highly dependent on your application



Acknowledgements

- Product Testing over Converging Networks



- Vesa Hekkala, Jouko Sankala, Stephan Schulz, Thomas Deiss, Petri Jurmu, Juho Perälä and Risto Teittinen: Thanks for your comments to my work!





Contact information

THANK YOU!

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