SIEMENS VDO

TTCN-3 MOST Challenges

Maria Teodorescu
maria.teodorescu@siemens.com

Agenda

SIEMENS VDO

- Automotive Infotainment Introduction
- MOST Protocol Overview
- MOST Architecture Mapping to TTCN-3
- Code reusability. Test Case Patterns
- Test Approaches for MOST
- Human Machine Interface stimulation via MOST for system tests
- Function Blocks simulation in TTCN-3 for development tests
- Mixing MOST with different protocols and layers
- Lessons Learned
- Conclusions

Automotive Infotainment

SIEMENS VDO

The modern automobile is a rolling office and entertainment center.
In-vehicle infotainment refers to all the digital applications that can be used by all passengers:

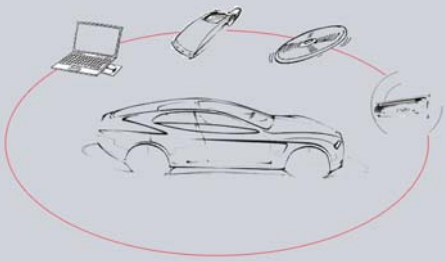
- Internal connectivity
- Navigation and location-based services
- Entertainment
- External communications
- Tuner

Complex Automotive entertainment and information systems.
TTCN-3 challenges shift towards concept creation, smart design and test strategy definition.

MOST Protocol Overview

SIEMENS VDO

Media **O**riented **S**ystem **T**ransport (MOST)
is a networking standard intended for optically interconnecting multimedia components in automotive industry.



Features:

- *Network protocol*
- *Wide Application Range*
- *Ring Topology*
- *Asynchronous and Synchronous* data transfer
- *Plug and Play* feature for adding and removing devices

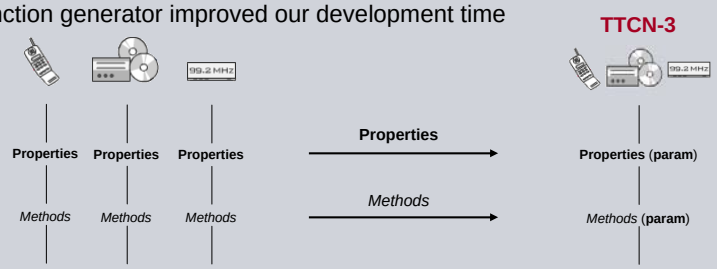
MOST Architecture Mapping to TTCN-3

SIEMENS VDO

- MOST - good possibilities for type and codec generation
- TTCN-3 – provides the foreign type systems interface
- Allows to focus on test suite creation

MOST Properties and Methods follow well defined patterns.

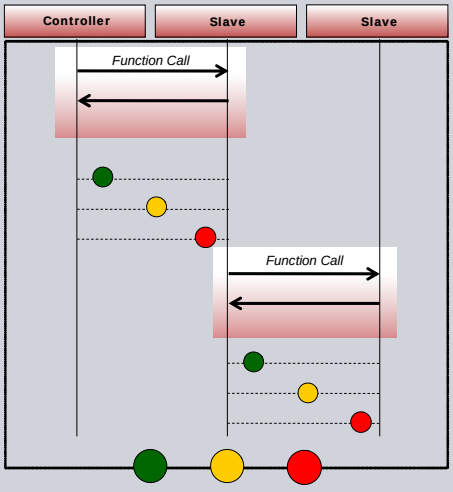
- *We created*:
- Structured library of functions to support MOST flow and specifications
- MOST patterns integrated in the functions library
- Function generator improved our development time



Code Reusability. Test Cases Patterns

SIEMENS VDO

- Test Case design consists of combining the right function calls and controlling the test verdict and execution
- Maintenance is done mainly in the function library
- Changes are propagated automatically to a large sets of test cases

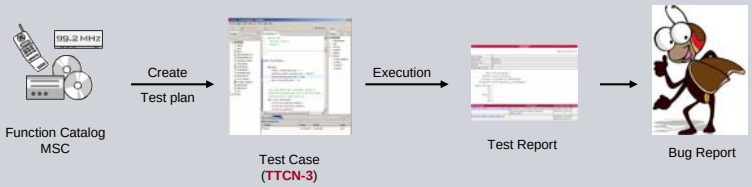


Test Approaches for MOST

SIEMENS VDO

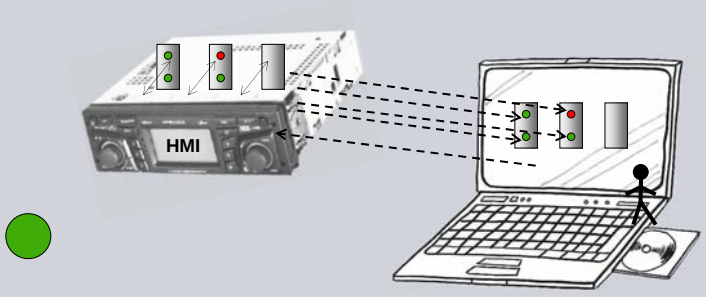
- **Smoke Test** – boundary analysis and equivalence classes
- **Integration tests** - message sequence charts
- **System integration tests** – component interaction based tests

We apply concrete test strategies to design test scenarios and complete test suites.



Human Machine Interface Stimulation

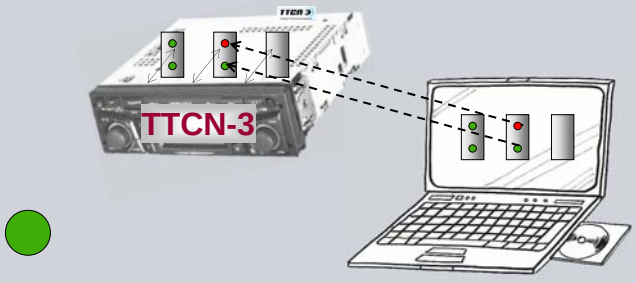
SIEMENS VDO



- Send user actions to SUT via MOST specific function blocks
- Simulate the function blocks and spy at incoming messages from HMI
- Compare the HMI calls against the sequence charts
- Test how the HMI communicates with the function blocks
- Ensure the right data is sent through MOST on user action and the expected behavior is achieved

Function Blocks Simulation in TTCN-3

SIEMENS VDO



- TTCN-3 test cases will stimulate a controller (e.g. HMI) of the function blocks
- Verify if the expected application behavior is met
- In order to test our test system we chose to simulate the application layer of the SUT at the communication level
- TTCN-3 will encapsulate both communicating parties

Mixing MOST with Different Protocols and Layers

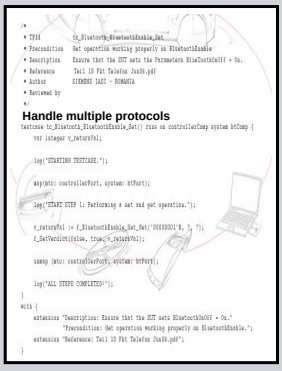
SIEMENS VDO

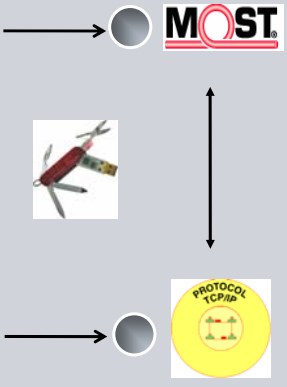
System Under Test design for testability can offer additional layers of verification.

TTCN-3

MOST traces compared with messages in other system layers to verify correct behavior.

Defined ports and system architecture to handle multiple protocol.





Lessons Learned

SIEMENS VDO

- Good understanding of the SUT is necessary
- Quality of the test suite is very important
- Synchronize with the subcontractors regularly
- Involvement in requirements right from the beginning
- Test management tool integration eases reporting
- Coverage metrics very important

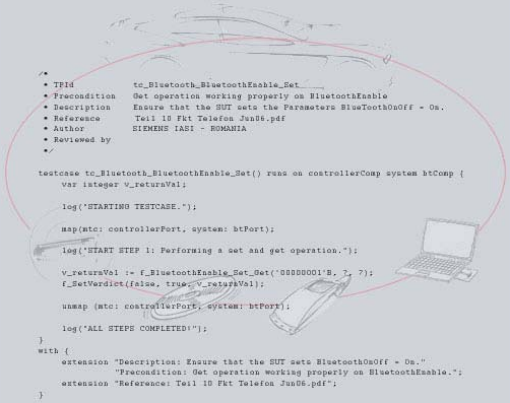
Conclusions

SIEMENS VDO

TTCN-3 MOST Challenges	Our Approaches
Code reusability	Generic functions structure
Complex MOST ring testing	Use of multiple devices
Support any kind of specification on string encoding level	Use of multiple dynamic string encoding
Stimulate the HMI	Use of MOST with TTCN-3
Testing the test system	Implement reactive architecture to simulate the function blocks
Mixing MOST with different protocols and layers	Defined ports and system architecture to handle multiple protocols

SIEMENS VDO

There is a long way to consume it all but
new possibilities lead us to search for the best solutions!



```
/*
 * TPId             tc_Bluetooth_BluetoothEnable_Set
 * Precondition     Get operation working properly on BluetoothEnable
 * Description      Ensure that the SUT sets the Parameters BlueToothOnOff = On.
 * Reference        Teil 10 Fkt Telefon Jun06.pdf
 * Author           SIEMENS IASI - ROMANIA
 * Reviewed by
 */

testcase tc_Bluetooth_BluetoothEnable_Set() runs on controllerComp system btComp {
    var integer v_returnVal;

    log("STARTING TESTCASE.");

    map(mtc: controllerPort, system: btPort);

    log("START STEP 1: Performing a set and get operation.");

    v_returnVal := f_BluetoothEnable_Set_Get('00000001'B, 7, 7);
    f_SetVerdict(false, true, v_returnVal);

    unmap (mtc: controllerPort, system: btPort);

    log("ALL STEPS COMPLETED!");
}
with {
    extension "Description: Ensure that the SUT sets BluetoothOnOff = On."
              "Precondition: Get operation working properly on BluetoothEnable.";
    extension "Reference: Teil 10 Fkt Telefon Jun06.pdf";
}
```

Thank you!
TTCN-3 Team Iasi Romania

© Siemens VDO Automotive 2007 |
Maria Teodorescu | I IS