

Compliance Verification Process for Ethernet ECUs

Automotive Ethernet Congress 2015

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Dr.-Ing. Terezia Toth

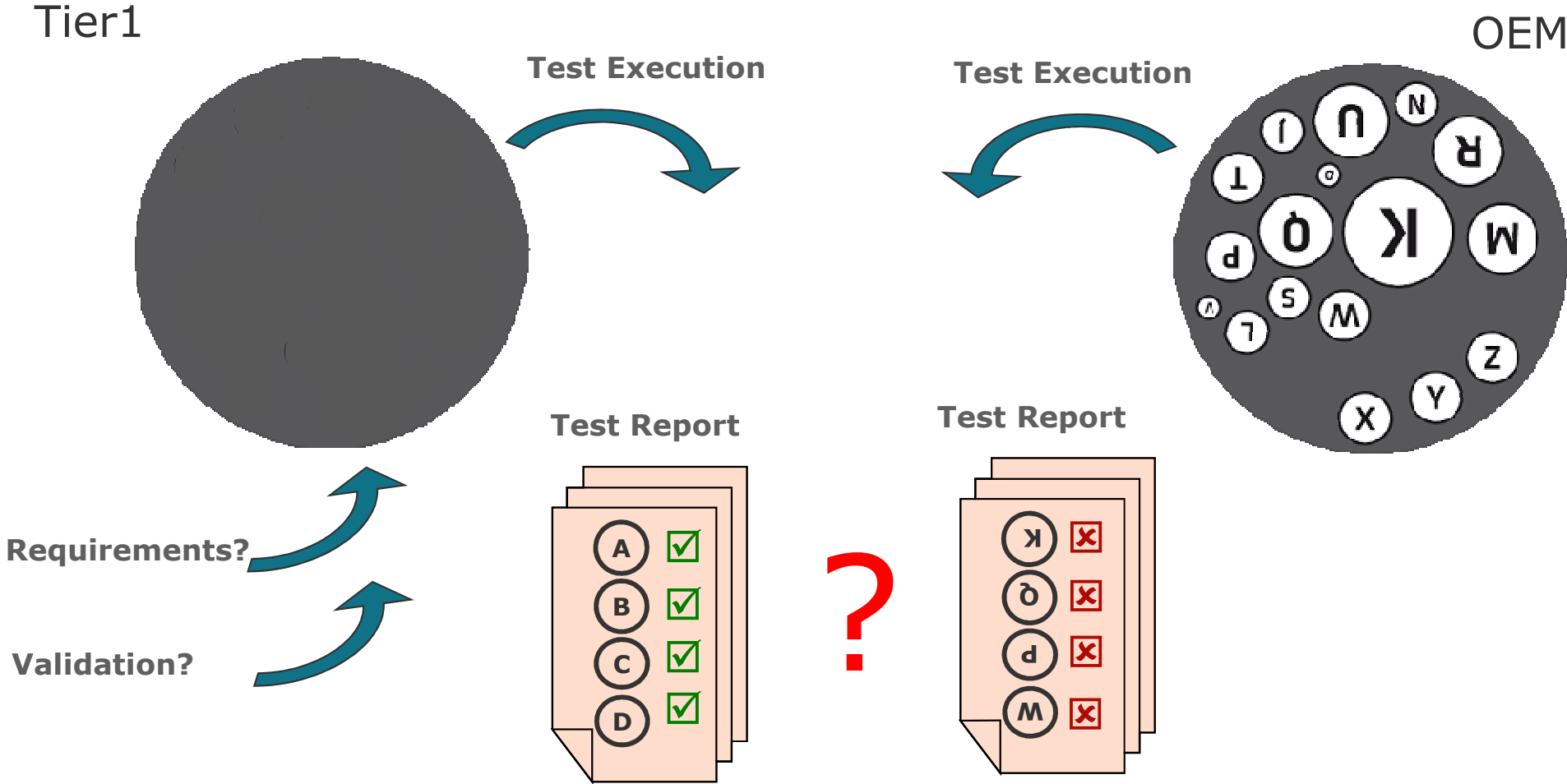
Head of Compliance Laboratory / Senior Consultant Engineer

Agenda

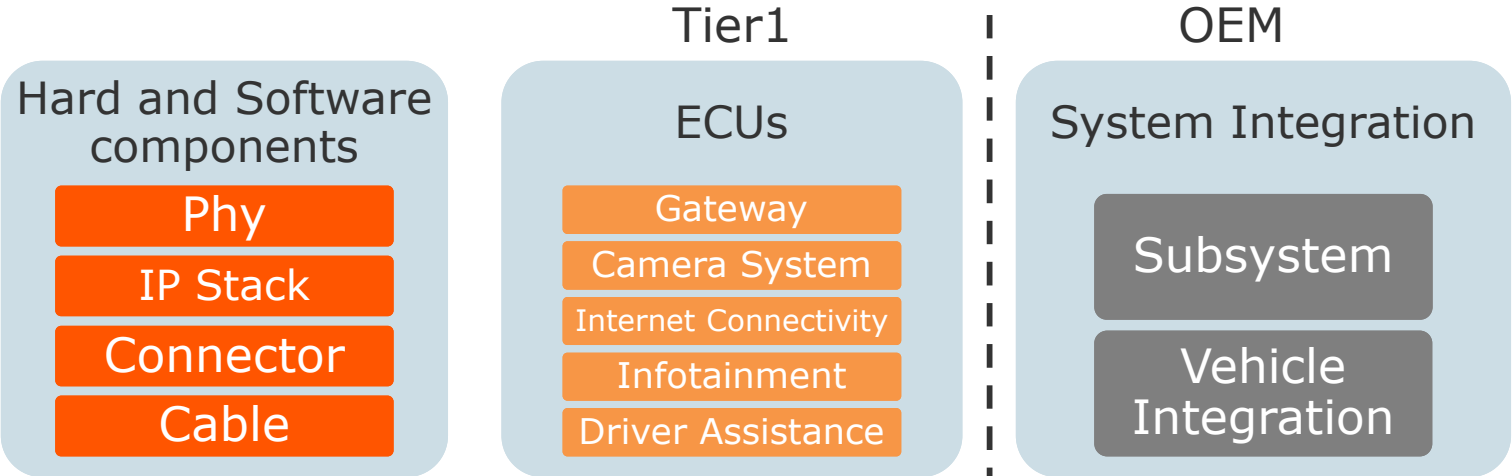
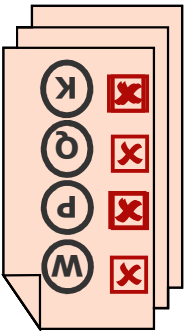
1. Motivation
2. Compliance Verification Process
 - Goals
 - How to achieve a high quality Test Specification?
 - How to achieve a high Testing Quality?
3. Benefits for OEMs and Tier1s

Motivation (1/2)

Typical Situation without Compliance Verification Process



Motivation (2/2)



Detection of component problem at ECU level = Lots of extra time and effort
 When to recognize failures? -> As early as possible

- Goals:
- High quality ✓
 - Transparency ✓
 - Low effort ✓

Test Level	Responsible
Hard and Software components	Tier2
ECUs	Tier1
System Integration	OEM

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Goals

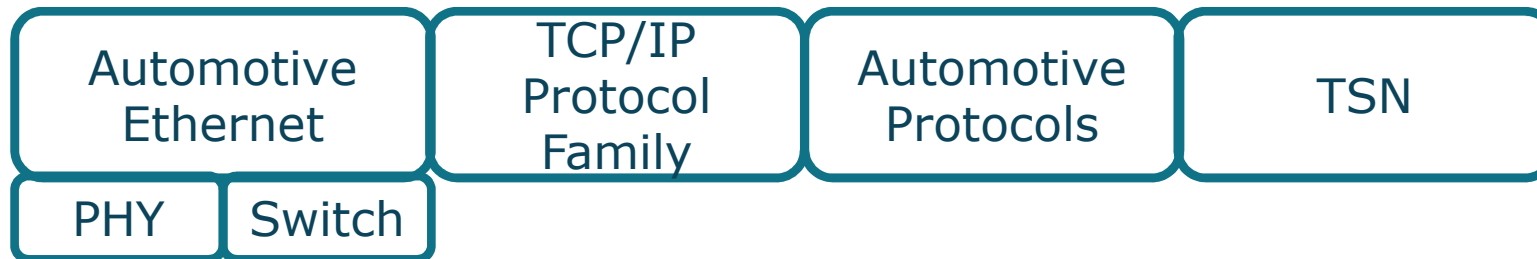
- High quality test specification
- High testing quality
- Transparency and reduced effort via distribution of responsibility

Test Level	Responsible
Hard and Software components	Tier2
ECUs	Tier1
System Integration	OEM

First achievements:

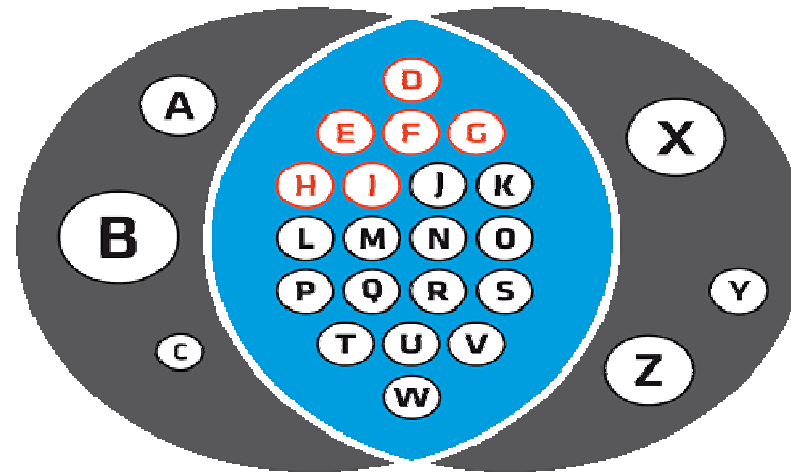
- OPEN Alliance TC1: BroadR-Reach 100Mbps PHY Test
- OPEN Alliance TC8: ECU and Network Test

- Maximizing standardization level
 - Reasonable and cost competitive verification
- Definition of appropriate test solutions for ECU verification
 - Different qualification requirements than for components



- Qualified Test Houses
 - Qualified by OPEN Alliance Requirements on Test Houses
- Reduction of the validation efforts for OEM and Tier1
 - They can concentrate on customer specific functions

Tier1	OEM
develops ECU	specifies functionalities and takes care of the system integration



Test House

concentrates on the detection of implementation errors:
supports Tier2s during component development,
supports Tier1s during ECU development,
supports OEMs during system integration

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TC8: ECU and Network Test

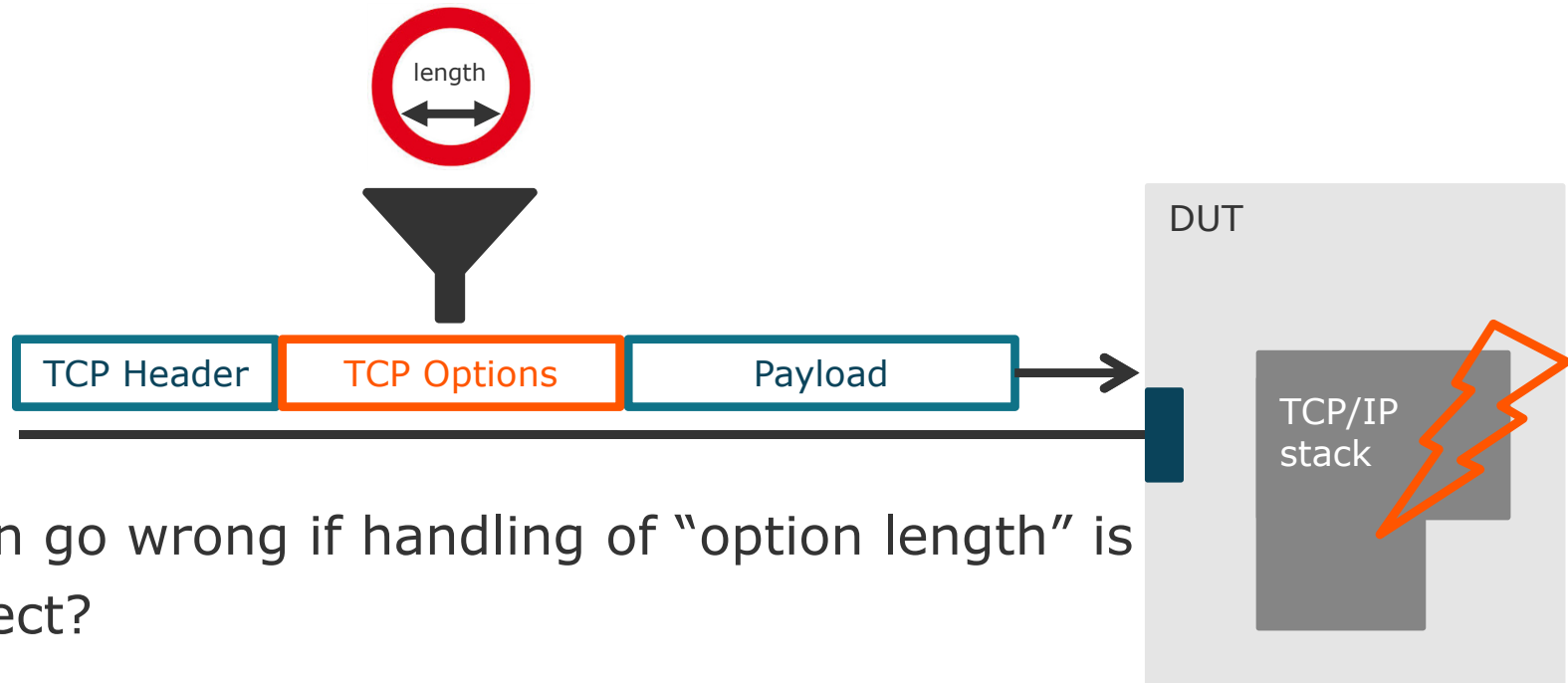
- At first it summarizes existing test content for ECU Test
- Refers to other specifications



- Ensures communication with other organizations in order to identify overlaps and avoid double standards
- If TC8 recognizes gaps it specifies new test content

TCP Header Options as specified in RFC 793, RFC 1122 4.2.2.5

“Cope with illegal option length”



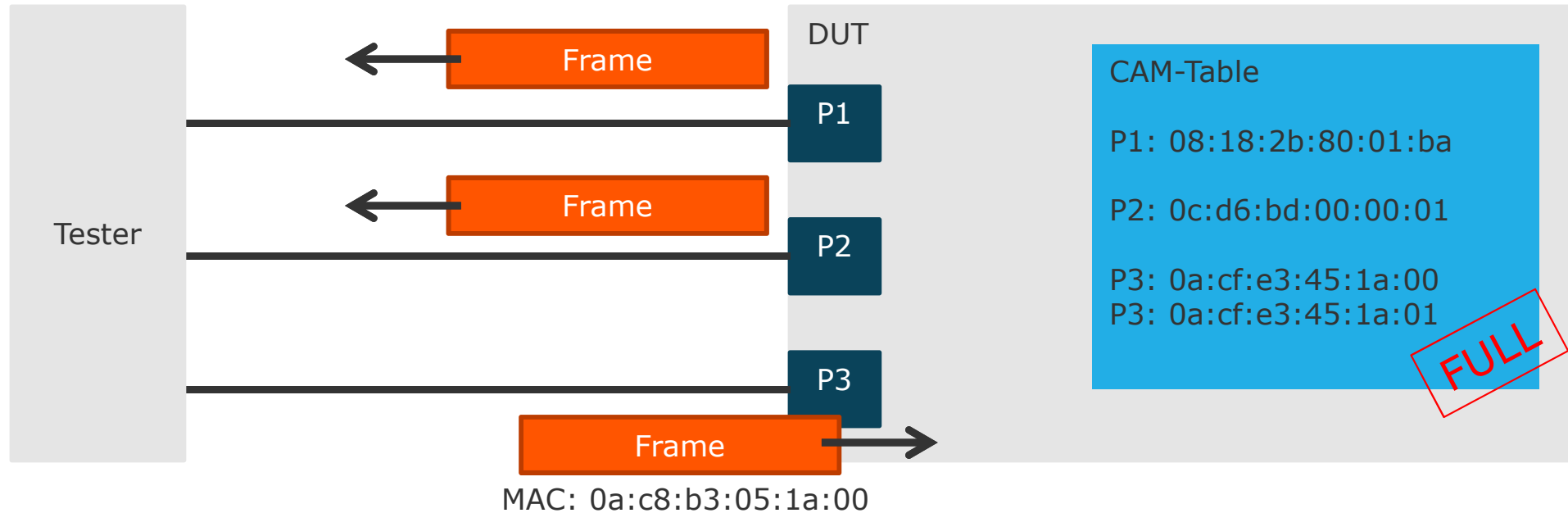
1. What can go wrong if handling of “option length” is not correct?

→ TCP/IP stack crashes!

2. Who can decide if it is an issue for in-car networks?

→ TC8

Address Caching Capacity specified in RFC 2889



MAC flooding

1. Can this problem be avoided? → Yes, if in-car network design comprises switch configuration
2. Can the solution be tested? → TC8

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Prerequisite is extensive technical experience of a Test House in:

- Automotive technology
- Ethernet technology
- Product certification

→ Ensures reliability


The Test House's responsibility is to carry out testing according to ISO 17025 including:

- Validation of test methods
- Procedures
- Records

→ Ensures worldwide reproducibility

Test process and requirements on test houses

TC8 - ECU and network test



Author & Company	Thomas Kirchmeier (BMW)
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This document describes all requirements on a test house which are necessary to implement and to perform the specified test cases by the tch of the OPEN Alliance. These requirements shall be fulfilled by the test house in order to trust the test report and to ensure a reliable communication in network of the tested ECU.

Transparency via overview of ECU Test Scopes and Test Houses

	Automotive Ethernet		TCP/IP Protocol Family	Automotive Protocols	TSN
	PHY	Switch			
Test House x	x				
Test House y		x	x	x	x
Test House z	x	x			
Test House w			x	x	x

- More than 1 Test House for 1 Test Scope
- Test Equipment of Test Houses can be individual
- Comparability of test results will be assured via exchange of reference SW and HW implementations

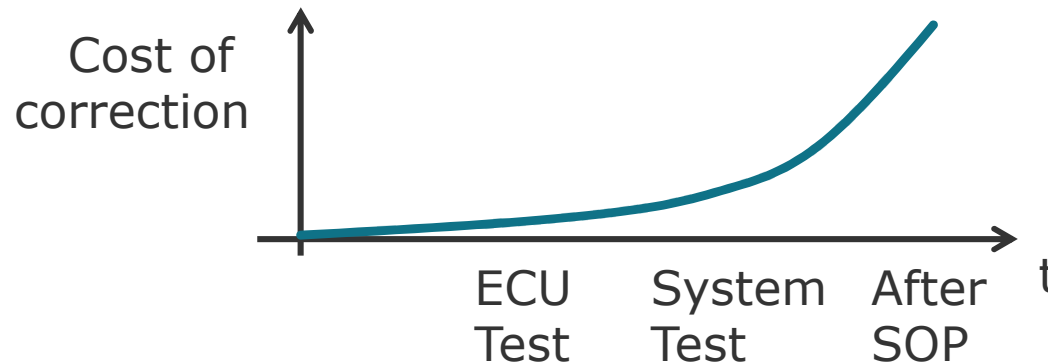
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Benefits for OEMs and Tier1s (1/2)

Challenges:

1. Bugs in basic functionalities should be solved as early as possible:



2. Setup of Test Equipment is quite expensive, esp. for lower layers

3. Setup of an efficient Test Process needs lots of Lessons Learned

Solution:

- Use the services of a qualified Test House
- Buy standardized and approved Tests Setups

Benefits for OEMs and Tier1s (2/2)

Introduction of a Compliance Process Allows:

- Separation of Component and ECU verification
 - Early recognition of component problems via component verification
→ Reduces costs of ECU design and verification
- Transparency during design process
 - With the help of reliable test results
→ That needs to come from an independent source (Test House) that follows ISO 17025

Conclusion:

- Compliance Verification Process also eases the entry for new suppliers
 - Standardized test methods
 - Ecosystem for component and ECU verification
 - Tier2s and Tier1s can access independent support

Thank you for your attention!

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Motivation

Background of Ruetz System Solutions

Bundled experience of 15 years in in-car networks:

- Technology validation, gap analysis, assessment, reference implementation
- System specification
- System integration
- Providing Training, e.g. Automotive Ethernet
- Compliance work

Partners:

- OEMs, Tier1s, Tier2s and tool vendors

Driving force for many technological backgrounds:

