

Building Blocks

for a Successful Verification Process of a Tier1 ECU

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Agenda

1. Motivation
2. Test House as a Service
3. Test Case Development
4. Test Example
5. Benefits

Motivation

Tier1 supplier new to MOST Technology

- No reference for benchmarking
- Missing know-how (standards, OEM req.)
- Tight time schedule of project

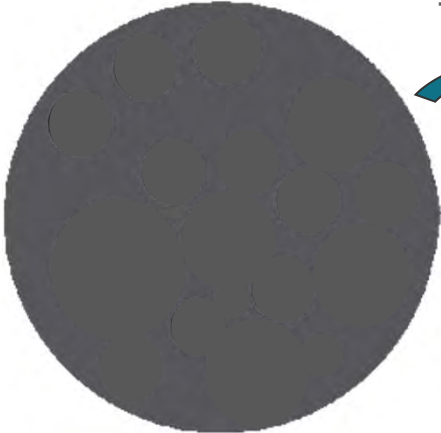
→ Tier1 supplier needs fast ramp up

- Know-how
- Staff
- Development
- Quality management, test infrastructure

Motivation

Typical Situation of Tier1 Suppliers

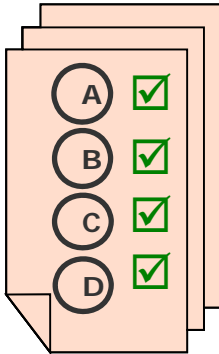
Tier1 Supplier



Test Execution



Test Report



Requirements

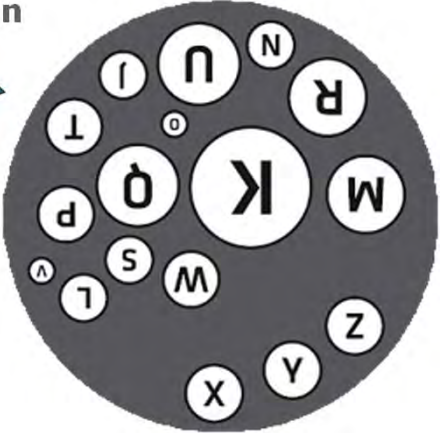


Validation?

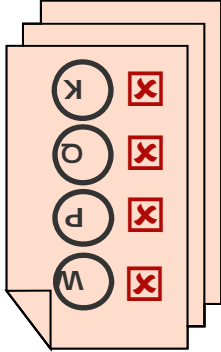


OEM

Test Execution



Test Report



Motivation

Tier1 supplier needs

Quality management

- Simple method for system verification
- Effective feedback reg. test results
- Regular reporting to OEM
 - Project status
 - Key performance indicator

Test infrastructure

- Test equipment
- 100% coverage of requirements
- Regression tests
- Test cases reg. robustness, availability and error handling

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Test House as a Service

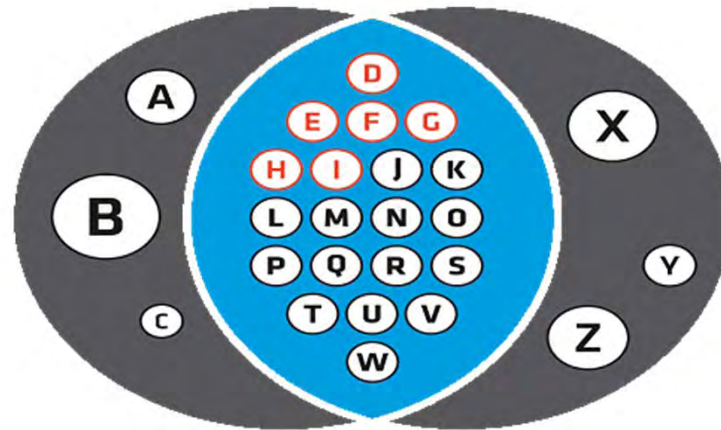
Role Allocation

Tier1 Supplier

develops control units,
not test processes and tools

OEM

specifies functionalities and verifies
the successful implementation



Test House as a Service

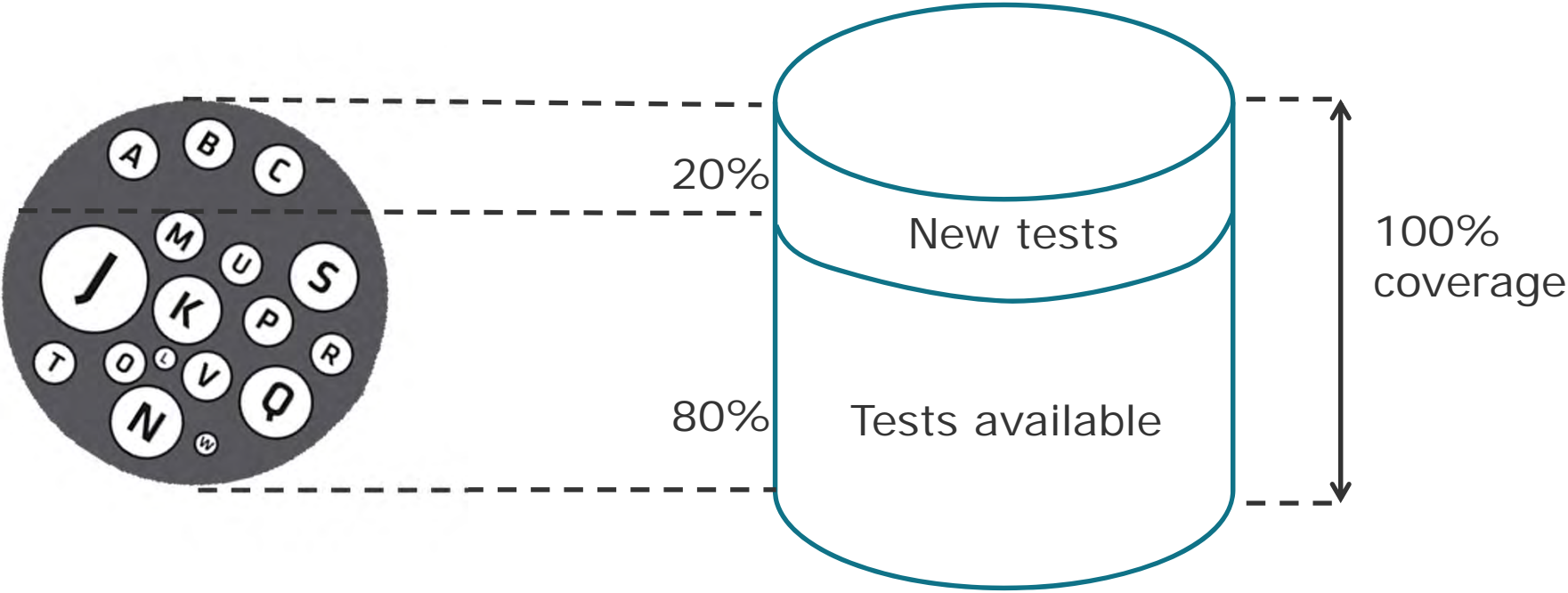
concentrates on detection of implementation errors and
supports OEMs and suppliers with the integration

Test House as a Service

Test coverage

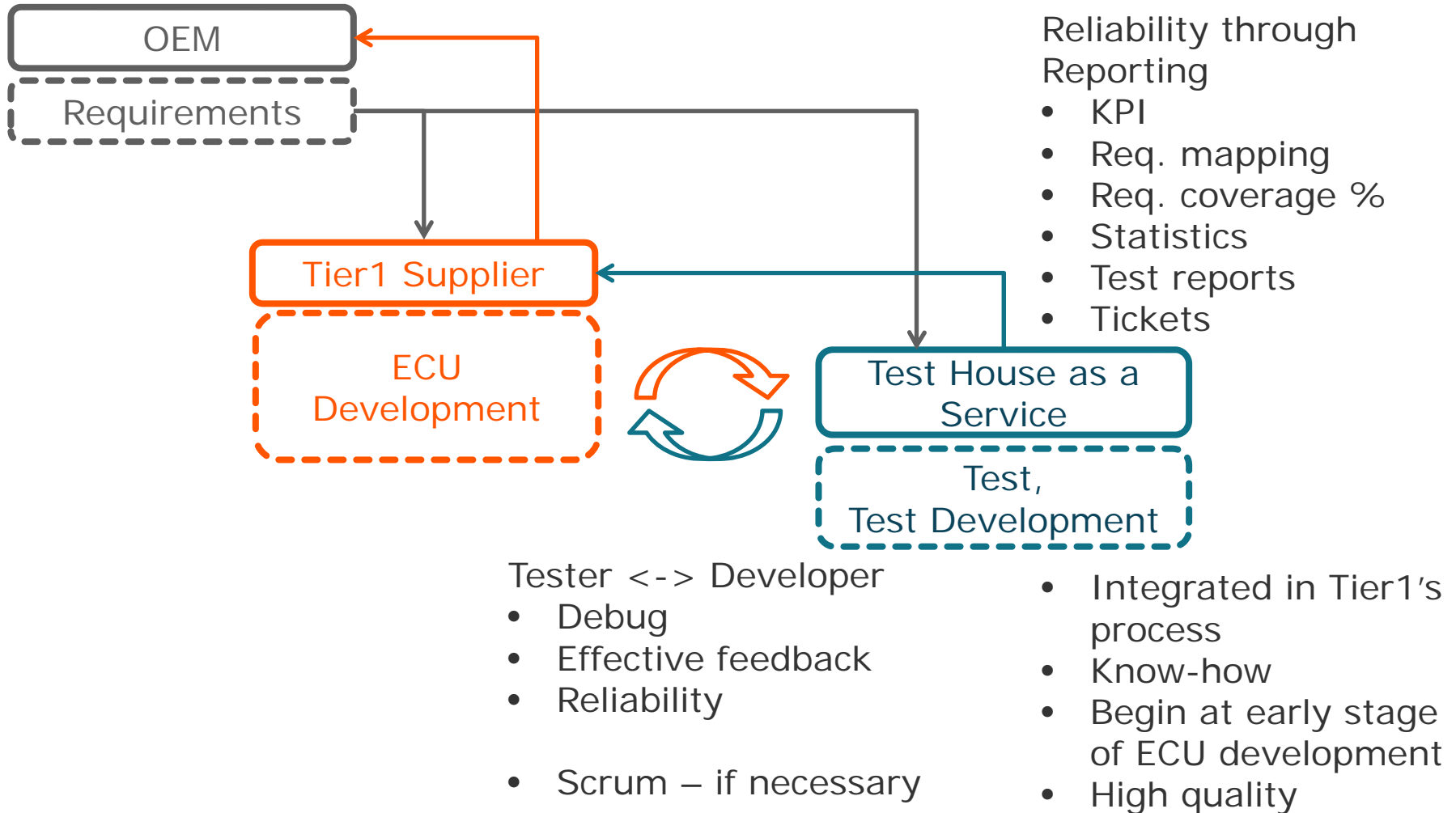
Tier1 Supplier

Test House as a Service



Test House as a Service

Process Support



Test House as a Service

Statistics of test automation

Number of Relations: Requirements - Test Cases

OEM Requirements	TOTAL	MANUAL	AUTOMATED	Discharged	Delivered	NOT Delivered
MOST150 Hardware	53	32	13	2	13	0
MOST-CAN-Router	204	15	189	0	189	0
MOST150 Vehicle	9	0	7	2	7	0
MOST150 Power	16	3	11	2	11	0
MOST150 NW-Management	35	13	20	2	20	0
MOST150 FBlock Netblock	12	0	12	0	12	0
MOST150 FBlock NW-Master	5	0	5	0	5	0
MOST150 FBlock-Diagnose	19	1	18	0	18	0
MOST150 Diagnose	235	0	171	64	171	0
MOST150 Datentransport	63	11	42	10	42	0
MOST150 Amplifier	6	0	5	1	5	0
Sum	657	75	493	83	493	0

TOTAL total number of relations between assigned OEM Requirements and RS Test Cases
MANUAL executed manually
AUTOMATED executed automatically
Discharged requirement is not applicable or not testable

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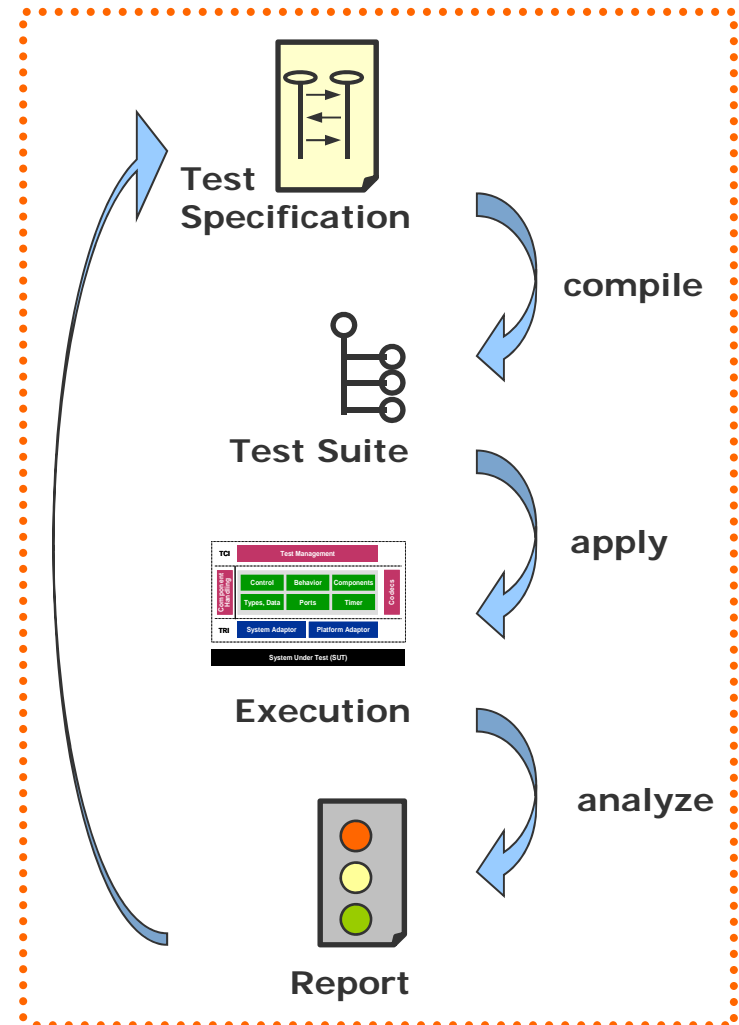
Test Case Development

Requirement Analysis, Review of Documents

- Check of requirement definitions
- Early identification of incompleteness saves effort later

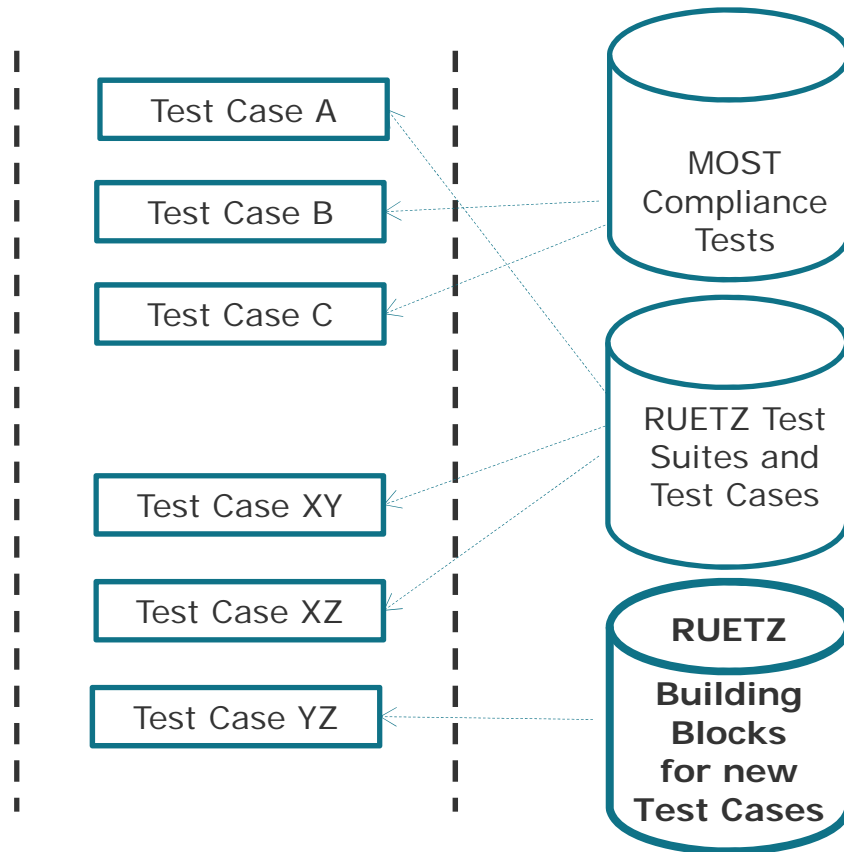
Test case definition

- Approved test specification process
- Know-how and best practice
- Including realistic use cases
- Experience from 15 years of system integration testing



Test Case Development

Ruetz Building Blocks help to develop the missing test cases



Minimum effort for 100% coverage

- Rational test automation
- Automation for regression tests
- Focus on progress of ECU development

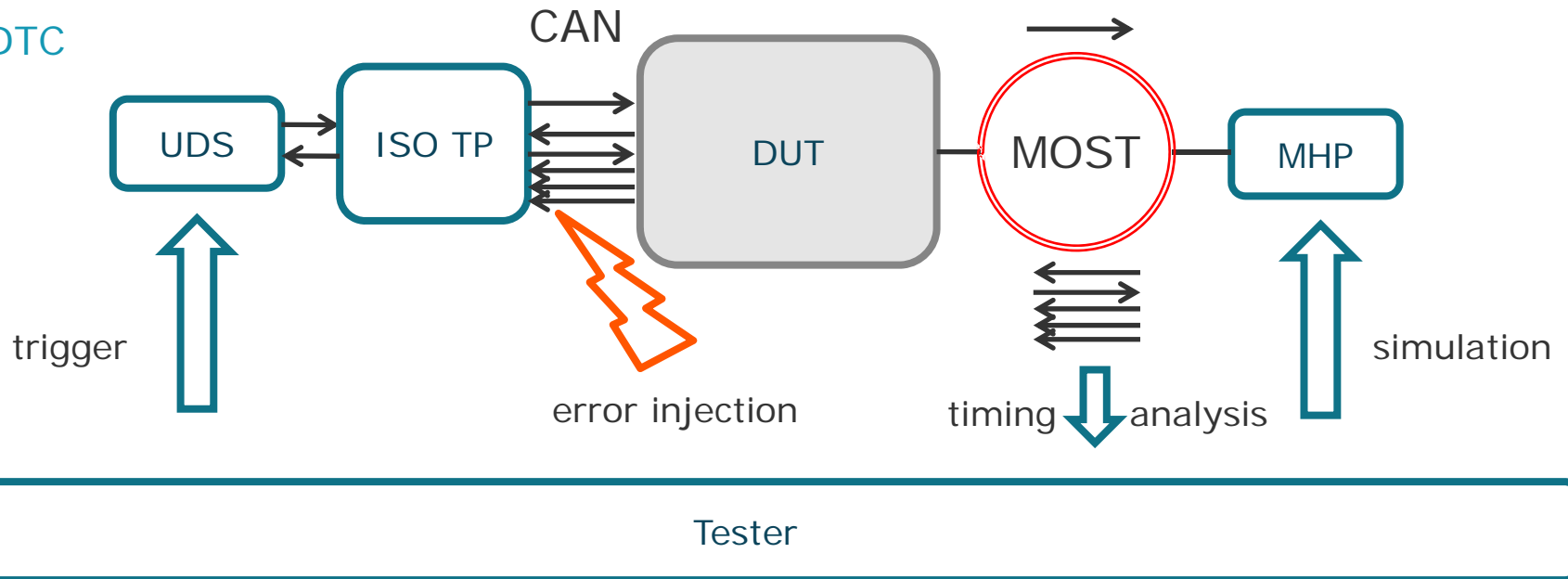
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Test Example

How to test a complex behavior including

- CAN-MOST Gateway
- Timing
- DTC



- Adapter for the OEM specific OBD tool
- Use of Ruetz Building Blocks: UDS, ISO TP, CAN, MHP

Test Example

The screenshot displays the TTCN-3 Execution Management interface. The main window shows a sequence diagram with participants MHP, DUT, and ISO-TP. The diagram includes several 'send' and 'receive' messages, with a 'match' block and test steps. A callout box on the left states 'Frames with payload 00..FF'. Two 'Test Data' windows are overlaid on the right, showing hierarchical data structures. The top window, titled 'Last Frame', shows a tree structure for 'isotpCANmsg_type' with fields like 'canID', 'isotp', 'CF', 'PCitype', 'sequenceNumber', and 'data'. The bottom window shows a tree structure for 'DiagMsg_Set_Data' with fields like 'FBHeaderVersion', 'PayloadLength', 'TypeOfService', 'SystemIntegratorPart', 'SourceAddress', and 'Payload'. Arrows point from the 'Test Data' windows to the corresponding messages in the sequence diagram.

Frames with payload 00..FF

Last Frame

Name	Value	Int2Hex
isotpCANmsg_type		
canID	0000076F	
isotp		
CF		
PCitype	2	'2'H
sequenceNumber	2	'2'H
data	FDFEFAAAAAAAAA	

Name	Value	Int2Hex
DiagMsg_Set_Data		
FBHeaderVersion	1	'1'H
PayloadLength	1024	'400'H
TypeOfService	e_UDS	
SystemIntegratorPart	0	'0'H
SourceAddress	1903	'76F'H
Payload	000102030405060708090...	

All ISO-TP msgs in 1 MHP msg

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Benefits

Confidence through transparency

- Initial tests ready for execution on demand at Test House
- Testing of DUT variants without any delay
- Well-approved Tools and Processes
- Professional Training, Support and Maintenance
- Tests can be executed in-house at Tier1

ECU meets OEM and MOSTCO requirements

Benefits

Documented project state to any given time

- Considered requirements
- Mapping of requirements and test cases
- Tickets
- State of the test case development
- State of the change requests
- State of the DUT

Project can be monitored and conducted precisely by Tier1

Thank you for your attention!

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