

PVT Manager Test Leader Training

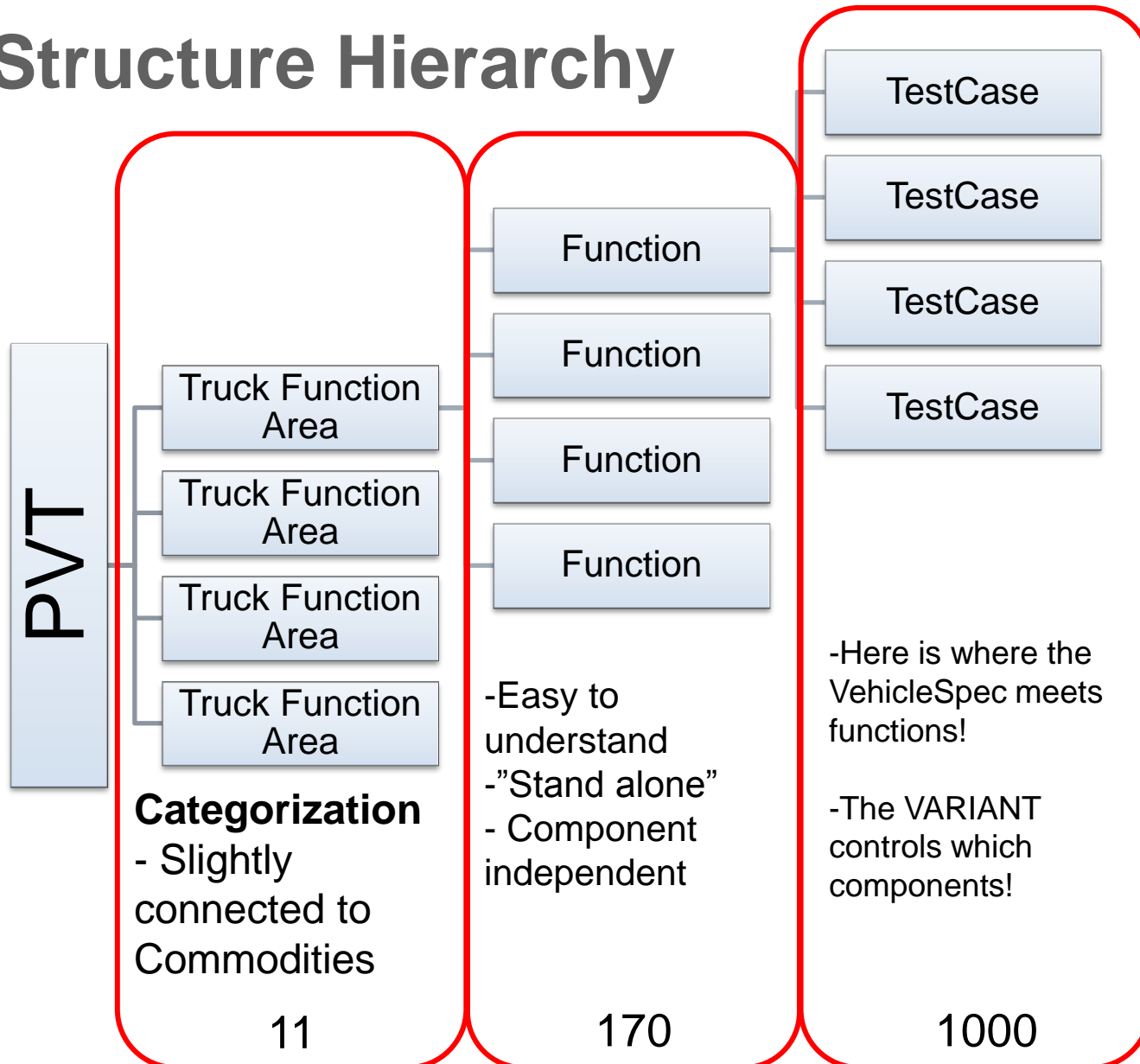


PVT – Performance Validation Test

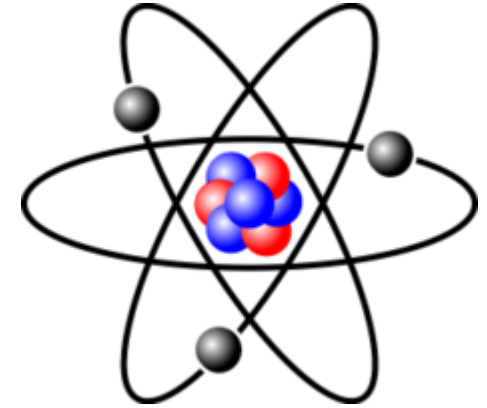
- Verify and Validate functionality in a truck from a driver perspective
 - Verify – the driver manual
 - Validate – with experienced drivers
- Corresponds to many very demanding customers using ALL functionality in the complete vehicle



Test Structure Hierarchy

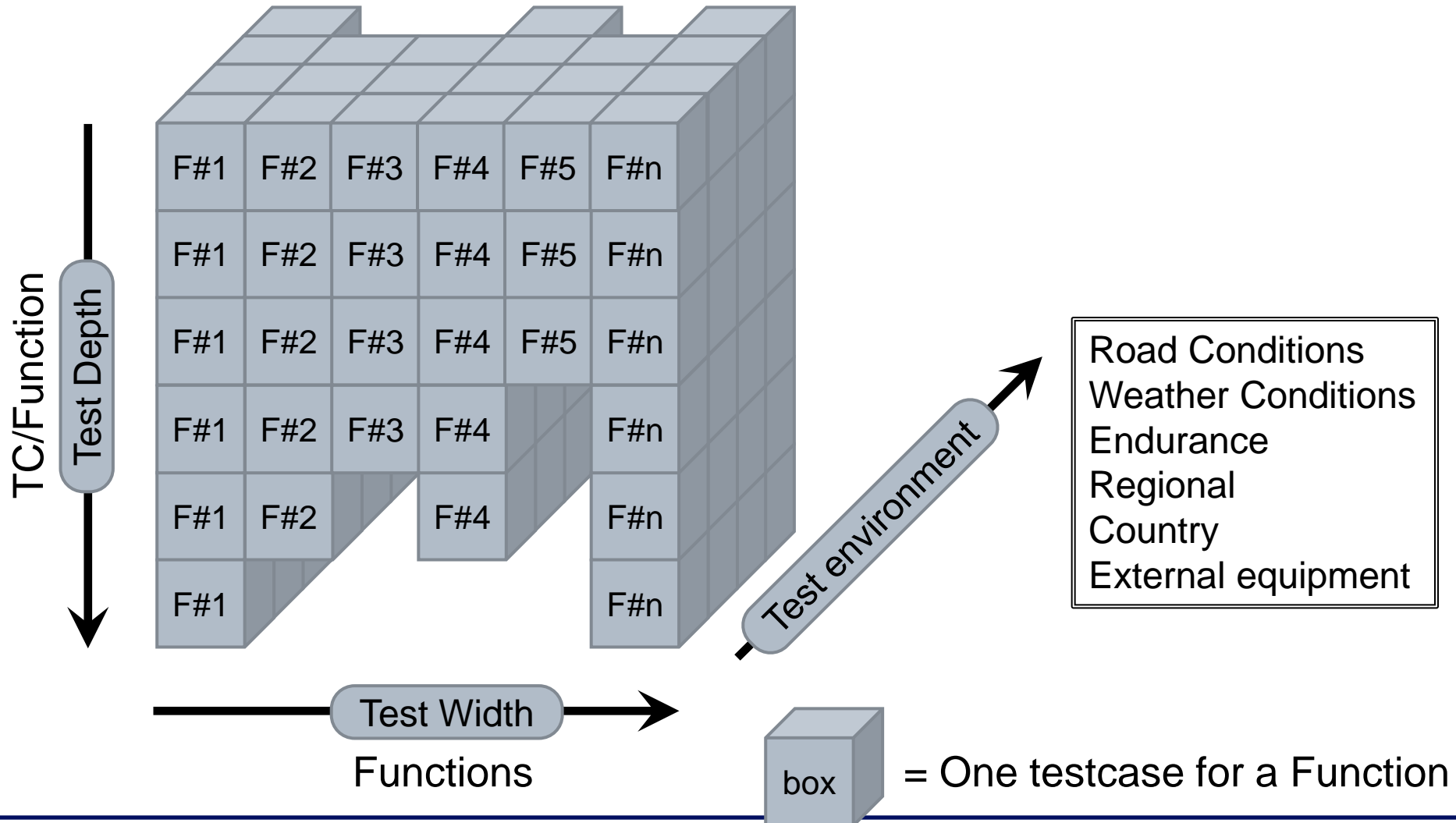


The Atomic PVT



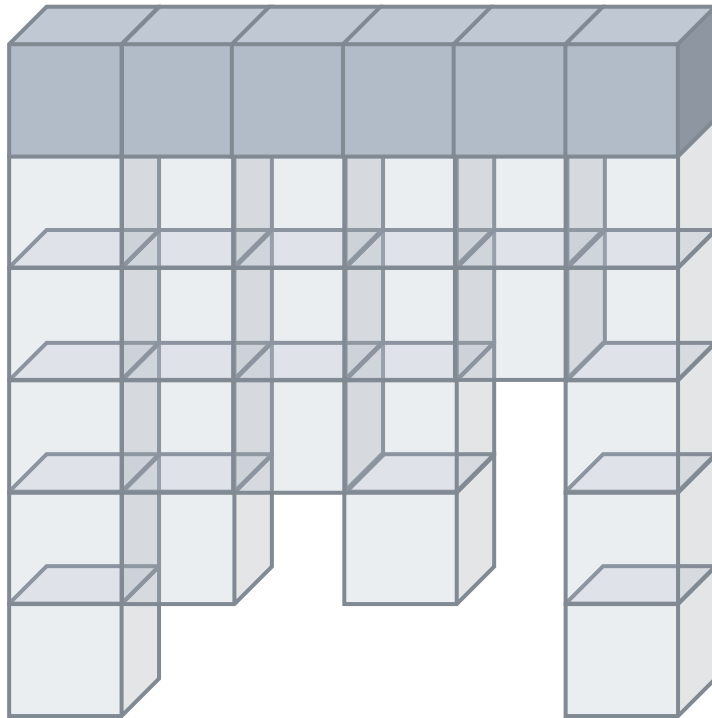
- Smallest piece in building a PVT is the test case!
- From that we can generate statistics and results with several different views
- Executing test cases is sequential testing and used for verification.
- **But it is actually what happens in between the testcases that is important when we are validating a product.**
For that, experience from the product usage is critical.

Testcases vs Functions and testcoverage



Formal Truck Function Verification & Validation

PVT CHECK



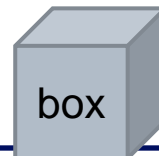
One testcase/Available functions

Very high level testing

~8h/truck

Finds stoppers in all available functions

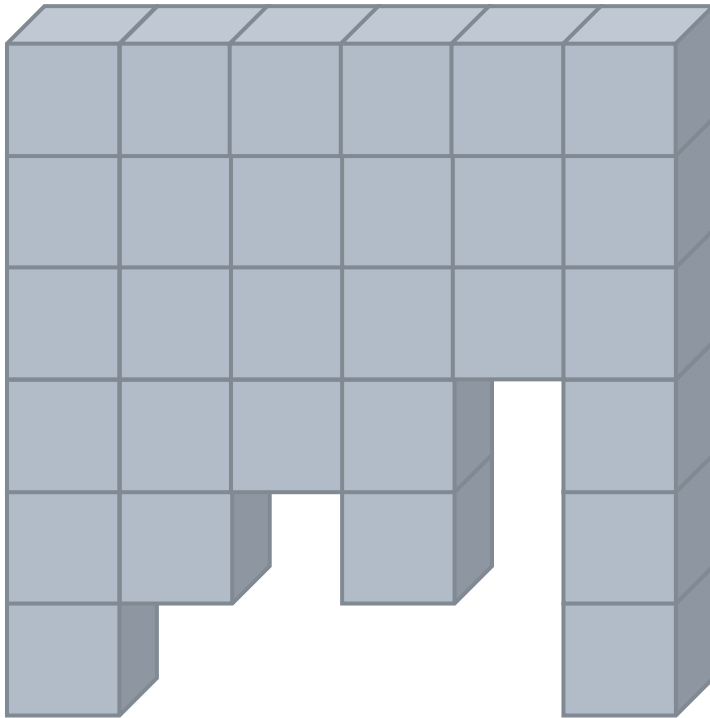
Used for delivery control



= One testcase for a Function

Formal Truck Function Verification & Validation

PVT TOTAL



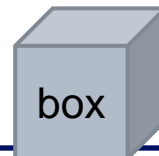
ALL testcases/Available functions

Dig deep!

~4weeks/truck

Exercise and challenge complete system

Most thorough Formal Verification



= One testcase for a Function

Formal Truck Function Verification & Validation

PVT Base

HALF of all testcases/Available functions
Dig pretty deep!

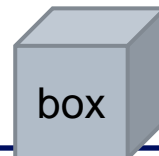
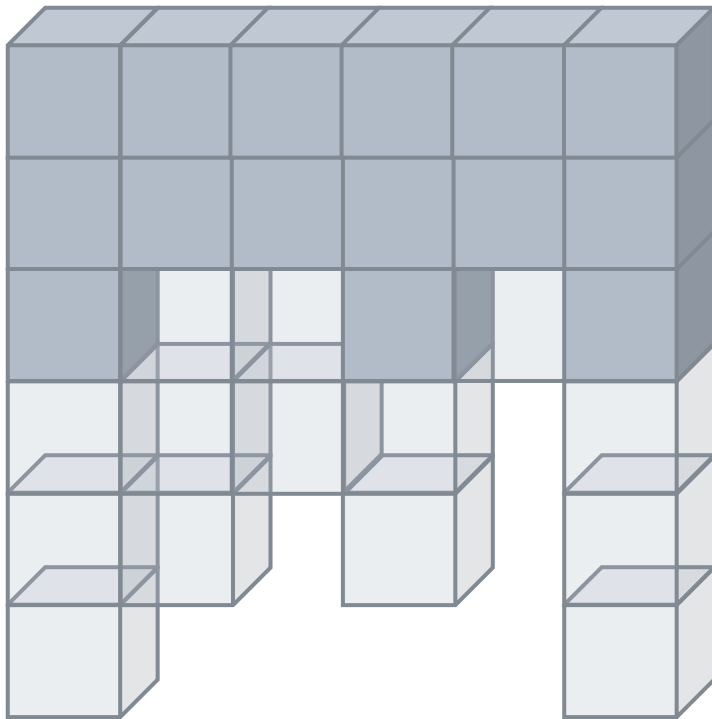
~2weeks/truck

Exercise and challenge complete system

"Normal Use" Formal Verification

Missing from TOTAL is:

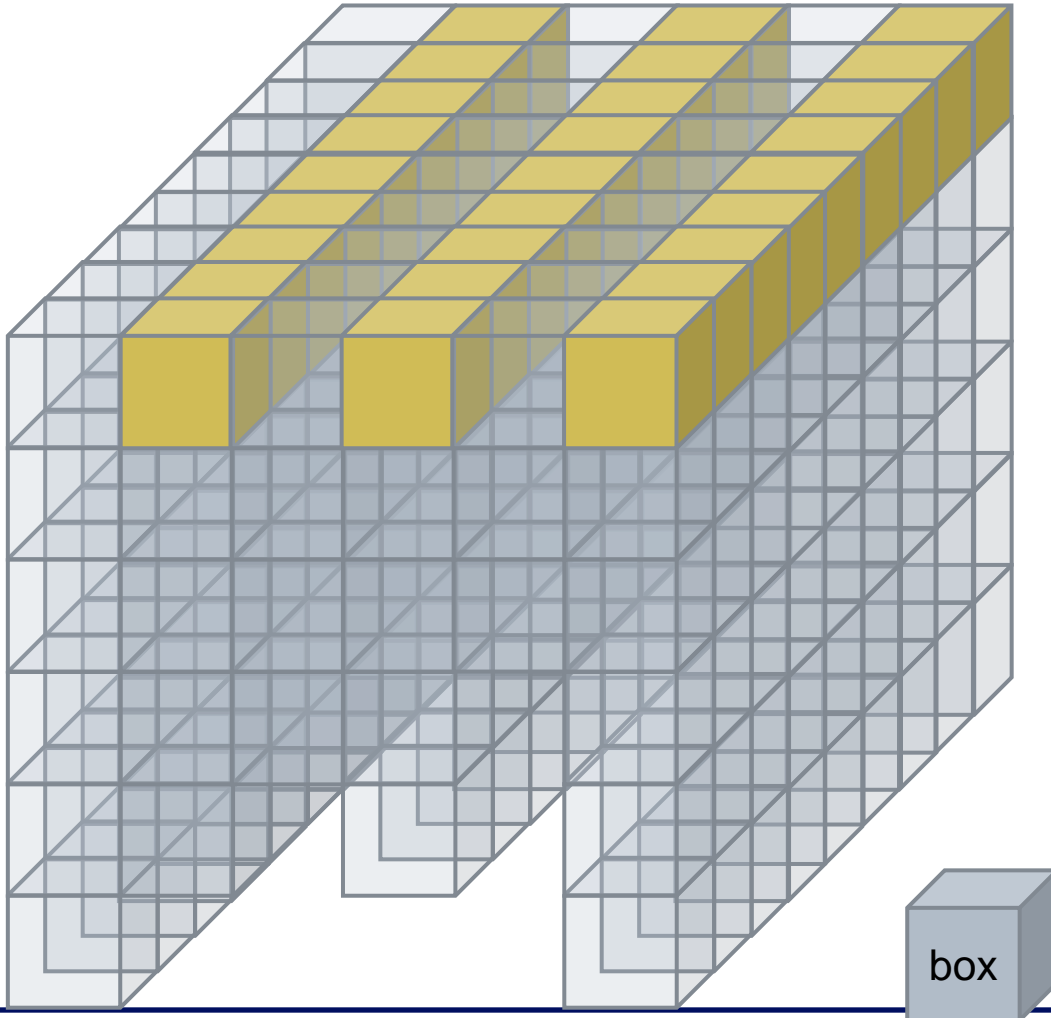
- Measurements! (In Base we trust the system, eg. Fuel level)
- Sleep over!
- Timeconsuming testcases
- Jeopardize the system
- Parameter changes
- Diagnostics
- Jinx the system



= One testcase for a Function

Truck Function Validation

PVT Europe



Most used functions during normal use are tested in several different environments.

~6weeks/truck

Environmental factor:

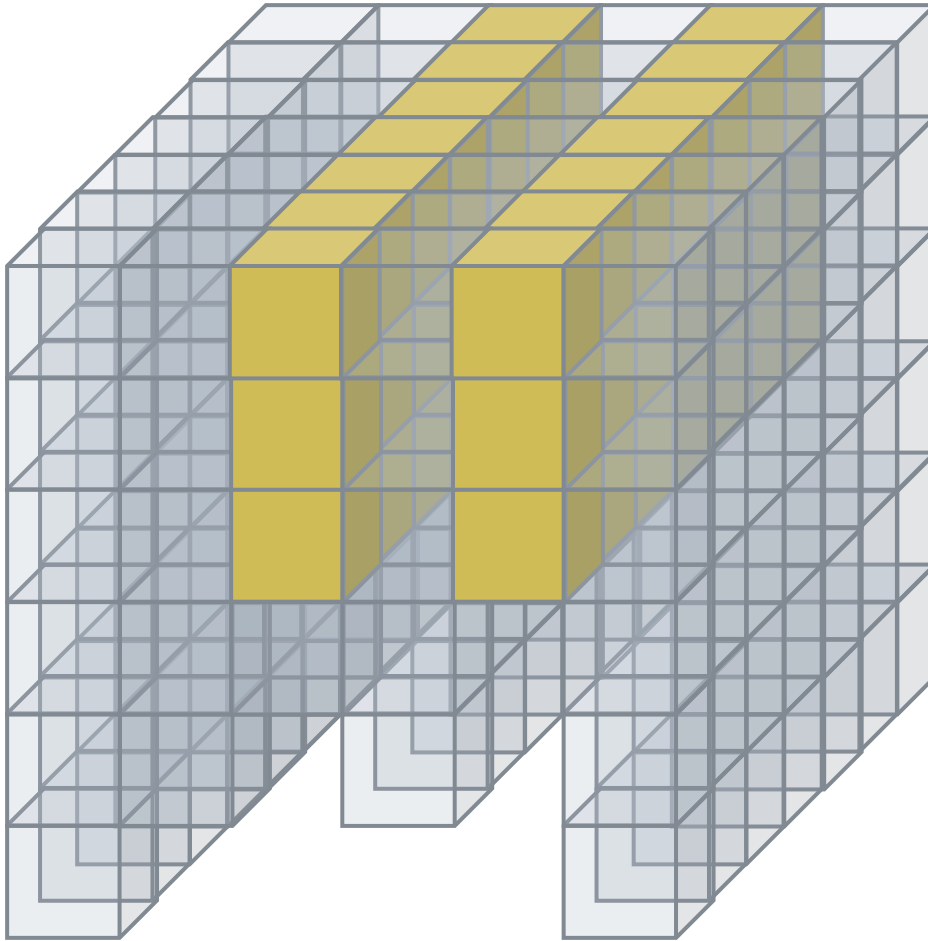
- Countries
- Road conditions
- Traffic situations (Ferries, tunnels, traffic jams etc.)
- Climate changes
- Sleepover at truck stops
- Using experiences from drivers

Validation test when product is mature enough

= One testcase for a Function

Truck Function Validation

PVT Haulage



SOME functions with several testcases are tested in different environments on a high level.

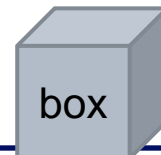
~6weeks/truck

Requirement on mileage.

Environmental factor:

- mileage

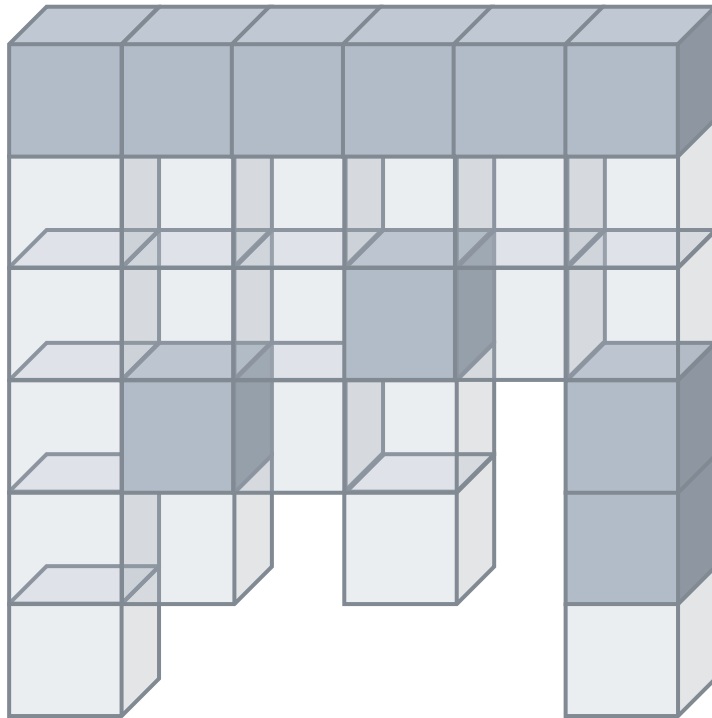
Validation test when product is mature enough.



= One testcase for a Function

Truck Function Verification & Validation

PVT Development

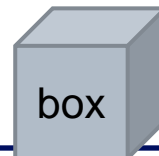


Custom Built test

Any test that the TestRequester orders

Using a PVT Check for regression testing

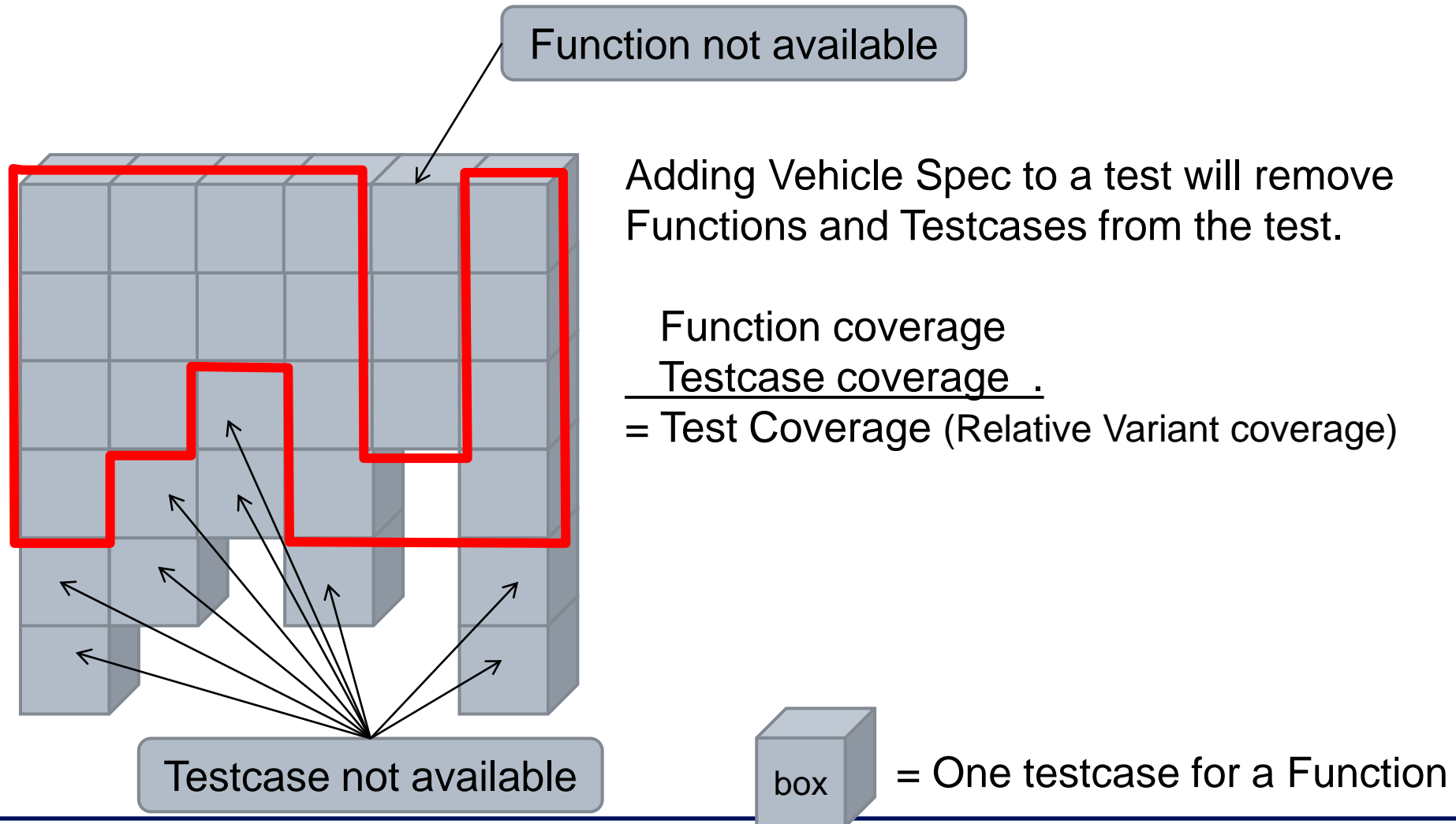
Normally used early in projects to evaluate a single project in a truck

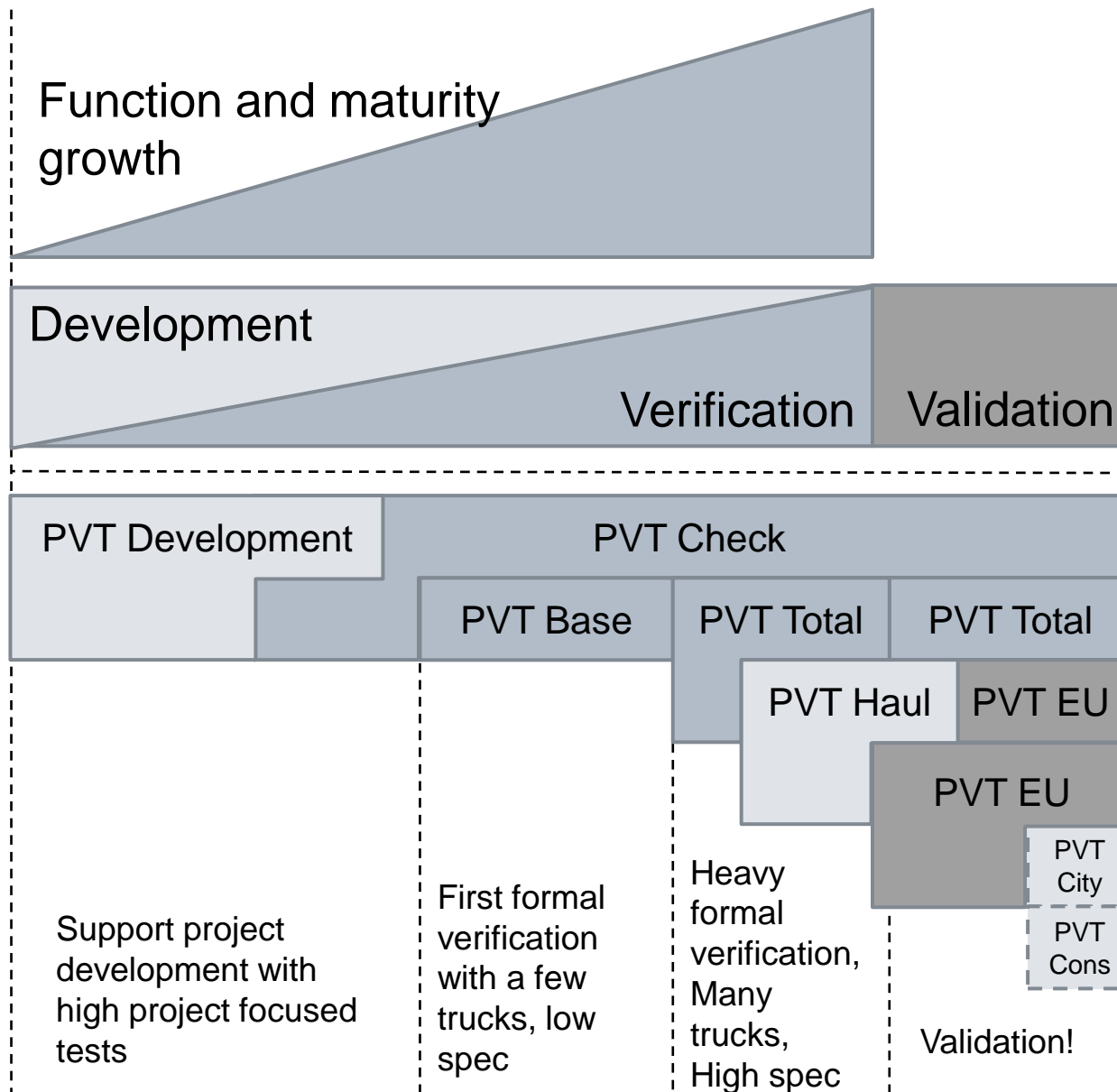


= One testcase for a Function

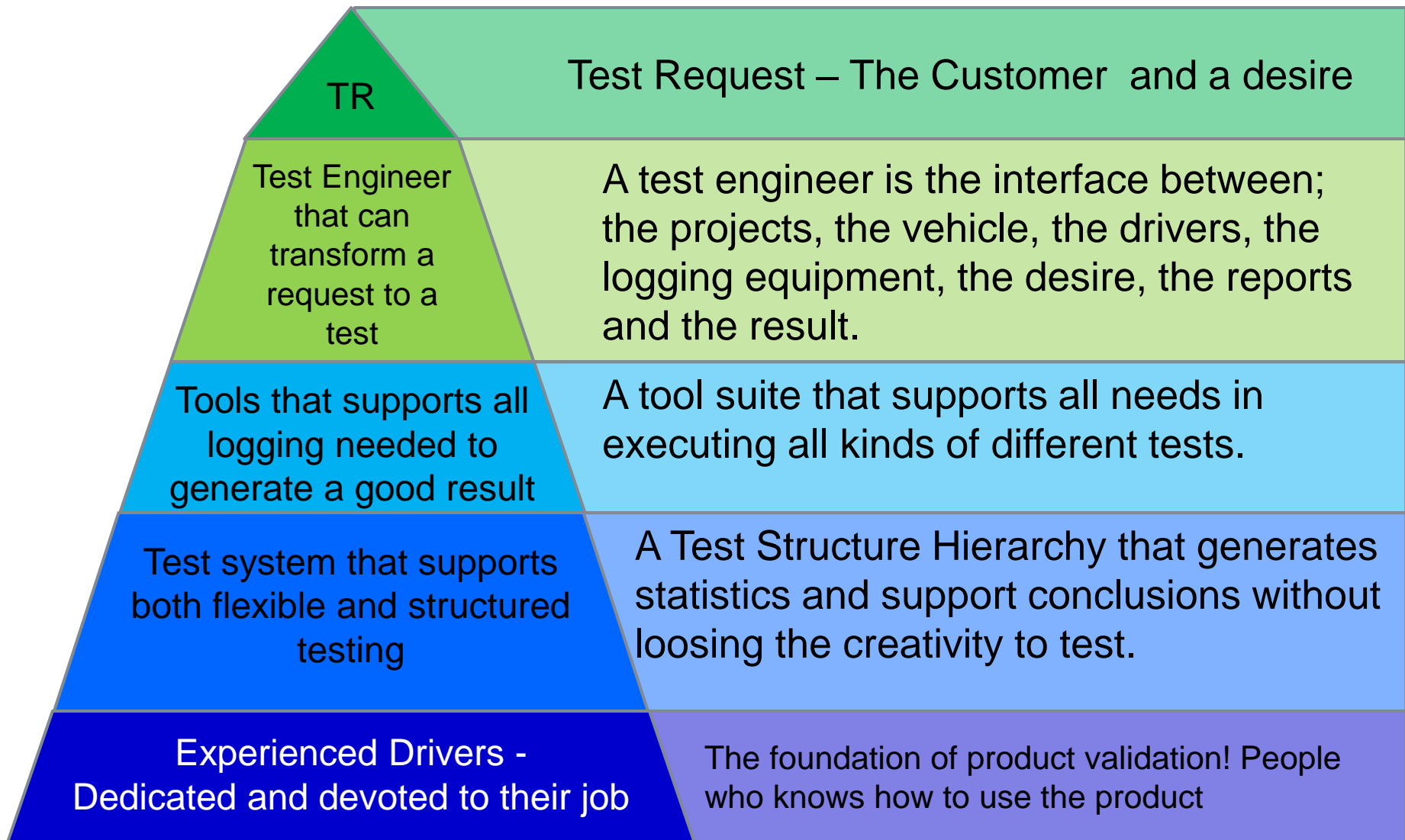
Vehicle Spec for a certain test

PVT TOTAL

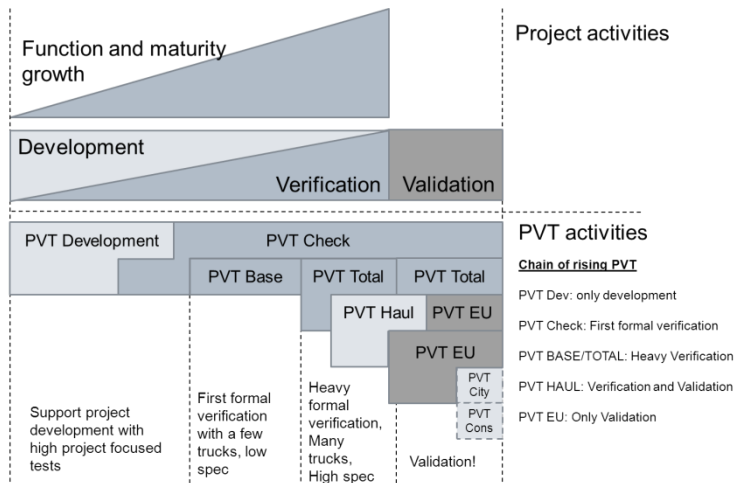




Foundations of PVT



Truck Function Validation (PVT - Performance Validation Test)



Verification test of driver manual &
Validation test of software functionality
from a driver perspective



Lessons Learned from site Lyon

Presented by Julien Rouge
Lyon TFV Manager

Lessons learned from Lyon

- Networking is crucial, securing understanding & acceptance by:
 - Direct contacts within the fault resolution process (local specific processes e.g. "PATI")
 - Testing organizations (RT/AET/FT)
 - Engineering
 - Project people (FVV-PMO, Product PM...)
 - Features ==> "FVV one voice"
 - Brands
- Renault adaptation of the test cases was the biggest work
- E-FACTS was quite well prepared for Lyon usage

Lessons learned from Lyon

- Aim for the fastest possible team set-up:
 - Work the right way from the start, don't cope too much
 - Look for a PVT Tester from the start (difficult to find, long to educate)
 - Drivers training:
 1. Educate drivers in truck functionality & technology (Bluetooth phones...)
 2. Then proceed to PVT testing
 - Synch work with GOT for speed & support (weekly in the beginning...)

Lessons learned from Lyon

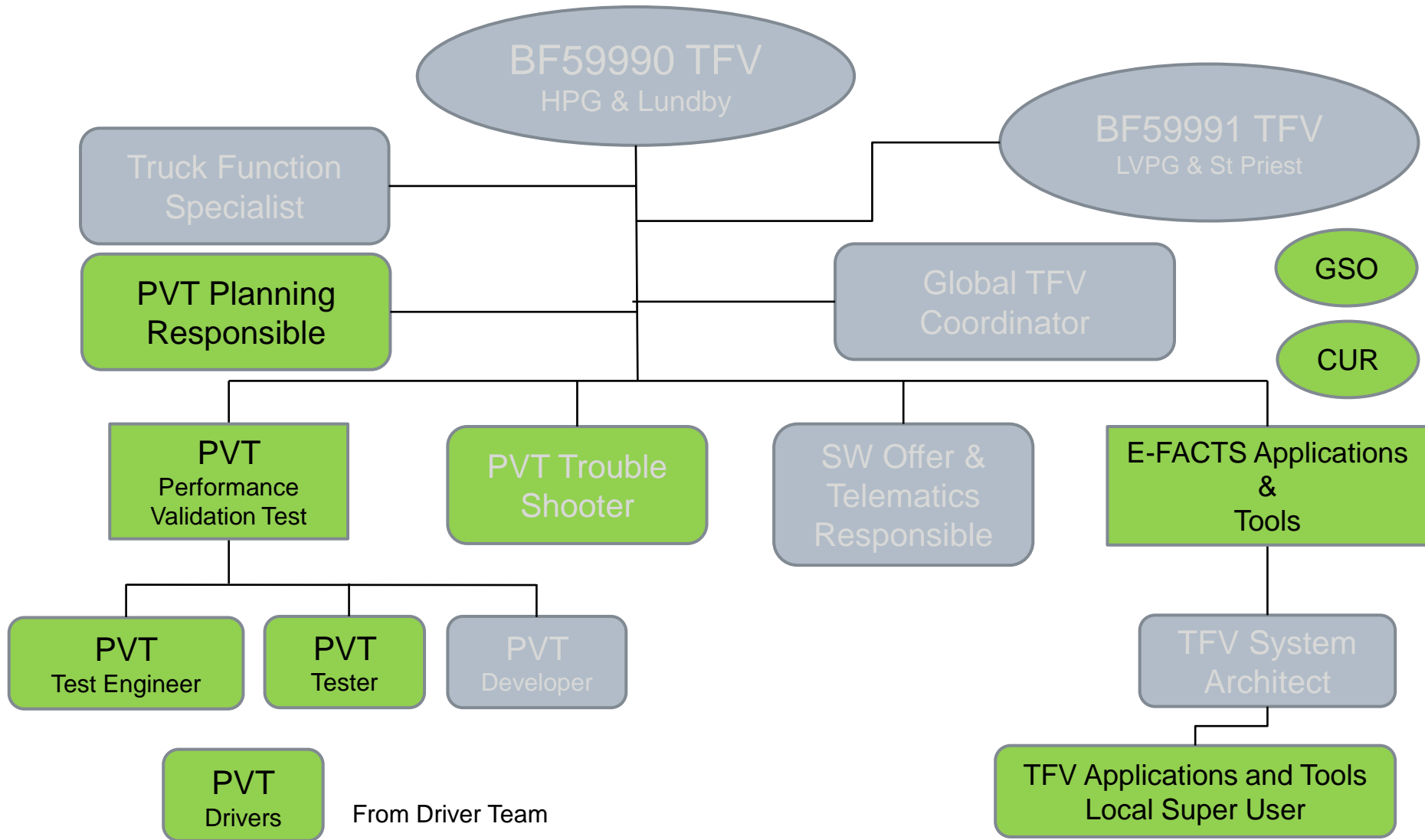
- Recruitment process issues:
 - It takes a long time to find the right people
 - Internal transfer can take a long time (6 months for TE)
 - The company economic status influences recruitment a lot
- Implementation financing:
 - A PIM project is not so bad, yet a lot of Presentations to prepare, requiring help from a experienced PM
 - P2683 also participated a lot to the cost
- IT data transfer rate from proving ground can be an issue



Plan to implement PVT at other sites

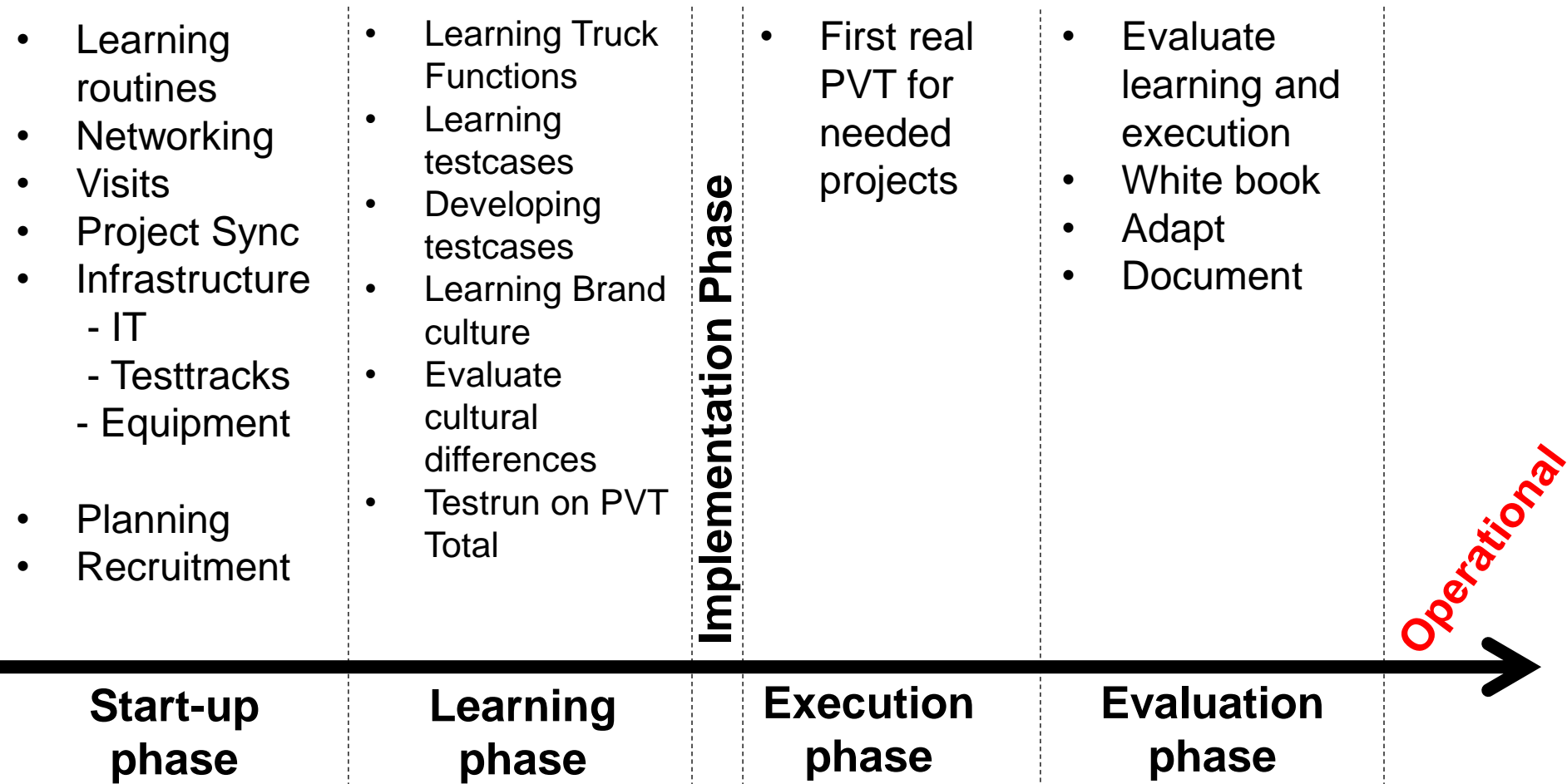
Presented by Martin Svennungsson

PVT at other site



PVT ramping phases - Overview

Draft



PVT ramping phases - Gates

Decided by Continental Manager PVT/

Global TFM Coordinator /Truck Function Specialist

Draft



Implementation Phase

- Timeplan
- Budget
- Infrastructure
- Roles
- Resources
- Testtracks
- Handshakes

- Visit PVT
- Total in GOT
- All roles have education and know what is expected from them
- Test code OK status

- Are every TC understood and have a result

- Are we mature enough?

**Start-up
phase**

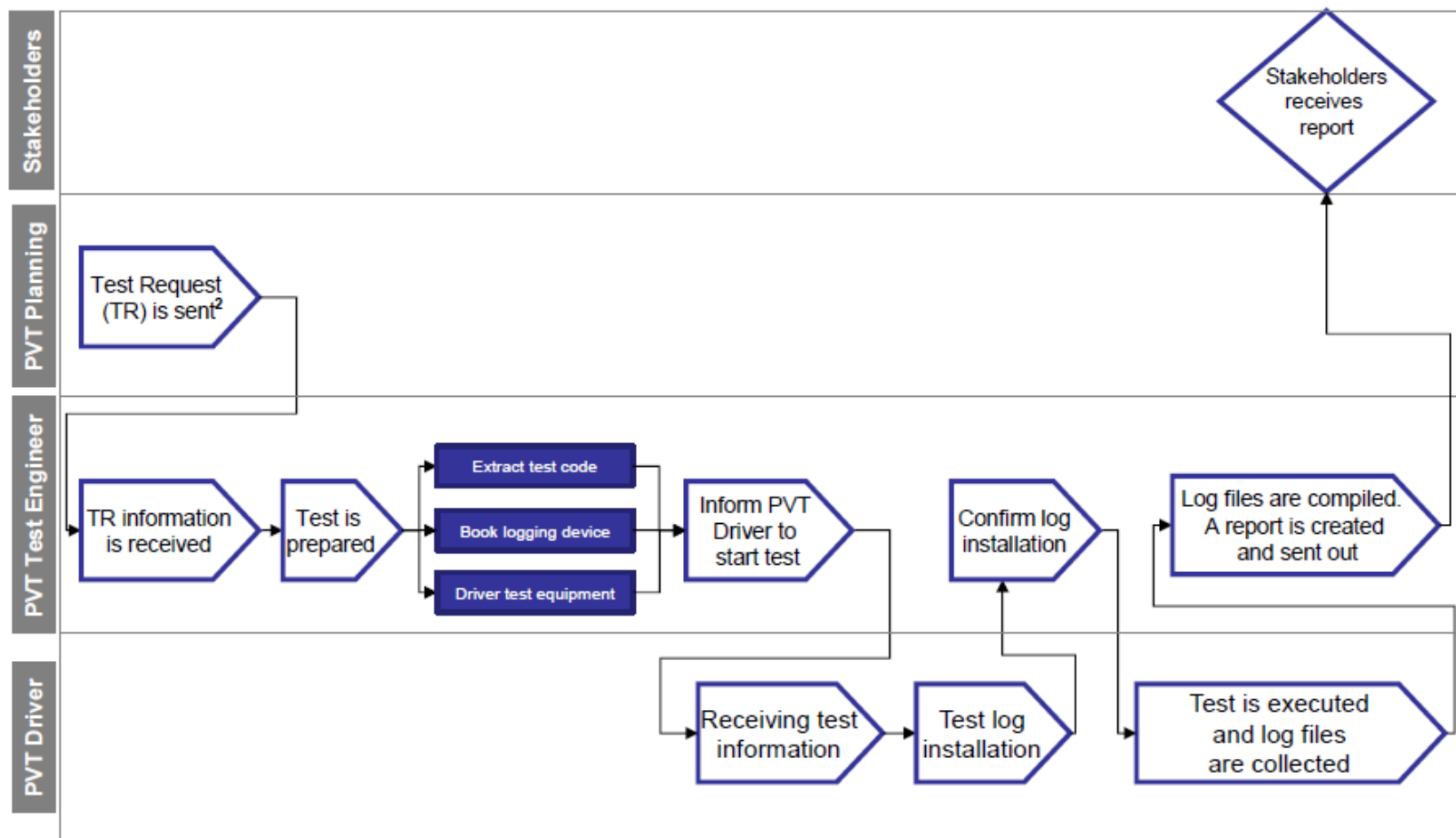
**Learning
phase**

**Execution
phase**

**Evaluation
phase**

Operational

PVT Test Proces



¹ PVT = Performance Validation Test

² Connected to "PVT Test Request Process"

PVT Manager - Purpose

- Database for all Test Cases
- Database for Test Sequences
- Tool to generate Reports
- Tool for Vehicle Planning
- Administration tool for users and content
- All questions – Send mail to "Application E-FACTS"

PVT Manager Access Level

	Test Leader	SE	ME	Tools	Adm
PVT Test Case Editor	View, CR, New	View, CR, New	Full		Full
TFA/TF	View	View	Full		Full
Test Sequence	View, Export	View, Export	Full		Full
Vehicle Planner	View	View	Full		Full
Vehicle Specification	View	View	Full		
Reports					Full
Tool Box				x	Full

PVT Test Case Editor

- Truck Function Area vs. Truck Functions vs. Test Case
- Test case content – Product Class/Specification/Test method
- Change Request or New test Case
- Excel Printout
- Filter and search for TC
- SPEC != NOT, |= OR, && = AND
- ProductClass \$ = AND

Send a Test Case Request

PVT Test Sequences

- Different PVT Test Methods
- Typical Test Routine for the PVT Test Methods
- Default Test Sequences
- Customized Test Sequences
- Export Test Sequences
- Test Leader Feedback to Site/Master Editor about problems found

Truck Function List Editor

- Handles all Truck Functions and Trucks Function Areas
- Gives short information about the Truck Functions
- (Some mismatch in PROTUS, due to delay)

Reports

- Only valid PVT trucks/SW are in the list
 - Ordered by mail to "Support E-FACTS"
- Individual Truck Report
- Total Truck Function Report (need to be handled in Refiner first)
- E2E Function Report
- Compare SW package
- Truck Function Consistency
- Test Case Consistency
- Current Test Coverage

Reports

PVT Test Case Editor
PVT Test Sequences
Truck Function List Editor
Reports
Vehicle Localizer
Vehicle Specifications
Vehicle Planner
Tool Box

Individual Truck Function Report
Total Truck Function Report
E2E Function Report
Compare SW Package
Truck Function Consistency
Test Case Consistency
Current Test Coverage

Individual Truck Function Report

Report Parameters

Filter Truck Function:
24-HDV

Select SW Release:
F0_VT_REL15_3.0

Select Truck Functions:
All
Clear

- ☒ Adaptive Cruise Control
- ☒ Adblue Functionality
- ☒ Air Production
- ☒ Air Suspension Drive Level Control
- ☒ Air Suspension Ferry Function
- ☒ Air Suspension Load Control
- ☒ Air Suspension Manual Control
- ☒ Air Suspension Prohibit
- ☒ Airbag
- ☒ Alarm Normal Mode
- ☒ Alarm Reduced Mode
- ☒ Alarm Service Mode
- ☒ Alcolock
- ☒ Alternator
- ☒ Ambient Temp
- ☒ Antilock Braking System
- ☒ Antitheft Performance
- ☒ Antitheft Related Fault Messages
- ☒ Approach Lights
- ☒ Audio Control
- ☒ Aux In
- ☒ Auxiliary Brakes
- ☒ Axle Load Distribution
- ☒ Battery Management And Information
- ☒ Battery Management Related Fault Messages
- ☒ Beacon Light
- ☒ Black Out And Convoy Mode
- ☒ Black Panel Mode
- ☒ Body Builder Performance
- ☒ Body Builder Related Fault Messages
- ☒ Bodybuilder Brake Systems Control
- ☒ Bodybuilder Display

Select Vehicles:
All
Clear

- ☒ FM-739

Group TF By

- ☒ Truck Function Area
- ☐ E2E Function

Create Report

Reports – Individual Report

Vehicle Localizer

- Showed the position for the last uploaded GPS data
- Today PAUSED, due to future RDM possibilities

Vehicle Localizer

Select Vehicle:

CM-1 ▼

This location is based on the
last log position.

For more accurate information use:

[TT Tracker](#)

NOT IN USE FOR THE MOMENT
LOCATION OPENED IN SEPARATE WINDOW

Vehicle Specification

- Search and show Specification inside eFACTS
- Should be updated once a month from PROTUS, total file
- Should be updated every day from PROTUS for changes

Vehicle Specification

Vehicle: VNM-111

Product Class:

Project:

Search ->

E-FACTS Spec

PROTUS SPEC

Spec type: V Project: 31_00034 Identity: VNM-111

Intro time: 201346

FG	VF	Family Description	Variant	Variant Description
000	AAX	PRODUCT CLASS	04-TLV	HEAVY TRUCKS (FH/FM/VN/NH)
000	ABX	PRODUCT TYPE	VNM64T N	VOLVO MEDIUM NOSE 6*4 TRACTOR, NORTH AMERICA
0101	CKX	VEHICLE PROFILE	TYPE-N	CONVENTIONAL (N-SERIES)
0102	8ZC	HOOD AERODYNAMICS	NOT SELECTED	
0102	CDX	CONVENTIONAL TYPE	MEDIUM	MEDIUM HOODLENGTH
0103	DAX	AXLE ARRANGEMENT	6*4	6 WHEELS THEREOF 4 DRIVING
0104	DDX	CHASSIS TYPE	TRACTOR	TRACTOR TYPE
0105	51A	BRAND	BRAND-V	BRAND VOLVO
0105	DLX	CONCEPT	CONC-NAM	NORTH AMERICAN CONCEPT
030	3XB	ZONE PACKAGE, LEFT FRONT	ZPLF5010	ZONE PACKAGE LEFT FRONT 5010MM
030	3YB	ZONE PACKAGE, RIGHT FRONT	ZPRF5140	ZONE PACKAGE RIGHT FRONT 5140MM
030	4HB	ZONE PACKAGE, ABOVE FRAME RAIL	ZPAF5470	ZONE PACKAGE, ABOVE FRAME RAIL 5470MM
030	A6X	VERSION	VERSION2	VERSION 2
030	MCX	CHASSIS PACKAGING	UCPAK	WITHOUT CUSTOMER SPECIFIED CHASSIS PACKAGING
031	78X	TRANSPORT CYCLE	TC-LONGD	LESS THAN ONE DELIVERY OR PICK-UP OF GOODS EVERY 50KM
031	DHX	ROAD CONDITION	RC-SMOOT	WELL MAINTAINED SURFACED ROADS >95 DRIVING DISTANCE
0311	GJX	VEHICLE VERSION	VERS-NAM	NORTH AMERICAN VERSION
0312	DKX	GROSS COMBINATION WEIGHT	GCW36.0	36.0 TONNES, GROSS COMBINATION WEIGHT
032	6WA	DRIVELINE POWER TYPE	DPOW-D	DRIVELINE POWER, DIESEL
032	CJX	EXHAUST GAS RECIRCULATION	EGR-C	EXHAUST GAS RECIRCULATION, COOLED
032	DPX	ENGINE TYPE	ENG-VE11	11 L. ENGINE
032	N1C	DRIVELINE TECHNOLOGY	DTECH-CO	DRIVELINE TECHNOLOGY, COMBUSTION
0323	N8C	ENGINE FUEL CONCEPT	EFC-LQ	LIQUID FUEL
036	GPX	REGULATORY REQUIREMENTS	UREG	WITHOUT REGULATORY GUIDELINES
0361	FVX	FRONT AXLE LOAD	FAL5.7	5.7 TONNES, FRONT AXLE LOAD
0362	F1X	REAR AXLE LOAD	RAL17	17 TONNES (38,000 LBS), REAR AXLE LOAD
0364	FAX	STEERING WHEEL POS.	STWPOS-L	LEFT HAND SIDE
0365	F3X	REAR AXLE POSITION	RAP6690	XM = 6690 MM, REAR AXLE POS.
0365	FYX	FRONT AXLE POSITION	FAP2940	XM = 2940 MM, FRONT AXLE POS.
037	FHX	VEHICLE WIDTH	VW2590	2590 MM (102") VEHICLE WIDTH
037	GSX	CHASSIS HEIGHT	CHH-STD	CHASSIS HEIGHT STANDARD

Vehicle Planner

- Tool to support Project to select trucks
- Can also be used to check
 - Test Case Coverage
 - Test Function Coverage - Test Depth
 - Test Confidence

Vehicle Planner

Select test vehicles to find non covered test cases and truck functions.

Vehicle Selection

Selected Product Class:

24-HDV

Available Vehicles:

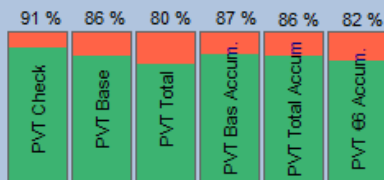
FH-1045
FH-1047
FH-1076
FH-1097
FH-1100
FH-1101
FH-1106
FH-1122
FH-1123
FH-1124
FH-1139
FH-1153
FH-1154
FH-1158
FH-1159
FH-1223
FH-1224
FH-1225
FH-1226
FH-1227
FH-1228
FH-1230
FH-1231
FH-1265
FH-1266
FH-1267
FH-1268
FH-1270
FH-1271
FH-1272
FH-1273
FH-1334
FH-1336
FH-1337
FH-1352
FH-1353

Selected Vehicles:

FH-1107
FH-1335

Clear

Test Case Coverage



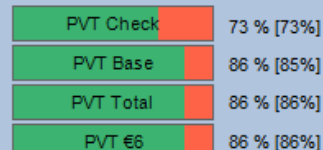
Select Filter:

PVT Check

Not Covered Test Cases

TRUCK_FUNCTION	VERSION	SPEC
Engine Idle Shutdown	1026.2	EIDLESDJISD03
Trailer Brake	1144.2	TRBR-HCR
Transmission PTO	1037.2	IUPTOTRA
Battery Management A...	1039.2	BATTAMP
Traction Control	1117.2	TRACAID
Front Axle Steering	952.1	ACTST-TO
Mainswitch	1040.2	IUADR
Head Light Adjustment	1052.2	IUHLADJ&&I04...
Extra Lights Front	1049.2	IUDRIVL
Beacon Light	1043.2	BEACON-P BE...
Plough Light	113.1	E3SNOWPS E...
Fifth Wheel Locking Inf...	466.1	TCIND
PTO Control	499.1	REMC-MF&P...

Truck Function Coverage



Select Filter:

Only Unhandled TF

All Incomplete TF

Not Covered Truck Functions

Truck_Function	TC
Air Suspension...	5 / 5
Kneeling	0 / 0
Air Suspension...	6 / 7
Load Indicator	16 / 20
Air Suspension...	5 / 5
Corner Light	5 / 5
Powertrain Gau...	11 / 12
Air Suspension...	5 / 6
Climate Automa...	3 / 3
Transmission M...	1 / 9
Telematics GPS...	1 / 1
Panic Alarm	7 / 7
Alarm Reduced...	13 / 13
Interior Resting...	4 / 4
Interior NightLight	3 / 4
Interior Light - D...	5 / 5
Immobilizer	2 / 2
Electrical Load...	0 / 9
Pre Trip Inspect...	0 / 0
Time and Date	5 / 5
Odometer	6 / 7
Information And...	4 / 4
Brightness Control	4 / 4
Driver Settings	5 / 5
Engine PreHeat	2 / 2

Stat

Est. Confidence

Details..

Tool Box

- Administration of
 - Move data to correct truck
 - Import Vehicle Specification from PROTUS
 - System Parameters
 - Users
 - SW versions
 - Status report PVT items (Vehicle/SW)
 - Mail contact
 - Measurement Topics

Tool Box - GUI

Move Measurement Location

Measurement Name [MEA_xxxx]:

From Vehicle: To Vehicle:

Note: To run more than one measurement at a time use ; as separator.

Add Vehicle Specification

Vehicle:

Note: To add more than one vehicle at a time use ; as separator.

System Parameters

Refiner Users

User Id: User Name: User Rights: ☒ User ☐ Administrator Vehicle Grp:

SW Versions

SW Version: *Note: SW Version shall be on standard format only!!* ☐ Show SW Version

Status Report Items

New Item Name: Item Type:

Mail Contacts:

Contact Name: Mail Address: *[Only one per unique contact name]*

☐ Apply ☐ Statistics

☐ WD ☐ Trouble Shooter

Measurement Topics:

Topic Name: GUID: Topic Short Name:

☐ Has Ext. Service ☐ Ext. Service Active *Note: You can not update names and GUID. Only Ext. Service*

Activity Display

Refiner usage for PVT

- Test Leader access level needed to handle results from PVT Testing.
- Truck Function Status Report
- Report fault against Test Cases

Job list (for Site and Master Editor)

Weekly TFV Status Report – Delivered by GOT today

Example

Truck	Project	Type of PVT	SW package	Test Progress	Faults found
FH-1678	Introblock	Total	F0_VT_REL11_3.0 (TSP)	3 of 4 weeks	63 Faults 363 Points
FH-1671	P2826	Total	F0_VT_REL11_3.0 (TSP)	3 of 4 weeks	37 Faults 213 Points
FM-739	Introblock	Total	F0_VT_REL15_3.0 (REPRO)	3 days of 4 weeks	Reporting ongoing
FH-1690	P2829	E6	F0_VT_REL19_3.0 Audio (PROTUS)	1 of 5 days	Reporting ongoing