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ERTMS testing in a simulation laboratory

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Background

- Digirail will use ETCS L2 and Hybrid Level 3.
- Kotka–Kouvola–Hamina test track is being built.
- Thales has delivered an ETCS simulation laboratory to the Rail Training Centre (RTC) in Kouvola.
- We got an in-depth training of ETCS and the laboratory in the beginning of 2022 (picture).
- The team could start early the journey into ETCS.



Credit photo: Guido Triebel

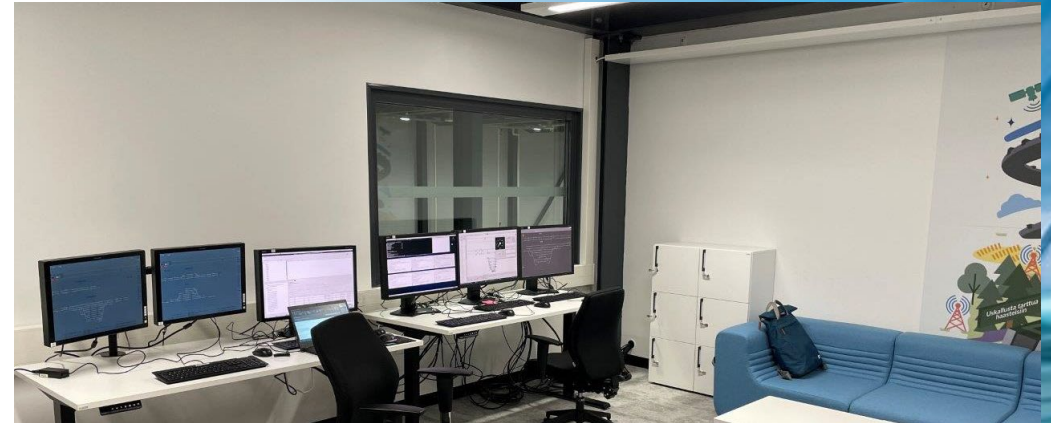
Difference ETCS vs. JKV

- The elements involved (IXL, RBC and OBU) are mainly **software** components and the hardware they are running at are of lower importance.
- Testing follows a lot the principles of software testing.
 - Test cases are planned and executed.
 - Found functional faults are described in defect reports.
 - Fixes to the defects are mainly delivered as software updates to the laboratory.



Our Laboratory

- The laboratory is a production-like mirror of the Kotka–Kouvola–Hamina onsite equipment: two interlockings, one RBC, one OBU.
- The first version is virtualized, i.e. without dedicated hardware.
- A versatile simulator ‘SimBa’ allows to simulate the track and its interaction with a train.
- An OBU simulator “OBUSim” simulate trains. Created by a mouse click.
- Many testing activities require special knowledge. Our testers have learned constantly and become insiders of the testing environment.



Credit photo: Teppo Hulkko



Credit photo: Saara Haapala

Main purposes

Purposes

Gaining deep ETCS competence by writing and executing test cases

Developing a generic test case library as basis for ERTMS roll-out

Creating a practical test process with work cycles and tools

Validating system requirements

Getting ready for testing future features and version updates



In addition to pass-or-fail testing, we also explore.

Test Case Library

Finnish ETCS test cases are based on material from other European countries.

We have around 250 test cases.

They are grouped into 8 categories like Level Transitions and Arrivals.

Each test case has title and objective, starting conditions and detailed test steps with expected results.

They are now in MS-Excel files but will be moved to IBM Engineering Test Management (ETM).

Test Case					Requirements	
	ID	Creator	Title	Train type		
Test Case	2-001	T.Hulkko (updated by LyTa)	Departure with valid position		S-A035 L2TS-382	
	Priority	Date				
	Medium	upd. 06/07/2022				
Objective	To test departure when train has valid position, train goes from OS to FS mode					
Starting conditions	Level		L2			
	Speed		0			
	Mode		SB			
	Additional		Test case 1-001 has to perform first ending inside trusted area			
Step	Details (packet, etc)		Step description	Expected result		Notes
1			Create a train route starting from first signal in advance of train and press start button from DMI	Route should be set and locked and first signal should show proceed-aspect		OK

Benefits of Simulation Testing

Fast and light: Experts can investigate ETCS details much faster.

Cost saving: The laboratory will avoid many test runs with a real test locomotive.

Avoiding onsite surprises: Onsite test runs are run beforehand in the laboratory.

Easier track commissioning: A majority of tests can be done in laboratory.

Faster rolling stock approval: New OBU versions can be largely proven in lab, only a minor part of the tests are needed onsite.

Outlook

A laboratory instance with dedicated hardware is installed in the beginning of 2023.

The test track and the laboratory will be available to the ERTMS rollout until the track is converted to ERTMS, currently 2033.



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THE WORLD
ON TRACK

