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ITEA 2 is a EUREKA strategic ICT cluster programme

INFORMATION TECHNOLOGY FOR EUROPEAN ADVANCEMENT

Project Progress Report openETCS

01.07.2013 – 31.12.2013
Edited by Peter Mahlmann on 17.12.2013

Executive summary

- Project official start date: 01.07.2012
- Project end date: 30.06.2015
- Latest review: 03.07.2013 #1
- Next planned review: 12.06.2014 #2
- PCA Status: PCA has been signed by 23 of 31 partners

Managerial status

E.g., when relevant: PCA status[1], funding status synthesis, project organisation, kick-off and project meetings, major outputs of review meetings, Change Requests, delays, etc.

For each of these issues, describe the changes or the progress achieved within the reporting period and/or recall the current status.

<Text to be inserted here>

Technical progress and achieved results

Describe the main innovations actually achieved within the reporting period (not just deliverables). Whenever helpful, you might highlight the status at the beginning and at the end of the reporting period.

<Text to be inserted here>

Impact

Describe the main achievements with regards to exploitation (fast exploitation opportunities, expected new/updated products, spin-offs/start-ups, etc.) and all its enables and facilitators: standardization activities (de jure/de facto standards, open source communities, etc.), dissemination (towards customers, partners, industrial or scientific communities: major contributions to conferences, seminars, journals, etc.)

<Text to be inserted here>

The Executive Summary should provide the highlights and be a stand-alone section of maximum one (1) page.

Starting projects, for which technical progress and impact are not yet significant, can skip these parts and only address the managerial topics.

[1] *In some countries, a signed PCA is a pre-requisite for the partners actually getting the funding.*

Table of Contents

1. Project one-page description

1.1 The Context

Europe's railways have developed over the last 150 years within national boundaries, resulting in a variety of different signalling and train control systems, which hampers cross-border traffic. The European Union has decided to improve interoperability for the railway sector. Therefore the European Train Control System (ETCS) as part of the European Rail Traffic Management System (ERTMS) is intended to replace almost all national legacy mainline signalling and train control systems all across Europe. ETCS consists of infrastructure components and on-board units (OBU). A System Requirement Specification has been cooperatively created mainly by 6 major European railway signalling manufacturers. Beginning with the 3rd version of the SRS, this document has been published by the European Railway Agency (ERA), therefore in the "public domain" and will be mandatory by 2015 for all new infrastructure and train borne signalling and train control equipment.

1.2 The Goals and major expected impact of the outcomes

The purpose of the openETCS project is to develop an integrated modelling, development, validation and testing framework for leveraging the cost-efficient and reliable implementation of ETCS. The framework will provide a holistic tool chain across the whole development process of ETCS software. The tool chain will support the formal specification and verification of the ETCS system requirements, the automatic and ETCS compliant code generation and validation, and the model-based test case generation and execution. openETCS will utilize "Open Standards" on all levels, including hardware and software specification, interface definition, design tools, verification and validation procedures and last but not least embedded control soft-ware. By applying those technologies and related business concepts a significant cost cut for the final on-board product is expected down to or even below conventional high performance cab signalling systems (e.g. LZB Linien-Zug-Beeinflussung, as used in Germany, Austria and Spain). The open source concept provides for a neutral and formal method based "correct" functioning reference device that will help to overcome existing interoperability problems, supporting manufacturers, infrastructure managers and railway undertakings alike, avoiding exhaustive field tests, transferring verification and validation activities from the track site into laboratories, saving scarce resources and finally accelerating the migration phase and therefore supporting the European ERTMS deployment plan.

1.3 The innovative aspects

This project addresses mainly interoperability for the European railway sector, promoting competitiveness of the European industry giving them a leading edge and creating new jobs in the software service industry by applying first time a new concept called "open Proofs", fulfilling safety and security demands as requested by EU parliament resolution A5-0264/2001.

1.4 The business relevance

Key element for improving that situation seems to be a greater degree of standardization in particular for the ETCS on-board equipment on various levels. Standardization by applying open source licensing concepts will be the focus of this project, and therefore has been called "openETCS".

2. Context updates

NB: none of the following paragraphs should be regarded as an implicit Change Request.

2.1. Changes in the market relevance

Document the market relevance changes that occurred since the last PPR was issued.

Should you consider that they haven't changed, then explicitly state it here.

<Text to be inserted here>

2.2. Changes in the technical and strategic relevance

Reconsider the relevance, importance and impact of the project in particular with respect to the current technological state-of-the-art (as opposed to the one described in the FPP). Address possible new or similar related projects.

If the technical and strategic relevance have not changed, state it here.

If major changes occurred since the last PPR or FPP release, document such changes in this paragraph.

<Text to be inserted here>

3. Progress

This chapter must report on the progress made and/or achievements reached since the last reporting period.

3.1. Technical progress

Summarise the technical and quantitative results achieved in the reporting period by providing the equivalent of an "executive summary" for each work package (maximum 1 page per WP).

3.1.1. Work Package 1: <NAME>

Responsible: Pierre-Jean Ginoux

<Text to be inserted here>

3.1.2. Work Package 3: Modelling – Code Generation

Responsible: Pierre-Francois Jauquet

<Text to be inserted here>

3.1.3. Work Package 4: Validation & Verification Strategy

Responsible: Marc Behrens

The verification and validation activities in openETCS have progressed largely as planned in the Description of Work. Adjustments consist in adding mechanisms to flexibly react to developments in WP 3 and WP 7 and experiences in performing the tasks of WP 4.

The following changes in the work plan have been made.

- It is planned to revise the deliverable D4.1 "Report on V&V Plan and Methodology" after each of three planned levels of V&V activities.
- The Sub-System Requirements Specification (SSRS) has been identified as an additional object for V&V

The following results have been achieved in WP 4 in the second half of 2013.

- The first version of the deliverable D 4.1 has been completed and reviewed (Task 4.1).
- The first level of V&V activities has been performed on six targets, four models (Tasks 4.2) and two code blocks (Task 4.3)
- Reports on the first level of V&V results have been prepared for review Tasks 4.2 and 4.3)
- The internal assessment has been performed on available documents (Task 4.5)

The following activities have been started or prepared.

- The safety plan for the EVC software development is in preparation (Task 4.4)
- The internal assessment of the safety aspect has been prepared. A workshop will be held on this topic in Q1 2014.

- An interface to apply model based testing methods to the DLR test laboratory which will host the demonstrator has been defined.

During the second half of 2013 a number of project meetings concerning WP 4 were held.

- Weekly web conferences organizing the ongoing work
- Web conferences according to the SCRUM process (sprint planning, daily meetings)
- Collaboration meetings between Siemens, DLR, University Bremen and ERTMS Solutions
- A project-wide workshop on verification and tools in 10/2013

3.1.4. Work Package 5: openETCS Demonstrator

Responsible: Patrick Deutsch

<Text to be inserted here>

3.1.5. Work Package 6: Dissemination, Exploitation Standardization

Responsible: Michael Ditze

<Text to be inserted here>

3.1.6. Work Package 7: openETCS Tool Chain

Responsible: Michael Jastram

<Text to be inserted here>

3.2. Compliance with plans

3.2.1. Milestones and deliverables

Document the status of <u>all</u> the milestones & deliverables using the following table.

The three first columns should contain:

- *the table provided at the "Major milestones/deliverables" § of the FPP;*
- *every possible additional deliverable addressed in the various Work Packages descriptions.*

The fourth column documents the status ("✔" when delivered or at least available, "Late" when late or left blank when not yet due). The fifth column should contain the actual (past) or expected (future) delivery date.

The sixth column <u>may</u> provide a comment when short or the N° of a comment to be then provided after the table otherwise.

WP[2]	Milestone or Deliverable title	Planned (FPP3.0.2) delivery date (YYYY/Qx)	Status	Actual or expected delivery date[3] (YYYY/Qx)	Short comment or comment N°
WP1 Project Management					

[2] *Work Package producing the milestone or deliverable.*

[3] *Left blank when not yet due.*

1	D1.1.1 Report on final Project Plan and Meeting Agenda	2013/Q1	✔	2013/Q4	The final project plan and meeting agenda in the form of a change request and updated FPP 3.0.2 has been submitted. Different views on scope shift between WP2 and WP3 due to a new task (SSRS) considered as necessary by majority of partners and resulting different views on who should lead and provide resources for the activity has caused that delay to update the Project Plan.
1	D1.3.1 Project Guide on Quality Assurance	2013/Q1	Late	2013/Q4	Institute Telecom was not able to deliver due to budget cuts, substitute did not meet expectations, and therefore new start of activity by SQS after funding was approved. Intermediate solution by adapting eclipse QA plan, see "Ecosystem" repository.
1	D1.2.1 Periodic Report	2013/Q1	✔	2013/Q1	
1	D1.2.2 Periodic Report	2013/Q3	✔	2013/Q3	
1	D1.2.3 Periodic Report	2014/Q1	✔	2014/Q1	
1	D1.2.4 Periodic Report	2014/Q3		2014/Q3	
1	D1.2.5 Periodic Report	2015/Q1		2015/Q1	
1	D1.2.6 Final Project Report	2015/Q3		2015/Q3	
WP2 Requirements for Open Proofs					
2	D2.1 Report on existing methodologies	2013/Q1	✔	2013/Q1	
2	D2.2 Report on CENELEC standards	2013/Q1	✔	2013/Q2	
2	D2.3 Process definition	2013/Q2	✔	2013/Q2	
2	D2.4 Methods definition	2013/Q1	Late	2014/Q1	Final version currently in review. Finalizaition had been postponed after decision of WP7 on the primary tool chain.
2	D2.5 Description of ETCS using those methodologies	2013/Q2	✔	2013/Q2	
2	D2.6 Requirements for the model	2013/Q2	✔	2013/Q2	
2	D2.7 Set of requirements for API, tools, V&V	2013/Q2	✔	2013/Q2	
2	D2.8 Set of requirements for tools	2013/Q2	✔	2013/Q2	
2	D2.9 Set of requirements for V&V	2013/Q2	✔	2013/Q2	
WP7 openETCS Tool Chain					
7	D7.1 Report on the final choice(s) for the primary tool chain (means of description, tool and platform)	2013/Q3	✔	2013/Q1	
7	D7.2 Report on all aspects of secondary tooling (results of T7.2)	2013/Q3			
7	D7.3 Tool chain qualification process description	2014/Q1			
7	D7.4 Tool chain first release	2014/Q1	✔	2013/Q4	Ahead of time.

7	D7.5 Ecosystem Artefacts: Proposed Terms of use, Proposed Committer Agreements, Proposed IP Policy, Proposed Development Process Description, Development Process Guidelines, Infrastructure Documentation, Infrastructure Template, Evolution Report of previous Deliverables	2015/Q2			
WP3 Modelling - Code Generation					
3	D3.5 System Specification Model	2014/Q1			
3	D3.6 Functional Model	2014/Q3			
3	D3.7 System architecture model with physical allocation	2014/Q4			
3	D3.8 Open Source Code	2015/Q2			
WP4 Validation & Verification Strategy					
4	D4.1 V&V Plan & Methodology	2013/Q3		2013/Q4	
4	D4.2.1 1st interim V&V report on the applicability of the V&V approach to the formal abstract model	2013/Q4			
4	D4.2.2 1st interim V&V report on the applicability of the V&V approach to the implementation / code	2013/Q4			
4	D4.3.1 Report on the prototypical application of the V&V tool chain and processes - for the formal model & formal abstract model	2015/Q1			
4	D4.3.2 Report on the prototypical application of the V&V tool chain and processes - for the implementation / code of the formal model	2015/Q1			
4	D4.3.3 Report on the prototypical application of the V&V tool chain and processes - Safety case for the tool chain and the processes	2015/Q1			
4	D4.4 Final report and conclusions of the whole WP4	2015/Q2			
WP5 openETCS Demonstrator					
5	D5.1 Functional Specification of Demonstrator	2012/Q4	Late	2014/Q1	Document is currently under review. Work on D5.1 has been delayed due to restructuring of the project (i.e. split of WP3 into WP3 and WP7), input from other WPs that was needed, and lack of technical resources.
5	M5.1 First iteration of OBU Simulator available	2013/Q4		2014/Q1	
5	M5.2 Data for testing available	2014/Q1		2014/Q2	
5	M5.3 Preliminary test Environment with Logical interfaces and remote access	2014/Q2		2014/Q3	
5	M5.4 Test Environment with Logical interfaces and remote access available	2014/Q3			
5	D5.2 OBU Simulator Demonstrator	2014/Q4			
5	M5.5 Main Tests Executed	2015/Q2			
5	D5.3 Report on Test results	2015/Q2			
WP6 Dissemination, Exploitation and Standardization					
6	D6.1 Dissemination Plan and Report	2013/Q1	✔	2013/Q1	

6	D6.2 Initial Exploitation Plan and Standardization Strategy, Open Source Business Model	2013/Q4	✔	2014/Q1	Delayed by two weeks only.
6	D6.3 Updated Dissemination Report	2014/Q3			
6	M6.1 Midterm Workshop Organization	2014/Q3			
6	D6.4 Updated Exploitation Plan, Report on Standardization	2014/Q2			
6	D6.5 Final Dissemination Report, Final Exploitation Plan, Final Standardization Report	2015/Q2			
6	M6.2 Final Workshop Organization	2015/Q2			
Milestones					
1	M1 Project guide: final project plan, meeting agenda, IPR plan, quality assurance plan	2013/Q1	Late	2014/Q1	Except for the quality assurance plan, M1 has been achieved.
2, 4, 5, 7	M2 openETCS tool chain development plan: Definition of Process and Methods, tool chain architecture, OpenETCS language, functional specification of demonstrator	2013/Q2	Late	2014/Q1	Except for the functional specification of the demonstrator, M2 has been reached.
2, 3, 4, 6, 7	M3 Full openETCS design and early prototype: requirements, tool chain, open Source Business Model, Exploitation Plan	2013/Q4	✔	2013/Q4	
2, 3, 4, 5, 7	M4 openETCS beta platform: First OBU Simulator, Set of requirements for API, tools, V&V	2014/Q2			
3, 4, 5, 7	M5 openETCS final platform, ready for testing	2015/Q1			
3, 4, 6, 7	M6 Final assessment, benchmarking and success measures	2015/Q2			

Comment n°1: <Text to be inserted here if relevant – elsewise remove the line>

Comment n°2: <Text to be inserted here if relevant – elsewise remove the line>

<Etc.>

3.2.2. Workplan

Discuss the current status and progress of the overall project with respect to the current FPP.

Indicate any possible change or delay that occurred during the reporting period and their cause.

<Text to be inserted here>

3.2.3. Manpower

Partner			2012	2013	2014	2015	Total
AEbt GmbH	DEU	Spent	0,50	0,25			0,75
		Planned	0,30	0,85	0,75	0,60	2,50
ALL4TEC	FRA	Spent	1,65	1,48			3,13

		Planned	1,65	3,55	2,70	1,70	9,60
ALSTOM	BEL	Spent	0,10	0,66			0,76
		Planned	0,25	1,64	2,02	1,01	4,92
ALSTOM Transport	FRA	Spent		0,10			0,10
		Planned	0,06	0,36	0,45	0,21	1,08
ALSTOM Transport GmbH	DEU	Spent	0,20	0,45			0,65
		Planned	0,20	0,65	0,55	0,30	1,70
ATOC	GBR	Spent					
		Planned	0,02	0,03	0,03	0,02	0,10
CEA	FRA	Spent	5,43	1,63			7,06
		Planned	0,77	3,37	3,14	0,89	8,17
LAAS - CNRS	FRA	Spent	0,78	0,63			1,41
		Planned	0,78	1,62	1,70	0,75	4,85
Deutsche Bahn AG	DEU	Spent	2,29	4,84			7,13
		Planned	2,40	4,90	5,00	3,50	15,80
DLR							
		Planned	0,43	1,48	1,55	0,74	4,20
Eclipse Foundation Europe Gmbh	DEU	Spent					
		Planned	0,02	0,04	0,04	0,02	0,12
EclipseSource Group	DEU	Spent	0,95	1,11			2,06
		Planned	0,54	1,14	0,83	0,50	3,01
ERSA	FRA	Spent	0,18	0,05			0,23
		Planned	0,58	2,71	3,75	1,12	8,16
ERTMS Solutions	BEL	Spent	0,75	0,99			1,74
		Planned	4,26	2,04	1,28	0,90	8,48
Formal Mind	DEU	Spent					
		Planned	0,40	1,00	1,00	0,50	2,90
Fraunhofer Gesellschaft	DEU	Spent	0,86	0,76			1,62
		Planned	0,80	1,50	1,50	0,70	4,50
GE Transportation	ITA	Spent	0,03	0,02			0,05
		Planned	0,20	0,40	0,50	0,10	1,20
Innovalia	ESP	Spent	1,10	0,69			1,79
		Planned	0,65	1,15	1,55	0,55	3,90
INPT Toulouse	FRA	Spent	0,60	0,50			1,10
		Planned	0,90	1,50	1,50	0,90	4,80
Institut Télécom	FRA	Spent	1,20	1,40			2,60
		Planned	2,61	3,20	3,20	0,80	9,81
lloyd's register rail B.V.	NLD	Spent	0,05	0,05			0,10
		Planned	0,20	0,10	0,10	0,30	0,70
Mitsubishi Electric	FRA	Spent	0,76	0,37			1,13
		Planned	0,74	1,49	1,53	0,74	4,50
NS Nederlandse Spoorwegen	NLD	Spent	0,20	0,60			0,80
		Planned	0,38	0,40	0,20	0,20	1,18
Siemens AG	DEU	Spent	0,15	0,91			1,06
		Planned	0,60	2,90	3,00	2,60	9,10
SNCF	FRA	Spent	0,27	0,81			1,08
		Planned	0,80	1,80	1,10	0,30	4,00

Software Quality Systems S.A.	ESP	Spent	1,65	2,24			3,89
		Planned	1,98	4,91	5,53	2,40	14,82
Systerel	FRA	Spent	1,30	1,12			2,42
		Planned	2,95	2,85	1,75	0,67	8,22
Technical University Braunschweig	DEU	Spent	0,80	0,45			1,25
		Planned	0,70	1,70	1,20	0,60	4,20
TWT GmbH	DEU	Spent	0,55	1,91			2,46
		Planned	0,35	1,43	1,68	0,89	4,35
Universität Bremen	DEU	Spent	0,42	1,00			1,42
		Planned	0,70	1,38	1,38	0,80	4,26
University of Rostock	DEU	Spent	0,51	0,31			0,82
		Planned	0,51	1,67	1,49	0,51	4,18
	Total	**Spent**	**23,53**	**25,84**			**49,37**
		Planned	**27,73**	**53,76**	**52,00**	**25,82**	**159,31**

4. Exploitation

4.1. Exploitation enablers

For each of the topics listed below:

- *document the Dissemination & Exploitation overview[4] (template available on the 'ITEA 2 Community website') by exhaustively updating it;*
- *highlight in this chapter the major activities performed in the reporting period;*
- *provide further details (with regards to the separate overview) hereafter whenever judged appropriate.*

Please only address here new activities from the reporting period (the exploitation perspectives are to be addressed in §4.3).

4.1.1. Dissemination

Consider here dissemination towards customers, communities (industrial, scientific, etc.), incl. communication, seminars, workshops, conferences, papers, courses, etc.

<Text to be inserted here>

4.1.2. Standardisation

Standardisation includes de jure/de facto standards, published APIs, open source repositories and associated communities, etc.

<Text to be inserted here>

4.1.3. Patents

<Text to be inserted here>

4.1.4. Start-ups / Spin-offs

<Text to be inserted here>

4.2. Fast exploitation

Please only address here the fast exploitations performed in the reporting period (the exploitation perspectives are to be addressed in §4.3).

<Text to be inserted here>

4.3. Perspectives

Present, for each project partner, the exploitation perspectives for the project results.

Examples of results that may be later exploited, either internally or turned into products or services, are as follows:

[4] Providing information in this format will enable the ITEA 2 Office to use this information for statistics and publication.

- *new products or services, existing products or services upgrades, etc.;*
- *software packages, tools, etc.;*
- *methodologies, etc.;*
- *Patents or Intellectual Property Rights, licenses, etc.;*
- *new standards, published APIs, etc.;*
- *open source software and community, "freeware", etc.;*

or a combination thereof.

For the exploitation perspectives of all partners we refer to PPR 2013 / S1, where these have been presented for all partners.

5. Plus/minus report

This part should highlight, in a simple table form, what went well/wrong with the project in the reporting period.

You may use the proposed categorisation (i.e. 'Organisational', 'Overall progress', 'Demonstrators' and 'Work Packages') of the following table or another one that you judge more appropriate to your project. Add or remove lines depending on your needs.

+/-	Description	Impact description	Action
	Organisational		
	Overall progress		
	Demonstrators		
	Work Packages		

<Text to be inserted here, if relevant>

6. Risk analysis

Discuss any possible risk (technological, managerial, commercial, etc.) identified during the reporting period. For each of them, present appropriate and realistic contingency plans.

You may use the proposed categorisation of the following table or another one that you judge more appropriate to your project. Add or remove lines depending on your needs.

Identified risks	Contingency plan
Technological	
Managerial	
Commercial	
Misc.	

<Text to be inserted here, if relevant>