OCORA

Open CCS On-board Reference Architecture

Set of Requirements

Beta Release

Document ID: OCORA-30-010-Beta
Version: 1.00
Date: 29.06.2020
Status: final

Revision history

Version	Change Description	Name (Initials)	Date of change
0.10	Initial release	BJ	30.04.2020
1.00	DRAFT release, consolidated version	BJ	18.06.2020
1.10	Final for Beta Release	BJ	29.06.2020

References

[1] OCORA-10-001-Beta – Release Notes
[2] OCORA-10-002-Beta – Review Plan
[3] OCORA-10-003-Beta – Feedback Form
[4] OCORA-20-001-Beta – Program Slide Deck
[5] OCORA-20-002-Beta – Technical Slide Deck
[6] OCORA-20-003-Beta – Program Posters
[7] OCORA-20-004-Beta – Technical Posters
[8] OCORA-30-001-Beta – Introduction to OCORA
[9] OCORA-30-002-Beta – Problem Statements
[10] OCORA-30-003-Beta – Road Map
[11] OCORA-30-004-Beta – Business Objective and Economic Model
[12] OCORA-30-005-Beta – Alliances
[13] OCORA-30-006-Beta – High Level Methodology
[14] OCORA-30-007-Beta – High Level Tooling
[15] OCORA-30-008-Beta – Acceptance of Global Standards
[16] OCORA-30-009-Beta – Minimal Viable Product (MVP)
[17] OCORA-30-010-Beta – Set of Requirements
[18] OCORA-40-001-Beta – System Architecture
[19] OCORA-40-002-Beta – System Architecture – Capella Model
[20] OCORA-40-003-Beta – UVCC Bus Evaluation
[21] OCORA-40-004-Beta – Computing Platform
[22] OCORA-40-005-Beta – Functional Vehicle Adapter
[23] OCORA-40-006-Beta – CCS-TCMS Interface - ETCS Functionality (SS119)
[24] OCORA-40-007-Beta – CCS-TCMS Interface - ATO Functionality (SS139)
[25] OCORA-40-007-Beta – (Cyber) Security
[26] OCORA-90-001-Beta – Question and Answers
[27] OCORA-90-002-Beta – Glossary
[28] EN 50126-1:2017 – Railway Applications – The Specification and Demonstration of Reliability, Availability, Maintainability and Safety (RAMS) - Part 1: Generic RAMS Process
[29] EN 50126-2:2017 – Railway Applications – The Specification and Demonstration of Reliability, Availability, Maintainability and Safety (RAMS) - Part 2: Systems Approach to Safety
[30] EN 50128:2011 – Railway Applications – Communication, signalling and processing systems - Software for railway control and protection systems
[31] EN 50129:2018 – Railway applications - Communication, signalling and processing systems - Safety related electronic systems for signalling
[32] EN 50159:2010 – Railway applications - Communication, signalling and processing systems - Safety-related communication in transmission systems
[33] TSI CCS: 02016R0919 — EN — 16.06.2019 — 001.001 — 1: COMMISSION REGULATION (EU) 2016/919 of 27 May 2016 on the technical specification for interoperability relating to the ‘control-command and signalling’ subsystems of the rail system in the European Union, amended by Commission Imple-men-ting Regulation (EU) 2019/776 of 16 May 2019 L 139I
[34] RCA.Doc.13, Gamma.1, Concept: Architectural approach and Systems-of-Systems Perspective
[35] RCA.Doc.35, Gamma.1, RCA System Architecture

1 Introduction

1.1 Document context and purpose

This document is published as part of the OCORA Beta release, together with the documents listed in the release notes [1]. It is the first release of this document and it is still in a preliminary state.

Subsequent releases of this document (gamma, etc.) and topic specific documentation will be developed in a modular and iterative approach, evolving within the progress of the OCORA collaboration.

This document aims to provide the reader a complete overview of the OCORA requirements. The documents already containing requirements are listed in chapter 2 and are therefore not repeted in this

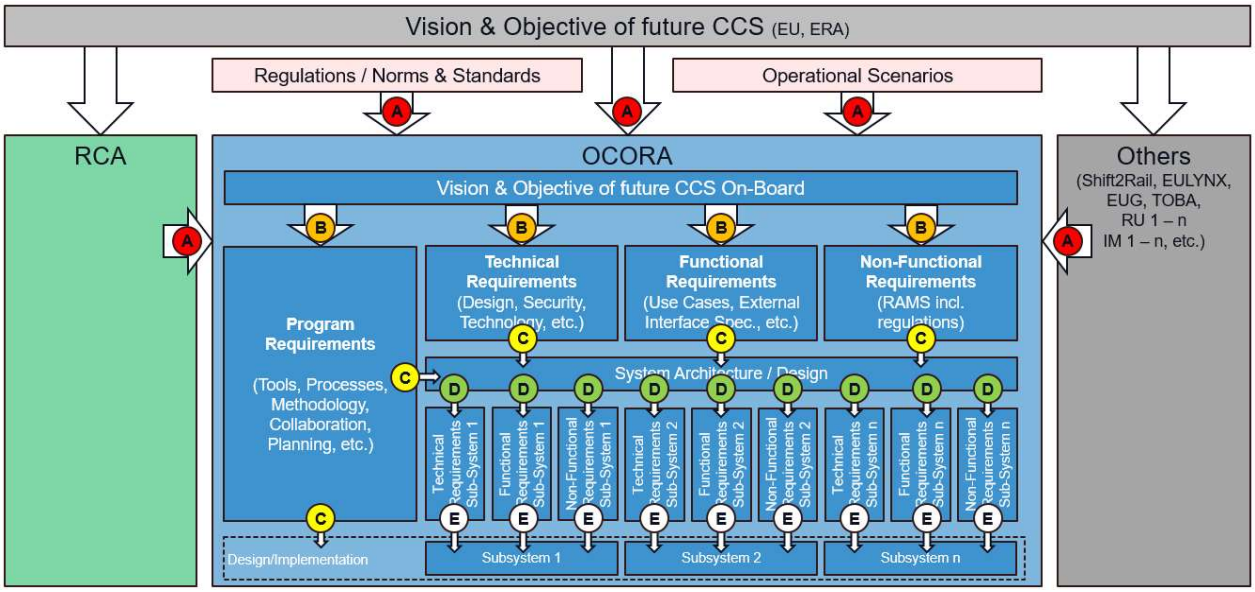
OCORA set of requirements targets to be the test environment for OCORA principles and objectives. It could be used to verify and validate the architecture (e.g. model economic impact of OCORA concepts) and to assess relevance of product implementations (e.g. test solutions, support for tender templates). Further release of the document will allow to tune and complement requirements (e.g. scaling VS requirements to other applications). Refinements are in particular foreseen on the distinction between requirements that shall be fulfilled or targeted and implementations that could be envisaged

1.2 Why should I read this document?

This document is addressed to experts in the CCS domain and to any other person, interested in the OCORA technical concepts for on-board CCS. The reader will gain insights regarding the topics listed in chapter 1.1, will be able to provide feedback to the authors and can, therefore, engage in shaping OCORA.

Before reading this document, it is recommended to read the Release Notes [1], the Introduction to OCORA [8], and the Problem Statements [9]. The reader should also be aware of the Glossary [24].

2 The OCORA requirements engineering process



A OCORA has to manage many different requirements, coming from different stakeholders and interested parties.

B In addition, the OCORA initiative has defined its own vision and objectives that lead to requirements for the program and the system to be developed.

C Further more, program, technical, functional, and non-functional requirements are developed in the different OCORA workstreams that provide input for the system architecture.

D While building the system's architecture, subsystems are identified and their interfaces and behaviours are specified. In addition, the different requirements are apportioned to the identified subsystems.

E These apportioned requirements, together with the interface specifications and the specified behaviours provide the requirements applicable for designing and implementing (or sourcing) the subsystems.

3 Instructions on how to capture OCORA requirements

The OCORA requirements are currently captured in Excel format and will eventually be transferred in a requirements management tool. The Excel table contains the coulmns as explained below.

3.1 Requirement ID

Every requirement has a unique ID. The 1st two digits represent a requirement group while the 3 digits after the dash are a sequential number within the group.

3.2 Level

In this coulumn, requirements are assigned to a level as per the definition in chapter 2.

3.2 Type

In this coulumn, requirements are assigned to a type as per the definition in chapter 2. The types available are:

- Program: All requirements applicable to the program but not to the system to be build.
- Technical: Functional- and Non-Functional requirements that are of system internal nature
- Functional: Functional requirements from an enduser perspective of the (sub-)system.
- Non-Functional: Non-Functional requirements from an enduser perspective of the (sub-)system

3.3 Title and Description

This column contains a title, allowing to quickl understand the topic of the requriement and a text describing the requirement. Requirements need to be:
- Unterstandable
- Traceable (where do they come from, source) and audible (who raised it)
- Testable (see also column for test criteria)
- Unambiguous
- Not contradicting each other
- Complete

3.4 Rational Statement / Reason for Requirement

In this column, the rational / reason for a requirement is stated.

3.5 Parent Requirement ID

This column is used to indicate what uper-level objective/requirement is addressed by this requirement.

3.6 Stakeholder

Identifies the primary stakeholder of the requirement

3.7 Necessity

Identifies the necessity of the requirement, according to IEEE 830-1998

3.8 Status

Identifies the status of the requirement. The options are:
- Proposed
- Under Reveiew
- Approved
- Rejected
- Deleted

3.9 Priority

Identifies with what priority a requirement is planned to be implemented.

3.10 Owner

Identifies who (from OCORA) manages the requirement.

3.11 Reference

Provides references to external documentation, if applicable

3.12 Test Criteria

Provides the criteria for testing the requirement.

3.13 Comments

Any comments applicable to the requirement

Requirements Category	Category	Topic	Lead	Support 1	Support 2	Support 3	OCORA Beta Remarks:
High Level User Requirements	Reg. 1.1	User Requirements (Business needs/vision) Capabilities	Jos Holtzer, NS	Jean Baptiste, SNCF	Matthias Moritz, DB	Baseliyos Jacob, DB	
	Req. 1.2	User Requirements (Operational needs/vision) Capabilities	Jos Holtzer, NS	Jean Baptiste, SNCF	Baseliyos Jacob, DB	Matthias Moritz, DB	
High Level OCORA Goals and Tasks (need to be aligned with the High Level User Requirement	Req. 2.1	High Level Objectives (to deliver the vision/solution for problem statements)	Jos Holtzer, NS	Baseliyos Jacob, DB	Rolf Mühlemann, SBB		
	Req. 2.2	High Level Tasks (to deliver the vision/solution for problem statements)	Jean Baptiste Simmonet, SNCF	Jos Holtzer, NS	Rolf Mühlemann, SBB	Matthias Moritz, DB	
OCORA Requirements on Collboration, Tools, Process and Methodology	Req. 3.1	High Level Tooling : support a common approach ensuring reusability and sharing of the outputs	Rolf Mühlemann, SBB	Baseliyos Jacob, DB			
	Req. 3.2	High Level Methodology	Rolf Mühlemann, SBB	Baseliyos Jacob, DB	Jean Baptiste, SNCF		
	Req. 3.3	Design Process					To be provided in a later OCORA Release.
Non functional requirements for the OCORA solution	Req. 4.1	Performance					To be provided in a later OCORA Release.
	Req. 4.2	(Cyber) Security	Roger Metz, SBB	Max Schubert, Patrick Marsch, DB	Quentin Rivette, SNCF	Hans Willemsen, NS	
	Req. 4.3	RAMS					To be provided in a later OCORA Release.

System requirements/Design requirements for the OCORA solution	Req. 5.1	Operational Scenarios (Use Cases)					To be provided in a later OCORA Release.
	Req. 5.2	System					To be provided in a later OCORA Release.
	Req. 5.3	Architecture and Model (functional, technical and physical) (FIS and FFFIS difference)	Baseliyos Jacob, DB	Albert Ledermann, SBB	Jan Welvaarts, NS	Hélène Arfaoui Kaynak, Damieon Martinetti, Jérôme Lalouette, SNCF	
	Req. 5.4	CCS Bus Technology Evaluation (OSI 1-4)	Stefan Schürch, SBB	Matthias Moritz, Zahoora Ahmed, DB	Jan Welvaarts, NS	Hélène Arfaoui Kaynak, Damieon Martinetti, Jérôme Lalouette, Matthieu Thibault, SNCF	
	Req. 5.5	CCS Bus Specification (OSI 1-5/6)					To be provided in a later OCORA Release.

	Req. 5.6	Interfaces ATO & ETCS to TCMS (OSI 6/7)	Baseliyos Jacob, DB Matthias Moritz, DB as link to Connecta	Stefan Schürch, SBB	Jan Welvaarts, NS	Hélène Arfaoui Kaynak, François Foussard, Benoît Tellier, Jérôme Lalouette, SNCF	
	Req. 5.7	other Interfaces exkl. TCMS (STM, LTM, BTM, DMI, Voice Cab, GSM-R, FRMCS, etc.) (OSI 6/7)					
	Req. 5.8	Computing Platform	Thomas Martin, SBB	Prashant Pathak, Patrick Marsch, DB	Jan Welvaarts, NS	Christian Daniel, SNCF	
System requirements/Design requirements for the OCORA solution	Req. 5.9	API-Application Programming Interface (interface between middleware and application)					To be provided in a later OCORA Release.
	Req. 5.10	Hardware					To be provided in a later OCORA Release.
	Req. 5.11	Test Concept and Test Cases					To be provided in a later OCORA Release.
	Req. 5.12	Demonstrator Activities and Test Cases					To be provided in a later OCORA Release.
	Req. 5.13	Verification & Validation					To be provided in a later OCORA Release.
Demonstrate why we need that requirements.	Req. 6.1	Acceptance of Global Industry Standards/CENELEC	Aziz Akintayo, Hélène Arfaoui Kaynak, SNCF	Jan Welvaarts, NS	Matthias Moritz, DB		

Req. ID	Level	Type	**Title:** Description	Rational Statement / Reason for Requirement	Parent Req. ID	Stakeholder	Necessity	Status	Priority	Owner	Reference
1.1-001	A	Non-Funct.	**Ensure a positive business case:** To fulfill public and private contractual obligations of OCORA partners towards business partners, e.g. concession grantors, passengers, shippers and forwarders, etc., while achieving **a positive revenue to expenditure ratio**	Drives the business case for CCS investments	None	RU	Essential	Approved	1	NS - JH	None
1.1-002	A	Non-Funct.	**To effectively manage and control total cost of ownership of physical assets:** To fulfill public and private contractual obligations of OCORA partners towards business partners, e.g. concession grantors, passengers, shippers and forwarders, etc.	Drives the business case for CCS investments	None	RU	Essential	Approved	1	NS - JH	None
1.1-003	A	Non-Funct.	**Ensure agreed punctuality levels:** To fulfill public and private contractual obligations of OCORA partners towards business partners, e.g. concession grantors, passengers, shippers and forwarders, etc.	Identifies key performance indicators and parameters for CCS architecture decisions and procurement processes	None	RU	Essential	Approved	1	NS - JH	None
1.1-004	A	Non-Funct.	**Ensure sufficient transportation capacity to balance supply and demand:** To fulfill public and private contractual obligations of OCORA partners towards business partners, e.g. concession grantors, passengers, shippers and forwarders, etc.	Drives the business case for CCS investments (business attractiveness)	None	RU	Essential	Approved	1	NS - JH	None
1.1-005	A	Non-Funct.	**Ensure services according to planning:** To fulfill customer (passengers, shippers, forewarders, etc.) requirements, needs and expectations.	Drives the business case for CCS investments (business attractiveness)	None	RU	Essential	Approved	1	NS - JH	None
1.1-006	A	Non-Funct.	**Ensure agreed asset performance levels:** To fulfill customer (passengers, shippers, forewarders, etc.) requirements, needs and expectations	Identifies key performance indicators and parameters for CCS architecture decisions and procurement processes	None	RU	Essential	Approved	1	NS - JH	None
1.1-007	A	Non-Funct.	**Ensure agreed operations performance levels:** To fulfill customer (passengers, shippers, forewarders, etc.) requirements, needs and expectations	Identifies key performance indicators and parameters for CCS architecture decisions and procurement processes	None	RU	Essential	Approved	1	NS - JH	None
1.1-008	A	Non-Funct.	**Satisfy legal requirements:** To satisfy legal obligations and stakeholder ethical, political and social requirements and expectations	Drives business case external arguments for CCS investments (compliance issue)	None	RU	Essential	Approved	1	NS - JH	None
1.1-009	A	Non-Funct.	**Satisfy sustainability requirements:** To satisfy legal obligations and stakeholder ethical, political and social requirements and expectations	Drives business case external arguments for CCS investments	None	RU	Conditional	Approved	2	NS - JH	None
1.1-010	A	Non-Funct.	**Satisfy security requirements:** To satisfy legal obligations and stakeholder ethical, political and social requirements and expectations	Drives both business case and business case external arguments for CCS investments	None	RU	Essential	Approved	1	NS - JH	None
1.1-011	A	Non-Funct.	**To satisfy operational interoperability requirements:** To satisfy legal obligations and stakeholder ethical, political and social requirements and expectations	Drives both business case and business case external arguments for CCS investments	None	RU	Conditional	Approved	2	NS - JH	None
1.1-012	A	Non-Funct.	**To ensure modal competitiveness:** To satisfy legal obligations and stakeholder ethical, political and social requirements and expectations	Drives business case external arguments for CCS investments	None	RU	Conditional	Approved	2	NS - JH	None

Req. ID	Test Criteria	Comments
1.1-001	Assesment criteria need to be developed to allow for weighing and evaluation of OCORA output	Input also developed for and communicated to LinX4Rail WP 5.1 - Common Business Objectives (to be finalized in June)
1.1-002	Assesment criteria need to be developed to allow for weighing and evaluation of OCORA output	Input also developed for and communicated to LinX4Rail WP 5.1 - Common Business Objectives (to be finalized in June)
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Req. ID	Level	Type	Title: Description	Rational Statement / Reason for Requirement	Parent Req. ID	Stakeholder	Necessity	Status	Priority	Owner	Reference
1.2-001	A	Non-Funct.	**Ensure a cost effective roll out of ERTMS and integration of gamechangers:** To fulfill contractual obligations towards business partners, e.g. concession grantors, passengers, shippers and forwarders, etc.	Reinforces RU committment to ERTMS and gamechanger implementation	None	RU	Essential	Approved	1	NS - JH	None
1.2-002	A	Non-Funct.	**Ensure affordable LCC solutions for the on board CCS in retrofits and rolling stock procurement projects:** To fulfill contractual obligations towards business partners, e.g. concession grantors, passengers, shippers and forwarders, etc.:	Reinforces RU committment to ERTMS and gamechanger implementation	None	RU	Essential	Approved	1	NS - JH	None
1.2-003	A	Non-Funct.	**Ensure performance of CCS on-board systems in operation:** To fulfill contractual obligations towards business partners, e.g. concession grantors, passengers, shippers and forwarders, etc.	Enables continuation or improvement of RU level and quality of service; reinforces RU committment to ERTMS and Gamechanger implementation	None	RU	Essential	Approved	1	NS - JH	None
1.2-004	A	Non-Funct.	**Ensure or increase present capacity volume:** To fulfill contractual obligations towards business partners, e.g. concession grantors, passengers, shippers and forwarders, etc.	Risk mitigation of negative impact of ERTMS or Gamechanger implementation; reinforces RU committment to ERTMS and Gamechanger implementation	None	RU	Essential	Approved	1	NS - JH	None
1.2-005	A	Non-Funct.	**Ensure adaptability of design for enduring customer satisfaction:** To fulfill customer (passengers, shippers, forewarders, etc.) requirements, needs and expectations	Enables continuation or improvement of RU level and quality of service; reinforces RU committment to ERTMS and Gamechanger implementation	None	RU	Essential	Approved	1	NS - JH	None
1.2-006	A	Non-Funct.	**Ensure sufficient transportation capacity to enable continuously fulfilling capacity demand requirements** To fulfill customer (passengers, shippers, forewarders, etc.) requirements, needs and expectation	Enables continuation or improvement of RU level and quality of service; reinforces RU committment to ERTMS and Gamechanger implementation	None	RU	Essential	Approved	1	NS - JH	None
1.2-007	A	Non-Funct.	**Ensure usability in compliance with applicable ergonomy guidelines:** To fulfill customer (passengers, shippers, forewarders, etc.) requirements, needs and expectations	Enables continuation or improvement of RU level and quality of service; reinforces RU committment to ERTMS and Gamechanger implementation	None	RU	Essential	Approved	1	NS - JH	None
1.2-008	A	Non-Funct.	**Ensure compliance with relevant legal requirements:** To satisfy legal obligations and stakeholder ethical, political and social requirements and expectations	Reinforces RU committment to ERTMS and gamechanger implementation	None	RU	Essential	Approved	1	NS - JH	None
1.2-009	A	Non-Funct.	**Ensure compliance with sustainability requirements and expectations:** To satisfy legal obligations and stakeholder ethical, political and social requirements and expectations	Reinforces RU committment to ERTMS and gamechanger implementation	None	RU	Essential	Approved	1	NS - JH	None
1.2-010	A	Non-Funct.	**Ensure compliance with security requirements and expectations:** To satisfy legal obligations and stakeholder ethical, political and social requirements and expectations	Reinforces RU committment to ERTMS and gamechanger implementation	None	RU	Essential	Approved	1	NS - JH	None
1.2-011	A	Non-Funct.	**Ensure interoperability:** To satisfy legal obligations and stakeholder ethical, political and social requirements and expectations	Improves business case for roll out of ERTMS and gamechangers. Reinforces RU committment to ERTMS and gamechanger implementation	None	RU	Essential	Approved	1	NS - JH	None
1.2-012	A	Non-Funct.	**Ensure increased productivity of train services:** To satisfy legal obligations and stakeholder ethical, political and social requirements and expectations	Improves business case for roll out of ERTMS and gamechangers. Reinforces RU committment to ERTMS and gamechanger implementation	None	RU	Essential	Approved	1	NS - JH	None

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Req. ID	Level	Type	Title: Description	Rational Statement / Reason for	Parent Req. ID	Stakeholder	Necessity	Status	Priority	Owner	Reference
2.1-001	B	Program	OCORA **Architecture modularity and exchangeability:** All deliveries must provide open, i.e. FFFIS specified, interface specifications for CCS internal interfaces and interfaces between the CCS system and its environment	Modularity, Openness, Simplification, Evolvability, Independence	High Level Objectives (to deliver the vision/solution for problem statements)	RU´s, IM´s, Supplier, ERA, EC, CER, EIM, ERFA, EUG, UIC, S2R	Essential	Approved	1	DB - BJ	n.a.
2.1-002	B	Program	**OCORA Architecture:** To deliver a formal, open and vendor independent CCS reference architecture so called “OCORA” architecture	Modularity, Openness, Simplification, Evolvability, Independence	High Level Objectives (to deliver the vision/solution for problem statements)	RU´s, IM´s, Supplier, ERA, EC, CER, EIM, ERFA, EUG, UIC, S2R	Essential	Approved	1	DB - BJ	n.a.
2.1-003	B	Program	**OCORA interfaces:** To deliver a formal, open and vendor independent set of CCS interface specifications with respect to 2.1-002, so called “OCORA” interfaces.	Modularity, Openness, Simplification, Evolvability, Independence	High Level Objectives (to deliver the vision/solution for problem statements)	RU´s, IM´s, Supplier, ERA, EC, CER, EIM, ERFA, EUG, UIC, S2R	Essential	Approved	1	DB - BJ	n.a.
2.1-004	B	Program	**OCORA model:** To deliver a formal, open and vendor independent CCS functional correct model with respect to 2.1-002 and 2.1-003 and the VS, VL and AV functions, the so called “OCORA” model.	Modularity, Openness, Simplification, Evolvability, Independence	High Level Objectives (to deliver the vision/solution for problem statements)	RU´s, IM´s, Supplier, ERA, EC, CER, EIM, ERFA, EUG, UIC, S2R	Essential	Approved	1	DB - BJ	n.a.
2.1-005	B	Program	**OCORA computing platform and API:** To deliver a specification for an open computer platform including the application programming interface so called “OCORA” API.	Modularity, Openness, Simplification, Evolvability, Independence	High Level Objectives (to deliver the vision/solution for problem statements)	RU´s, IM´s, Supplier, ERA, EC, CER, EIM, ERFA, EUG, UIC, S2R	Essential	Approved	1	DB - BJ	n.a.
2.1-006	B	Program	**OCORA requirements book:** To deliver a requirements book incl. the content of 2.1-002, 2.1-003, 2.1-004 and 2.1-005 for e.g. procurement purposes, the so called “OCORA” requirements book.	Modularity, Openness, Simplification, Evolvability, Independence	High Level Objectives (to deliver the vision/solution for problem statements)	RU´s, IM´s, Supplier, ERA, EC, CER, EIM, ERFA, EUG, UIC, S2R	Essential	Approved	1	DB - BJ	n.a.
2.1-007	B	Program	**OCORA development environment:** To deliver an open test-, simulation and development platform so called “OCORA” development environment.	Modularity, Openness, Simplification, Evolvability, Independence	High Level Objectives (to deliver the vision/solution for problem statements)	RU´s, IM´s, Supplier, ERA, EC, CER, EIM, ERFA, EUG, UIC, S2R	Essential	Approved	1	DB - BJ	n.a.
2.1-008	B	Program	**Compliance to OCORA requirements:** All deliveries must be compliant the functional and non-functional requirements delivered by “OCORA”.	Modularity, Openness, Simplification, Evolvability, Independence	High Level Objectives (to deliver the vision/solution for problem statements)	RU´s, IM´s, Supplier, ERA, EC, CER, EIM, ERFA, EUG, UIC, S2R	Essential	Approved	1	DB - BJ	n.a.
2.1-009	B	Program	**Compliance to European norms and standards:** All deliveries must be compliant with applicable European standards and norms like TSI CCS and TSI Loc&Pass. Equivalence from non railway norms should be considered.	Modularity, Openness, Simplification, Evolvability, Independence	High Level Objectives (to deliver the vision/solution for problem statements)	RU´s, IM´s, Supplier, ERA, EC, CER, EIM, ERFA, EUG, UIC, S2R	Essential	Approved	1	DB - BJ	n.a.
2.1-010	B	Program	**Compliance to OCORA methodology, processes and tooling:** All deliveries must ressect the OCORA “state-of-the-art" methodologies, research and development processes and procedures and tooling.	Modularity, Openness, Simplification, Evolvability, Independence	High Level Objectives (to deliver the vision/solution for problem statements)	RU´s, IM´s, Supplier, ERA, EC, CER, EIM, ERFA, EUG, UIC, S2R	Essential	Approved	1	DB - BJ	n.a.

Req. ID	Test Criteria	Comments
2.1-001	Proofed by designer through documents, artefacts or simulation.	
2.1-002	Proofed by designer through documents, artefacts or simulation.	
2.1-003	Proofed by designer through documents, artefacts or simulation.	
2.1-004	Proofed by designer through documents, artefacts or simulation.	
2.1-005	Proofed by designer through documents, artefacts or simulation.	
2.1-006	Proofed by designer through documents, artefacts or simulation.	
2.1-007	Proofed by designer through documents, artefacts or simulation.	
2.1-008	Proofed by designer through documents, artefacts or simulation.	
2.1-009	Proofed by designer through documents, artefacts or simulation.	
2.1-010	Proofed by designer through documents, artefacts or simulation.	

Req. ID	Level	Type	Title: Description	Rational Statement / Reason for Requirement	Parent Req. ID	Stakeholder	Necessity	Status	Priority	Owner	Reference
2.2-001	C	program	**Release architecture versions identifying assumptions, justifications, recommended solutions, issues under development and issues to be further explored** To deliver and keep up to date a consistent picture of OCORA vision and requirements	Collaboration within OCORA collaboration and with non OCORA members	High Level Objectives (to deliver the vision/solution for problem statements)	RU	Essential	Approved	1	SNCF - JBS	n.a.
2.2-002	C	Program	**Compile and manage OCORA related requirements** To support operators procurement processes including migration from actual to OCORA compliant products and services	Capitalise on knowledge for early OCORA development effort benefits	High Level Objectives (to deliver the vision/solution for problem statements)	RU, S2R	Essential	Approved	1	SNCF - JBS	n.a.
2.2-003	C	Program	**Develop a train interface specification that can be used in actual and imminent procurements** To support early benefit from OCORA work stream output	Capitalise on knowledge for early OCORA development effort benefits	High Level Objectives (to deliver the vision/solution for problem statements)	RU´s, Supplier	Essential	Approved	1	SNCF - JBS	n.a.
2.2-004	C	Program	**Develop a formal model of OCORA Vehicle Supervisor** To support early benefit from OCORA work stream output	Capitalise on knowledge for early OCORA development effort benefits	High Level Objectives (to deliver the vision/solution for problem statements)	RU´s, IM's, Supplier, S2R	Essential	Approved	1	SNCF - JBS	n.a.
2.2-005	C	Program	**Develop a physical mock up of OCORA platform** To demonstrate the validity and technical and economical viability of OCORA concepts	Prove OCORA concept and increase technical readiness level.	High Level Objectives (to deliver the	RU´s, Supplier, S2R	Essential	Approved	1	SNCF - JBS	n.a.
2.2-006	C	Program	**Develop a prototype of the OCORA platform** To demonstrate the validity and technical and economical viability of OCORA concepts	Increase technical and industrial readiness level for OCORA solutions	High Level Objectives (to deliver the vision/solution for problem statements)	RU´s, Supplier, S2R	Essential	Approved	1	SNCF - JBS	n.a.
2.2-007	C	Program	**Certify a Minimum Viable Product** To demonstrate the validity and technical and economical viability of OCORA concepts	Increase technical and industrial readiness level for OCORA solutions	High Level Objectives (to deliver the vision/solution for problem statements)	RU´s, Supplier, ERA, S2R	Essential	Approved	1	SNCF - JBS	n.a.
2.2-008	C	Program	**Develop formal models for enhanced OCORA functionalities** To support full benefit from OCORA architecture	Enable more benefit with enhanced automation functionalities	High Level Objectives (to deliver the vision/solution for problem statements)	RU´s, IM's, Supplier, S2R	Optional	Approved	1	SNCF - JBS	n.a.
2.2-009	C	Program	**Develop a middleware solution** To support full benefit from OCORA architecture	Enable hardware independance and facilitate modular safety	High Level Objectives (to deliver the vision/solution for problem statements)	RU´s, IM's, Supplier, S2R	Optional	Approved	1	SNCF - JBS	n.a.
2.2-010	C	Program	**Certify applications and peripheral covering enhanced functionalities** To support full benefit from OCORA architecture	Enhance relevance (e.g. benefit) for OCORA solutions	High Level Objectives (to deliver the vision/solution for problem statements)	RU´s, Supplier, ERA, S2R	Optional	Approved	1	SNCF - JBS	n.a.

Req. ID	Test Criteria	Comments
2.2-001	Detailed planning supported by sufficient ressources and identification of interface milestones covering the relations between workpackages and relations with other sector initiatives on CCS	
2.2-002	Detailed planning supported by sufficient ressources and identification of interface milestones covering the relations between workpackages and relations with other sector initiatives on CCS	
2.2-003	Detailed planning supported by sufficient ressources and identification of interface milestones covering the relations between workpackages and relations with other sector initiatives on CCS	
2.2-004	Detailed planning supported by sufficient ressources and identification of interface milestones covering the relations between workpackages and relations with other sector initiatives on CCS	
2.2-005	Detailed planning supported by sufficient ressources and identification of interface milestones covering the relations between workpackages and relations with other sector initiatives on CCS	
2.2-006	Detailed planning supported by sufficient ressources and identification of interface milestones covering the relations between workpackages and relations with other sector initiatives on CCS	
2.2-007	Detailed planning supported by sufficient ressources and identification of interface milestones covering the relations between workpackages and relations with other sector initiatives on CCS	
2.2-008	Detailed planning supported by sufficient ressources and identification of interface milestones covering the relations between workpackages and relations with other sector initiatives on CCS	
2.2-009	Detailed planning supported by sufficient ressources and identification of interface milestones covering the relations between workpackages and relations with other sector initiatives on CCS	
2.2-010	Detailed planning supported by sufficient ressources and identification of interface milestones covering the relations between workpackages and relations with other sector initiatives on CCS	

Req. 3.1
High Level Tooling : support a common approach ensuring reusability and sharing of the outputs
SBB - Rolf Mühlemann

Req. ID	Level	Type	**Title:** Description	Rational Statement / Reason for	Parent Req. ID	Stakeholder	Necessity	Status	Priority	Owner	Reference
3.1-001	A	Program	**High Level Tooling:** The high level tooling used by OCORA is described in the document: OCORA-30-007-Beta High Level Tooling	Ensure lean work	None	RU	Essential	Approved	1	SBB - RM	OCORA-30-007-Beta High Level Tooling

Req. ID	Test Criteria	Comments
3.1-001	Request of machine readable/re-useable content	Document may be extended at a later stage

Req. ID	Level	Type	**Title:** Description	Rational Statement / Reason for	Parent Req. ID	Stakeholder	Necessity	Status	Priority	Owner	Reference
3.2-001	A	Program	**High Level Methodology:** The high level methodology used by OCORA is described in the document: OCORA-30-006-Beta High Level Methodology	Ensure lean work	None	RU	Essential	Approved	1	SBB - RM	OCORA-30-006-Beta High Level Methodology

Req. ID	Test Criteria	Comments
3.2-001	Proof if artefakts are as per the defined methodology	Document may be extended at a later stage

Req. ID	Level	Type	**Title:** Description	Rational Statement / Reason for	Parent Req. ID	Stakeholder	Necessity	Status	Priority	Owner	Reference
4.2-001	A	Non functional	**(Cyber) Security Requirements** The (Cyber) Security Requirements are defined the document: OCORA-40-008-Beta Cyber Security - Overview	Ensure standards are used	None	Railway Supplier Industry	Essential	Approved	1	SBB - RM	OCORA-40-008-Beta Cyber Security - Overview

Req. ID	Test Criteria	Comments
4.2-001	To be defined in a later release	Reflected in chapter 3.3

Req. ID	Level	Type	**Title:** Description	Rational Statement / Reason for Requirement	Parent Req. ID	Stakeholder	Necessity	Status	Priority	Owner	Reference
5.3-001	C	Non functional	**System Development and completeness of Subset 26:** The Vehicle Supervisor model and specification shall encompass all mandatory functions and parameters covered by the TSI Subset 26 as well as those that are identified as necessary, but are not yet covered by the TSI Subset 26.	Subset 26 does not deliver a system description and also not all necessary functions for the entire VS system.	None	Raliway supplier, RU´s, IM´s, S2R, EC, ERA	Essential	Approved	1	DB - BJ	
5.3-002	C	Technical	**Use of Formal Methods:** The functional architecture of the Vehicle Supervisor shall be described using formal methods.	OCORA Requirement for application of formal metthods	2.2.-004	Raliway supplier, RU´s, IM´s, S2R, EC, ERA	Essential	Approved	1	DB - BJ	
5.3-003	C	Technical	**Modularity of the System:** The formal model shall define the Vehicle Supervisor functions and their mutual relations.	Modularity of the Vehicle Supervisor system	5.3. -002	Raliway supplier, RU´s, IM´s, S2R, EC, ERA	Essential	Approved	1	DB - BJ	
5.3-004	C	Technical	**Defintion of data dicitionary:** The formal model shall unambigiously define data interface (data dictionary and format) between the Vehicle Supervisor and its environment.	Standardized data dictionary is necessary to ensure full modularity	5.3. -002	Raliway supplier, RU´s, IM´s, S2R, EC, ERA	Essential	Approved	1	DB - BJ	
5.3-005	C	Technical	**Traceability:** The Vehicle Supervisor formal model shall enable tracing all mandatory functions to Subset 26	Fully tracebility according CENELEC 50128 is necessary	5.3. -002	Raliway supplier, RU´s, IM´s, S2R, EC, ERA	Essential	Approved	1	DB - BJ	

Req. ID	Test Criteria	Comments
5.3-001	Artefacts, documents need to be delivered and proof need to be done by the designer.	
5.3-002	Artefacts, documents need to be delivered and proof need to be done by the designer.	
5.3-003	Artefacts, documents need to be delivered and proof need to be done by the designer.	
5.3-004	Artefacts, documents need to be delivered and proof need to be done by the designer.	
5.3-005	Artefacts, documents need to be delivered and proof need to be done by the designer.	

Req. ID	Level	Type	**Title:** Description	Rational Statement / Reason for	Parent Req. ID	Stakeholder	Necessity	Status	Priority	Owner	Reference
5.4-001	A	Non-Funct.	**UVCC Bus Technology Evaluation (OSI 1-4)** The UVCC Bus Technology Evaluation is described in the document: OCORA-40-003-Beta_UVCC-Bus	Ensure a modular and open architecture of OCORA.	None	Railway Supplier Industry	Essential	Approved	1	SBB - SSt	OCORA-40-003-Beta_UVCC-Bus

Req. ID	Test Criteria	Comments
5.4-001	Proof by the supplier.	

Req. ID	Level	Type	**Title:** Description	Rational Statement / Reason for Requirement	Parent Req. ID	Stakeholder	Necessity	Status	Priority	Owner	Reference
5.6-001	C	Functional	**Functional Vehicle Adapter:** See OCORA-40-005-Functional_Vehicle_Adapter-Introduction_and_Overview	Actual SS 119/034/139/143 does not fully cover the OCORA requirements	none	Railway Supplier Industry	Essential	Approved	1	SBB -CG	OCORA-40-005-Functional_Vehicle_Adapter
5.6-002	C	Functional	**CCS-TCMS Interface - ETCS Functionality (SS119):** See requirements for ETCS to TCMS in OCORA-40-006-Beta CCS-TCMS Interface - ETCS Functionality (SS119)	Actual SS 119/034 does not fully cover the OCORA requirements	5.6-001	Railway Supplier Industry	Essential	Approved	1	DB - BJ	OCORA-40-006-Beta CCS-TCMS Interface - ETCS Functionality (SS119)
5.6-003	C	Functional	**CCS-TCMS Interface - ATO Functionality (SS139):** See requirements for ATO to TCMS in OCORA-40-007-Beta CCS-TCMS Interface - ATO Functionality (SS139)	Actual SS 139/143 does not fully cover the OCORA requirements	5.6-001	Railway Supplier Industry	Essential	Approved	1	DB - BJ	OCORA-40-007-Beta CCS-TCMS Interface - ATO Functionality (SS139)

Req. ID	Test Criteria	Comments
5.6-001	Proof needs to be deliverd by the designer within a traceability matrix or within a test enviroment, if available.	
5.6-002	Proof needs to be deliverd by the designer within a traceability matrix or within a test enviroment, if available.	
5.6-003	Proof needs to be deliverd by the designer within a traceability matrix or within a test enviroment, if available.	

Req. ID	Level	Type	Title: Description	Rational Statement / Reason for Requirement	Parent Req. ID	Stakeholder	Necessity	Status	Priority	Owner	Reference
5.8-001	B	Non-Funct.	**Computing Platform - White Paper: OCORA-40-004-Beta**	To seperate software and hardware for vendor independent products and introduce modular safety		RU	Essential	Proposed	1	SBB - TM	OCORA-40-004-Beta

Req. ID	Test Criteria	Comments
5.8-001	Proof need to be delivered by the designer. Artefacts and Documents need to be delivered for proof.	

Req. ID	Level	Type	Title: Description	Rational Statement / Reason for Requirement	Parent Req. ID	Stakeholder	Necessity	Status	Priority	Owner	Reference
6.1-001	B	Non-Funct.	**Title: Facilitate the use of off the shelf components in the railway industry that are compliant with global standards** Description : ensure the easy introduction in Railway Control Command and Signaling Systems of up to date technologies already validated in other safety related industries	Allow non institutional suppliers to enter the Railway Control Command and Signaling market will help the railway sector to profit from generic technical developments and allow swift exchange of suppliers, necessary in case of e.g. bankruptcy or change of business policy,		Railway Supplier Industry	Essential	Approved	1	SNCF - HAK	OCORA-30-008-Beta – Acceptance of Global Standards
6.1-002	B	Non-Funct.	**Title: Reduce the time necessary to introduce new technologies in the railway industry** Description : allowing an express process for the certification of new technologies already used in other industries ,	One example for safety related component : Cross acceptance of components certified against standards used in other industries can be supported with a comparison between EN50126-129 and the concerning industry standard. Such comparison can speed up the acceptance of new components/techniques from other industries	6.1-001	Railway Supplier Industry	Essential	Approved	1	SNCF - HAK	OCORA-30-008-Beta – Acceptance of Global Standards
6.1-003	B	Non-Funct.	**Title: Allow the use of global industry standards for Safety related electronic systems** Description : For selected uses allow equipements compliant with the EN IEC 61508 in railway safety systems, or at least reduce the further demonstration necessary	The main aspect blocking the use of electronic systems certified against IEC61508 is the proof of independence between different parts of the system. A description of the process to use independence between programmable electronics as shown according to IEC61508, in the context of a safety case according to EN50126-129, will ease the certification of generally used “off the shelf” components.	6.1-001	Railway Supplier Industry	Essential	Approved	1	SNCF - HAK	OCORA-30-008-Beta – Acceptance of Global Standards

Req. ID	Test Criteria	Comments
6.1-001	Proof by the designer by delivering documents and artefacts.	
6.1-002	Proof by the designer by delivering documents and artefacts.	
6.1-003	Proof by the designer by delivering documents and artefacts.	