

# RCA



Reference CCS Architecture

*An initiative of the ERTMS users group and  
the EULYNX consortium*

## RCA Documentation Plan

Document id: RCA.Doc.6  
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## Change history

|           |            |             |   |
|-----------|------------|-------------|---|
| Gamma.1   | 31.01.2020 | B. Rytz     | Ready for publication after review RCA core group                                   |
| 0.1 (0.A) | 11.09.2020 | M. Blazic   | Updated document list for BL0 R1, sync introduction section setup                   |
| 0.2 (0.A) | 04.02.2021 | M. Blazic   | Updated document list for BL0 R1 update   |
| 0.3 (0.A) | 16.04.2021 | M. Blazic   | Concepts for Digital map and Plan Execution added<br>Realization of RCA goals added |
| 0.4 (0.A) | 02.07.2021 | N. Hurman   | Updated document list for BL0 R2  |
| 0.5 (0.A) | 03.09.2021 | M. Blazic   | Architectural Design Concept Plan Execution added                                   |
| 0.5 (0.A) | 29.11.2021 | P. Moosmann | Updated document list for BL0 R3  |
| 0.6 (0.A) | 19.04.2022 | D.Iacopino  | Updated document list for BL0 R4  |

# 1. Introduction

## 1.1. Release information

### Basic document information:

RCA.Doc.6

RCA Documentation Plan

Cenelec Phase: -

Version: 0.6 (0.A)

RCA Baseline set: 0

Approval date: 25.04.2022

## 1.2. Imprint

### Publisher:

RCA (an initiative of the ERTMS Users Group and EULYNX Consortium)

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Support and Feedback: For feedback, or if you have trouble accessing the material, please contact [rca@eulynx.eu](mailto:rca@eulynx.eu).

## 1.3. Purpose of the document

This document lists, identifies and defines all documents of the RCA (reference CCS architecture).

The document contains:

- An overview of the document categories used in RCA
- A list of all documents developed by RCA, i.e. the documentation plan

A graphical depiction of the documentation plan can be found in RCA.Doc.36.

## 1.4. Related documents

- The “RCA Documentation Plan Visualisation” [RCA.Doc.36] provides a visualisation of the current and planned documents.
- The “RCA Release notes” [RCA.Doc.5] describe the relevant documents (according to this documentation plan) for a given release.
- The “RCA Change Management Control Process” [RCA.Doc.39, planned] describes how the documents / deliverables are managed (baselines, etc.).

## 2. Structure of the documentation plan

### 2.1. Document attributes

The documentation plan uses the following attributes for every document:

|                        |   |
|------------------------|---|
| <b>Id</b>              | A unique identifier for the document of the form RCA. Doc. XXX where XXX is a decimal number without special meaning.                   |
| <b>Category</b>        | See description below   |
| <b>Type</b>            | Distinguish between <ul style="list-style-type: none"><li>▪ Doc = Document</li><li>▪ MB = Model-based</li><li>▪ Dia = Diagram</li></ul> |
| <b>Name</b>            | Name of the document  |
| <b>CENELEC</b>         | CENELEC phase(s) (if applicable)  |
| <b>First published</b> | Release in which document was first published. May be “Planned”, when document is not yet published.                                    |
| <b>Comment</b>         | Important information, e.g., that the document is obsolete or has been superseded by other document.                                    |

As soon as formal change control is in effect (to be defined in Change Control Management process [RCA.Doc.39], the handling of versions / releases / baselines will be specified in more detail.

### 2.2. Documentation categories

The documentation plan for RCA includes different categories of documents with differing needs of formality and change control. The following table describes the defined categories:

| <b>Category</b>                    | <b>Purpose</b>   | <b>Content (examples)</b>  | <b>Degree of formality</b>   |
|------------------------------------|--|--|--|
| <b>A. RCA system specification</b> | The (future) core RCA specification with CENELEC-compatible structure      | formalised system, function, component, interface specification  | High: formalized, modelled, formal QA, formal change-control (CC) in CCB |
| <b>B. Concept development</b>      | Concepts not (yet) suitable for system specification (maturity, formality) | RCA effects, migration paths for RCA users, principles of the safety logic, capability-based protocols | Low-to-medium: free-form, QA and CC by RCA core group                    |

|   |  |  |   |
|---|--|--|---|
| <b>C. Mission and Process description</b> | Description of how the RCA process is organized  | Process overview, modelling guidelines                               | Medium: free-form, QA and CC by RCA core & strategy group |
| <b>D. Communication support</b>           | Material to explain RC and to create awareness   | FAQ, presentations, films  | Low: free-form, informal QA                               |
| <b>E. Demonstrators</b>                   | Support development by concrete experiments<br>Showcase RCA  | RCA demonstrator planned for InnoTrans                               | (for InnoTrans) Low: free-form, informal QA               |
| <b>X. eXternal documents</b>              | Documents provided / prepared by other working groups, but which (on mutual agreement) are included in an RCA release. | Documents on localisation from the LWG (Localisation Working Group). | See B. Concept development                                |

Each document / artefact of the documentation plan is classified according to these categories.

Note on the relationship between categories «A. System specification» and «B. Concept development»:

- A given topic (e.g., modular safety or platform independence) is expected to start in «concept development» and to transition to «system specification» if and only if it is
  - needed for the formal specification and
  - mature enough (shared understanding achieved, efficient work process in formal environment)
- Such topics will typically end up in the «domain knowledge» or in the «generic ... requirements» part of the «system specification»
- In some cases, the treatment of a topic may remain distributed over documents both in «concept development» and in «system specification» if they differ in the need for formality (an example might be some architectural design principles).

### 3. List of documents

| Id         | Ca<br>t | Type | Name   | Short description  | CENE-<br>LEC<br>phases | Valid          | First Published | Latest Update |
|------------|---------|------|--|--|------------------------|----------------|-----------------|---------------|
| RCA.Doc.1  | C       | Doc  | <b>RCA White Paper</b>   | The rationale for starting RCA. Foundation for MoU between EUG and EU-LYNX.  | -                      | Y              | Alpha           | Alpha         |
| RCA.Doc.2  | B       | Doc  | <b>RCA Architecture Overview</b>                                       |  | -                      | N              | Alpha           | Beta          |
| RCA.Doc.3  | C       | Doc  | <b>RCA Process Overview</b>  | How the RCA group works to prepare, maintain and bring the RCA specification to the sector.                          | -                      | Y              | Alpha           | Gamma         |
| RCA.Doc.5  | C       | Doc  | <b>RCA Release Notes</b>   | Description of current release of RCA deliverables.  | -                      | Y              | Alpha           | BL0 R4        |
| RCA.Doc.6  | A       | Doc  | <b>RCA Documentation Plan</b>  | Overview of the documentation set of RCA   | -                      | Y              | Gamma           | BL0 R4        |
| RCA.Doc.7  | D       | Doc  | <b>RCA FAQ</b>   | Frequently asked questions and answers regarding RCA. Useful for a quick overview.                                   | -                      | Y              | Alpha           | Gamma         |
| RCA.Doc.8  | B       | Doc  | <b>Concept: Modular Safety</b>   | A modular architecture requires and enables concepts to reduce the safety workload.                                  | -                      | Y              | Beta            | Beta          |
| RCA.Doc.9  | B       | Doc  | <b>Concept: Sourcing scenarios</b>                                     |  | -                      | N              | -               | -             |
| RCA.Doc.10 | B       | Doc  | <b>Concept: RCA Effects - Business Case</b>                            | The economic effects (savings) of an RCA-based implementation, based on smartrail 4.0 and extrapolated to other IMs. | -                      | Y              | Gamma           | Gamma         |
| RCA.Doc.11 | B       | Doc  | <b>Concept: Platform Independence</b>                                  | The need to achieve more modularity between applications and the platforms.  | -                      | N <sup>1</sup> | Beta            | Beta          |
| RCA.Doc.12 | B       | Doc  | <b>Concept: RCA Effects - Capacity</b>                                 | The effects on traffic capacity for an RCA-based system.   | -                      | Y              | Beta            | Beta          |
| RCA.Doc.13 | B       | Doc  | <b>Concept: Architectural approach / System-of-systems perspective</b> | Architectural principles for the RCA.  | -                      | Y              | Beta            | Gamma         |
| RCA.Doc.14 | A       | MB   | <b>RCA Terms and Abstract Concepts</b>                                 | Definition of used terms.  | -                      | Y              | Gamma           | BL0 R4        |
| RCA.Doc.15 | A       | Doc  | <b>RCA System Concept</b>  | A high-level description of the goals and fundamental concepts of RCA:   | 1                      | Y              | Gamma           |               |
| RCA.Doc.28 | B       | Doc  | <b>Migration</b>   | Illustrates how migration towards an RCA-based system can be planned, including examples of different IMs.           | -                      | Y              | Gamma           | BL0 R2        |
| RCA.Doc.29 | B       | Doc  | <b>Concept: LSL - Enhanced L3, Supervision, Localisation</b>           | Evolution of ETCS, rationale for submitted TSI CRs.  | -                      | Y              | Gamma           | Gamma         |
| RCA.Doc.30 | B       | Doc  | <b>Concept: Principles of the safety logic</b>                         | Geometric-based interlocking for more capacity and flexibility.  | -                      | Y              | Gamma           | Gamma         |

|            |   |     |  |   |       |   |        |        |
|------------|---|-----|--|---|-------|---|--------|--------|
| RCA.Doc.31 | B | Doc | <b>Concept: Operational plan</b>   | Concept for the standardized interface between RCA and a TMS.   | -     | Y | Gamma  | BL0 R3 |
| RCA.Doc.32 | B | Doc | <b>Concept: Degraded modes</b>   | The role of degraded modes in specifying RCA.   | -     | Y | Gamma  | Gamma  |
| RCA.Doc.33 | C | Doc | <b>Methods and Tooling : Arch Process</b>  | Describes the methods and tools used for developing the RCA specification.  | -     | N | BL0 R3 | BL0 R4 |
| RCA.Doc.34 | C | Doc | <b>RCA Roadmap</b>   | Overview planned development for RCA.   | -     | Y | Gamma  | Gamma  |
| RCA.Doc.35 | A | MB  | <b>RCA System Definition</b>   | Definition of the RCA System architecture   | 2,4,5 | Y | BL0 R2 | BL0 R4 |
| RCA.Doc.36 | A | Dia | <b>RCA Documentation Plan - Annex</b>  | Visualisation of the documentation plan.  | -     | Y | Gamma  | Gamma  |
| RCA.Doc.37 | B | Doc | <b>Concept: RCA effects overview</b>   | Overview of potential the effects / benefits of an RCA-based system.  | -     | Y | Gamma  | Gamma  |
| RCA.Doc.39 | C | Doc | <b>RCA Change Control Management Process</b>   |   | -     | N | -      | -      |
| RCA.Doc.40 | D | Doc | <b>RCA Architecture Poster</b>   | Illustrative, high level architecture overview of RCA.  | -     | Y | Alpha  | BL0 R3 |
| 18E112     | X | Doc | <b>LWG: Railways Localisation System HL Users' Requirements</b>                                | Provided by the Localisation Working Group of the EUG.  | -     | Y | Gamma  | Gamma  |
| 19E100     | X | Doc | <b>LWG: Railways Localisation System Performance Requirements from Use Cases</b>               | Provided by the Localisation Working Group of the EUG.  | -     | N | -      | -      |
| RCA.Doc.41 | C | Doc | <b>Declaration of Intent by DB, NR and SBB</b>   | Public statement on contribution to RCA.  | -     | Y | Beta   | Beta   |
| RCA.Doc.42 | A | Doc | <b>RCA Reference document list</b>   | List of important referenced documents (documents outside RCA).   | all   | N | -      | -      |
| RCA.Doc.43 | B | Doc | <b>Concept: Informal Architecture Overview</b>   | Provides an informal overview, until the MBSE-generated documents are officially published.                       | all   | Y | Gamma  | Gamma  |
|            | X | Doc | <b>LWG: Railways Localisation System Performance Requirements from Use Cases</b>               | Provided by the Localisation Working Group of the EUG.  | -     | N | -      | -      |
|            | X | Doc | <b>LWG: Railways Localisation System Performance Requirements from Use Cases</b>               | Provided by the Localisation Working Group of the EUG.  | -     | N | -      | -      |
|            | X | Doc | <b>White paper: An Approach for a Generic Safe Computing Platform for Railway Applications</b> | Concept for generic safe computing platform for onboard and trackside CCS applications, prepared by RCA and OCORA | -     | N | -      | -      |

|            |   |     |   |  |   |   |        |        |
|------------|---|-----|---|--|---|---|--------|--------|
| RCA.Doc.44 | C | Doc | <b>RCA-OCORA Liaison</b>                                | Statement on collaboration between RCA and OCORA   | - | N | -      | -      |
| RCA.Doc.45 | B | Doc | <b>(Cyber) Security Guideline</b>                       | A guideline to and definition of a harmonized Security Risk Assessment for System Design process   | - | Y | BL0 R1 | BL0 R1 |
| RCA.Doc.46 | B | Doc | <b>Concept: Digital Map</b>                             | Provide a complete conceptual view of the Digital Map, its main scope, principles, environment, functional and non-functional requirements, etc. | - | Y | BL0 R2 | BL0 R2 |
| RCA.Doc.47 | B | Doc | <b>Concept: Plan Execution</b>                          | System concept of SubSys Plan Execution  | - | Y | BL0 R2 | BL0 R3 |
| RCA.Doc.48 | B | Doc | <b>Realization of RCA goals</b>                         | Description of the goals and objectives of RCA   | - | Y | BL0 R2 | BL0 R2 |
| RCA.Doc.49 | B | Doc | <b>Concept: Architectural Design for Plan Execution</b> | Description for the architectural design related to plan execution.  | - | Y | BL0 R3 | BL0 R3 |
| RCA.Doc.50 | B | Doc | <b>A.P.M business targets and strategy</b>              | Describes the strategy of the A.P.M. part of RCA and business requirements   | - | Y | BL0 R3 | BL0 R4 |
| RCA.Doc.51 | B | Doc | <b>Concept: APS</b>                                     | Solution principles, objectives and requirements   | - | Y | BL0 R4 | BL0 R4 |
| RCA.Doc.52 | B | Doc | <b>APS detailed concepts overview</b>                   | Overview on detail concepts, their relation, their content, and common reading hints.  | - | N | -      | -      |
| RCA.Doc.53 | B | Doc | <b>A.P.M objectives</b>                                 | Objectives (high level requirements) list for APS  | - | Y | BL0 R3 | BL0 R3 |
| RCA.Doc.54 | B | Doc | <b>Solution Concept: MAP</b>                            | Describes the solution concepts for the overall Map process from preparation until activation of Map Data  | - | Y | BL0 R4 | BL0 R4 |
| RCA.Doc.55 | B | Doc | <b>Digital Map Business Case</b>                        | Provides a short overview of the content of the Digital Map and presents its business case.  | - | Y | BL0 R3 | BL0 R3 |
| RCA.Doc.56 | B | Doc | <b>Digital Map Evaluation Onboard Map</b>               | Provides a detailed evaluation of different approaches on provisioning of Map Data from trackside to on-board.                                   | - | Y | BL0 R3 | BL0 R3 |
| RCA.Doc.57 | B | Doc | <b>Digital Map Evaluation Reference Model</b>           | Provides a detailed evaluation of different reference models used to represent topology.   | - | Y | BL0 R3 | BL0 R3 |
| RCA.Doc.58 | B | Doc | <b>Digital Map Preliminary Hazard Analysis</b>          | Provide the results of Preliminary Hazard Analysis (PHA) of the Digital Map.   | - | Y | BL0 R4 | BL0 R4 |
| RCA.Doc.59 | B | Doc | <b>Digital Map System Definition</b>                    | Provides the basic system level understandings, boundaries, detailed functionalities, interfaces, Life-cycle aspects etc.                        | - | Y | BL0 R4 | BL0 R4 |
| RCA.Doc.60 | B | MB  | <b>Explanation to the RCA ARCH Processes</b>            | Explanation of the architecture process applied in RCA   | - | Y | BL0 R3 | BL0 R4 |



|            |   |     |   |  |   |   |        |        |
|------------|---|-----|---|--|---|---|--------|--------|
| RCA.Doc.61 | B | Doc | <b>APS Concept: Operating state</b> and safety logic domain objects               | Operating state and domain objects; geometric representation; relation to MAP model; abstract concepts;                            | - | N | -      | -      |
| RCA.Doc.62 | B | Doc | <b>APS Concept: Route setting and route protection</b>                            | Route protection: Setting of field elements; flank protection; level crossings   | - | N | -      | -      |
| RCA.Doc.63 | B | Doc | <b>APS Concept: Movement Permission</b>   | Train protection: Parts of MP; life cycle; safety checks; scenarios; relation of MA/signalling and MP                              | - | N | -      | -      |
| RCA.Doc.64 | B | Doc | <b>APS Concept: Transitions</b>   | Not yet defined  | - | N | -      | -      |
| RCA.Doc.65 | B | Doc | <b>APS Concept: Operational application (scenarios)</b>                           | Not yet defined  | - | N | -      | -      |
| RCA.Doc.66 | B | Doc | <b>System Architecture Specification / System Usage Documentation</b>             | Description of the Overall System Architecture and System Usage  | - | N | -      | -      |
| RCA.Doc.67 | B | Doc | <b>APS Concept: Movable Object and Object Aggregation</b>                         | Taxonomy of movable objects; life cycle; object aggregation  | - | N | -      | -      |
| RCA.Doc.68 | B | Doc | <b>Concept: Track Occupancy (Overall Solution Concept)</b>                        | Not yet defined  | - | N | -      | -      |
| RCA.Doc.69 | B | Doc | <b>MAP Object Catalogue</b>   | Defines and describes the Object Model used to provide reliable and validated topology and topography data in the form of Map Data | - | Y | BL0 R4 | BL0 R4 |
| RCA.Doc.70 | B | Doc | <b>Concept SCI-CMD</b>  | Not yet defined  | - | N | -      | -      |
| RCA.Doc.71 | B | Doc | <b>Business Case for the Track Occupancy Concept</b>                              | Description of the track occupancy   | - | N | -      | -      |
| RCA.Doc.72 | B | Doc | <b>ATO Concept</b>  | Description of the automatic train operation   | - | N | -      | -      |
| RCA.Doc.73 | B | Doc | <b>AE Concept</b>   | System concept of SubSys ATO Execution   | - | N | -      | -      |
| RCA.Doc.74 | B | Doc | <b>SMI Concept</b>  | Concept for the standardized interface between DCM and RCA Subsystems.   | - | N | -      | -      |
| RCA.Doc.75 | B | Doc | <b>IPM Concept</b>  | Not yet defined  | - | N | -      | -      |
| TWS03-30   | X | Doc | <b>Draft Initial Specification of the PI API between Application and Platform</b> | Whitepaper for Computing Platform  | - | Y | BL0 R3 | BL0 R3 |

|          |   |     |   |  |   |   |        |        |
|----------|---|-----|---|--|---|---|--------|--------|
| TWS03-20 | X | Doc | <b>Generic Safe Computing Platform High-Level Requirements</b>                                | Requirements for Computing Platform  | - | Y | BL0 R3 | BL0 R3 |
| TWS03-10 | X | Doc | <b>White paper: An Approach for a Generic Safe Computing Platform for Railway Application</b> | Definition of Computing Platform API   | - | N | -      | -      |
|          | X | Doc | <b>Operational Harmonisation</b>  | Not yet defined  | - | N | -      | -      |
|          | X | Doc | <b>MDM Concept Paper</b>  | Concept of the Minimization of the average passenger travel time with the microscopic delay management (MDM) | - | Y | -      | -      |

Notes:

- This list will be extended over the course of RCA development.
- The column “Valid” indicates if this document is valid in the current release (i.e. available and not deprecated).
- “DS = Development snapshot” in the column “Latest Update” indicates, that the MBSE specifications will be made available as frequently updated snapshot, without being part of a specific release, until the first official baseline is achieved.