

# RCA



## Reference CCS Architecture

*An initiative facilitated by the ERTMS Users Group and the EULYNX consortium*

# RCA Process Overview

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# RCA Process Overview

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## Version history

Alpha.1	28.2.2019	M. Leining	First release after review RCA core group.
Gamma.1	31.1.2020	M. Leining	Update after input RCA strategy group and review core group.

# 1. Introduction

## 1.1. Purpose of the document

This document shall provide an overview of the most important processes within and around RCA from a high-level perspective. This also comprises a description of the organisation of RCA. The document describes the status quo and future developments. The basis of RCA is the RCA white paper.

## 1.2. Other relevant documents

The current versions of documents used as input or related to this document are listed in the “RCA Documentation Plan”. **RCA FAQ** (frequently asked questions): a short summary of important and known questions regarding RCA [RCA.Doc.7].

- **RCA Glossary**: a list of abbreviations and definitions used in RCA [RCA.Doc.14].
- **RCA White Paper**: the rationale for starting RCA, description of goals (published in August 2018): [https://ertms.be/workgroups/ccs\\_architecture](https://ertms.be/workgroups/ccs_architecture) or <https://www.eulynx.eu/index.php/home2/37-reference-ccs-architecture-white-paper>. [RCA.Doc.1].
- Recommended read: Command and Control 4.0 by Josef Doppelbauer (ERA): [https://www.era.europa.eu/sites/default/files/library/docs/command\\_and\\_control\\_en.pdf](https://www.era.europa.eu/sites/default/files/library/docs/command_and_control_en.pdf).

## 1.3. Working Principles

The RCA initiative will act according to the following principles:

- RCA encourages contributions from stakeholders and feedback from the industry;
- Contributions to RCA are possible from all stakeholders;
- RCA specifications may be worked out by other initiatives like Shift2Rail, but under the supervision/guidance and change control of RCA;
- To produce harmonised requirements between railways, the RCA members (the customers) have a consensus process;
- Contributions must adhere to the overall architecture and conform to the defined methods and tooling; supervised by the change control of RCA;
- A delegation of final decisions to other third parties has to be supported by all RCA initiative members. The RCA initiative will normally not delegate final decisions to a single industry company or industry group, or to a group of some railways, that do not represent all RCA railways;
- The RCA initiative agrees upon the need of free availability (without any IPR restrictions) of the top-level architecture and specifications. The RCA initiative will not exclude anyone (railway, industry company) unreasonably from the RCA usage. The RCA initiative does not expect product implementations to be free of IPRs from industry;
- RCA will rely on ERTMS and EULYNX specifications and will use organisational synergies with EUG and EULYNX.

## 2. RCA process perspective

The following diagram shows the top-level processes for RCA. In blue, processes that will be under the responsibility of RCA and in grey, processes influenced/supported by RCA.

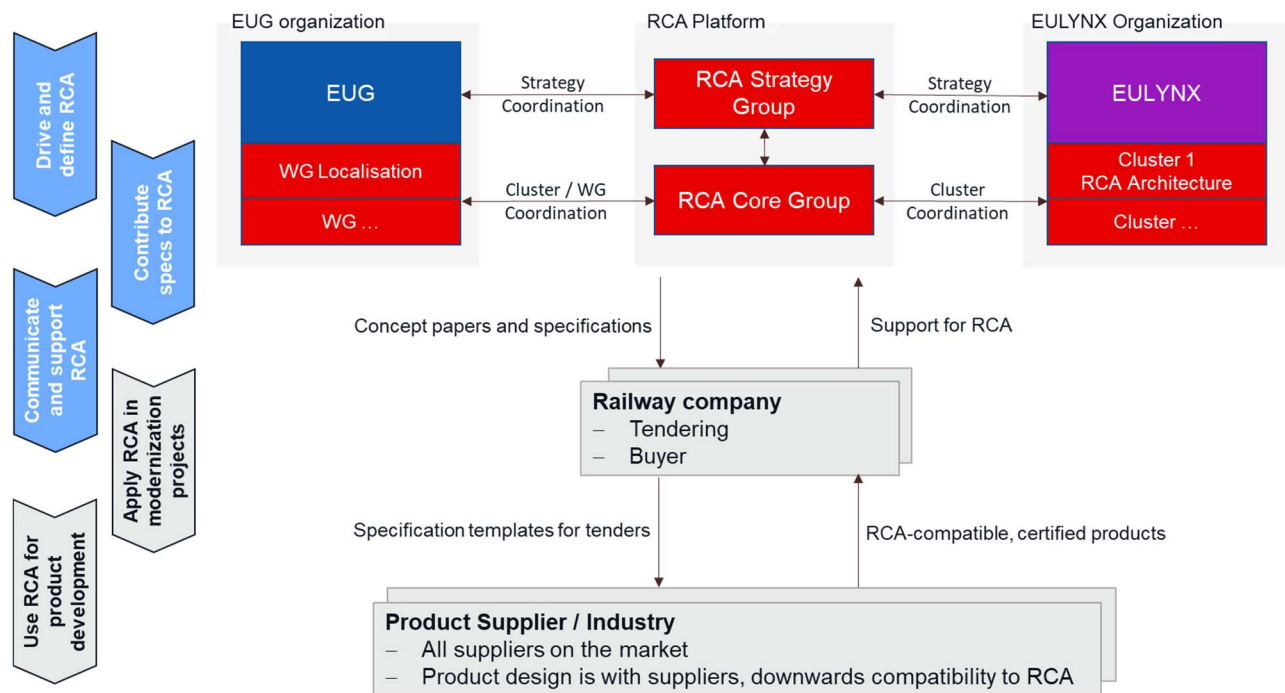


Figure 1: High level RCA processes

The following table provides a brief description of the processes above (omitting process steps). The processes “Drive & Define” and “Contribute Spec” are together called “RCA development”.

Process	Goal / Outcomes	Roles/Actors
Drive & Define RCA	<ul style="list-style-type: none"> <li>Harmonised requirements expressed in a top-level architecture and a set of interface specifications</li> <li>The process must be much faster “than usual”, while ensuring a critical mass of actively supporting IMs and enough followers</li> </ul>	<ul style="list-style-type: none"> <li>Lead: RCA initiative backed by EUG and EULYNX</li> <li>Approvers: all members of EUG and EULYNX</li> </ul>
Contribute Spec to RCA	<ul style="list-style-type: none"> <li>A specification or other RCA element as a candidate for integration into the RCA</li> <li>Prototypes / Demonstrators</li> </ul>	<ul style="list-style-type: none"> <li>Basically, any party willing to provide a “building block” for RCA (according to rules such as IPR, design principles, tooling)</li> </ul>
Communicate and Support RCA	<ul style="list-style-type: none"> <li>Disseminate RCA activities and results</li> <li>Ensure that the RCA is known and appreciated at the right levels by IMs</li> <li>Get commitments for applying RCA</li> <li>Support IMs interested in applying RCA</li> <li>Ensure maintenance of RCA specifications</li> </ul>	<ul style="list-style-type: none"> <li>RCA initiative backed by EUG and EULYNX</li> </ul>

Apply RCA in modernisation projects	<ul style="list-style-type: none"> <li>• Plan, procure, roll-out and successfully operate modernisation projects based on RCA specifications</li> </ul>	<ul style="list-style-type: none"> <li>• IMs (and their financiers &amp; regulators)</li> </ul>
Use RCA for product development and innovative railway solutions	<ul style="list-style-type: none"> <li>• Base product strategies, R&amp;D and actual products on RCA</li> <li>• Offer RCA-based products in procurements by IMs</li> </ul>	<ul style="list-style-type: none"> <li>• Suppliers and their organisations (UNIFE, UNISIG)</li> <li>• Shift2Rail</li> </ul>

**Table 1: Process description as shown in Figure 2**

### 3. RCA internal structure, roles, stakeholder groups and processes

Processes and structures of RCA shall be optimised by integrating cluster work within the existing organisations of EUG and EULYNX. The scope of the EUG management and of the Consortium Management Bureau of EULYNX has been extended with tasks concerning RCA. EUG working groups will contribute to the ETCS related part of RCA while EULYNX contributes to the standardisation of interfaces of the interlocking system. The processes and organisation of the Change Control Board of EULYNX will be used for all decisions concerning the development of the architecture. After coordination between RCA, EUG and EULYNX and whenever necessary for RCA, the scope of the RCA Core Group will be broadened by topics and people who will act either under EUG or EULYNX organisation, depending on the topic.

The working structure elaborated is reflected in the following figure:

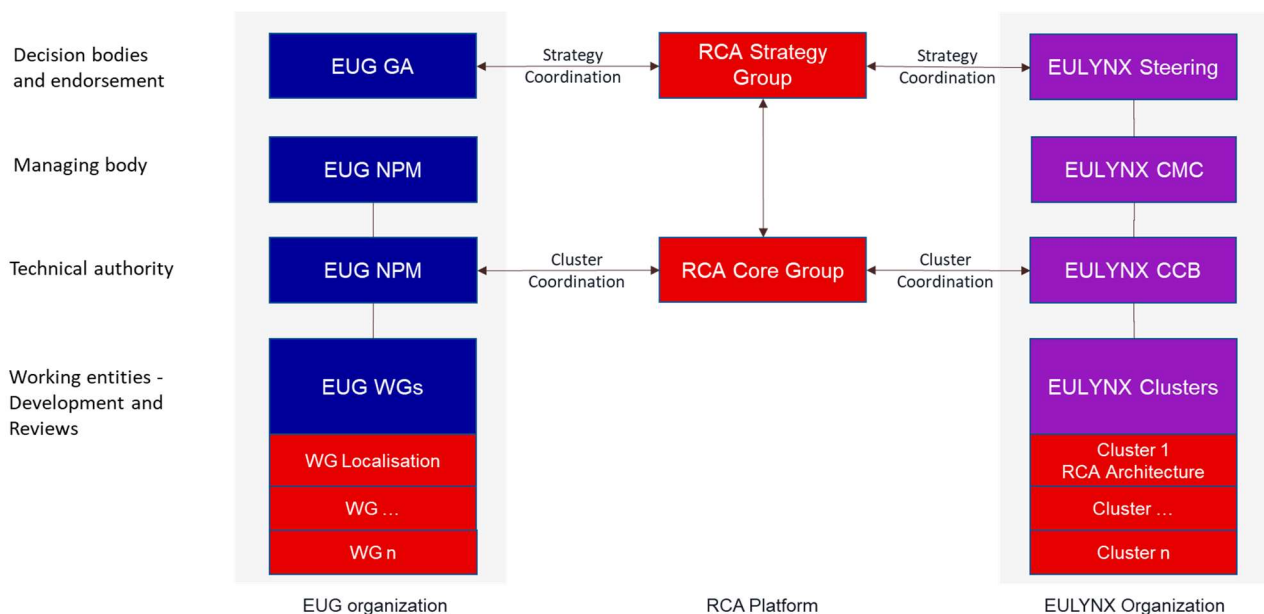


Figure 2: Organisational and technical view on RCA

#### 3.1. RCA Strategy Group

The strategic work is performed by the RCA Strategy Group. This group aligns the RCA activities with the members of EUG and EULYNX and if necessary, with other initiatives like OCORA. Stakeholder management and further development of RCA structures and processes is initiated by the RCA Strategy Group.

The role of the RCA Strategy Group is also reflected in the composition of the members of the two groups. The RCA Strategy group consists of two representatives of EUG and EULYNX and one representative of the RCA Core Group.

#### 3.2. RCA Core Group

The members of the RCA Core Group consist primarily of those IMs with major digitalisation programs, such as Network Rail, ProRail, SBB, DB but also of further IMs that today are willing to shape RCA, like RFI, Banedanmark, Infrabel or Trafikverket. The RCA Core Group coordinates the clusters, allocates work packages and ensures that the work can be done on time.

### 3.3. RCA Clusters, goals and content

Contributions to the RCA specification are organised in so called “Clusters”. Clusters may contain several working groups; this is up to the Cluster itself.

RCA Clusters are organised in the form of EULYNX Clusters and EUG Groups. There are no Clusters within the RCA platform.

The working group that defines the RCA Architecture is allocated within the EULYNX structure as tools and processes are heavily reused from EULYNX activities and EULYNX is one of the core elements within RCA. Having said this, it is also possible to allocate work packages outside of EUG and EULYNX. These work packages would have to synchronise with EULYNX Clusters and/or EUG Working Groups. The process document will have to be updated on the first integration of such a work package.

The currently identified clusters are as shown in Table 2:

ID	Cluster Title	Goals / Content
AR	Overall Architecture	<ul style="list-style-type: none"><li>• Produce RCA architecture documents able to serve as CENELEC Phase 1-Concept and Phase 2-System Definition document for RCA</li><li>• Ensure technical synchronisation among all clusters</li><li>• Produce (minimal/shared) Initial Operational Need &amp; System Need Analysis a.k.a. business architecture</li><li>• Document initial / driving UC / scenarios / interactions</li><li>• Document initial / driving NFRs</li><li>• Start shared data model for data flow on interfaces</li><li>• Clarify degraded modes</li></ul>
MT	Modeling & Tooling	<ul style="list-style-type: none"><li>• Provide Modelling Standard</li><li>• Provide usable Toolchain</li></ul>
PL	Platform	<ul style="list-style-type: none"><li>• Concept Platform Independence</li><li>• Communication stack</li></ul>
AT	ATO	<ul style="list-style-type: none"><li>• Ensure integration of on-going S2R work on GoA2 and GoA3/4</li><li>• Focus on “system-level” effects</li></ul>
AP	Applying RCA	<ul style="list-style-type: none"><li>• RCA effects</li><li>• Migration scenarios</li><li>• Target configurations</li></ul>
DP	Data model / Data preparation	<ul style="list-style-type: none"><li>• Provide common data model</li><li>• Semi-automatic data acquisition</li><li>• Semi-automatic data generation for deployment</li><li>• Safe data storage</li><li>• Process of constant synchronisation of data after deployment</li></ul>
DE	Demonstrator	<ul style="list-style-type: none"><li>• Putting together a demonstrator (first public demonstration at Innotrans)</li></ul>
TMS-PE	TMS Plan Execution	<ul style="list-style-type: none"><li>• Movement Control Component</li></ul>

**Table 2: Description of existing clusters**

### 3.4. Internal stakeholders, roles and interests

The following table summarises the description and the interests of the above described internal stakeholders:

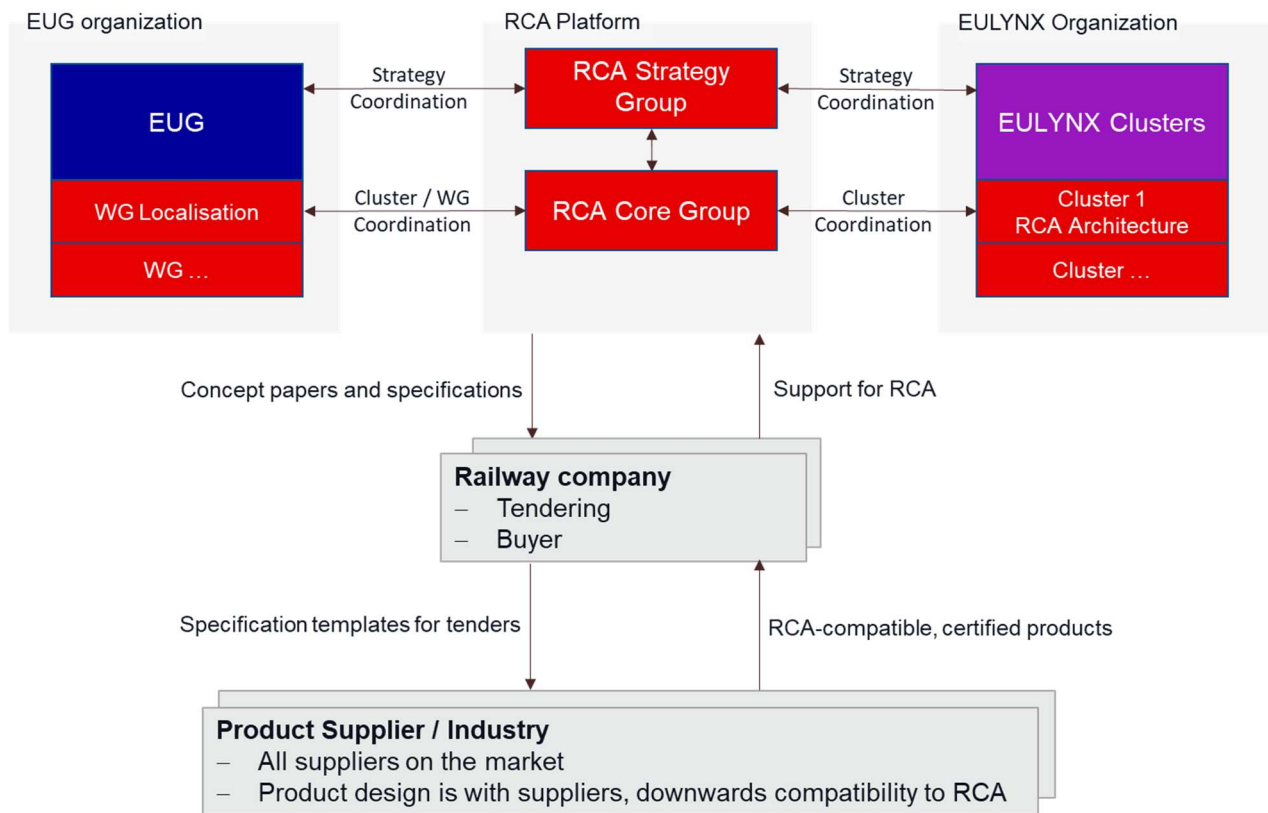


Stakeholder	Description / Interests
RCA Strategy Group	<ul style="list-style-type: none"> <li>• Drives, manages and secures the financing within the RCA process</li> <li>• Fosters dialogue between IMs and industry</li> <li>• Coordinates stakeholder management on European level</li> <li>• Supports dialogue to RUs</li> <li>• Decides on development of organisational structures</li> <li>• Mandated by EUG GA and EULYNX SC</li> </ul>
RCA Core Group	<ul style="list-style-type: none"> <li>• Defines the RCA scope and content (e.g., whether a specification is included in RCA)</li> <li>• Reviews architectural work and takes decisions that influence the overall RCA Architecture and therefore cannot be taken within specific working groups</li> <li>• Supports the technical authorities EUG NPM and EULYNX CCB for formal approval of RCA specifications and change requests</li> <li>• Drives and enables the goals outlined in the RCA whitepaper and subsequent RCA publications</li> <li>• Supports top management and procurement meetings of IMs at least by providing appropriate documents</li> <li>• Supports implementation of national RCA projects</li> <li>• Disseminates results</li> <li>• Coordinates division of work and schedules of clusters, assures on-time delivery</li> <li>• Works with the EULYNX Consortium Management Bureau to ensure coordination across RCA Clusters</li> <li>• Provides tools and rules where essential (RCA Framework)</li> <li>• Coordinates assurance and certification activities</li> </ul> <p>Coordinates dedicated and managed feedback of suppliers and supplier bodies on specifications</p>
RCA Cluster	<ul style="list-style-type: none"> <li>• An RCA Cluster is generally working on an aspect (cluster) of RCA (e.g., an interface specification)</li> <li>• Work is primarily allocated within working groups of EUG and EULYNX</li> <li>• Railway and programs like DSD, Smartrail40, Target190+, etc. participate in RCA clusters based on their interest and need</li> <li>• Generally, external parties (e.g., research projects like S2R, UIC, supplier, ERA, etc.) can work on specifications in synchronisation with RCA Clusters</li> <li>• Different designs may compete if there is more than one group working on a topic</li> </ul>

**Table 3: Description of roles and interests of internal stakeholders**

### 3.5. Railway companies and suppliers - Roles, interaction and interests

Figure 3 shows the internal stakeholders of RCA as described in Chapter 3 and the main external stakeholder groups around RCA as well as the main processes and their interactions.



**Figure 3: Common understanding of long-term roles**

A detailed view on the stakeholder landscape can be found in Table 4, which defines the roles of the main external RCA stakeholder groups within Figure 3:

Stakeholder	Description / Interests
Product Supplier/ Industry	<ul style="list-style-type: none"> <li>• Uses RCA specification for product implementation</li> <li>• Product Design / Driving product portfolios</li> <li>• Homologation</li> <li>• Product Authorisation</li> </ul>
Railway company (IM) <ul style="list-style-type: none"> <li>• in general</li> </ul>	<ul style="list-style-type: none"> <li>• Decision for rollout/modernisation and applicable technology</li> <li>• Contracting entity for product suppliers</li> </ul>
Railway company (IM) <ul style="list-style-type: none"> <li>• RCA member</li> </ul>	<ul style="list-style-type: none"> <li>• Full support of RCA goals</li> <li>• Member of the RCA initiative through EUG or EULYNX</li> <li>• Provision of personnel and/or financial resources according to availability of resources and intended role in the process</li> </ul>
Railway company (IM) <ul style="list-style-type: none"> <li>• National Railway Modernisation Program</li> </ul>	<ul style="list-style-type: none"> <li>• Drives rollout/modernisation and uses RCA in its overall architecture and tender templates</li> <li>• Systems Integration</li> <li>• Contributes to working groups</li> </ul>

Stakeholder	Description / Interests
Railway company (RU)	<ul style="list-style-type: none"> <li>• Decision for rollout/modernisation and applicable technology</li> <li>• Works with IMs to establish migration plans</li> </ul>

**Table 4: Description of stakeholders as shown in Figure 4**

## 4. RCA Stakeholders - Management and linking of stakeholders

This chapter details the stakeholder groups. RCA is strongly interested in exchanging views and positions with all stakeholders. Figure 4 shows the result of the first stakeholder analysis. This analysis gives a more detailed view on the most relevant institutions and associations in Europe for RCA.

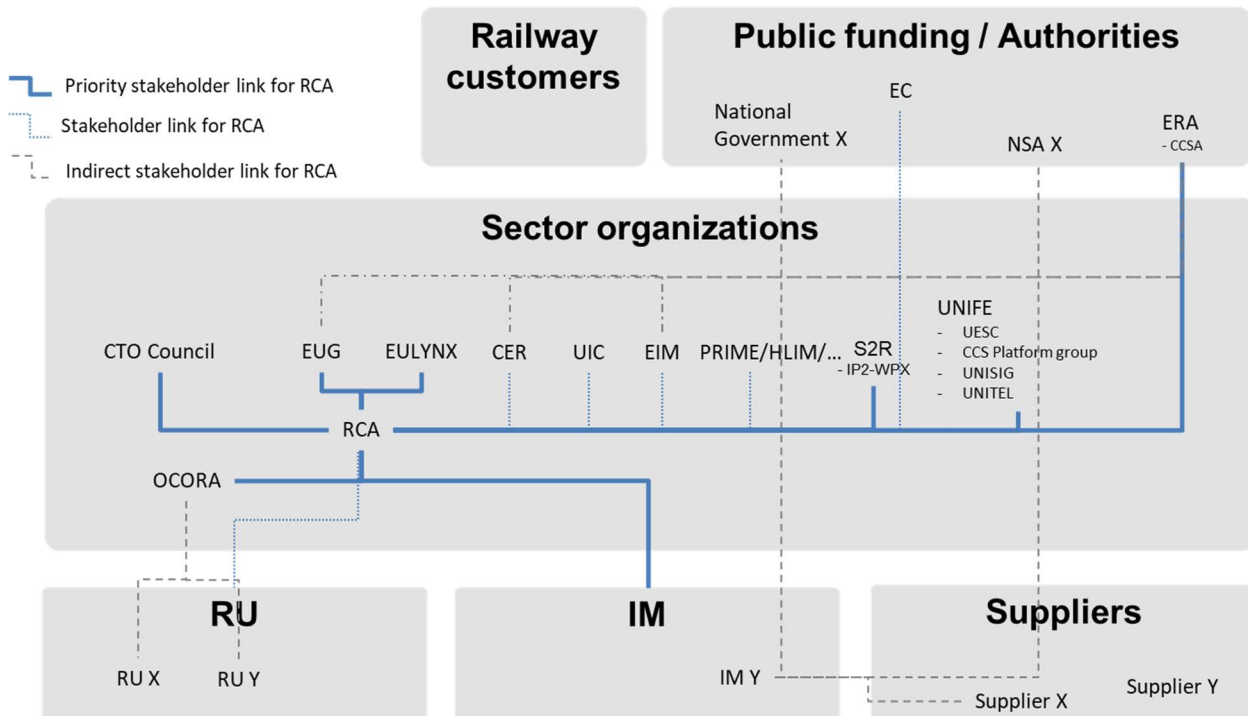


Figure 4: Overview stakeholder relations

### 4.1. Stakeholder Authorities

Within the RCA Core group there are named contact persons that are taking care of individual stakeholders. The tables below give a broader and more complete overview of RCA stakeholders, the named liaison officers and the planned actions.

Authorities	Goals/Expectations of RCA for stakeholder	Liaison	Planned actions
ERA	<ul style="list-style-type: none"> <li>Support of the vision of RCA</li> <li>Support for TSI CRs</li> <li>Support for changes in regulatory context (TBD what?)</li> <li>Integration of relevant RCA features into TSI as System Authority for ERTMS</li> <li>Political support for overall direction</li> </ul>	<ul style="list-style-type: none"> <li>EUG/IM representatives on political level (Michel Ruesen (EUG), Steffen Schmidt (SBB))</li> <li>Rob Dijkman (EUG) for CRs</li> <li>Link to EIM/CER-CCS speakers: Nicola Furness (Network Rail)</li> </ul>	<ul style="list-style-type: none"> <li>Paper on TSI CRs by end of 2019 by RCA, see [RCA.Doc.29]</li> </ul>

Authorities	Goals/Expectations of RCA for stakeholder	Liaison	Planned actions
RISC	Support of TSI CRs	<ul style="list-style-type: none"> <li>Link over CCS working party, Nicola Furness (Network Rail)</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>
CCSA	<ul style="list-style-type: none"> <li>Support CR discussion</li> <li>Later: overall architecture discussion</li> <li>Make sure, no other initiatives are started.</li> </ul>	<ul style="list-style-type: none"> <li>2 representatives of EUG: Rob Dijkman (EUG) and Steffen Schmidt (SBB).</li> </ul>	<ul style="list-style-type: none"> <li>Participation in CCSA meetings</li> </ul>
EC, DG MOVE	<ul style="list-style-type: none"> <li>Support of the vision of RCA</li> <li>Policy framework decisions considering / recommending RCA</li> <li>Setting direction for Shift2Rail</li> <li>Funding for RCA work</li> </ul>	<ul style="list-style-type: none"> <li>Michel Ruesen (EUG) to Ian Conlon and Keir Fitch (DG Move)</li> </ul>	<ul style="list-style-type: none"> <li>Discuss alignment of S2R</li> <li>Discuss Funding</li> </ul>

**Table 5: Stakeholder description authorities**

## 4.2. Stakeholder IMs in EUG/EULYNX

As EUG and EULYNX play an important role for RCA, the table is split into a stakeholder view on EUG and EULYNX itself and into a view on the IMs and their roles within the organisations.

IMs in EUG/EULYNX	Goals/Expectations of RCA for stakeholder	Liaison	Planned actions
IMs in EUG and EULYNX	<ul style="list-style-type: none"> <li>Active participation in RCA</li> <li>Implementation of RCA</li> </ul>	<ul style="list-style-type: none"> <li>EUG/EULYNX</li> </ul>	<ul style="list-style-type: none"> <li>Reporting at Steering Level</li> </ul>
Top Management	<ul style="list-style-type: none"> <li>Support of vision</li> <li>Sponsor vision</li> </ul>	<ul style="list-style-type: none"> <li>General Assembly (GA) EUG and Steering Committee (SC) EULYNX</li> </ul>	<ul style="list-style-type: none"> <li>Declaration of intent</li> </ul>
Procurement	Sourcing/Procurement	<ul style="list-style-type: none"> <li>ERPC</li> </ul>	<ul style="list-style-type: none"> <li>Formal involvement of CPO once a year</li> </ul>
Signaling ERTMS	Contribute know-how and workforce	<ul style="list-style-type: none"> <li>Via EULYNX</li> <li>NPM</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>
Programs	<ul style="list-style-type: none"> <li>Alignment with RCA</li> <li>Demand Management</li> </ul>	<ul style="list-style-type: none"> <li>Link to Target190+, DBB, SR40 through members strategy/core group</li> </ul>	<ul style="list-style-type: none"> <li>Regular meetings</li> </ul>

**Table 6: Generic perspective of IMs in EUG/EULYNX (roles)**

### 4.3. Stakeholder EUG/EULYNX

<b>EUG/ EULYNX</b>	<b>Goals/Expectations of RCA for stakeholder</b>	<b>Liaison</b>	<b>Planned actions</b>
EUG	<ul style="list-style-type: none"> <li>• Founder of RCA</li> <li>• Based on MoU, members continue to support / accept RCA process.</li> <li>• EUG continues to provide links into the “ERTMS world” (ERA, S2R, UNISIG, ...)</li> <li>• Coordination of stakeholder management</li> <li>• Execution of dedicated stakeholder relations</li> <li>• Sets up Cluster work on behalf of RCA</li> </ul>	<ul style="list-style-type: none"> <li>• Michel Ruesen (EUG) in RCA strategy group. Rob Dijkman (EUG) in Core group.</li> </ul>	<ul style="list-style-type: none"> <li>• Continuous exchange</li> </ul>
EULYNX	<ul style="list-style-type: none"> <li>• Founder of RCA</li> <li>• Based on MoU, members continue to support/accept RCA process.</li> <li>• Shared method/tooling, applying EULYNX interfaces change request from RCA</li> <li>• Sets up Cluster work on behalf of RCA</li> <li>• Provision of processes, structures and tools</li> </ul>	<ul style="list-style-type: none"> <li>• Mirko Blazic (EULYNX) in Core Group.</li> <li>• Oliver Lemke (DB) to EULYNX modelling</li> </ul>	<ul style="list-style-type: none"> <li>• Continuous exchange</li> </ul>
IMs outside EUG / EULYNX	<ul style="list-style-type: none"> <li>• Disseminate Info about EULYNX, RCA, OCORA at conferences / meetings and make clear process / membership is open.</li> </ul>	<ul style="list-style-type: none"> <li>• EIM and CER contacts</li> <li>• Maybe UIC</li> </ul>	<ul style="list-style-type: none"> <li>• No specific steps</li> </ul>

**Table 7: Description of IMs within EUG/EULYNX**

#### 4.4. Stakeholder Sector Organisations

Sector organisations	Goals/Expectations of RCA for stakeholder	Liaison	Planned actions
CTO Council	<ul style="list-style-type: none"> <li>Sponsorship for RCA at the top-level of their respective organisations</li> <li>Sounding board for strategic &amp; communication topics</li> </ul>	<ul style="list-style-type: none"> <li>Members of the strategy group: Bernd Elsweiler (DB), Steffen Schmidt (SBB), Andrew Simmons (Network Rail), Bernhard Rytz (SBB)</li> </ul>	<ul style="list-style-type: none"> <li>Regular reporting / info.</li> <li>Declaration of Intent</li> </ul>
CER	<ul style="list-style-type: none"> <li>Overall: keep informed, use conferences / meetings for dissemination.</li> <li>General support RCA</li> <li>Support onboard changes</li> <li>Support CR process</li> </ul>	<ul style="list-style-type: none"> <li>Michel Ruesen (EUG) with Libor Lochmann (CER).</li> <li>Generally: All IMs active in RCA.</li> <li>CCS working group</li> <li>OPE working group</li> </ul>	<ul style="list-style-type: none"> <li>Keep informed</li> </ul>
EIM <ul style="list-style-type: none"> <li>- ERTMS</li> <li>- OPE</li> <li>- Telecom</li> </ul>	<ul style="list-style-type: none"> <li>Overall: keep informed, use conferences / meetings for dissemination.</li> <li>Support CR process</li> <li>General support RCA</li> </ul>	<ul style="list-style-type: none"> <li>Nicola Furness (Network Rail)</li> <li>Generally: All IMs active in RCA.</li> <li>CCS working group</li> <li>OPE working group</li> </ul>	<ul style="list-style-type: none"> <li>Keep informed</li> </ul>
UIC	<ul style="list-style-type: none"> <li>Support groups on specific topics such as FRMCS.</li> <li>Overall: just keep informed, use conferences / meetings for dissemination.</li> </ul>	<ul style="list-style-type: none"> <li>Michel Ruesen (EUG)</li> <li>Generally: All IMs active in RCA.</li> </ul>	<ul style="list-style-type: none"> <li>Presentation FRMCS conference 14.5.</li> </ul>

Table 8: Stakeholder description of sector organisations

#### 4.5. Stakeholder Suppliers

RCA welcomes explicitly the participation of suppliers but has not yet defined and agreed on the organisational framework for such a participation.

Suppliers	Goals/Expectations of RCA for stakeholder	Liaison	Planned actions
UNIFE	<ul style="list-style-type: none"> <li>Suppliers see opportunity in RCA</li> <li>Responsible for feasibility checks and content reviews</li> </ul>	<ul style="list-style-type: none"> <li>Michel Ruesen (EUG) → Philippe Citroën (UNIFE)</li> </ul>	<ul style="list-style-type: none"> <li>Reaction to announced position paper</li> <li>Proposal for working together on RCA</li> </ul>
UESC	<ul style="list-style-type: none"> <li>Mutual understanding of current situation</li> <li>Support of RCA</li> </ul>	<ul style="list-style-type: none"> <li>EUG, SBB, Network Rail, DB, ProRail</li> </ul>	<ul style="list-style-type: none"> <li>Regular workshops</li> </ul>

Suppliers	Goals/Expectations of RCA for stakeholder	Liaison	Planned actions
CCS Platform group	<ul style="list-style-type: none"> <li>Shape opinions for UNIFE</li> <li>Consolidated viewpoint of UNIFE members</li> <li>Member of EULYNX CCB</li> </ul>	<ul style="list-style-type: none"> <li>Bernhard Rytz (SBB) → Ralf Kaminsky (Siemens)</li> <li>Mirko Blazic (EULYNX) → Ralf Kaminsky (Siemens)</li> </ul>	<ul style="list-style-type: none"> <li>UNIFE decides on role Platform group / UNISIG</li> </ul>
UNISIG	<ul style="list-style-type: none"> <li>Maybe: Shape opinions for UNIFE</li> <li>Maybe: consolidated viewpoint of UNIFE members</li> <li>Responsible for feasibility checks and content reviews</li> </ul>	<ul style="list-style-type: none"> <li>Michel Ruesen (EUG) → Van Liefferinge (UNISIG)</li> </ul>	<ul style="list-style-type: none"> <li>Ongoing exchange with goal to cooperate soon</li> </ul>
Suppliers	<ul style="list-style-type: none"> <li>Except for providing public information or taking back feedback from public workshops, the RCA initiative does not directly deal with individual suppliers.</li> <li>Individual IMs are encouraged to disseminate RCA info and the role of RCA for their company in their supplier contacts (procurements according to RCA on roadmaps).</li> </ul>	<ul style="list-style-type: none"> <li>IM-specific</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>
Supplier X	<ul style="list-style-type: none"> <li>Suppliers incorporate RCA concepts / interface specifications in their product roadmaps.</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>

**Table 9: Stakeholder description Suppliers**



## 4.6. Shift2Rail Working Groups

Within Shift2Rail there are three relevant groups.

Related initiatives / working groups	Goals/Expectations of RCA for stakeholder	Liaison	Planned actions
Shift2Rail	<ul style="list-style-type: none"> <li>Shift2Rail, as a rail sector organisation, is an opportunity for the RCA initiative and supply industry to work collectively on the refinement of specifications and the development of RCA compatible products</li> <li>Challenge in Overall architecture and interface specifications: Commitment to modular architecture with exchangeable and upgradable components</li> </ul>	<ul style="list-style-type: none"> <li>Michel Ruesen (EUG) → Carlo Borghini (Shift2Rail)</li> </ul>	<ul style="list-style-type: none"> <li>Regularly inform S2R JU</li> <li>Offer Workshops</li> <li>Further alignment of RCA and S2R for second phase of S2R</li> </ul>
S2R – IP2	<ul style="list-style-type: none"> <li>Ideally IP2 in general and WP2 in particular will start to use RCA as reference (proposal for X2Rail4 goes exactly in this direction). That is IP2 would be the “main vector” for RCA topics in S2R.</li> </ul>	<ul style="list-style-type: none"> <li>IP2 Group of Railways</li> <li>Nicola Furness (Network Rail) in IP2 Steering committee</li> <li>Direct participation of IMs in IP2 work</li> </ul>	<ul style="list-style-type: none"> <li>Feedback on X2Rail-4</li> </ul>
S2R Linx4Rail	<ul style="list-style-type: none"> <li>Cross-cutting topics that are not addressed in S2R IP 2, e.g., data prep, architecture</li> </ul>	<ul style="list-style-type: none"> <li>Network Rail (Imtithal Aziz / Nicola Furness)</li> <li>Trafikverket (Andreas Wik)</li> </ul>	<ul style="list-style-type: none"> <li>Lead WP5 DB (Bernd Eberts)</li> <li>WP CDM to be checked (data models for topology)</li> </ul>
X2Rail 2, 3, 4, 5	<ul style="list-style-type: none"> <li>Link via Linx4Rail</li> </ul>	<ul style="list-style-type: none"> <li>Network Rail (Nicola Furness)</li> </ul>	<ul style="list-style-type: none"> <li>Representatives of railways need to be briefed on RCA</li> </ul>

**Table 10: Stakeholder description of Shift2Rail Groups**

#### 4.7. Related initiatives / working groups

Other groups may be invited to closely work together with RCA. Results of these collaborations are needed in RCA.

Related initiatives / working groups	Goals/Expectations of RCA for stakeholder	Liaison	Planned actions
OCORA (Open CCS Onboard Reference Architecture)	<ul style="list-style-type: none"> <li>• “Fitting” scope of architectural work since CCS and ATO control loops include onboard systems</li> <li>• Linking architectural content</li> <li>• Align cross-cutting features (modular safety, platform independence, etc.)</li> <li>• Coherent / “simple” communication towards another stakeholder</li> <li>• the capabilities of OCORA may be important for RCA rollout</li> <li>• Need to share messages to reduce complexity and prove alignment</li> </ul>	<ul style="list-style-type: none"> <li>• OCORA is in the starting phase. “Alpha”-Version recently published. No White Paper.</li> <li>• Michel Ruesen (EUG) &amp; Bernhard Rytz (SBB)</li> </ul>	<ul style="list-style-type: none"> <li>• Explicit “linking group” to be established</li> <li>• Alignment between RCA and OCORA.</li> <li>• DB and SBB are participating in RCA and OCORA</li> <li>• Some shared activities in Linx4Rail WP5.</li> </ul>
Localisation / EUG LWG (Localisation Working Group)	<ul style="list-style-type: none"> <li>• enhanced/additional localisation is a core feature for RCA</li> <li>• topic is also with OCORA</li> </ul>	<ul style="list-style-type: none"> <li>• Steffen Schmidt (SBB)</li> <li>• Christina Galvan (NR)</li> </ul>	<ul style="list-style-type: none"> <li>• Regular meetings</li> <li>• LWG is also attending X2R-2 WP3 meeting dealing with train positioning as a game changer</li> </ul>
FRMCS / Telecoms Onboard Architecture TOBA (UIC)	<ul style="list-style-type: none"> <li>• FRMCS is needed for some RCA applications (and for Lifecycle)</li> <li>• There are also some 3GPP activities as input to TOBA DBB is supporting</li> </ul>	<ul style="list-style-type: none"> <li>• EUG (Rob Dijkman) is chairing this activity</li> <li>• DB (DBB) and SBB (SR40) are representing in RCA and OCORA issues in TOBA</li> </ul>	<ul style="list-style-type: none"> <li>• There is the WP8.3 in our DAP project in which EUG, UNISIG, UNITEL and UIC (TOBA) work together to agree on the on-board architecture regarding the interface between ETCS on-board and the on-board telecom system.</li> </ul>

Related initiatives / working groups	Goals/Expectations of RCA for stakeholder	Liaison	Planned actions
Braking curves	<ul style="list-style-type: none"> <li>Better braking curves will help, yet it is only a “parameter” for RCA</li> </ul>	<ul style="list-style-type: none"> <li>Via EUG TSG (Technical System Group) (Rob Dijkman, EUG)</li> </ul>	<ul style="list-style-type: none"> <li>Paper on braking curves will be discussed in February</li> <li>Enhancements of the current braking curve functionality are discussed in EUG TSG (Technical System Group) and subsequently in the ERA EECT meetings (Maarten Bartholomeus, ProRail).</li> </ul>

**Table 11: Related initiatives / working groups**

#### 4.7.1. Future collaboration with OCORA

Like the RCA initiative, which was founded by Infrastructure Managers, several Railway Undertakings (DB, NS, ÖBB, SNCF and SBB) agreed on a partnership with the name OCORA (Open CCS Onboard Reference Architecture). The partnership was concluded by means of a Memorandum of Understandings in March 2019 and further developed into a Code of Conduct, signed in October 2019. The objectives of this group are the definition of an open vehicle architecture, the promotion and development of interfaces and use of OCORA. This includes the standardisation of architecture and interfaces as well as the reduction of approval and verification efforts. It is the goal of OCORA to be integrated in an overall architecture together with RCA.

Though it is all related to on-board technology, OCORA will be an important building block in achieving cost efficiency with RCA infrastructure systems. Only if there is an affordable migration strategy for RUs, migration will be fast enough.

Thus, there are some common RCA/OCORA topics like localisation, Hardware-/Software-separation which should be addressed together.

Therefore, it is important to align the activities of OCORA with those of RCA. In a first approach, the alignment could be a consequent, further development of the internal structure of RCA. In November 2019 there will be further discussions on how RCA and OCORA can be efficiently aligned.

#### 4.8. Map of goals of stakeholders

Obviously different stakeholders have different goals in the process of RCA, which is summarised in Figure 5.

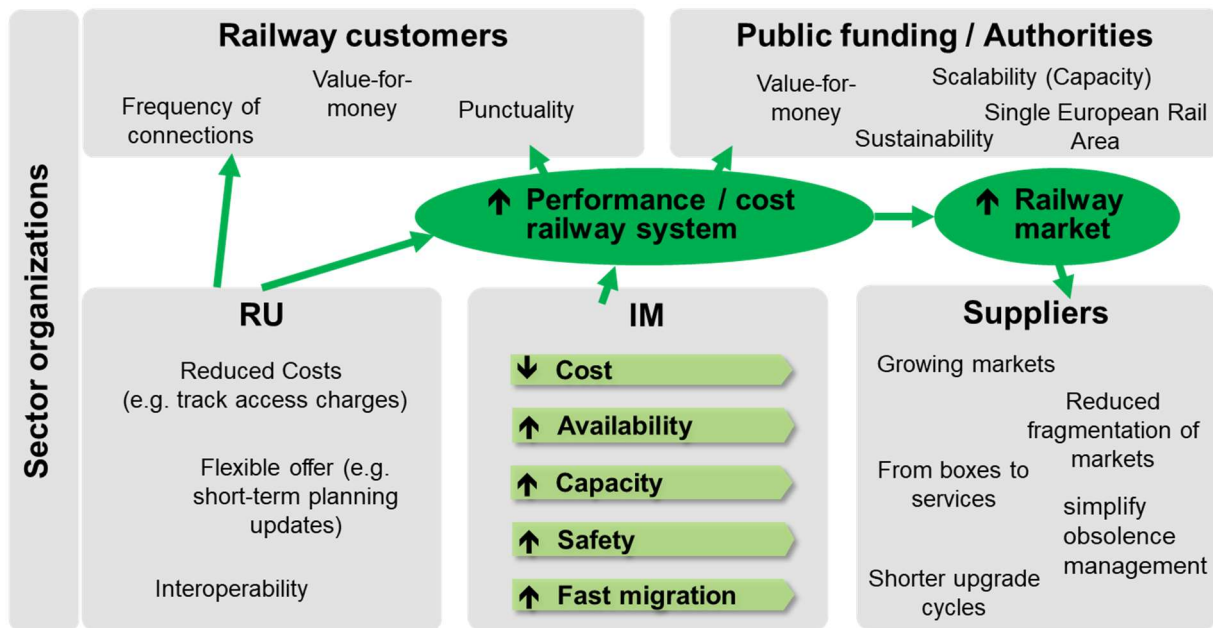


Figure 5: Stakeholders and their goals

#### 4.9. Interaction of RCA with ongoing national programs

The RCA enables IMs to modernise their systems by going beyond the currently available ETCS L2 implementations. The over-arching goals of RCA can be found in the RCA White Paper. Railways (IMs) committed to RCA will use the RCA architecture and its specifications in the planning and procurement (“tender templates”) of their modernisation projects. Therefore, the architectural requirements concerning the main interfaces of the CCS architecture published in tenders are harmonised in detail and are used in every tender in the same way.

Feedbacks from implementation to RCA will be catalysed in the Cluster “Overall Architecture”.

For further details the RCA documents “Architectural approach” and “Informal Architectural Overview” are recommended to read.

## 5. Iterative development of RCA

The architectural elements to be provided by the RCA and the process of developing specifications is described more detailed in the RCA document “Architectural Approach”.

Available specifications for product development will be released in iterations. From a high-level perspective, RCA development follows a spiral model to ensure early first results while acknowledging that not all parts of the RCA can be developed in one iteration.

### 5.1. The RCA development process applies spiral development

An effective RCA cannot be developed in one big step:

- Some national programs are already started and will need quick (if preliminary) answers from RCA.
- The RCA idea is new for the sector, before joining, many stakeholders will need to see first results.
- The technological evolution will go on, RCA is never finished in that sense. However, RCA will provide stability by defining releases and requiring backwards compatibility.

The goal is to work in many iterations, getting feedback for every iteration to steer the process. While there is an overall goal and roadmap, it must be possible to include new learnings. For every iteration, its feedback and the necessary scope and quality must be explicitly specified.

The process is based on spiral development and is performed in several iterations. The iterations aim at:

- early communication of fundamental direction and principles;
- practice collaboration among the RCA contributors;
- prompt feedbacks.

The process of one iteration will follow nine rough steps:

1. Define / refine scope incl. addressed target architecture and migration paths
2. Define / refine top level functional decomposition and interfaces
3. Define / refine cross-cutting concerns (NFRs, design principles, ...)
4. Initialise / mandate specification working groups
5. Support / coordinate specification working groups
6. Integrate / validate results of working groups
7. Perform quality check, review of iteration results
8. Formal decision on iteration results (optional)
9. Communicate iteration results



### 5.2. RCA Roadmap

Please find further planned iterations and roadmaps of RCA in the document “RCA Roadmap” [RCA.Doc.34]

## 6. Information dissemination and intellectual property management

An architecture like RCA is all about information sharing. We need to make sure that:

- up-to-date information can be efficiently shared with interested parties;
- we enable appropriate feedback;
- we safeguard Intellectual Property Rights;
- we don't infringe on third-parties' rights and will not be restricted by such rights ("freedom to operate").

### 6.1. Intellectual property management

#### 6.1.1. Background

Intellectual property is relevant for RCA for the following reasons:

- The RCA process (documents) creates copyrighted material;
- RCA results may describe (or imply the use of) an invention already patented;
- RCA results may be patented by RCA contributors or third parties;
- The RCA policy on intellectual property management influences if and how confidentiality is needed in the RCA process.

#### 6.1.2. Main drivers

- RCA results must be openly available for RCA to work as intended (tender templates for railways, guidance for industry).
- To pursue the goal of interchangeability of components, we need to avoid lock-in on a specific solution / vendor. The RCA specifications must not explicitly or implicitly require specific IPR for their implementation (possibility for royalty-free implementation).
- We continue to need the motivation of our industry partners for development of products; therefore, we do not exclude intellectual property protection in product implementations.
- The RCA development process should be as un-encumbered by intellectual property rules as possible.

#### 6.1.3. RCA policy on intellectual property management

- The RCA results (documents) are published today under an "open copyright" (e.g., [https://en.wikipedia.org/wiki/European\\_Union\\_Public\\_Licence](https://en.wikipedia.org/wiki/European_Union_Public_Licence)).
- To help protect against new patents by third parties, RCA results will be continuously published (also drafts, defensive publication).
- To help protect against new patents by contributors or persons / organisations included in the RCA process, we will adopt a policy analogous to e.g., <https://opcfoundation.org/news/opc-foundation-news/opc-foundation-announce-updated-opcf-ipr-policy/>.

#### 6.1.4. Important message: IPR regarding products based on RCA

- We do not want IPR to be an obstacle to exchangeability (initial procurement or later lifecycle) of components based on the defined specifications.
- Like today, the implementation of the specifications in a specific product / component by any partner may be protected by IPR.

## **6.2. Making information about RCA available**

The results of RCA will be published at the end of each iteration. In the initial iterations the main goal is to get feedback from railways and suppliers.

The publication and communication tasks are assigned to the Consortium Management Bureau of EULYNX. The CMB shall together with EUG also foster communication from Working Groups to stakeholders and organise the feedback loop.

Results will be published on the websites of EUG and EULYNX.