

# RCA



## Reference CCS Architecture

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

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# 1 RCA Glossary

Term	Description
<b>Advanced Protection System (APS)</b>	A group of components in the RCA interface architecture responsible for protection of train movement within the RCA AoC.
<b>Application Lifecycle Management (ALM)</b>	Application Lifecycle Management is the product lifecycle management (governance, development, and maintenance) of computer programs and continues after development until the application is no longer used.
<b>Application Programming Interface (API)</b>	In computer programming, an Application Programming Interface is a set of subroutine definitions, communication protocols, and tools for building software.
<b>Area of Control (AoC)</b>	<p>A Track Area where train operations are under the control of one entity and where functionality is provided by one physical system (e.g. an instance of SysRCA). The highest level of Area of Control has a boundary which is a CCS System Border with its neighbours.</p> <p>Areas of Control can be subdivided operationally (for example in a large operations centre where each individual operator has responsibility for a separate Area of Control within the overall Area of Control supervised by that centre).</p> <p>The boundaries of subdivided Areas of Control can change dynamically, for example a single RCA operation manager might control a large region overnight when there is low traffic, while in the day the same region might be split into two or more Areas of Control, each controlled by an individual RCA operation manager.</p>
<b>Automatic Train Operation (ATO)</b>	Automatic Train Operation is an operational enhancement used to help automate operations of trains.
<b>Business Continuity Management (BCM)</b>	The process of creating systems of prevention and recovery to deal with potential threats to a company. In addition to prevention, the goal is to permit ongoing operation, before and during execution of Disaster recovery.
<b>Capacity Object</b>	The Capacity Object is a usage of the capacity to carry out a transport service or a Railway Undertaking offer. A Capacity Object can be a train run, a shunting movement, stabling or a Usage Restriction Area
<b>Capacity Reservation</b>	A Capacity Reservation is needed to be able to produce transport service demanded by an RU. Capacity Reservation can be train run, a shunting movement, stabling.

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<b>Capacity Restriction</b>	The Capacity Restriction is a restriction of the usage of the topology resulting from construction, maintenance or inspection work, as well as special environmental events or disturbances.
<b>Change Control Board (CCB)</b>	A Change Control Board is a committee that consists of Subject Matter Experts and Technical Chiefs, who will make decisions regarding whether or not proposed changes to a software project should be implemented.
<b>Change Request (CR)</b>	A change request is a document containing a call for an adjustment of a system; it is of great importance in the change management process.
<b>Community of European Railway and Infrastructure Companies (CER)</b>	CER's role is to represent the interests of its members on the EU policy-making scene, in particular to support an improved business and regulatory environment for European railway operators and railway infrastructure companies. <a href="http://www.cer.be">www.cer.be</a>
<b>Confidentiality, Integrity and Availability (CIA)</b>	Confidentiality, integrity and availability, also known as the CIA triad, is a model designed to guide policies for information security within an organization. The elements of the triad are considered the three most crucial components of security.
<b>Consortium Management Bureau</b>	The Consortium Management Bureau forms the central core team of the EULYNX consortium and consists of the Technical Lead, Liaising expert and the support staff.
<b>Consortium Management Committee</b>	Organisation group in EULYNX.
<b>Control Command and Signalling (CCS)</b>	All the trackside and on-board equipment required to ensure safety and to command and control movements of trains authorised to travel on the network.
<b>Design Rationale</b>	Explains the reason for a certain design decision
<b>Digitale Schiene Deutschland</b>	Digitale Schiene Deutschland is the German programme for digitalisation of CCS Systems (see also Target 190+, SR40). <a href="https://digitale-schiene-deutschland.de/en">https://digitale-schiene-deutschland.de/en</a>
<b>Driver Machine Interface (DMI)</b>	The interface to enable direct communication between the ERTMS/ETCS on-board equipment and the driver.
<b>ERTMS Users Group (EUG)</b>	The mission of the ERTMS Users Group is to help the railway companies in applying ERTMS/ETCS in a harmonised and interoperable way, to enable the free flow of trains and a competitive railway. <a href="http://www.ertms.be">www.ertms.be</a>

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<b>ETCS Mission</b>	<p>Any train movement started under the supervision of an ERTMS/ ETCS on-board equipment in one the following modes: FS, LS, SR, OS, NL, UN, or SN. The ETCS mission is ended when any of the following modes is entered: SB, SH. A concept used in the ETCS Standard.</p> <p>Source: ETCS Specification Subset-023 v330</p>
<b>EULYNX</b>	<p>EULYNX is an European initiative by 13 Infrastructure Managers to standardise interfaces and elements of the signalling systems. Aiming for defining and standardising interfaces in the future digital control command communication, signalling and automation system, the goal is a significant reduction of the lifecycle cost. A full set of EULYNX specifications was published as Baseline 3 in 2018 and 2019.</p>
<b>European Committee for Electrotechnical Standardization (CENELEC)</b>	<p>CENELEC is the European Committee for Electrotechnical Standardization and is responsible for standardization in the electrotechnical engineering field. <a href="http://www.cenelec.eu">www.cenelec.eu</a> &lt;<a href="http://www.cenelec.eu">http://www.cenelec.eu</a></p>
<b>European Rail Infrastructure Managers (EIM)</b>	<p>The role of EIM is to provide a single voice to represent its members (infrastructure managers vis-à-vis to the relevant European institutions and sector stakeholders. EIM also assists members to develop their businesses through the sharing of experiences and contributing to the technical and safety activities of the Agency (ERA). <a href="http://www.eimrail.org">www.eimrail.org</a></p>
<b>European Rail Traffic Management System (ERTMS)</b>	<p>ERTMS is a single European signalling and speed control system that ensures interoperability of the national railway systems, reducing the purchasing and maintenance costs of the signalling systems as well as increasing the speed of trains, the capacity of infrastructure and the level of safety in rail transport. (from <a href="http://www.era.europa.eu">www.era.europa.eu</a>)</p>
<b>European Train Control System (ETCS)</b>	<p>The European Train Control System is the signaling and control component of the European Rail Traffic Management System (ERTMS). It is a replacement for legacy train protection systems and designed to replace the many incompatible safety systems currently used by European railways. ETCS is specified at four numbered levels (x = 0, 1, 2, 3).</p>
<b>European Union Agency for Railways (ERA)</b>	<p>The European Union Agency for Railways is established to provide the EU Member States and the Commission with technical assistance in the development and implementation of the Single European Railway Area. <a href="http://www.era.europa.eu">www.era.europa.eu</a></p>

Term	Description
<b>European Union Public Licence (EUPL)</b>	The European Union Public Licence is a free software licence that has been created and approved by the European Commission.
<b>European Vital Computer</b>	The European Vital Computer is the heart of local computing capabilities in the driving vehicle. It is connected with external data communication, internal controls to speed regulation of the loco, location sensors and all cab devices of the driver.
<b>Field Element</b>	Field Element is a railway fixed equipment on/or adjacent to track, e.g. Light Signal, Point, Level Crossing.
<b>Flank Protection</b>	Flank protection is the set of measures to prevent a vehicle entering a route reserved by a train, which can be provided by movable elements, in particular points, and to a lesser extent by signals and train detection section.
<b>Form Fit Function Interface Specification (FFFIS)</b>	Form, Fit, and Function is the identification and description of characteristics of a part or assembly. Each defines a specific aspect of the part to help engineers match parts to needs. The FFF framework increases design change flexibility by allowing changes to the part with minimal documentation and design cost as long as the fit, form and function of the product are maintained.
<b>Future Railway Mobile Communication System (FRMCS)</b>	FRMCS is the successor of GSM-R but also a key enabler for rail transport digitalisation, handling voice and data communication. FRMCS has the objective to become the worldwide standard, conforming to European regulation as well as responding to the needs and obligations of rail organisations outside of Europe. As such, the UIC FRMCS project duly associates non-European members and is a first concrete application of UIC strategy to build a Global Rail Traffic Management System for the whole rail industry. <a href="http://www.uic.org/frmcs">www.uic.org/frmcs</a>
<b>Global Navigation Satellite System (GNSS)</b>	Global Navigation Satellite System refers to a constellation of satellites providing signals from space that transmit positioning and timing data to GNSS receivers. The receivers then use this data to determine location.
<b>Global Positioning System (GPS)</b>	The Global Positioning System is a satellite-based radio navigation system owned by the United States government and operated by the United States Air Force. It is a global navigation satellite system that provides geolocation and time information to a GPS receiver anywhere on or near the earth where there is an unobstructed line of sight to four or more GPS satellites.

Term	Description
<b>Global System for Mobile communications - Railway (GSM-R)</b>	GSM-R is an international wireless communications standard for railway communication and applications.
<b>Grade of Automation (GoA)</b>	<p>Grade of Automation refers to the degree of automation in Automatic Train Operation. The list of automatable activities of the driver is divided into 5 categories:</p> <p>GoA 0: No automation, everything is in the hands of the driver.</p> <p>GoA 1: The driver is prevented from unsafe actions (e.g. driving over a signal).</p> <p>GoA 2: The train driver is present, but during the journey a system takes over the speed control or at the station the door control (autopilot).</p> <p>GoA 3: No person is present in the driver's cab, most processes are automated. In situations that are difficult to automate (e.g. driving on sight in the event of faults), manual remote control is provided by the train attendant or the operations centre, for example.</p> <p>GoA 4: All train control processes are automated. Intervention groups only intervene on site in the event of locomotive malfunctions or evacuations.</p>
<b>Hardware</b>	Hardware includes the physical, tangible parts or components of a computer.
<b>Horizon 2020</b>	Horizon 2020 is the financial instrument implementing the Innovation Union, a Europe 2020 flagship initiative aimed at securing Europe's global competitiveness. <a href="https://ec.europa.eu/programmes/horizon2020/en">https://ec.europa.eu/programmes/horizon2020/en</a>
<b>Independent Verification &amp; Validation (IVV)</b>	Independent Verification & Validation is targeted at safety-critical software systems and aims to increase the quality of software products, thereby reducing risks and costs through the operational life of the software. IVV provides assurance that software performs to the specified level of confidence and within its designed parameters and defined requirements.
<b>Institute of Electrical and Electronics Engineers (IEEE)</b>	IEEE is the world's largest technical professional organization dedicated to advancing technology for the benefit of humanity. IEEE and its members inspire a global community through its highly cited publications, conferences, technology standards, and professional and educational activities. <a href="http://www.ieee.org">www.ieee.org</a>

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<b>Intellectual Property Rights</b>	Intellectual property is a category of property that includes intangible creations of the human intellect. Intellectual property encompasses two types of rights; industrial property rights (trademarks, patents, designations of origin, industrial designs and models) and copyright.
<b>Interlocking</b>	In railway signalling, an interlocking is a system composed by a set of signal apparatus that prevents trains from conflicting movements through only allowing trains to receive authority to proceed, when routes have been set, locked and detected in safe combinations.
<b>International Electrotechnical Commission (IEC)</b>	The IEC is the world's leading organization for the preparation and publication of International Standards for all electrical, electronic and related technologies. These are known collectively as "electrotechnology". <a href="http://www.iec.ch">www.iec.ch</a>
<b>International Organization for Standardization (ISO)</b>	ISO is an independent, non-governmental international organization with a membership of 164 national standards bodies. Through its members, it brings together experts to share knowledge and develop voluntary, consensus-based, market relevant International Standards that support innovation and provide solutions to global challenges. <a href="http://www.iso.org">www.iso.org</a>
<b>International Requirements Engineering Board (IREB)</b>	The International Requirements Engineering Board, a non-profit organization, is the provider of the CPRE (Certified Professional for Requirements Engineering) certification scheme. The board consists of leading RE representatives, who come from science, research, industry and consulting.
<b>Life Cycle Cost (LCC)</b>	Life Cycle Cost refers to the total cost of ownership over the life of an asset. Costs considered include the financial cost which is relatively simple to calculate and also the environmental and social costs which are more difficult to quantify and assign numerical values. Typical areas of expenditure which are included in calculating the whole-life cost include planning, design, construction and acquisition, operations, maintenance, renewal and rehabilitation, depreciation and cost of finance and replacement or disposal.
<b>Mean Time to Recovery resp. Repair (MTTR)</b>	Mean Time to Recovery is the average time that a device will take to recover from any failure.
<b>Middleware</b>	Middleware is computer software that provides services to software applications beyond those available from the operating system. It can be described as "software glue".



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<b>Model Based Systems Engineering (MBSE)</b>	Model-Based Systems Engineering is a systems engineering methodology that focuses on creating and exploiting domain models as the primary means of information exchange between engineers, rather than on document-based information exchange. MBSE begins in the conceptual design phase and continues throughout development and later life cycle phases.
<b>National Safety Authority</b>	Authority for authorisation of CCS components and systems.
<b>Non Functional Requirement (NFR)</b>	In systems engineering and requirements engineering, a Non Functional Requirement is a requirement that specifies quality criteria that can be used to judge how well a system performs, rather than if it provides specific functional behaviors.
<b>Object</b>	An Object is an abstract, logical representation of one or several Devices.
<b>On Board Unit (OBU)</b>	Equipment to control train operation and safety which interacts with RCA System located on board of the vehicle.
<b>Open CCS Onboard Reference Architecture (OCORA)</b>	European initiative to define the CCS vehicle architecture.
<b>Operating System</b>	An Operating System is system software that manages computer hardware and software resources and provides common services for computer programs.
<b>Operation Point</b>	Infrastructure elements such as railway stations. In TAF/TAP Operation Points are called locations
<b>Platform of Rail Infrastructure Managers in Europe (PRIME)</b>	PRIME was established between DG MOVE and Infrastructure Managers at the end of 2013 with the objective to improve the cooperation of rail infrastructure managers across borders, support implementation of Europe-an rail policy and develop performance benchmarking for the exchange of best practices.
<b>Point (P)</b>	A junction of two railway lines that can be set to guide a train onto one of two alternative routes, or allow two lines to merge into one.
<b>Radio Block Centre (RBC)</b>	A centralised safety unit that receives train position information via radio and sends movement authorities via radio to trains.
<b>Railway Undertaking (RU)</b>	Any public or private undertaking which is authorized to provide services for the transport of goods and/or passengers by rail.

Term	Description
<b>Reference CCS Architecture (RCA)</b>	Reference CCS architecture is an initiative by the members of EUG and EULYNX to define a harmonised architecture for the future railway CCS, with the main goal to substantially increase the performance/TCO ratio of CCS in comparison with today's implementations.
<b>Reliability, Availability, Maintainability (and Safety) (RAMS)</b>	RAMS constitutes the key element of the assessment in the rail industry today. For rail system operator, RAMS means a safe, reliable, high-quality service and lower operating and maintenance costs. For the rail system provider, RAMS is representing a high-quality system and product.
<b>Research and Development</b>	Research and Development refers to the work a business conducts for the innovation, introduction and improvement of its products and procedures. It is a series of investigative activities to improve existing products and procedures or to lead to the development of new products and procedures.
<b>Safety Integrity Level (SIL)</b>	Safety Integrity Level is defined as a relative level of risk reduction provided by a safety function, or to specify a target level of risk reduction. In simple terms, Safety Integrity Level is a measurement of performance required for a safety instrumented function. The Safety Integrity Levels are defined in the European norm EN 50128. The norm defines four levels of safety (1-4) in which 4 is the level with the highest requirements.
<b>Shift2Rail</b>	Shift2Rail is a European initiative which fosters the introduction of better trains to the market (quieter, more comfortable, more dependable, etc.), which operate on an innovative rail network infrastructure reliably from the first day of service introduction, at a lower Life Cycle Cost, with more capacity to cope with growing passenger and freight mobility demand.
<b>smartrail 4.0</b>	With the smartrail 4.0 programme, the Swiss railway industry is harnessing digitalisation and the potential of new technologies to further increase capacity and safety, make more efficient use of railway infrastructure, save costs and thus maintain the railway's competitiveness in the longer term. <a href="http://www.smartrail40.ch">www.smartrail40.ch</a>
<b>Software</b>	Software is a collection of data or computer instructions that tell the computer how to work. Software includes computer programs, libraries and related non-executable data, such as online documentation or digital media.

Term	Description
<b>Systems Modeling Language (SysML)</b>	The Systems Modeling Language is a general purpose architecture modeling language for systems engineering applications. Systems Modeling Language supports the specification, analysis, design, verification and validation of a broad range of systems and systems-of-systems. These systems may include hardware, software, information, processes, personnel, and facilities. <a href="http://www.sysml.org">www.sysml.org</a>
<b>Target 190+</b>	Target 190+ is the name of the British programme for digitalisation of CCS System (see DSD, SR40). <a href="https://www.networkrail.co.uk/industry-and-commercial/research-development-and-technology/research-and-development-programme/target-190plus-sustainable-signalling-renewals/">https://www.networkrail.co.uk/industry-and-commercial/research-development-and-technology/research-and-development-programme/target-190plus-sustainable-signalling-renewals/</a>
<b>Technical Specification for Interoperability (TSI)</b>	The Technical Specification for Interoperability are specifications drafted by the European Railway Agency and adopted in a decision by the European Commission, to ensure the interoperability of the trans-European rail system. The interoperability issues apply to the lines within the Trans-European Rail network.
<b>Total Cost of Ownership (TCO)</b>	Total Cost of Ownership is a financial estimate intended to help buyers and owners determine the direct and indirect costs of a product or system. It is a management accounting concept that can be used in full cost accounting or even ecological economics where it includes social costs.
<b>Traffic Management System (TMS)</b>	Traffic Management System is part of the planning system and provides permanent control across the network, automatically plans the movement of trains and logs train movements as well as detects and solves potential operational conflicts.
<b>Train Integrity Monitoring System (TIMS)</b>	System to monitor and confirm train integrity.
<b>Union des Industries Ferroviaires Européennes (UNIFE)</b>	Union des Industries Ferroviaires Européennes is representing the European rail manufacturing industry. Union des Industries Ferroviaires Européennes' purpose is to represent its members' interests at international and EU level. The mission of the association is to proactively foster an environment where its members can provide competitive railway systems for the growing demand for rail transport. <a href="http://www.unife.org">www.unife.org</a>
<b>Union Industry of Signaling (UNISIG)</b>	Union Industry of Signaling is a working group of UNIFE with the goal to create the ERTMS/ETCS specifications.

Term	Description
<b>Union Internationale des Chemins de fer or International Union of Railways (UIC)</b>	The worldwide railway organisation. <a href="http://www.uic.org">www.uic.org</a>
<b>Unique Selling Proposition</b>	A Unique Selling Proposition refers to the unique benefit exhibited by a company, service, product or brand that enables it to stand out from competitors. The Unique Selling Proposition must be a feature that highlights product benefits that are meaningful to consumers.
<b>Verification and Validation</b>	Verification and validation are independent procedures that are used together for checking that a product, service, or system meets requirements and specifications and that it fulfills its intended purpose.