

Moving Europe towards a sustainable and
safe railway system without frontiers.

Light Impact Assessment

2022 Revision of the CCS TSI

June 2022

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1. Context and problem definition			
1.1. Problem and problem drivers			
<p>Within the context of the 2022 revision of the Technical Specifications for Interoperability ('TSI'), a package of legislative actions aimed at updating the framework for rail interoperability, the Agency is addressing a substantial number of change requests ('CRs') relevant for the Control Command Signalling TSI ('CCS TSI'). The review process is in line with Commission Delegated Decision (EU) 2017/1474.</p> <p>The main problem to be analysed in this impact assessment is a recommendation by the Agency as per Art. 5 of Directive (EU) 2016/797 aimed at amending Commission Regulation (EU) 2016/919 and related following amending regulations for the CCS TSI. The CRs considered in this impact assessment are enhancements which touch multiple aspects of the ERTMS and a new process for error corrections in the ERTMS specifications. A generic assessment of each CR is provided in Annex 1 using a table that allows readers to have an overall summary of the CRs and of their envisaged benefits. All CRs part of the 2022 revision of the CCS TSI are included in this IA. CRs referring to error corrections in the ERTMS specifications or being of minor nature have not been included in this impact assessment, however the process to deal with corrections of errors within ERTMS specifications was within the scope of this IA. Also CR 262/275 on 'ETCS Trackside and on-board deployment requirements' is not included in this IA since they have been assessed separately by a report commissioned to the ERTMS Deployment Management Team by the DG MOVE.</p>			
1.2. Evidence of the problem			
<p>Evidence of the problem is provided by the details submitted by requestors of the CRs in the ERA's CCM Clearquest database https://ccm.era.europa.eu/cqweb/. Each CR has unique identifiers and the full set of information about description, field of application, requestor, etc. can be easily retrieved from the database.</p>			
1.3. Baseline scenario			
<p>The baseline scenario is the current version of the CCS TSI Regulation (EU Regulation 2016/919 including amendments) which does not consider the proposed innovations brought by the batch of CRs under analysis.</p>			
1.4. Main assumptions			
<p>For all CRs in scope, this impact assessment is based on the information provided by requestors in terms of context and description of the benefits and on Agency's staff expert opinion with regards to the magnitude of the impacts the CRs may generate and the relevant transition regimes if applicable. Details are available in Annex.</p>			
1.5. Stakeholders affected			
Railway undertakings (RU)	<input checked="" type="checkbox"/>	Member States (MS)	<input checked="" type="checkbox"/>
Infrastructure managers (IM)	<input checked="" type="checkbox"/>	Third Countries (TC)	<input type="checkbox"/>
Suppliers (SU)	<input checked="" type="checkbox"/>	National safety authorities (NSA)	<input checked="" type="checkbox"/>
Keepers (KE)	<input checked="" type="checkbox"/>	European Commission (EC)	<input type="checkbox"/>
Entity Managing the Change (EMC)	<input checked="" type="checkbox"/>	European Union Agency for Railways (ERA)	<input checked="" type="checkbox"/>
Notified Bodies (NoBo)	<input checked="" type="checkbox"/>	Citizens living nearby railway tracks	<input type="checkbox"/>

Associations (AS)	<input type="checkbox"/>	Persons with reduced mobility (PRM)	<input type="checkbox"/>
Shippers (SH)	<input type="checkbox"/>	Passengers (PAX)	<input type="checkbox"/>
Assessment Bodies (AsBo)	<input checked="" type="checkbox"/>	Travel agents / tour operators (B2C)	<input type="checkbox"/>

The traditional rail stakeholders involved in CCS TSI will be affected. More specifically, suppliers are rather identified as the providers of ETCS products, software, components, Interoperability Constituents (IC) and services used in CCS.

The geographical scope is the entire EU rail industry within the scope of the CCS TSI Regulation as part of the Single European Railway Area (SERA).

Keepers and Entities in charge of maintenance might be impacted. Such impacts are reflected under the impacts assessed for RUs.

1.6. Subsidiarity and proportionality

This revision of the CCS TSI is in application of Commission Delegated Decision (EU) 2017/1474 which mandates action at EU level. The revision envisaged is a recurrent process for the integrity of the legal framework and for compliance with the latest EU legislation. EU action is recommended in order to ensure uniform application of the CCS TSI across the Union.

2. Objectives

2.1. Specific objectives

Among others, the specific objectives of the CCS TSI 2022 revision assessed in this report relate to:

- *A new process for tackling errors in the ERTMS specifications;*
- *A number of more minor enhancements easy to integrate and considered add-ons for the further optimization of ERTMS;*
- *A few major enhancements in order to make ERTMS more performing, up-to-date and ready for future innovations such as Automatic Train Operation (ATO).*

The main reasons to introduce enhancements through a new revision package are:

- *ATO GoA1/2, avoiding multiple national ATO systems being developed for ERTMS;*

The minor enhancements are added to further optimize the ETCS system as these enhancements can be incorporated as part of the package, however they are not expected to justify a new ETCS system version.

3. Options

3.1. List of options

Option 0 (Baseline) is the current CCS TSI in force. Besides the baseline scenario, only one option can be considered which is the implementation of the full set of CRs in scope. In fact, besides the process for error corrections, the CRs in scope of this impact assessment only relate to enhancements. No other options have been assessed given that the set of CRs is to be seen as a package covering diverse areas of the ERTMS system.

4. Impacts of the options			
4.1. Qualitative analysis			
Stakeholder assessment			
<p>As described in 3.1, Option 0 (Baseline) is the as-is situation of not implementing the batch of CRs in scope of this IA. Option 1 is the only alternative option analysed and below a general qualitative non-exhaustive description of impacts is available in order to provide an overview of the impact per stakeholder for implementing the CRs. The impacts on different category of stakeholders are broken down as Option 1.1, through a table listing impacts from the proposed new process for error corrections implementation, and as Option 1.2, through a table listing impacts from the proposed enhancements. Further details on the CRs and especially of the benefits envisaged (when available) for each CR are presented in Annex 1¹.</p>			
<i>Option 0 (Baseline)</i>			
<i>Category of stakeholder</i>	<i>Impact type</i>	<i>Description</i>	<i>Overall Impact</i>
RU	Positive	RU has gained sufficient experience and knowledge to apply the existing legal framework. No additional efforts to get used to a new legal framework	Neutral
	Negative	Sub-optimal operations due to lack of system enhancements, costs of adaptation of ERTMS systems to future innovations and IMs-led sudden introduction of new/optional functions	
IM	Positive	IM has gained sufficient experience and knowledge to apply the existing legal framework. No additional efforts to get used to a new legal framework	Neutral
	Negative	Sub-optimal operations due to lack of system enhancements, less interoperable networks resulting in less attractiveness of new traffic flows, high costs of adaptation of ERTMS systems to future innovations,	
SU	Positive	SU has gained sufficient experience and knowledge to apply the existing legal framework. No additional efforts to get used to a new legal framework	Neutral
	Negative	Low uptake of innovations by RUs/IMs,	
NoBo	Positive	NoBo has gained sufficient experience and knowledge to apply the existing legal framework. No additional efforts to get used to a new legal framework	Neutral
	Negative	N/A	
AsBo	Positive	AsBo has gained sufficient experience and knowledge to apply the existing legal framework. No additional efforts to get used to a new legal framework	Neutral
	Negative	N/A	
MS	Positive	MS has gained sufficient experience and knowledge to apply the existing legal framework. No additional efforts to get used to a new legal framework	Neutral
	Negative	N/A	

¹ The status of some CRs is marked as ‘ongoing’ given that at the time of drafting of this report discussions within the CCS WP were not yet finalized.

NSA	Positive	NSA has gained sufficient experience and knowledge to apply the existing legal framework. No additional efforts to get used to a new legal framework	Neutral
	Negative	N/A	
ERA	Positive	ERA has gained sufficient experience and knowledge to apply the existing legal framework. No additional efforts to get used to a new legal framework	Neutral
	Negative	N/A	

Option 1.1 new process for error corrections implementation

<i>Category of stakeholder</i>	<i>Impact type</i>	<i>Description</i>	<i>Overall Impact</i>
RU	Positive	One common solution for corrections of specification errors valid for the complete European network instead of individually agreed solutions between IM, RU and supplier for each location where the specification errors causes an interoperability issue in an existing ERTMS implementation. For locally operating RUs the impact is rather neutral or negative whereas for long distance operating or crossborder operating RUs the impact is more positive.	Rather positive
	Negative	Establishment of a maintenance process to debug existing ETCS installations with regards to specification errors. (e.g. for error correction fixed at trackside)	
IM	Positive	European harmonised implementation framework for corrections of specification errors, avoidance of potential trackside mitigation measures where errors are fixed at on-board level.	Rather positive
	Negative	Establishment of a maintenance process to debug existing ETCS installations with regards to specification errors. (e.g. for error correction fixed at trackside)	
SU	Positive	N/A	Rather negative
	Negative	Establishment of a maintenance process to debug products with regards to specification errors.	
NoBo	Positive	N/A	Neutral
	Negative	N/A	
AsBo	Positive	N/A	Neutral
	Negative	N/A	
MS	Positive	N/A	Neutral
	Negative	N/A	
NSA	Positive	N/A	Neutral
	Negative	N/A	
ERA	Positive	N/A	Neutral

	Negative	N/A	
<i>Option 1.2 new enhancements</i>			
<i>Category of stakeholder</i>	<i>Impact type</i>	<i>Description</i>	<i>Overall Impact</i>
RU	Positive	Implementation of enhancements, higher degree of interoperability of fleets and networks allowing potential for new business, reduced costs of adaptation of ERTMS systems for future innovations and protection of on-going projects thanks to a fair transition and migration scheme, progressive standardisation of products leading to lower costs for equipment. Innovations introduced based on a single European harmonised solution avoiding different national solutions for ATO hence avoiding multiple different class-B ATO systems. The fair and migration scheme also includes that RUs will be guaranteed by a enhanced mediator role of the MS which should balance and coordinate RU/IM needs.	Very positive
	Negative	Less business freedom in implementing or not implementing IM-led new/optional functions and enhancements of the system.	
IM	Positive	Implementation of enhancements, higher degree of interoperability of networks resulting in potential for new traffic, reduced costs of adaptation of ERTMS systems for future innovations, guarantee of implementation of new technologies/functions by RUs for the on-board part within a set timeframe following IMs' notification. Innovations introduced based on a single European harmonised solution avoiding different national solutions for ATO hence incentivising a truly single market with overall lower costs.	Rather positive
	Negative	Less opportunities to introduce at any time new/optional functions resulting in OPEX savings and higher capacity. IMs will therefore have to respect the set of interoperability specifications without implementing specific national functions which could optimise locally the national IM specific business case.	
SU	Positive	Preparatory actions to ease the uptake of new technologies by IMs/RUs, innovations based on a single European harmonised solution avoiding different national solutions for ATO. One-off development costs will therefore be significantly lowered.	Neutral
	Negative	Product development costs	
NoBo	Positive	N/A	Neutral
	Negative	N/A	
AsBo	Positive	N/A	Neutral
	Negative	N/A	
MS	Positive	N/A	Neutral
	Negative	N/A	
NSA	Positive	N/A	Neutral
	Negative	N/A	
ERA	Positive	N/A	Neutral
	Negative	N/A	
<i>Railway system assessment</i>			

The following table provides a quick overview of the impact of the options in key aspects for rail safety and interoperability.

	<i>Option 0 (baseline)</i>	<i>Option 1</i>
<i>Safety</i>	Neutral	Neutral
<i>Interoperability</i>	Neutral	Rather high
<i>Market access</i>	Neutral	Neutral
<i>Competitiveness</i>	Neutral	Rather high
<i>Innovation</i>	Neutral	Rather high

Coherency assessment

The coherence of options vis-à-vis the wider legal framework is to be considered especially with regards to EU legal requirements for rail system interoperability and ERTMS deployment resulting from the TEN-T Regulation (EU) 1315/2013, which is about to be amended, and the ERTMS European Deployment Plan.

	<i>Option 0 (baseline)</i>	<i>Option 1</i>
<i>Coherence</i>	Neutral	Neutral

Cost assessment

At current stage, a cost assessment for the complete set of CRs in scope of this report is not possible. For few CR costs impacts are available while for others a qualitative assessment of the degree of complexity for implementing CR is provided. In any case, a transition and migration scheme will be introduced to keep costs for on-going projects to a minimum and provide a timeframe for implementation of the CRs.

5. Comparison of options and preferred option

5.1. Comparison of options

Below a quick comparison of the options with impact on the key stakeholders as noted in 4. above is provided.

	<i>Option 0 (baseline)</i>					<i>Option 1 (1.1+1.2)</i>				
<i>Stakeholder impact</i>	RU	IM	SU	ERA	NSA	RU	IM	SU	ERA	NSA
<i>Effectiveness</i>	Neutral					Rather high				
<i>Coherence (optional)</i>	Neutral					Neutral				
<i>NPV (optional)</i>	N/A					N/A				
<i>B/C ratio (optional)</i>	N/A					N/A				

Colour legend

	Very low/neg.	Rather low/neg.	Neutral	Rather high/pos.	Very high/pos.
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5.2. Preferred option

Option 1 is the preferred option and it is recommended to adopt the entire batch of CRs in scope. Even if taken individually certain CRs may entail certain extra costs in the short run for some stakeholder groups, the railway system will overall benefit from the adoption of the CRs in the revised CCS TSI. Most importantly, a fair transition and migration scheme will be implemented thus increasing legal certainty and providing a clear timeframe allowing stakeholders to adapt their processes, procedures and investments.

5.3. Risk assessment

This light impact assessment is not based on primary or secondary data but on desk research and expert opinion. For certain CRs the assessment of potential impacts, costs and benefits has been based only on partial and not peer-reviewed evidence and inputs provided by CR requestors and by the consortium of ERTMS suppliers UNISIG.

6. Monitoring and evaluation

6.1. Monitoring indicators

Some possible indicators that could be considered include:

- Number of track-km equipped with ATO GoA1/2; new ETCS system versions deployed on ERTMS equipped lines in the period [2025-2035];
- Number of vehicles equipped with ATO GoA1/2; new ETCS system versions deployed on vehicles in the period [2025-2035];
- Upgrade on-board costs for implementation of ATO GoA1/2 and new ETCS system versions;

6.2. Future evaluations

No evaluations are planned for the time being.

7. Sources and methodology

6.1. Sources

Desk research	<input checked="" type="checkbox"/>	Interviews	<input type="checkbox"/>
ERA database	<input checked="" type="checkbox"/>	Meetings (*)	<input checked="" type="checkbox"/>
External database	<input type="checkbox"/>	Survey	<input type="checkbox"/>

Sources used for this IA included the ERA’s CCM Clearquest database where submitters of CRs provided a description of issues and benefits as well as meetings with ERA experts that provided further details on benefits and scope of impacts of CRs.

(*) ERA WP meetings, no bilateral meetings with specific stakeholders took place.

6.2. Methodology

Given the very large scope of the CRs, an overall assessment of impacts is a difficult exercise while at the same time a detailed analysis of CRs in individual impact assessments would generate an unnecessary burden with likely very long timing to complete all relevant impact assessments, undermining a timely delivery of the Agency recommendation for the revision of the CCS TSI. Therefore this impact assessment is covering in its scope the entire batch of CRs related to enhancements and relevant for the 2022 revision of the CCS TSI. For this reason, compared to the standard template, a slightly simplified structure for the IA has been used but details per CR, especially on the benefits envisaged, are available in Annex 1.

Annex 1. Summary of Change Requests and costs/benefits envisaged

CR Number/ grouping of CRs	CR status	Title	Description	Operational and geographical scope	Costs impact envisaged	Benefits envisaged
257, 263		Error correction and specification maintenance	<p>The current legal framework does not mandate the implementation of corrections of specification errors. IMs and RUs are faced with the challenge that ETCS equipment suppliers do not offer reasonable supply or maintenance contracts inclusive of provisions for error corrections and compatibility issues. Instead, IMs and RUs incur ad hoc costs to correct errors. This is considered a market failure to be addressed. However, it is worth noting that this situation is less severe with Baseline 3 since error corrections for those products are less frequent and impactful.</p> <p>Moreover, the ERA technical opinions published according to Art. 10 of Regulation (EU) 2016/796 are not legally binding. This situation might lead to the implementation of temporary mitigation measures which limit the initial intended performance of ERTMS trackside implementation. In addition, there is a risk of uncertainty and disagreement between IMs and RUs on who should take action, being the IMs by implementing temporary mitigation measures or jointly RUs/IMs by implementing the corrections of specifications errors. To-date, the advisory and cooperation role for the Agency foreseen in Art. 30 of Regulation (EU) 2016/796 has been used to a limited extent.</p> <p>This CR will provide:</p> <p>1) A maximum timeframe between IM and RUs for the implementation of error corrections impacting normal service on new and existing vehicle projects.</p> <p>2) A guaranteed timeframe for suppliers to provide ERTMS Interoperability Constituents which have implemented the error corrections at IC-level.</p>	<p>All ops and services, on-board and trackside across SERA</p> <p>For existing vehicles, limited to concerned vehicles in their area of use if operation is impacted by the specification error.</p>	Establishment of a maintenance process to debug existing ETCS installations/products with regards to specification errors. (e.g. for error correction fixed at trackside)	<p>RU:</p> <p>One common solution for corrections of specification errors valid for the complete European network instead of individually agreed solutions between IM, RU and supplier for each location where the specification errors causes an interoperability issue in an existing ERTMS implementation.</p> <p>For locally operating RUs the impact is rather neutral or negative whereas for long distance operating or crossborder operating RUs the impact is more positive.</p> <p>IM:</p> <p>European harmonised implementation framework for corrections of specification errors, avoidance of potential trackside mitigation measures where errors are fixed at on-board level.</p>

CR Number/ grouping of CRs	CR status	Title	Description	Operational and geographical scope	Costs impact envisaged	Benefits envisaged
236, 252, 254, 256, 259, 262		Addition of new functionalities & enhancements	<p>ETCS allows the addition of new functions however the current CCS TSI does not provide mandatory requirements to be respected when new functions and/or enhancement are implemented. For instance, when Baseline 3 was available there was no mandatory timeframe to require operators, especially RUs, to adapt their equipment. Usually the addition of new functions generate a positive business case for the rail system as a whole but the implementation by individual stakeholders (IMs / RUs) can be influenced by a different preferred timeframe for the relevant investments to be done. This misalignment and the current lack of mandatory requirements can generate important costs and inefficiencies. In other cases, IMs have imposed new functionalities/enhancement without allowing a sufficiently long timeframe for the RUs to undertake the necessary adaptations in a cost efficient manner. In the future, other major investments by IMs for example on the new radio system FRMCS could be jeopardized if RUs are not ready with their on-board equipment to switch off the GSM-R.</p> <p>This CR will provide:</p> <ol style="list-style-type: none"> 1) A new responsibility for the Member States to balance IMs and RUs interests within the National Implementation Plans 2) A guaranteed 7-years compatibility timeframe before new functions can becoming mandatory on-board requirements on existing vehicles 3) A minimum 5-years notice for IMs to introduce new functions and enhancements 	All ops and services, on-board and track-side SERA	<p>The MS authorities will face an additional administrative burden to develop their National Implementation Plans but especially the cost of coordinating IMs and RUs interests which can be sometimes conflicting especially with regards to implementation timeframes for new functions and enhancements. It cannot be excluded that MS may face also direct costs to compensate for possible extra one-off costs by IMs / RUs when investing to adapt their equipment to new functions/enhancements.</p> <p>The guaranteed timeframe for implementation, not allowing freedom of investment planning and potentially very short timing for implementation, may generate extra costs in the short-term for those stakeholders, especially IMs, which aim to lower their OPEX or increase revenues or service quality thanks to new functions and enhancements. However, a too quick and unbalanced implementation can generate extra costs for the rail system as a whole putting at stake the profitability of certain players or the competitiveness of rail vs other transport modes.</p>	<ol style="list-style-type: none"> 1) The new responsibility for Member States to balance IMs/RUs interests will allow that a third party, the national authorities, will take charge of the planning and of the impacts of new functions and enhancements on rail sector stakeholders. This is particularly important for the introduction of innovations in unbundled rail systems. <p>The guaranteed 7-years timeframe and 5-years notice for implementing new incompatible functions and enhancements has been based on the findings of a study commissioned by ERA in 2016 (Study on migration of Railway radio communication system from GSM-R to other solutions). These timeframes will allow:</p> <ol style="list-style-type: none"> 2) A guaranteed time period sufficiently long in order to plan investments and protect on-going investments from sudden new requirements in terms of functionalities and enhancements and to allow a fair migration path 3) A guarantee for IMs that compatible new functions will be implemented on new vehicle projects, this is particularly important for ATO and ETCS system version 2.2
263, 256		Specification management (single set of specifications)	The current CCS TSI does not differentiate between maintenance of specifications linked to existing functions (error corrections) and introduction of new functions (enhancements). This CR is required to allow the implementation of CR 257/263 (error correction) and CR 256 (addition of new functionalities).	All ops and services, on-board and track-side SERA	It will impact the product development process of suppliers	It is a prerequisite to manage error in the specifications and to integrate enhancements

CR Number/ grouping of CRs	CR status	Title	Description	Operational and geographical scope	Costs impact envisaged	Benefits envisaged
257		Partial fulfilment	<p>The current CCS TSI contains a clause allowing partial fulfilment of CCS TSI requirements. This was provided in order to cope with the past situation where not fully compliant products were capable of work with specific trackside configurations, where some functionalities were not used on the infrastructure. That situation allowed the first deployment to be installed ensuring a partial compatibility between on-board and trackside, requiring a specific analysis of the track/train interactions.</p> <p>NSA FR provided some examples of non-compliances (specific Start of Mission products, trains only accepting specific trackside engineering of the ETCS variables or modes). The Agency is also finding many VA applications where some mandatory functions are excluded from the design phase of the products, like GPRS or on-line key management.</p> <p>In the current context where full network developments on the trackside are being performed by several Member States and with the increase in international operations, the partial compatibility between on-board and trackside is a technical barrier for the interoperability of the Union rail system.</p> <p>In the CCS TSI 2022 revision the clauses on partial fulfilment will be removed, with a defined transition period, allowing existing products to be evolved to one of the functional envelopes of system version defined in the single set of specifications.</p> <p>In order not to lose transparency, the template for recording the restrictions and conditions for use currently in the application guide, will be mandated as an appendix of the CCS TSI.</p>	<p>All ops and services, on-board and trackside</p> <p>SERA</p>	<p>Suppliers currently not providing fully TSI-compliant products will face certain additional initial costs to provide fully compliant OBUs.</p>	<p>All onboard products will work EU-wide and are not customised for a very specific area of use.</p> <p>No additional assessments are necessary if the area of use of the vehicle is extended to newly built ETCS lines. Such assessments would be required in case of partial fulfilment.</p>

CR Number/ grouping of CRs	CR status	Title	Description	Operational and geographical scope	Costs impact envisaged	Benefits envisaged
258		ESC/RSC Rex	The concept of ESC/RSC were introduced in the Regulation (EU) 2019/776 as a mean to demonstrate technical compatibility between the on-board and trackside subsystems at network and route level. In the CCS TSI 2022 revision the existing return of experience has been analysed. Clarifications and improvements to the current legal text are proposed in order to better define the cases where a new authorisation is needed, due to use of new functions for which the technical compatibility with the network was not fully demonstrated. Also, the responsibilities from each actor are clarified and it is better defined the scope of the NoBo assessment required at IC and Subsystem levels.	All ops and services, on-board and trackside SERA	No impact on the system itself.	No impact on the system itself. Increase of the transparency on the requirements for demonstrating technical compatibility with the network.
262		Class B deployment and interface	The current situation about the availability of STM or independent Class B system to interface with Class A equipment has been analysed, since it has been reported as a main barrier for the entrance of new operators to the infrastructure. Also different options regarding the possible interfaces between Class A and Class B systems have been analysed considering broader solutions than the STM interface defined in the TSI. The revised proposal for the CCS TSI 2022 revision targets to cover the well proven solutions already available in the market as well as ensuring the possibility to interface Class A with Class B systems in an open and non-discriminatory way.	All ops and services, on-board SERA	No impact on the system itself.	No impact on the system itself.
175, 193, 194, 195, 196, 197, 198, 199, 272, 1246, 1422	1422 on-going	Train modular architecture	Specific internal on-board interfaces are developed to further increase interchangeability of the ETCS On-Board Interoperability Constituents when adding ATO or FRMCS and to decouple the TDS and ETCS on-board IC. This CR will mandate specific on-board OB design to favour CCS integration and modularity into vehicles.	All ops and services, on-board SERA	1) Those suppliers having MVB/CAN-based CCS common bus will be required to invest in Ethernet-based CCS common bus in order to adapt their products to such more advanced type of buses. However, such costs will be faced only when integrating ATO or FRMCS which are Ethernet-based technologies.	1) Incentive to further develop the single market by requiring the mandatory application of specific internal interfaces and the use of an Ethernet-based platform 2) The newly mandated specific on-board design is compliant with the fair migration and transition concept and applicable only on newly developed vehicle design thus protecting investments in existing projects. 3) The integration of future CCS on-board interoperability constituents will be easier since

CR Number/ grouping of CRs	CR status	Title	Description	Operational and geographical scope	Costs impact envisaged	Benefits envisaged
						based on similar Ethernet-based platforms. 4) RUs will be faced with less adaptation/integration costs and lower complexity bringing a potential reduction in costs and system failures and an increase in the overall quality of products.
968	On-going	Session establishment failure	Increase of performance in specific degraded situation avoiding a deadlock scenario. It is expected that the occurrence of this specific degraded situation is rare, however the negative operational impact is high. The proposed solution is considered of a medium impact.	All ops and services, on-board and track-side SERA	Low	1) Performance can be increased thanks to less intermittent failures for ETCS L2 transitions. A stakeholder quantified this in a potential saving of about 30 MEUR/year.
988	On-going	Insufficient specification regarding Big Metal Mass (BMM)	Decrease of costs by making the specifications of Big Metal Masses less stringent.	All ops and services, track-side SERA	Low	1) Higher flexibility in planning of balise location - thus reduced planning costs for trackside. 2) Less unnecessary restrictions for planning of balises in large areas and near metallic objects located in or around the rails. 3) Less risk of recurrent alarms and train stops in case of decision to install balises in these areas or to omit announcement balises.
1174	On-going	Train interface FFFIS	This CR will harmonise the train and ETCS on-board interface.	All ops and services, on-board SERA	One-off development cost for newly built vehicle types	Higher standardisation allowing to facilitate the integration of RST with ETCS on-board.
1238		ATO	This CR will allow an interoperable solution for Automatic Train Operation (ATO) with automation grade 2. That means that the train will be able to run autonomously while the driver is present in the cabin to cover specific processes such as start of mission or driving in degraded situations.	Optional compatible enhancement, on-board and track-side SERA	It is expected that the implementation of this CR, impacting software, will generate a sizeable degree of cost due to the workload related.	1) Higher capacity also in view of L3 operations 2) More efficient braking 3) Lower energy consumption
1240		Attack from unlinked balise	This CR will implement certain technical measures in order to protect the rail system from cyber attacks.	All ops and services, track-side SERA	It is expected that the implementation of this CR, impacting software only.	Increased security in specific scenarios using unlinked balises.

CR Number/ grouping of CRs	CR status	Title	Description	Operational and geographical scope	Costs impact envisaged	Benefits envisaged
1244	On-going	PBD functional needs	This CR will address radio holes on secondary lines.	All ops and services, on-board and track-side Mostly Germany	Low	Less delays and higher performance on secondary lines, especially in Germany, in case of radio holes.
1302	On-going	SB feedback for multiple targets	This CR is about software algorithm to include service brake feedback.	All ops and services, track-side Mostly Sweden, service brake feedback is not used in other networks.	Low	Higher performance and reliability thanks to a reduction of unintended emergency breaking intervention (due for example to flat wheels) .
1344	On-going	Braking curve enhancement	This CR will optimise the time considered by the software algorithm for the activation of the train brakes (brake build up time) for those speed targets other than zero. Moreover, for the calculation of the braking curves the feedback status of the service brake will be considered depending on speed and distance.	All ops and services, on-board SERA	It is expected that the implementation of this CR, impacting software, will generate a sizeable degree of cost due to the workload related.	Higher performance thanks to optimised brake model in some specific scenarios.
1346		Radio remote control shunting under ETCS	This CR will allow radio remote shunting.	All ops and services during shunting, track-side and on-board SERA	Low	Higher performance during shunting operations.
1357		Eurobalise for Three-Rail tracks	This CR will allow a lower number of balises to deploy ETCS in three rail tracks sections.	All ops and services, track-side Spain, this CR is related to the non-standard Iberian gauge	Low	Lower CAPEX thanks to a reduced number of balises required in three rail tracks sections.
1359	On-going	Evolution of the interface between signalling applications	This CR will prepare ETCS to be FRMCS-ready once the new radio system will be deployed.	All ops and services, on-board SERA	Low	Setting of interface well in advance in order to mitigate costs during FRMCS deployment.

CR Number/ grouping of CRs	CR status	Title	Description	Operational and geographical scope	Costs impact envisaged	Benefits envisaged
		(ETCS and ATO) and the radio communication system on-board				
1363	On-going	ETCS L3 Standstill Report to trackside	This CR will address trains at standstill and increase slightly the performance with some seconds in specific 'standstill' scenarios	All ops and services, track-side SERA	Low	Higher performance of the infrastructure when trains are at standstill thanks to time savings.
1366	On-going	Text message as RRI at RBC-RBC handovers	This CR will enable a harmonization of message exchanges across borders when changes in traffic planning occur.	All ops and services, track-side SERA	Low	Higher performance thanks to better communication between RBC across border allowing better re-planning of traffic.
1367, 1350	On-going	Cab anywhere supervision		All ops and freight services during coupling/uncoupling, on-board and track-side SERA	It is expected that the implementation of this CR, impacting software, will generate a sizeable degree of cost due to the workload related.	<ul style="list-style-type: none"> 1) Higher capacity on dense lines 2) Decrease in energy consumption / travel time thanks to driver style 3) Avoiding different ATO systems across the EU 4) Increase of safety during shunting movements by applying the concept of Movement Authority 5) Improved interoperability and cost savings thanks to the reduction of shunting signals as well as other signals and reduce, where possible, the number of signal boards 6) Enabler for Level 3 shunting movements, i.e. providing complete train position information to allow infrastructure to be released in rear of the train
1370		Relocation without linking	This CR allows a specific L1 LS implementation mainly on the Swiss/German network. It allows a simple L1 LS trackside engineering. Without this CR, it could lead to an unsafe behaviour of the on-board in specific conditions or to some performance loss. Today, this CR is linked to (not agreed) NTRs on the Swiss and German network. In order to make the L1 LS implementations compliant to B3 specifications, it would generate significant trackside costs (> 100 MEUR), therefore it is considered to solve the issue by an on-board software modification to handle these specific conditions. It is considered as non-compatible as it will be needed to	All ops and services, track-side Mostly Switzerland and Germany	It is expected that the implementation of this CR, impacting software, will generate a sizeable degree of cost due to the workload related.	Reduced trackside installation costs for ETCS L1LS

CR Number/ grouping of CRs	CR status	Title	Description	Operational and geographical scope	Costs impact envisaged	Benefits envisaged
			implement the CR within a reasonable timeframe on all vehicles using this L1 LS implementation.			
1373	On-going	Balise Metal Free Volume	This CR will relax mounting requirements	All ops and services, track-side SERA	Low	Trackside Installation cost savings thanks to relaxed balise mounting requirements
1374		Non-leading	This CR will avoid the risk that the braking of the train is delayed or obstructed in non-leading mode scenario.	All ops and services, on-board SERA	Low	Higher reliability and punctuality
1375		Raise driver awareness on approaching an End Of Authority	This CR will increase driver's awareness in specific scenario.	All ops and services, on-board and track-side SERA	Low	Safety increase
1378		ETCS L3 CMD Mandatory	This CR improves the starting of mission and as such the operational performance, especially in cases where limited balises or limited train detection systems are installed.	All ops and services, on-board SERA	Low	Higher performance due to less time lost when starting of mission
1379	On-going	Technical Range Check during data entry	This CR improves the controls during data entry operations by staff members.	All ops and services, on-board SERA	Low	Increase in safety by avoiding hazards related to wrong data entry, reduction in human errors
1423	On-going	Unacceptable risks with High Priority data	This CR will implement certain technical measures in order to protect the rail system from cyber attacks.	All ops and services, on-board and track-side SERA	It is expected that the implementation of this CR will be impacting software only.	Increased security in specific scenarios using high priority data.