

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

ADDENDUM TO OPINION

ERA/OPI/2024-10

OF THE EUROPEAN UNION AGENCY FOR RAILWAYS

for

THE EUROPEAN COMMISSION

regarding

version 2 of Future Railway Mobile Communication System
(FRMCS) specifications

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1. Introduction

This addendum constitutes the second step deliverable in accordance with [Agency Opinion ERA/OPI/2024-10](#). It provides additional outcomes to complete the scope of the request by European Commission referring to the v2.1.0 set of FRMCS specifications for practical and harmonised use in any FRMCS Test & Validation activity at EU level (e.g. MORANE-2) or National level (pilots).

ERA organised, from January to April 2025, 6 EECT meetings to allow for a joint review of the additional elements, mobilising 3 FTEs from ERA and an estimation of 10 FTEs on EECT experts' side.

2. Outcomes

The additional outcomes agreed at EECT are:

1. Consolidation of the categorisation of V3/ Vx requirements (OPI-2024-10; Annex 3):

At chapter level no change was introduced in the annex 3 (i.e. which function/applications are expected to be part of V3 set of FRMCS specifications, and which ones are scheduled for a later version Vx). At requirement level however, EECT refined the scope for a better visibility (i.e. which requirements supporting a specific function are expected to be part of V3 set of FRMCS specifications). All five FRMCS specifications in version 2.1.0 now clearly indicate per requirement the V3/Vx applicability scope.

2. Identification of requirements related to interoperability:

In the December TO, requirements related to interoperability were only identified per chapter in the functional specifications. EECT agreed on which requirements in all five FRMCS specifications are related to interoperability (OPI-2024-10 section 4.2.2), and this is captured in an Annex on Interoperability in each FRMCS specifications V2.1.0. ERA recommends this information to be used by Test & Validation activities.

3. Refined description of the FRMCS v2 list of Open Points:

Following remarks from EECT members, EECT refined the list of Open Points to be closed in V3 specifications, to avoid confusion and to enable a better tracking of those Open Points resolution. The Annex 1 of the present addendum shall therefore replace the previous Annex 2 of OPI-2024-10.

4. New version of specifications as output of EECT RMR process for FRMCS V2

EECT endorsed the below listed versions of specifications. All references in the OPI-2024-10 to previous versions of the specifications should therefore be replaced.

The updated version of the FRMCS V2 deliverables are provided in the table below: (section 1.2 and 4.2.3 references of the OPI-2024-10). They will be published on the ERA website with this addendum.

Reference	Name of document/presentation	Title of document
[1]	FU-7120-2.1.0	Functional Requirement Specification
[2]	TOBA-7510-FRS-2.1.0	On-Board FRMCS Functional Requirements
[3]	AT-7800-v2.1.0	System Requirement Specification

Reference	Name of document/presentation	Title of document
[4]	FIS-7970-2.1.0	Functional Interface Specification
[5]	FFFIS-7950-v2.1.0	Form Fit Functional Interface Specification
[6]	Subset-037-3-v4.1.4	EuroRadio FIS FRMCS Communication Functional Module

All the other analysis, assessments and recommendations provided in the first step remains applicable.

3. Additional considerations

During the EECT discussion, some relevant points for this TO addendum were raised that are summarised in this section:

- During the review of the V3/Vx scope, UNITEL highlighted the challenge on the technical feasibility of all V3 scheduled features and proposed to further reduce the scope to focus on a “GSM-R equivalency”. UNITEL proposed to postpone some of the features to a later version, with a possible V4 set of specifications to be introduced a few years after the CCS TSI update for V3, planned as a simple software upgrade of the FRMCS system. All the other EECT members disagreed to this approach as this would imply the need to update OB-FRMCS after V3, possibly resulting in economic impact not quantified (e.g. software retrofit + authorisation aspects). EECT noted the potential risk in this approach of a lack of stability for first deployment of OB-FRMCS equipment based on V3 after notification of GSM-R decommissioning.
- During the review of the V3/Vx scope, UNITEL also remarked that the current EECT V2 exercise has not endorsed any of the requirements tagged as V3, and that those numerous requirements to be reviewed and agreed will have a possible impact on EECT RMR process for FRMCS V3.
- During the review of the functional to system requirements mapping tables (based on V2.0.0 specifications), CER expressed its concerns on the high number of Partially/Non-Compliant system requirements, i.e. the amount of system requirements that needs to be completed to fulfil the V3 functional requirements. CER specifically noticed the remaining workload until complete V3 specifications. This has a potential impact on the testing and validation activities.

The aspects above should be considered by the railway stakeholders in the planification of the V3 specifications development and by ERA for the scheduling of EECT V3 exercise.

Valenciennes, 12 May 2025

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Acting Executive Director

ANNEX 1

FRMCS v2 list of Open Points

Index	Category	Subindex	Topic/ feature	Problem statement	Impact in applications	Type	Criticality	Resolution Status	T&V activity*	Specification Framework
1	Addressing	1.1	IP routing for Host-to-Host (H2H) loose coupled applications	System requirements and technical details are only partly covered in FRMCS V2, for example, IP layer model and IP address ranges.	H2H in Loose Coupled	System	High	Solution available	Morane-2	ETSI/UIC
		1.2	IP routing for Host-to-Network (H2N) applications	System requirements and technical details are partly covered in FRMCS V2, for example, IP layer model and IP address ranges. Needed to contact KMC and PKI outside MCx domain.	H2N applications, like PKI or KMC	System	High	Under discussion	Morane-2	ETSI/UIC
		1.3	Support of IPv4 at FRMCS external reference points OBapp and Tsapp	System requirements and technical details are partly covered in FRMCS V2. The OB Applications and TS Applications can be in local networks using IP ranges from IPv4 or IPv6. Coexistence of IPv4 and IPv6 in an interoperable manner is not yet specified.	ETCS/ATO/ Others	System	High	Under discussion		ETSI
2	Superloose Applications	2.1	Superloose Applications	Minimum requirements (necessary features and interfaces to FRMCS i.e., OBapp) of agent to support Superloose Applications are partly covered in FRMCS V2.	KPI/KMC/ Others	System	High	Under discussion	Morane-2	UIC

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3	Application categories	3.1	Application communication category	The definition of "application category" and "communication category" used in OBapp needs to be further clarified in FFFIS, SRS/FIS and SS-037-3. For example, the relation to QoS, priority and way to communicate (H2H or H2N) with the corresponding values for a combination of appCategory and communicationCategory needs to be defined.	All	System	High	Under discussion	Morane-2	UNISIG/UIC
4	Authorisation of Applications	4.1	Authorisation of application common function	Authorisation of applications common function, functional and system requirements are only partially covered, for example: The definition of the metadata to be used by the applications.	All	Functional	Low	Only identified		UIC
5	Bearer flexibility	5.1	Multipath protocols	Investigation of FRMCS Multipath protocols is undergoing. FSmpm refers to phase 1 ETSI TS for the control protocol of FRMCS Multipath if more than one protocol is selected.	All	System	Medium	Solution available	Morane-2; 5GRACOM (R&D)	ETSI
6	Cybersecurity / TLS	6.1	Cybersecurity requirements	Service/Transport Stratum Security requirements may need to be revisited/complemented after risk assessment of FRMCS v2 specifications.	All	System	Medium	Solution available		UIC
		6.2	mTLS over OBapp and Tsapp	Detailed implementation of mutual TLS (mTLS) over OBapp and Tsapp is not covered in FRMCS V2. -Specification of TLS 1.3 configuration is missing.	ETCS/ATO	System	High	Under discussion	Morane-2	UIC
7	Data transmission	7.1	Functional description of Data Transmission for different applications	Point to point data transmission between OB and TR is included in v2 but point to multipoint (P-t-MPt) data calls are missing.	Data	Functional	Low	Under discussion		UIC

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8	DSD application	8.1	On-train safety device to ground communication	Functional and system requirements of on-train safety device to ground communication are partly covered in FRMCS V2.	DSD application	Functional/ system	Low	Under discussion		UIC
9	ETCS related	9.1	Incoming end of session notification to ETCS	It needs to be clarified if and how ETCS OB receives incoming End of Session from TR. The OB application could face a situation where the trackside entity receives a new connection request while the first one is not yet closed.	ETCS	System	Low	Under discussion		UNISIG
10	Functional Requirements	10.1	Critical Advisory Messaging	Functional requirements of Critical Advisory Messaging are only partly covered in FRMCS V2. System Requirements are also missing. Note: ERA will provide to UIC further clarifications about this functionality.	Some applications/ functions needed for v3	Functional/ system	High	Under discussion		UIC
		10.2	Undefined Functional Requirements	Functional requirements for some functions are only partly or not covered in FRMCS V2 (ex. Assured voice communication common function, Inviting-a-user common function, On-train outgoing voice communication from train staff towards a ground user, On-train incoming voice communication from a ground user towards train staff, Shunting, Banking, On-train voice communication (Intercom), On-train voice communication towards passengers (Public Address), etc). System Requirements are also missing.	Some applications/ functions needed for v3	Functional/ system	Medium	Under discussion		UIC

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		10.3	Traceability of Functional Requirements to System Requirements	As a result of the Mapping Tables follow up, the coverage and precision of functional requirements by corresponding system requirements is not complete. In a subsequent version of the specifications, either the system requirements are defined, or the functional requirements are revisited.	Some applications/ functions needed for v3	Functional/ system	High	Under discussion		UIC
11	Handhelds	11.1	FRMCS Handhelds	Functional and system requirements of FRMCS Handhelds for use by railway personnel are not covered in FRMCS V2.	Voice	Functional/ system	High	Only identified		UIC
12	HMI	12.1	FRMCS HMI	Functional and system requirements of HMI (e.x. HMI of VAS driver equipment) are partly covered in FRMCS V2.	Voice	Functional/ system	High	Only identified	Morane-2	UIC
13	Identities	13.1	Role based identification scheme	There are some system requirements missing for Role based identification scheme: Criteria Field is missing, e.g. for LDA target_user. Application identifiers for trackside to onboard communication are missing.	All	System	High	Under discussion	Morane-2	UIC
		13.2	Role management for interconnected calls between FRMCS Domains	System requirements for the usage of Functional Alias(es) across multiple FRMCS domains for interconnected calls are not covered in FRMCS V2.	Voice/others	System	High	Under discussion	Morane-2	UIC

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		13.3	Role-Based Access Control	Assigning permissions for call control based on roles is not covered in FRMCS V2. Only a User-Based Access Control is covered.	Voice	System	Medium	Under discussion		ETSI/UIC
		13.4	Subscriber identity	System requirements for addressing non-FRMCS users are missing.	Applications outside MCx	Functional/ System	Medium	Under discussion		UIC
14	FRMCS Location and positioning	14.1	FRMCS location and positioning system	FRMCS V2 covers the sufficient system requirements for location and positioning system. Objective is to enhance and provide some clarification on FRMCS location and positioning system with the following capabilities: (1) Conveyance of more than one location sources by the On-Board FRMCS i.e., GNSS receiver AND Cell ID(s) (2) Conveyance of external sources (3) Additional performance requirements to horizontal position accuracy (4) Security precautionary measures to prevent knowledgeable changes of the position information of a user.	Voice	System	Low	Under discussion		UIC
15	MNO parameters	15.1	Coexistence between RMR and MNO bands	The isolation requirements for onboard scenarios with simultaneous operation of RMR and MNO bands are to be confirmed by specific studies for each individual frequency band. Note: Those studies are not intended to be carried out by UIC, but their results will be reflected in the UIC specifications.	All	System	Medium	Under discussion		UIC

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16	Network transition	16.1	Network Transition Trigger	The technical solution for the Network Transition trigger needs to be defined.	All	System	High	Under discussion	Morane-2	UIC
		16.2	Network Transition for KMC&PKI	Inter-FRMCS-Domain Transition for KMC & PKI applications is missing.	KMC & PKI	System	High	Only identified		ETSI
		16.3	Inter-FRMCS- Domain Transition with only one OB Radio Module	Inter-FRMCS-Domain Transition with two OB Radio Modules is specified in phase 1 ETSI TS, while inter-FRMCS-Domain Transition with one OB Radio Module not covered in phase 1 ETSI TS.	ETCS/ATO/ others	Implementa tion	Low	Solution available	Morane-2	ETSI/UIC
		16.4	Inter FRMCS transition at service layer (for MCx)	MC Migration needs to be tested. 3GPP specifications are available but they have not been tested yet in any environment. Note: This OP could only be closed after testing in Morane-2 project.	All	System	High	Solution available	Morane-2	UIC
		16.5	Roaming architecture	The roaming architecture (Home Routed roaming and/or Local Break Out roaming and/or SIM profile switching) to enable trains to cross the borders and being able to use communications services in foreign countries with requested performance is partly covered in v2.	All	System	High	Solution available	Morane-2	ETSI/UIC
17	Operation and Maintenance	17.1	Operation and maintenance of the On-Board FRMCS - FSOMR	It is needed to clarify the role of OBOM/FSOMR in the provision & upgrade of FRIOP and what needs to be standardised in this case, if any, at the interface level.	All	System	Low	Under discussion		ETSI/UIC
		17.2	Operation and maintenance of the On-Board FRMCS -Train dependency	Requirements/dependencies of train to the FRMCS On-Board needs to be analysed/included. Requirements need to be further clarified by UNISIG.	All	System	Low	Under discussion		UNISIG/UIC

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18	Profiles	18.1	Profile exchange / provisioning	Mechanisms for provision, exchange, upgrades, etc. of FRIOP are missing. Application profile not available (i.e. VAS FRIOP)	All	System	High	Under discussion		ETSI/UIC
		18.2	SIM profile	Detailed content and format of SIM profile (i.e., minimum and necessary SIM files and their formats) are not covered in FRMCS V2 nor phase 1 ETSI TS.	All	System	High	Under discussion	Morane-2	ETSI/UIC
		18.3	Certificates in FRMCS	System requirements on certificates in FRMCS are partly covered in FRMCS V2. The following parts are not covered yet: (1) Certificates provisioning (phase 1 ETSI TS) (2) Certificates content (UIC)	All	System	High	Under discussion		ETSI/UIC
19	QoS	19.1	FRMCS QoS requirement values	QoS requirement values defined in FRMCS SRS Annex A - Table A.1-1 must be confirmed to be feasible in Test & Validation project(s) Also, QoS measurement procedures need to be defined. Note: This OP could only be closed after testing in Morane-2 project.	All	System	Medium	Solution available	Morane-2	UIC
		19.2	TCP Parameter settings for ETCS/ ATO and support functions	TCP parameters are not final for FRMCS (Subset-037). They need to be confirmed to be feasible in Test & Validation project(s) Measurements needed to be able to discuss and propose proper TCP parameter settings.	ETCS/ATO/ Others	System	High	Solution available	Morane-2	UNISIG
20	Recording	20.1	Recording metadata of voice and data calls	Functional requirements available, system requirements not covered.	Voice and Data	System	High	Under discussion		UIC

Index	Category	Subindex	Topic/ feature	Problem statement	Impact in applications	Type	Criticality	Resolution Status	T&V activity*	Specification Framework
		20.2	Recording media (audio) of voice calls	Mechanisms and details for recording media (audio) not yet defined. System requirements missing. Pointer to ETSI/3GPP specifications is not included in V2.	Voice	System	Low	Under discussion		ETSI/UIC
21	References	21.1	Version of 3GPP and ETSI Technical Specifications (TS)	Precise versions of 3GPP and ETSI Ts are missing in FRMCS V2	All	System	Medium	Under discussion		UIC
22	Registration and deregistration of functional identities	22.1	Reg/De-reg scenario's during migration.	Potential impact of scenarios for registration and deregistration during migration including Border Crossing, on system specs will be analysed.	Voice /others	Functional	High	Under discussion		UIC
		22.2	Unique train ID in a double coverage environment (FRMCS & GSM-R)	In a double coverage environment (FRMCS & GSM-R) the controller shall see only one train on its HMI, with the correct train running number. There shall be neither duplication of two trains with same number, neither two trains with two different train numbers (that represent only one train). This is not foreseen yet in IWF.	Voice /others	System	Medium	Under discussion		UIC
23	Technical requirements for accessing MNO resources	23.1	MNO interconnection	Technical requirements for interconnection are missing, MOCN versus roaming. MNO use cases are described in UIC document FW-AT 7324. Multipath, MOCN and National Roaming are addressed in phase 1 ETSI TSs.	All	System	Medium	Under discussion	Morane-2	ETSI
24	Time service	24.1	On-board Time Service	Assuming train will implement the Train Time and Location Service (TTLS) as specified in subset-147, time sources are not specified but are implementation choices. Clarifications are needed from	All	System	Low	Under discussion		UNISIG/UIC

Index	Category	Subindex	Topic/ feature	Problem statement	Impact in applications	Type	Criticality	Resolution Status	T&V activity*	Specification Framework
				UNISIG regarding the relation of On-board FRMCS with the time service.						
		24.2	FRMCS Time Service	FRMCS Time Service is partly defined in FRMCS V2. To be completed. For example, FRMCS Time Service performance and security requirements.	All	System	Low	Solution available		UIC
25	RAM requirements	25.1	Lack of definition of RAM requirements	Lack of definition of RAM requirements for OB FRMCS and TR Gateway as required from ETCS/ATO/Voice applications. Solutions need to be interoperable.	ETCS/ATO/Voice	System/Implementation	Low	Only identified		UNISIG/UIC
26	Voice System	26.1	Multi-User Talker Control	Functional and system requirements partially covered for v2 and need readjustment for v3.	Voice	Functional/system	High	Under discussion	Morane-2	UIC
		26.2	Call Arbitration and Queuing	System requirements for the following features are missing and need to be defined: Call Arbitration and Call Queuing. Solution under discussion in phase 1 ETSI TS.	Voice	System	High	Under discussion	Morane-2	ETSI/UIC
		26.3	VAS Controller equipment: TSctrl	TSctrl for voice dispatcher system requirements specification is missing and need to be completed. ETSI to precise the details of the interface.	Voice	System/Implementation	Low	Solution available	Morane-2	ETSI/UIC