H2020 ICT-053 5GRAIL

FRMCS 5G Demonstrator

- Build & Proof Project -

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UIC at a Glance : The Worldwide Railway Organisation

UIC is the worldwide professional association representing the railway sector and promoting rail transport.

UIC is the association for technical cooperation amongst railways and coordinates the sector's position as it negotiates its evolving relationship with the supply industry and research and develops needs in order to draw full advantage of potential interest to railway companies.

UIC MEMBERS ALL AROUND THE WORLD

UIC MEMBERS

UIC'S MISSION

Promote rail transport globally with the objective of responding effectively to current and future challenges relating to mobility and sustainable development;

Develop and facilitate all forms of international cooperation among members and promote sharing of best practice;

Promote interoperability and develop and publish solutions to railway systemrelated issues (IRSs);

Support members in their efforts to develop new business and areas of activity;

Propose new ways to improve the technical and environmental performance of rail transport, increase competitiveness and reduce costs.

TODAY IS GSM-R…

The railways currently use the GSM-R system for operational communication, a key component of the European Railway Traffic Management System ERTMS.

Designed 20+ years ago by UIC and completely border-crossing interoperable, GSM-R is deployed on more than 130,000 kilometers of track in Europe and 210,000 kilometers worldwide.

GSM-R is supporting the Train Radio voice applications including the Railways Emergency Call (considered to be the best method to avoid a train accident when all the other system have failed) and the European Train Control System (ETCS).

Based on the limited data capability, GSM-R is also supporting other railway applications, e.g. track side phones, passenger information on platform, etc.

GSM-R

- 2G+
- NATION-WIDE CONNECTIVITY
- CROSS BORDER INTEROPERABLE
- IMPROVE SAFETY
- RAILWAY EMERGENCY CALL
- ETCS
- LIMITED DATA

…TOMORROW WILL BE FRMCS

Future Railways Mobile Communication System (FRMCS) is the UIC's response for two elements of strategic importance for the future of the railways.

- GSM-R is a 2G system, where manufacturers have announced that GSM-R equipment is due to reach the end of its life (around 2030) and will be supported until around 2035.

- Whilst replacing GSM-R is a complex issue - due the specific railways requirements in term of Capability (Railway Emergency Call), Quality of Service, life cycle, where for Europe we need to add cross-border interoperability and migration timeline, it is also a significant opportunity - to enable new applications and support the Railways Digitalization, and therefore the need to transmit, receive and use increasing volumes of data, which is at the very heart of sustainable transport. Improving the service quality, the potential offered by driverless trains, the Internet of Things, smart maintenance... railways need a suitable radio system to circulate these ever-increasing communication flows.

FRMCS
Future Railway Mobile Communication System

- 5G
- EUROPEAN PLMN INTEROPERABLE
- ENHANCE SAFETY
- RAILWAY EMERGENCY CALL
- ETCS
- AUTONOMOUS TRAINS GOA 2
- ENHANCE RAIL TRAFFIC PERFORMANCE
- ENABLE DIGITALISATION

Introducing FRMCS

2Q'2019	4Q'2021	3Q'2023	2Q'2025
FRMCS V1 Specification	**FRMCS Demonstrator ⇒ V2 Spec**	**FRMCS European Trial ⇒ Readiness**	

STARTING POINT	**STARTING POINT**	**STARTING POINT**
• URS 4.0	• Stabilized FRMCS Specification	• Operational FRMCS Specification
• Use Cases V1 to 3GPP R16 (60%)	• R16 Products : MCX 4G/5G (→ Industry)	• R17 Products : FRMCS 5G (→ Industry)
PLAN	**PLAN**	**PLAN**
• FRS, SRS 1.0	• FRMCS demonstrator based on FRMCS V1 (→ H2020 - 5GRail, S2R)	• FRMCS European Trials based on FRMCS V2 (→ CEF 2, S2R)
• On-Board FRS, SRS 1.0	• FRS, SRS 2.0	• FRS & SRS 3.0
• Principle Architecture, FIS, FFFIS 1.0	• On Board FRS 2.0	• On-board FRS 3.0
• ETCS over FRMCS Principles	• Validation of Use Cases V1 in 3GPP R17	• FIS & FFFIS 3.0
• Interim specifications for TSI inclusion (→ ERA)	• Use Cases V3 in 3GPP R18	• Validation of Use Cases V3 in 3GPP R18
• Validation of Uses Cases V1 in 3GPP R16	• TSI inclusion 1 (→ ERA)	• Use Cases V4 in 3GPP R19
• Use Cases V2 to 3GPP R17 (95%)	• Additional elements for TSI	• TSI inclusion 2 (→ ERA)
• Use Cases Gaps vs. 3GPP => ETSI TS	• Frequency Plans for Migrations	• Cross-borders procedures
• CEPT Reports with Railway Frequencies & Coexistence Criteria, ECC Decision	• Deployment & ENIR Migration assessments	• Interconnection hubs development (ENIR) (→ Industry, → S2R)
• Migration Scenarios	• Signalling Continuity assessments	• Guidelines for Operational Migrations

UIC's goal is to make available together with partner Industry and Authorities a FRMCS 1st Edition to Railways , to start the national trials.

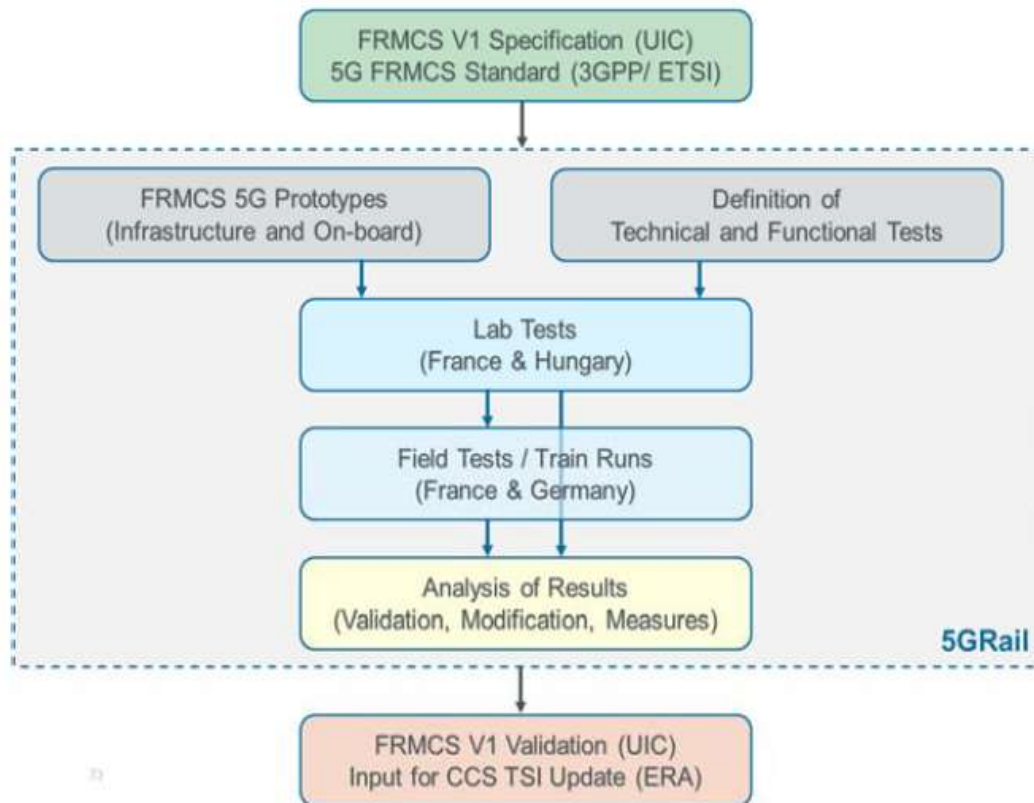This will be based on 5G, 3GPP R17 MCX products.

To reach that the embedded plan is followed.

A crucial step of this plan is building and testing the FRMCS demonstrator, especially On-Board.

This will be performed through the EU co-funded H2020 ICT-053 5GRAIL project.

5GRail

5GRAIL main activities and overall framework

- Elaborate prototypes based on the FRMCS V1 specifications, including telecom 5G infrastructure compliant with FRMCS 3GPP specific standardisation elements, and also the new on-board equipment (TOBA, and additionally prototypes of adapted ETCS and ATO elements)

- Define all the relevant technical and functional tests to be achieved to verify the conformity with FRMCS V1 specification, maximising the scope of applications to be tested or simulated (particularly operational voice services, ETCS, ATO, TCMS, video and interaction with automotive) and including some measurements of performance

- Execute these tests in lab environment firstly, and then in real-world environment with train runs, considering cross-borders conditions, and study the synergies with roads

- Analyse the outcomes of these tests to loop back on FRMCS V1 specification, to amend or modify those

- And then obtain a finalised version of FRMCS V1 specification for sector regulation.

Work Packages and Participants

WP Number	WP Title	Lead
WP1	FRMCS tests definition, tests results consolidation and specification review	UIC
WP2	TOBA prototypes development	KONTRON
WP3	Validation of ETCS, Voice, TCMS and CCTV/Video within TOBA – Laboratory tests	NOKIA
WP4	Validation of Data, ETCS, ATO and Cybersecurity within TOBA – Laboratory tests	KONTRON
WP5	Field Implementation and Evaluation	DB Netz
WP6	Rail and Road communication systems coexistence	UNI.EIFFEL
WP7	Dissemination, Communication and Exploitation	UNIFE
WP8	Project Management & Coordination	UIC

Participant	Country
UIC	France
Nokia-DE	Germany
KONTRON	Austria
Alstom	France
DB Netz	Germany
SNCF Reseau	France
THALES	France
SBB	Switzerland
UNIFE	Belgium
CAF	Spain
OBB	Austria
SIEMENS	UK
IP	Portugal
UNIVERSITE GUSTAVE EIFFEL	France
TELESTE	Finland
DTU	Denmark
NOKIA-IT	Italy
NOKIA-HU	Hungary

5GRAIL Roadmap
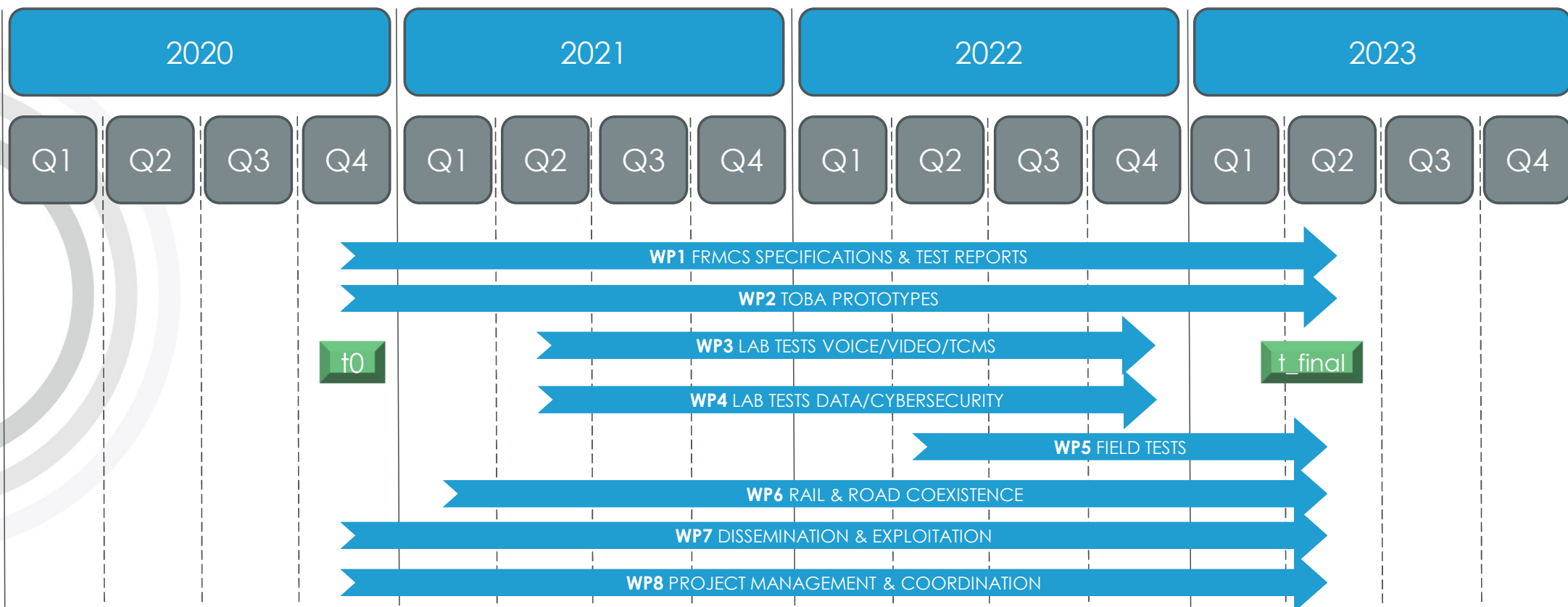
Stay in touch with UIC!

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UIC FRMCS Project on YouTube

Thank you for your kind attention