

5G MED

Sustainable 5G deployment model for
**Future mobility in the Mediterranean
Cross-Border Corridor**

Seamless Connectivity for Digital Trains

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About 5GMED Project

Instruments
ICT-53-2020

Start date
1st September 2020

Duration
72 months

Total funding
€ 11 942 189,99

The main target of 5GMED project is **to design a common roads/railways 5G infrastructure architecture**, with proven sustainable business models, demonstrated investment viability and scalability potential



21 partners

4 UCs

5gmed.eu



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5GME

3 small-scale testbed facilities

Situation of the Railway connectivity: FRMCS



- Railway industry is clearly focused into GSM-R substitution by FRMCS to address railway's needs for train operation. This will require big efforts for all the actors in the railway vertical in the next years as was explained in the UIC Global FRMCS Conference in Paris last June 7th -8th
- EC has decided on the harmonized use of the paired frequency bands 874.4-880 MHz and 919.4-925 MHz for the FRMSC services and of the frequency band 1900-1910 MHz for Railway Mobile Radio (RMR)
- UIC FRMCS has recently defined (May 2023) the On-Board Architecture Functional Requirements (TOBA) and the migration scenarios

Situation of the Railway connectivity: medium term

- In parallel, sustainable Gigabit train-to-track connectivity will be required by the railway industry at medium term: this will be required by Digital train and passengers' services
- The foundation for the digitalization of train operation will result in the need of additional bandwidth for new services
- The average demand for Internet connectivity per passenger is expected to be around 0.7 and 1 Mbps by 2025 \Rightarrow 700 Mbps and 1 Gbps for trains with 1000 passengers
- Long investment cycles (Railway) vs Quick Telecom Technology Obsolescence (how will be the communications in 2035?)
- MNO coverage will not be expected in many railway lines (neither roads) which have low ROI

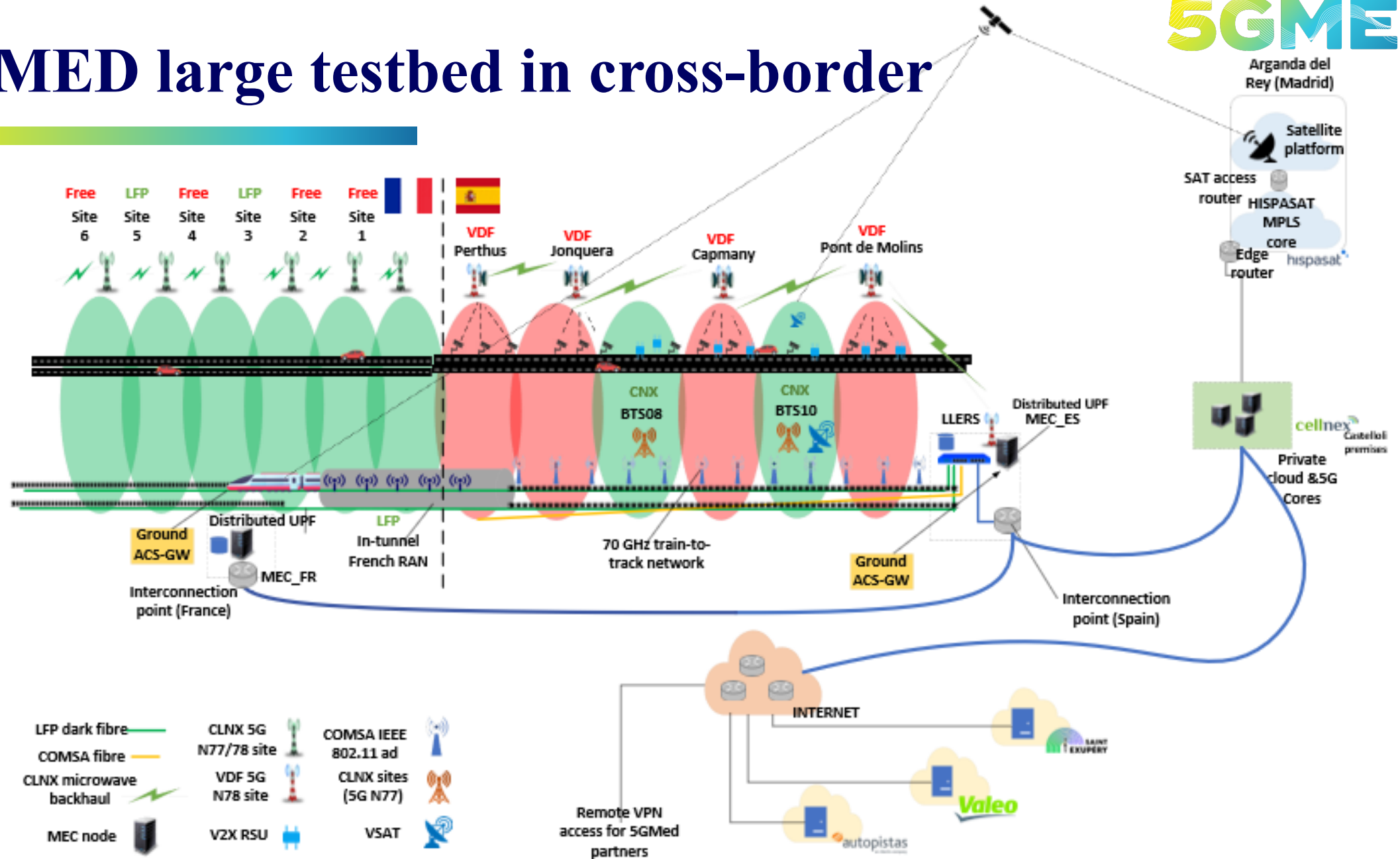
Gigabit train must be included in the critical/strategic path !!!

5GMED strategy

- 5GMED project adopts the idea where **IM will collaborate with RU to facilitate the connectivity to MNO and vice versa** (complemented with the use of additional private networks and new generation satellite networks) with an architecture opens to build new business models and relationships between stakeholders
- FRMCS and passenger services have different requirements (throughput, scalability, redundancy, security, TCO, complexity)
- **Combine both architectures, facilitating FRMCS quick introduction, but without stopping Gigabit train initiatives and including multi-stakeholder scenarios**

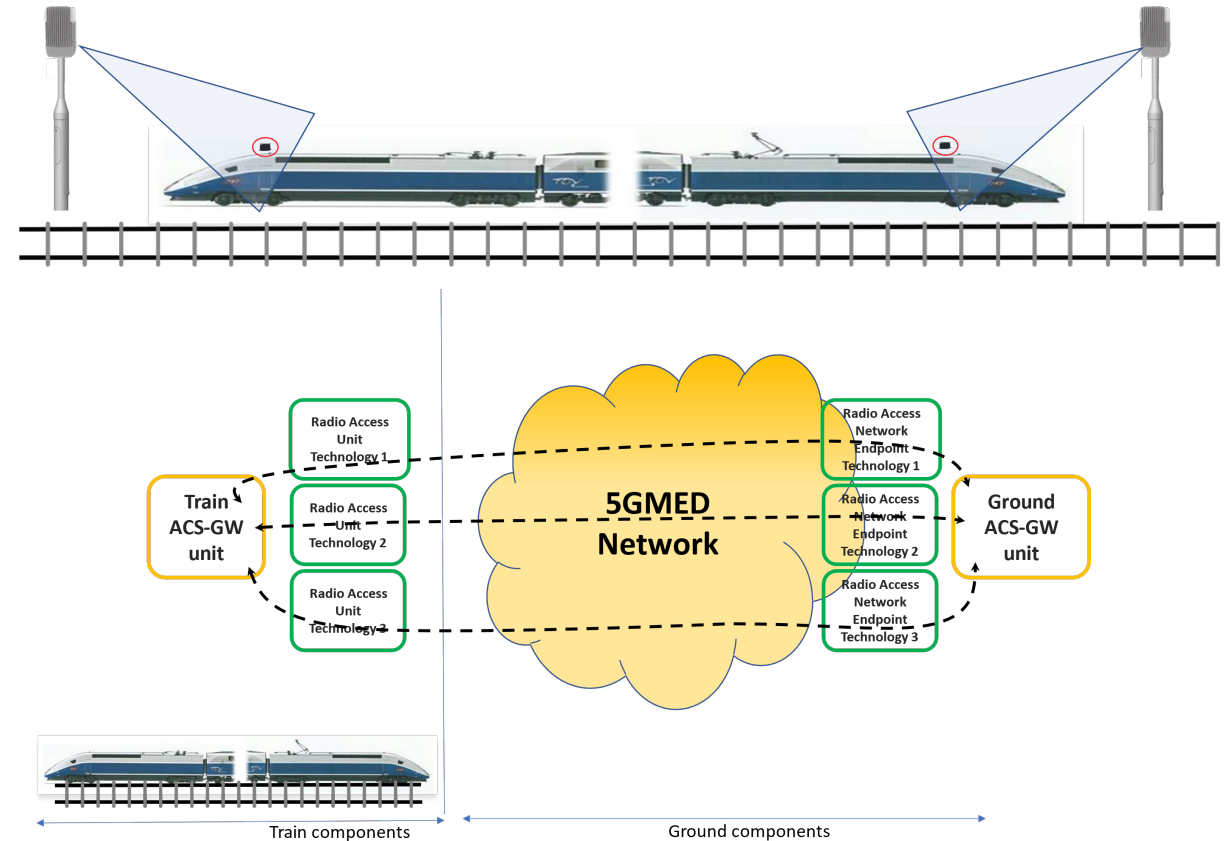
5GMED large testbed in cross-border

5GMED



5GMED strategy

- Multi-connectivity:
 - Public 3.5 GHz 5G NR
 - Private 802.11 ad 70 GHz (>1 Gpbs TDD, < 10ms latency) –free licence across Europe
 - Satellite (future proof architecture)
- Seamless services (ACS-GW units):
 - Radio selection per service
 - Transparent aggregation
 - Flow tracking for transparent HO
 - 10Gbps full speed throughput
 - Allows Traffic engineering reacting to train location
- 5G Neutral operator (two 5G SA cores) – different model in France (MOCN) and Spain (aggregate radio/coverage holes with additional cells)



Service Flow	ACS-GW forwarding priority			
	3.5 GHz 5G NR (fibre backhaul)	IEEE 802.11 ad 70 GHz	Satellite	3.5 GHz 5G NR (satellite backhaul from km X to Km Y)
FRMCS P1	3	4	2	1
FRMCS P2	2	1	-	-
FRMCS P3	1	2	4	3
B1	2	1	-	-
B2	4	3	2	1
EMT	1	2	-	-
TP	1	2	-	-

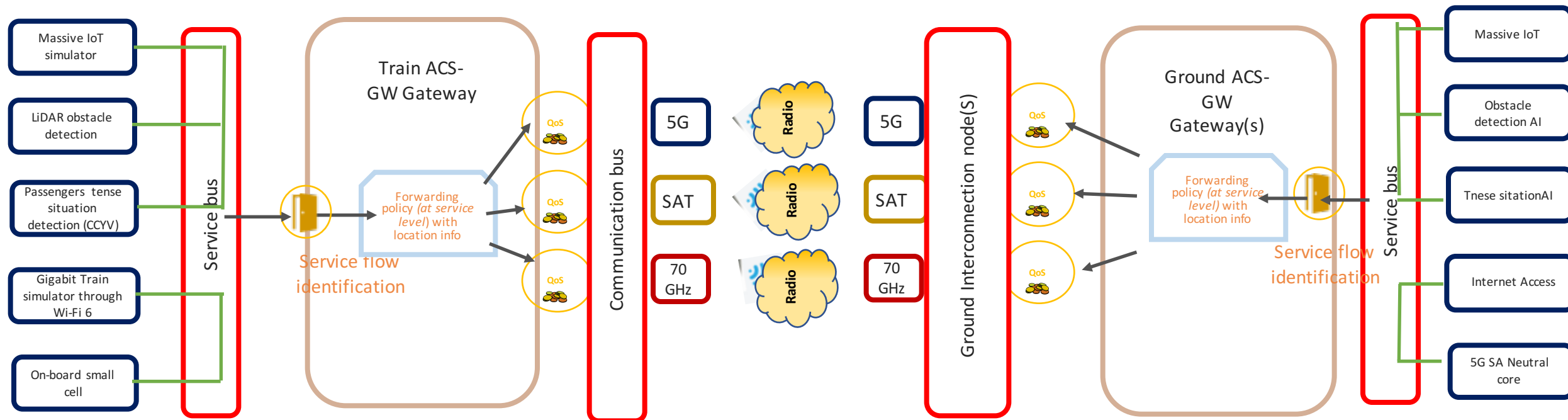
5GMED Railway Use Case



October 2023
90 km/h



June 2024
300 km/h



On-board small cell: proof of concept -> Train operator
 Can evolve to 5G MOCN
 Is not needed that Internet Access and MNO service



Thanks for your attention!
Questions?

5G-PICTURE Project

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