

COLLABORATIVE & COST EFFECTIVE GIGABIT TRAIN

Mobilidade na Era Digital

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Some key train telecoms issues

Evolution to **FRMCS** for train circulation **safety**, due to GSMR obsolescence, is very **onerous** to IM

Railways **success depends on MNO services** like

- Digital experience to **passengers**
- AI and IoT based **operations** optimisation

For these reasons **IM to share 5GNR access @7-900MHz with MNOs**

This provides **<300Mbps** and **current safety services ONLY**

- Not as if **@home** or **@work**
- **Non clear business case to MNOs**

Future proof safety, 1Gbps passenger & optimisation services requires **5G cells stacking** at multiple frequencies **along track (*)**

- Too complex and too onerous → **Not the way forward**

→ **IM & MNO require more advanced 5G-based solutions**



Future Railway Mobile Communication System (FRMCS)
Railways Infrastructure Managers (IM)
Mobile Network Operators (MNO)
(*) 7-900MHz, 1,9GHz & 3,5GHz

Investing in new solutions

Connectivity to train above 1+1 Gigabit → **Gigabit Train**

Large CAPEX and OPEX reductions

- Foster simplification
- Support IM + MNO investment sharing
- No spectrum barrier for IM to invest
- Strong energy savings
- Reusing existing assets

Fast deployment

Compatibility with 5G NR FRMCS in main railway lines and optimised solution for regional lines



Collaborating to share assets: 5GMED

Aggregating multiple connections to trains across EU corridor

- Hispasat Satellite
- Vodafone 5G NR @ 3.5GHz
- LFP IEEE @70GHz

Connecting on board access to Edge/Cloud servers on ground

- Wi-Fi AP
- Pico cell 5G NR @3,5Ghz

Seamless 1Gbps services (non-critical) across border

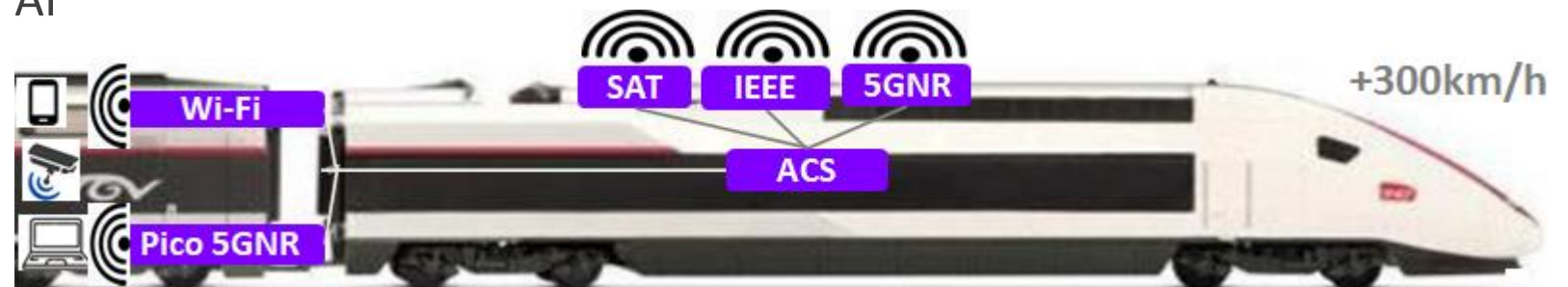
- Passengers: Voice, Internet Access, Infotainment
- Rail operational: IoT and AI

<https://www.youtube.com/watch?v=FXRA7FE3TXQ>



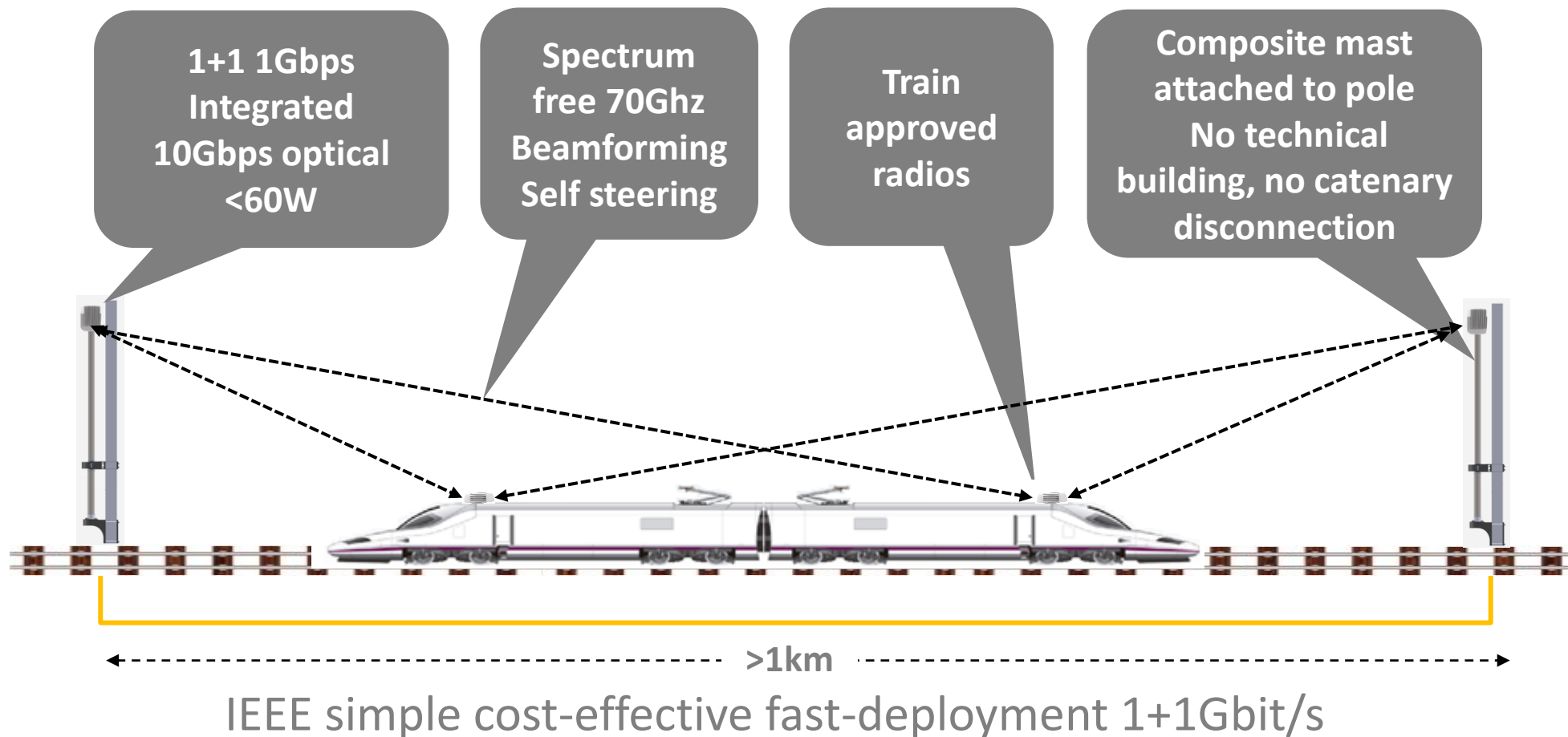
LFP
Perthus

50% ADIF 50% SNCF

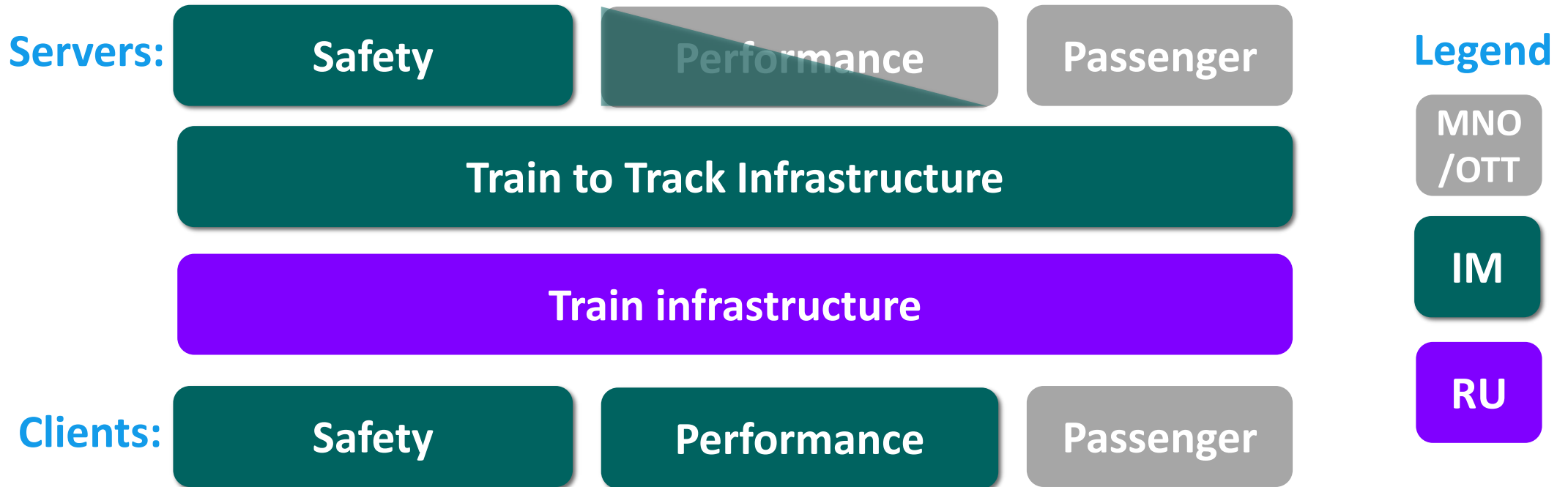


New 70GHz solution for IM

Existing 5G



Objective: Guaranteed connectivity for all services



OTT: Over The Top

Main lines

Will have FRMCS 800MHz for safety services interoperability

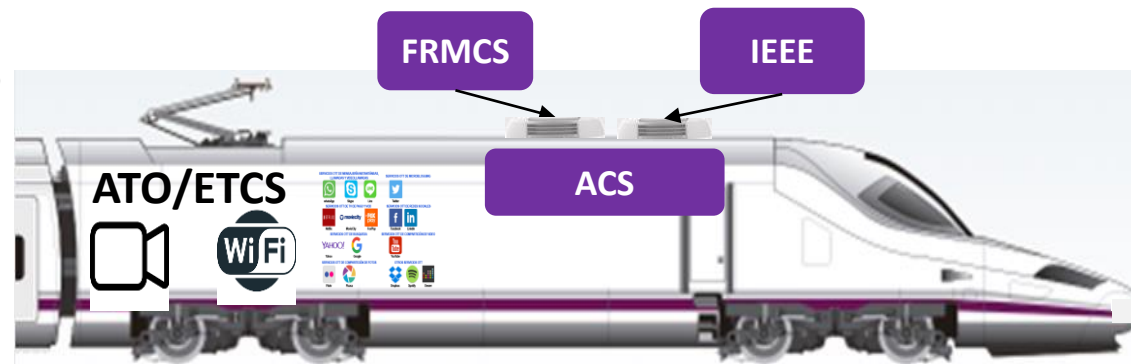
→ Enhance with IEEE 70GHz on train & track. ACS for multi-connectivity

Radios along
track

5GNR FRMCS 800MHz

IEEE 70GHz

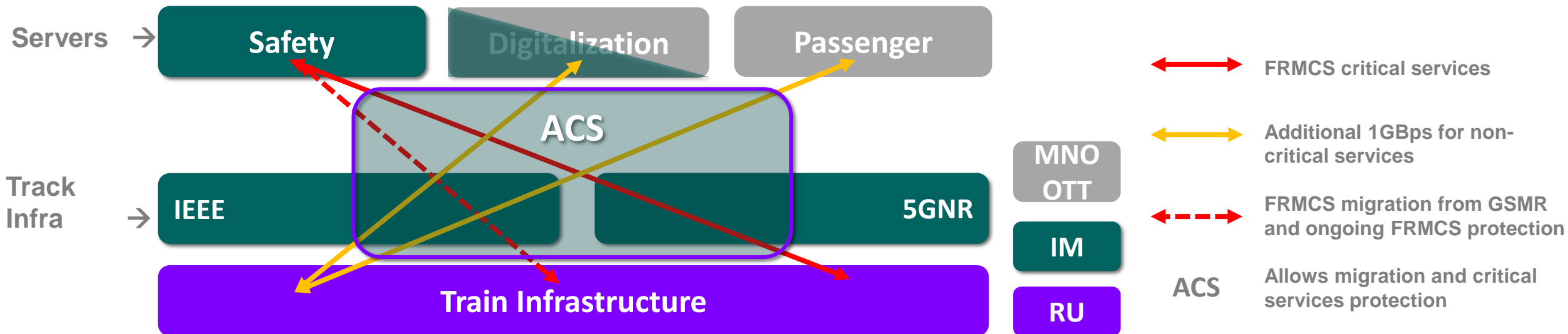
On-train radios



Proposal value:

- (1) 1Gbps for performance & passenger services
- (2) Support FRMCS migration from GSMR
- (3) and ongoing protection to FRMCS

Enhancing main Lines



Clients not shown for simplicity

1Gbps for performance & passenger services
 Support FRMCS migration from GSMR
 and ongoing protection to FRMCS

Regional lines

No FRMCS 800MHz for safety services interoperability

→ Add IEEE 70GHz on train & track

Network along track →

IEEE 70Ghz

On-train radio →

FRMCS (*)

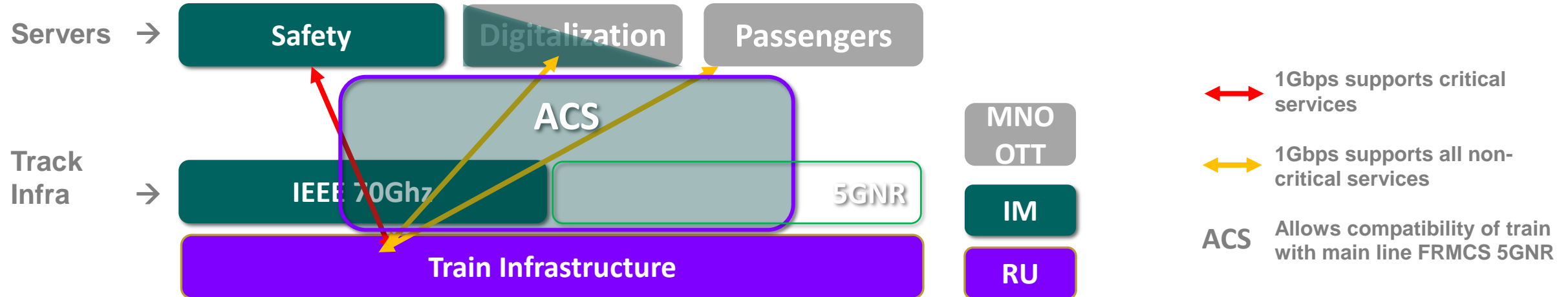
IEEE



(*) On train FRMCS for compatibility with main lines

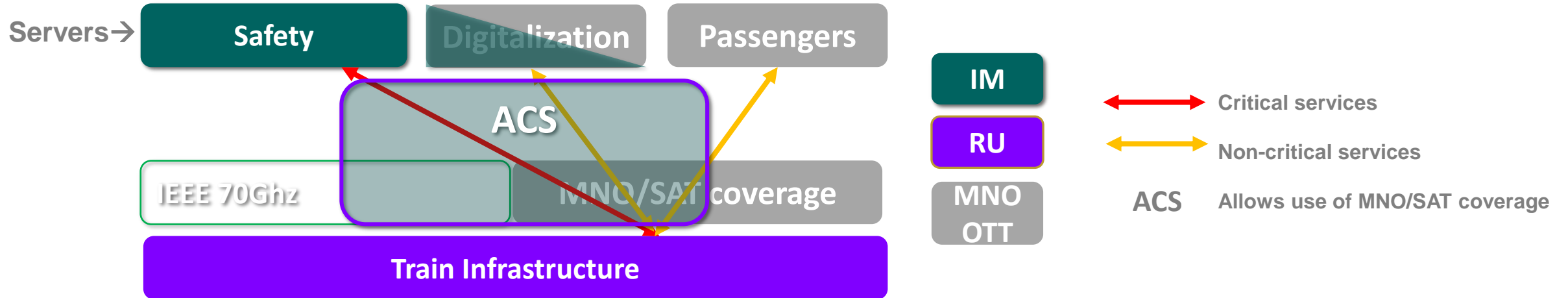
70Ghz facilitates 1Gbps for all services in regional lines

Cost effective regional lines



1Gbps for all services at regional lines

Reusing existing regional assets



Reusing MNO/SAT coverage for all services

Conclusion: requirements met

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Many thanks!

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