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Private Network and Smart Transportation

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ATHONET UPTIME 2023

June 9th 2023

Kontron Transportation: Part of Kontron Group

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With constant profitable growth, Kontron Group is a fast-moving multinational technology leader focused on IoT solutions. Based on longstanding, industry-leading expertise, it is well-placed to help businesses achieve their industrial transformation and digitalization goals.

Key figures Kontron Group (2022)
- 4,475 employees
- 1,100 Mio € revenue
- 109,5 Mio € EBITDA

Software

Industrial

Telecom

Transportation

Services

Our Market Focus: Mission-Critical Networks

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Our Approach

Enable successful digital transformation for mission-critical infrastructure operators: Railways, Public Transport, Utilities and Verticals

Our Solutions

End-to-end solutions for mission-critical Networks including GSM-R, 4G/5G private networks, MCx, FRMCS, NextGen Dispatcher, cybersecurity solutions, industrial IOT, SD-WAN, transmission

Our Competences

As a manufacturer and system integrator, we are combining technical trends with state-of-the-art technologies, expertise, service capabilities and sustainability

Our Solution Offers at a Glance

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GSM-R	FRMCS	Secondary Lines	4G/5G

GSM-R
- › Full and resilient ground to train communication solution based on standards
- › Full ecosystem, NSS, BSS, GPRS, OAM, terminals and more
- › Extended lifecycle (2035+)

FRMCS
- › Successor of GSM-R, smooth migration and coexistence with GSM-R
- › 5G 900 & 1900 MHz deployments
- › Compatible with GSM-R long term support
- › Reuse of the customers assets, support of network hybridization models
- › Transmission

Secondary Lines
- › MCx OTT solution and GSM-R features radio communication systems
- › Modern GSM-R train radio functionalities for Railways, Trams, and Buses
- › 1st technology step to FRMCS
- › SD-WAN intelligent over the top solutions

4G/5G
- › Mobile Private Network
- › For mission-critical implementation models in transportation (Railways, Public Transport, Airport)
- › Standardized, 3GPP compliant, scalable ecosystem
- › Interoperable with GSM-R, Tetra VoIP
- › Radio frequencies on demand
- › Edge gateway
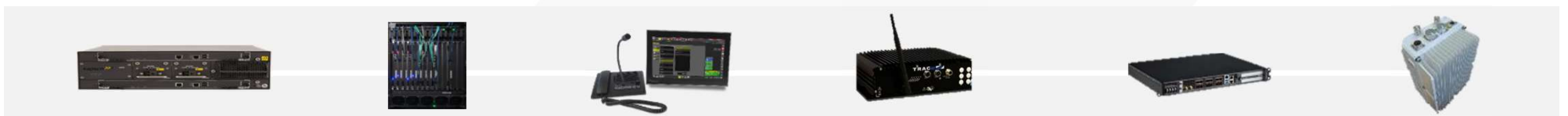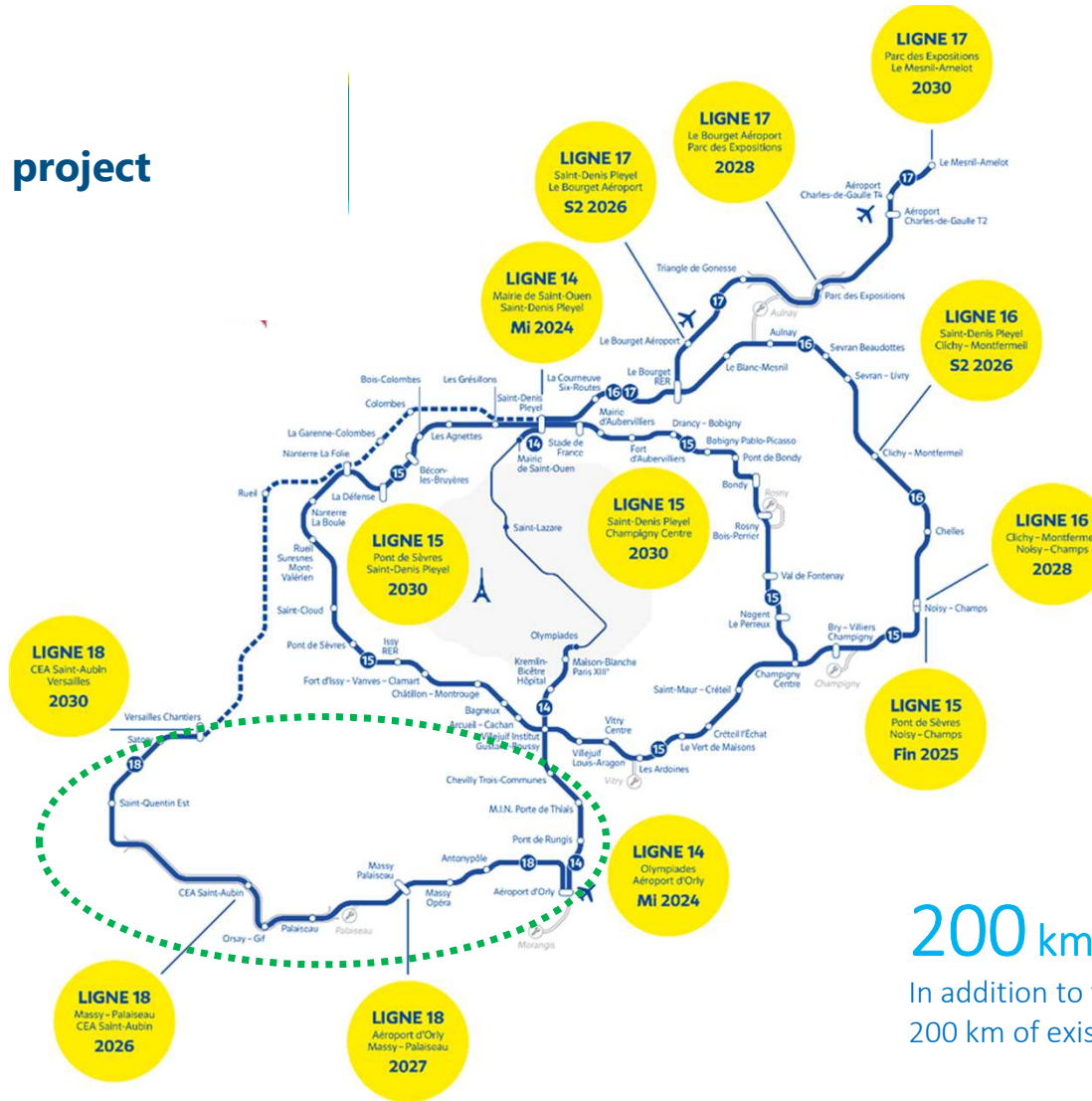
Public Transportation Use Case

Grand Paris Express
Europe's largest construction project

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4 New Lines

68 stations
& 6 operating centers

100 % automatic
for a guarantee of regularity,
adaptability, confort and safety

90 %
underground network

1 train
every 2 to 3 minutes

2 to 3 millions
daily travellers

An average traffic speed between
55 and 65 km/h

200 km of lines
In addition to the
200 km of existing metro

LIGNE 17 Parc des Expositions Le Mesnil-Amelot 2030

LIGNE 17 Le Bourget Aéroport Parc des Expositions 2028

LIGNE 17 Saint-Denis Pleyel Le Bourget Aéroport S2 2026

LIGNE 14 Mairie de Saint-Ouen Saint-Denis Pleyel Mi 2024

LIGNE 16 Saint-Denis Pleyel Clichy - Montfermeil S2 2026

LIGNE 15 Saint-Denis Pleyel Champigny Centre 2030

LIGNE 16 Clichy - Montfermeil Noisy - Champs 2028

LIGNE 15 Pont de Sèvres Saint-Denis Pleyel 2030

LIGNE 18 CEA Saint-Aubin Versailles 2030

LIGNE 15 Pont de Sèvres Noisy - Champs Fin 2025

LIGNE 14 Olympiades Aéroport d'Orly Mi 2024

LIGNE 18 Massy - Palaiseau CEA Saint-Aubin 2026
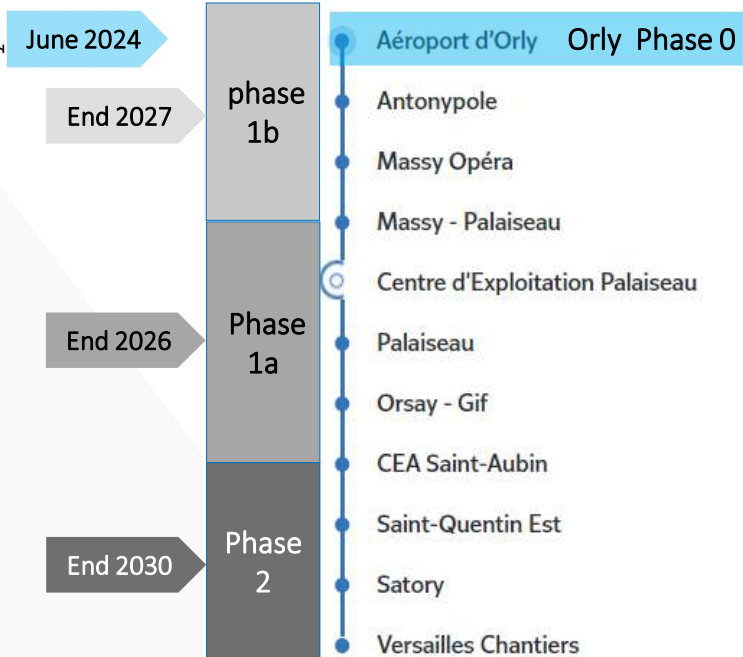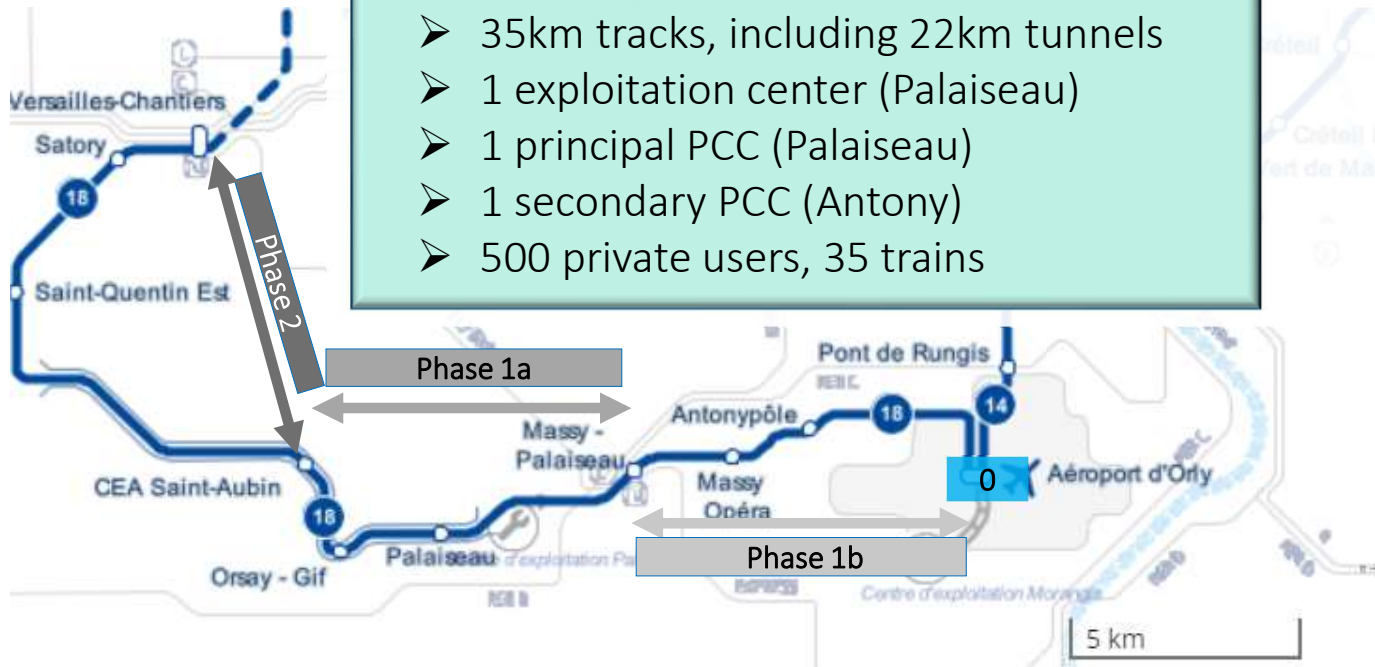
LIGNE 18 Aéroport d'Orly Massy - Palaiseau 2027

Large scale Project – In service between 2024 and 2030

Line 18 – 4 Phases

Line 18 in figures

- ‘Green line’ of Grand Paris Express
- 7 underground stations, 3 air stations
- 35km tracks, including 22km tunnels
- 1 exploitation center (Palaiseau)
- 1 principal PCC (Palaiseau)
- 1 secondary PCC (Antony)
- 500 private users, 35 trains

PARIS 2024

Timeline	Phase	Station
June 2024		Aéroport d'Orly — Orly Phase 0
End 2027	phase 1b	Antonypole
		Massy Opéra
		Massy - Palaiseau
		Centre d'Exploitation Palaiseau
End 2026	Phase 1a	Palaiseau
		Orsay - Gif
		CEA Saint-Aubin
End 2030	Phase 2	Saint-Quentin Est
		Satory
		Versailles Chantiers

Map labels: Versailles-Chantiers, Satory, Saint-Quentin Est, CEA Saint-Aubin, Orsay - Gif, Palaiseau, Massy - Palaiseau, Massy Opéra, Antonypôle, Pont de Rungis, Aéroport d'Orly

Phase 2, Phase 1a, Phase 1b, 0

5 km

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LTE PMR Solution : Use Cases

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FEATURES	USAGES
Agent Communications	➢ Voice Calls (individual, group calls, emergency calls) ➢ Data Transmission (message, video) between mobiles/tablets (point-to-point, point to multipoint) ➢ Access from cell phones to business applications ➢ Itinerancy for the agents of the prefecture (rescue and security)
Ground / Train Communications	➢ On-board video surveillance ➢ On-board intercom ➢ Passengers information and sound system ➢ Supervision info from on-board equipment
Ground / Train Communications in station	➢ Downloading of video sequences recorded on board during station stops or maintenance - 1Gbit/s upload for each link during 20s (train stop time)
Staff Safety	➢ Enable geolocation ➢ Ensure the protection of the isolated worker (alarm to PCC in case of a fall / immobility) ➢ Recording of communications and associated data

Challenges

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CHALLENGES	SOLUTION
➤ Ability to **geolocalize** using wherever the worker is	➤ **Mix of technology** (BLE, GPS, CellID) security)
➤ **Indoor/Outdoor Coverage with** complex environment	➤ **Strong radio design** knowledge with tunnels, stations, viaduct and proximity of other private network from other Industry and Airport in the vicinity
➤ **Future Evolution & obsolescence management**	➤ **4G to 5G evolution Readiness** for Core, Access but also On board devices
➤ **High Uplink throughput** for multiple trains	➤ **4G TDD 0** frame configuration support
➤ **Simplify management of a complex solution**	➤ **Unified Network Management** System for all technologies (UHD, THD)

Solution's Functions

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O&M & Services

- **MCX** Server/Clients, MCX-EM

- **IMS** (HSS, EIR, xSCF, MRF)

- **RECORDING** system

- **DISPATCH** Server, Clients, Devices & EM

- **NMS** : Network Management Server & Clients - (FM/PM)

- **RPM** : Provisioning Server & Clients– (CM)

RAN & Core

- RAN 4G:
  - ✓ eNodebs 700/2600 MHz
  - ✓ RAN-EM
  - ✓ Security interface (with SecGW)

- ✓ **Core Network 4G :**
  - ✓ **MME PCRF SGW PGW EIR HSS, & ePC-EM**
  - ✓ **Local & Geo-redundant**

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- MS client based smartphones
  - ✓ With MCX, MDM, LOCations clients
- THD :
  - ✓ On Board redundant & bi-Modems Units
 - ✓ On Track redundant Controller
  - ✓ THD-EM

Add On

- **Integrated functions** within solution:
  - ✓ UEs Smartphones, tablets, on board
  - ✓ MDM System
  - ✓ Simcards
  - ✓ System Clock (Time Synch)

- **Specific** to project functions
  - ✓ *Location Server, Clients & EM* (BT + Cellid + GNSS)
  - ✓ *LiFi Solution* (UHD EM, UHD Modem)
  - ✓ *PTI client on UEs, Dispatch*

- Major sub-contracteur for **Services**

Why Athonet in such a solution?

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ATHONET 4G Core

- ✓ Scalability
- ✓ Local Redundancy
- ✓ Geo redundancy
- ✓ Management PM/FM/CM

- ✓ IMS access (MCX users) —
- ✓ Dual LTE (On Board Users) —
- ✓ Basic Internet (Tablets) —

- ✓ Roaming for Home Office —

- ✓ Accounting
- ✓ Evolutivity
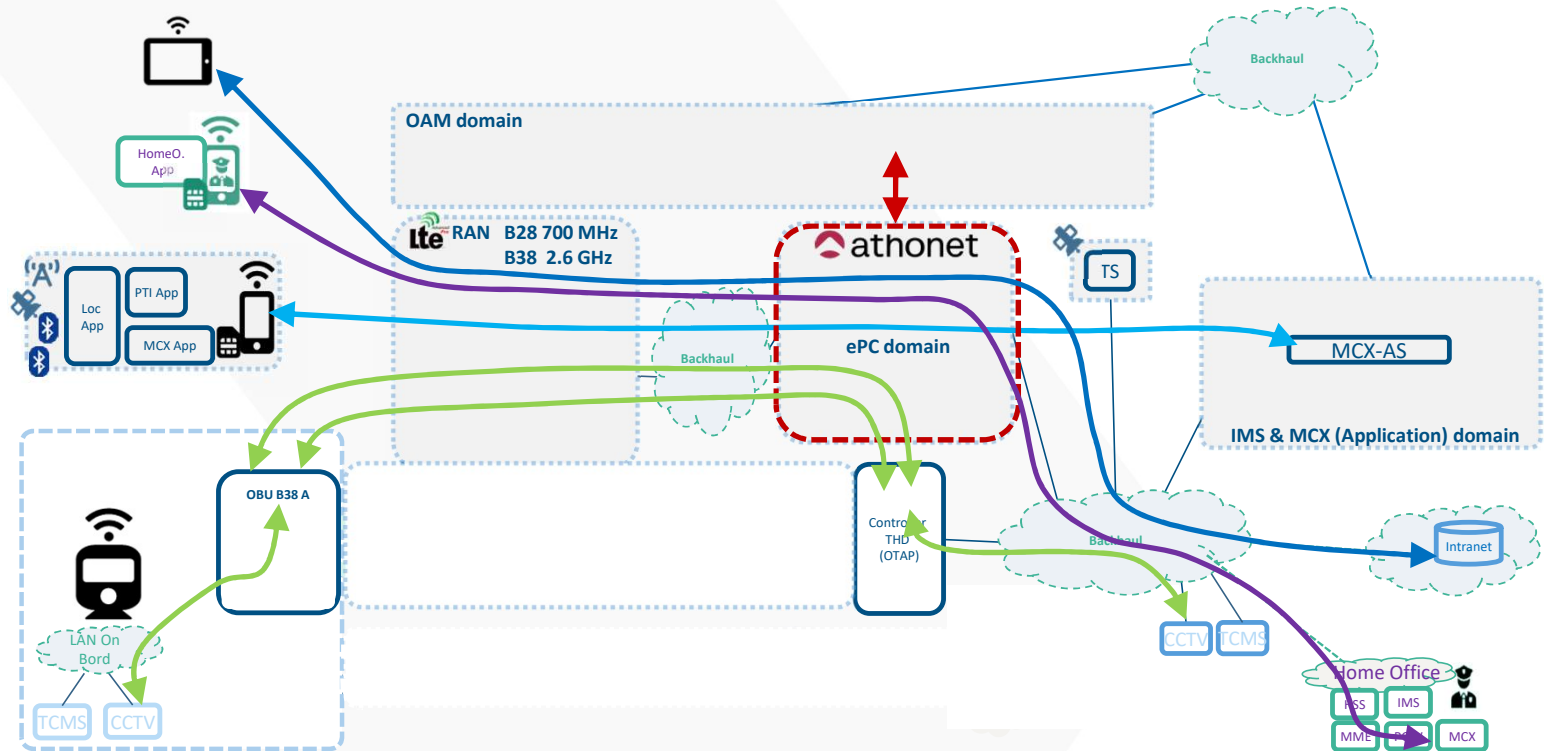
Athonet provides the best answer to KONTRON solution
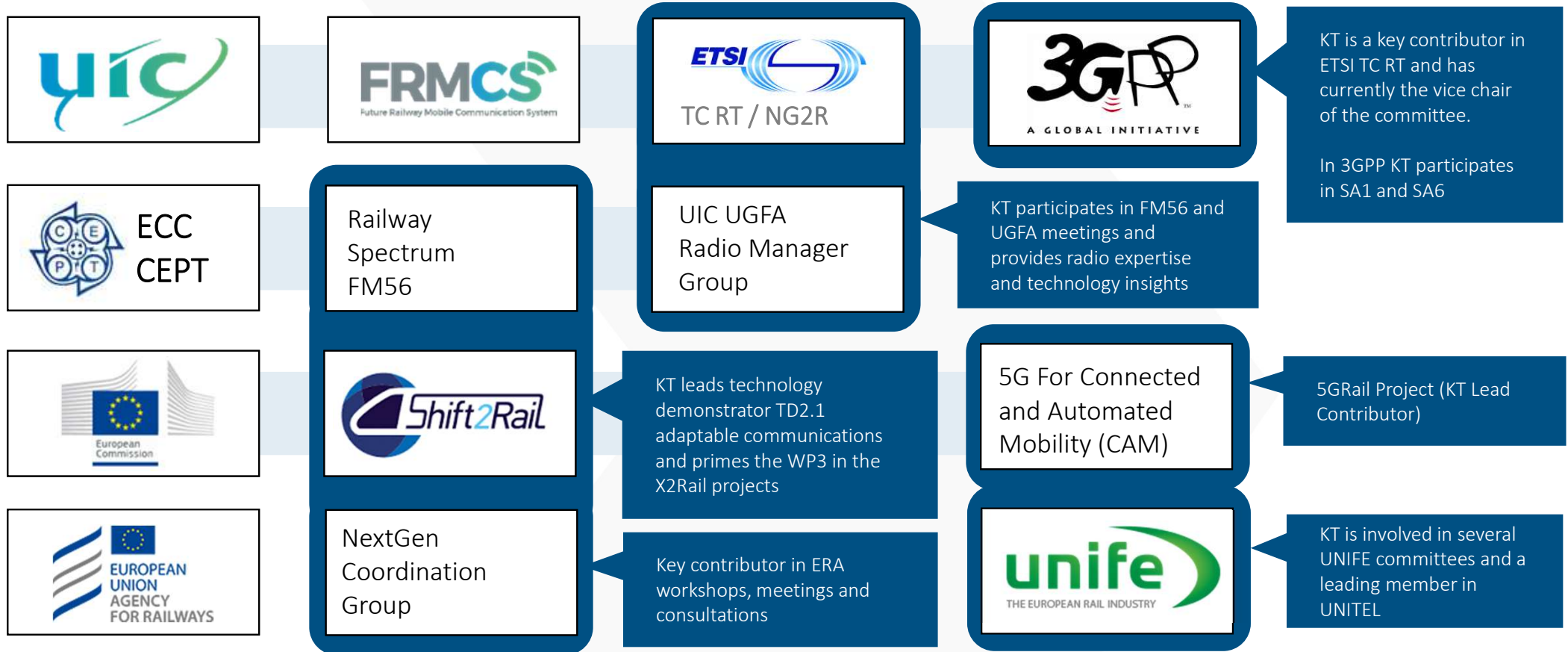
Railways Transportation Evolution (FRMCS)

FRMCS: Future Railway Mobile Communication System
Preparing a Smooth Transition from GSM-R to next generation Railways

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900 MHz
873-880
918-925
FDD

900 MHz
874.4-880
919.4-925
FDD

1900 MHz
1900-1910
TDD

Migration
Coexistence
2035+ Support

2G

5G

FRMCS preparation

FRMCS requires a strong preliminary engagement in standardization

KT is a key contributor in ETSI TC RT and has currently the vice chair of the committee.

In 3GPP KT participates in SA1 and SA6

KT participates in FM56 and UGFA meetings and provides radio expertise and technology insights

KT leads technology demonstrator TD2.1 adaptable communications and primes the WP3 in the X2Rail projects

5GRail Project (KT Lead Contributor)

Key contributor in ERA workshops, meetings and consultations

KT is involved in several UNIFE committees and a leading member in UNITEL

FRMCS = Next Generation for Railways

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› **UIC** drives the plan for **FRMCS introduction**
  › UIC V2 Spec – For start trials & migration → Horizon 2025
  › UICV3 Spec – For Commercial rollout → Horizon 2027

› **FRMCS** technology based on 5G 3GPP R18+
  › Harmonized Frequencies on 900MHz FDD and 1900MHz TDD spectrum
  › Deployment of 5G RAN and 5G Core SA overlay

› **Migration** & **Technologies coexistence** is not an option
  › Coexistence for at least 10 years from FRMCS introduction
  › GSM-R Long term support extended to 2035+

› A hybrid network design for coverage and densification
  › Private 5G network for Mission Critical applications (900 & 1900 MHz)
  › Reuse of GSM-R infrastructure to host FRMCS – Opex Reduction
  › Roaming with MNO's when add'l capacity needed – Not mission critical

Kontron Transportation solution for FRMCS

'Inherited' from KONTRON 4G solution...
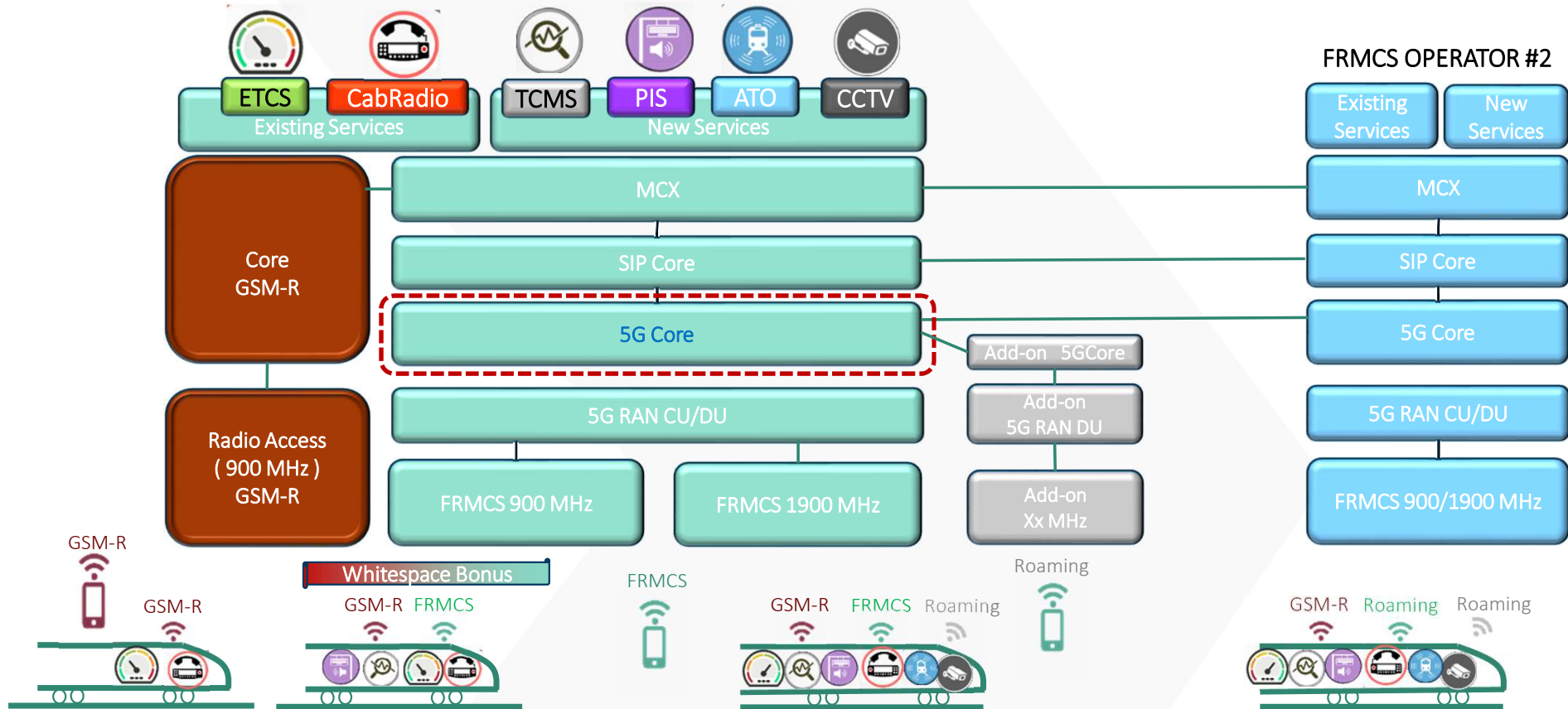
5G (SA) Core is in the middle of the solution and needs to support hybridization

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Thank you
for your attention

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