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

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Our Company

Eight Bells (8BELLS) is a 4-years old **SME** based in Nicosia, Cyprus. In 2020 8BELLS established **a new branch** in Athens, Greece.

Delivers customizable solutions that enhance existing communication technologies relevant to **5G, Cloud Computing, Internet of Things, Cybersecurity.** Specializes **also** in modelling and analysis for businesses.

Has participated in more than 20 EU and national projects that have attracted more than €4 million**.**

Preparation, Execution, Management of R&D projects (mainly H2020), analysis, and quantification of results. Business and Technical Consulting.

EIGHT BELLS at a glance 2/3

Research Expertise & Consulting Services

Customizable solutions that enhance modern communications relevant to the area of 5G Mobile Technology

5G communications

Knowledge on Network Function Virtualization (NFV) and management solutions for Cloud infrastructures.

NVF Cloud service

Portfolio of cybersecurity solutions that can be used for risk assessment, cyber-hygiene, anomaly detection, and threat remediation.

Cybersecurity solutions

Delivers special advisory services in ICT that help clients understand the market dynamics and profit from the ever-changing landscape. Advise and support other companies and organizations in every step of the process.
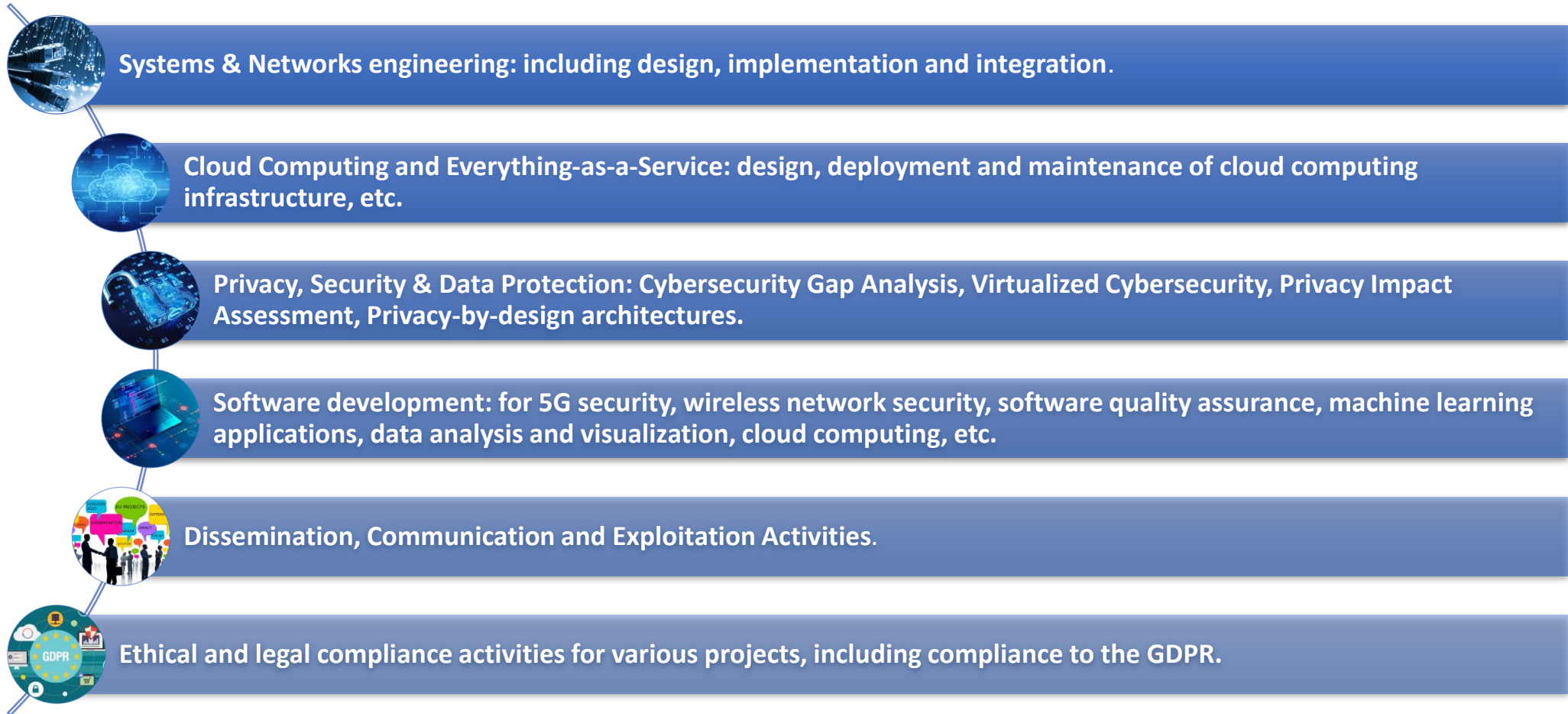
Advisory services

Business consulting includes also innovation management, technology transfer and exploitation (including market analysis, patenting, licensing, etc.).

Consulting

EIGHT BELLS at a glance 3/3

Technical Capabilities

Systems & Networks engineering: including design, implementation and integration.

Cloud Computing and Everything-as-a-Service: design, deployment and maintenance of cloud computing infrastructure, etc.

Privacy, Security & Data Protection: Cybersecurity Gap Analysis, Virtualized Cybersecurity, Privacy Impact Assessment, Privacy-by-design architectures.

Software development: for 5G security, wireless network security, software quality assurance, machine learning applications, data analysis and visualization, cloud computing, etc.

Dissemination, Communication and Exploitation Activities.

Ethical and legal compliance activities for various projects, including compliance to the GDPR.

Our Projects
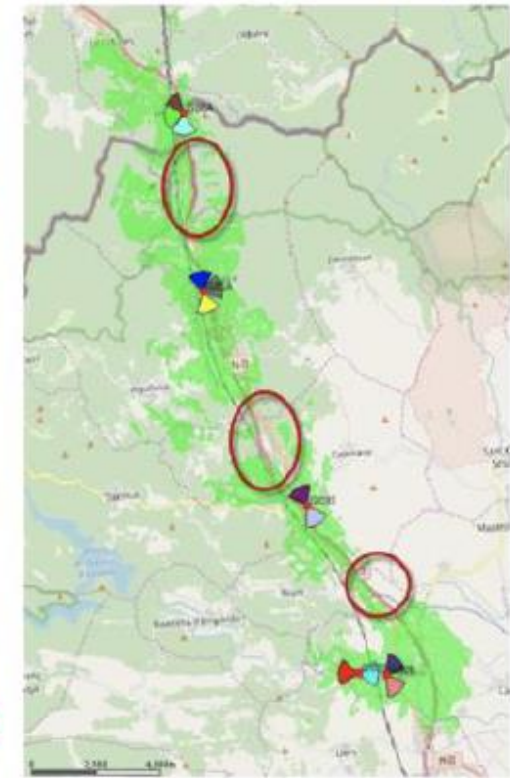
Fig.1 Highway and rail track in corridor.

1. POLIGON 1 PARCELA 19, SN. La Jonquera
2. Dipósit d'Aigua. La Jonquera
3. N-II Km 744 / GI-602. Capmany
4. GIV-5041 (a Boadella). (Torre de Tradia). Pont de Molins
5. Dipósit d'Aigua. Pont de Molins

Potential sites on Spanish side

Preliminary coverage analysis at 3.5 GHz

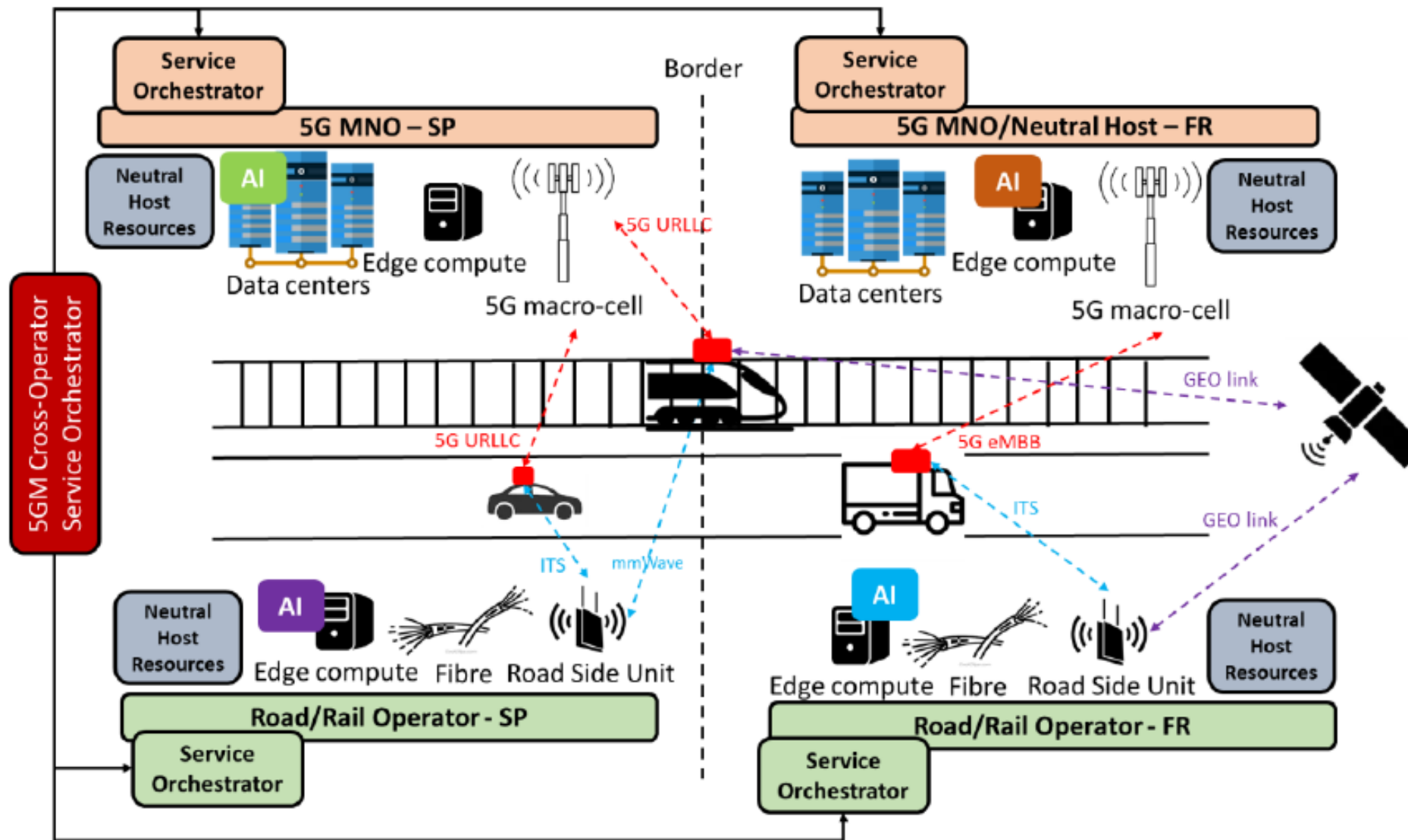Fig.2 Potential sites and preliminary coverage in the Spanish side.

Fig.3 5G Med high-level system vision – an overview of the project.

Objectives

Scalable, **cross-border** and **multi-stakeholder 5G** and **AI-enabled** system architecture supporting **CCAM** and **FRMCS** services that can be **replicated** along Europe, envisaged for **CEF Digital**.

Cross-operator service orchestration enabling service continuity for end-users, Remote Driving, Advanced Control Traffic and Infotainment UCs in cross-border scenarios and enhanced FRMCS performance.

Standardization activities, collaboration with relevant joint public-private platforms of industry and public authorities, to build a **harmonized voice towards the implementation of CCAM.**

Wide and sustainable impact of 5GMed outcomes, through **dissemination**, **active engagement** of industry, public authorities, government bodies towards operational deployment models and **communication campaigns**.

Cost/benefit analysis of the 5G infrastructure deployment, considering the **impact on other business stakeholders**.

Innovative business models for CCAM/FRMCS service provisioning, **new market opportunities for third-parties** and **positioning** the role of Public Authorities.

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Main Deliverables

An integrated system of **advanced CCAM, FRMCS and Infotainment services along the "Barcelona – Perpignan" cross-border corridor, enabled by a multi-stakeholder compute and network infrastructure deployed by MNOs, neutral hosts, and road and rail operators.** The system will support the test cases derived from the project UCs, including **multi-connectivity** aspects, **orchestration, slicing** and offering support for **AI functions**.

Joint end-to-end CCAM and FRMCS services, provided by the **multiple entities** involved, **resulting in sustainable and scalable 5G deployment models that can be replicated across Europe.**

Integration of **In-car V2X** extensions and **media functions** required in railways environment to support the Infotainment services.

Validation of use cases in small-scale test beds and in the cross-border corridor.

Market analysis and business models, **standardization** plan and **impact maximization** strategy.

Use Cases

❑UC1: Remote Driving

❑UC2: Road infrastructure digitalization for intelligent management of the connected and automated vehicles mobility

❑UC3: FRMCS applications and business service continuity

❑UC4: Follow-ME Infotainment
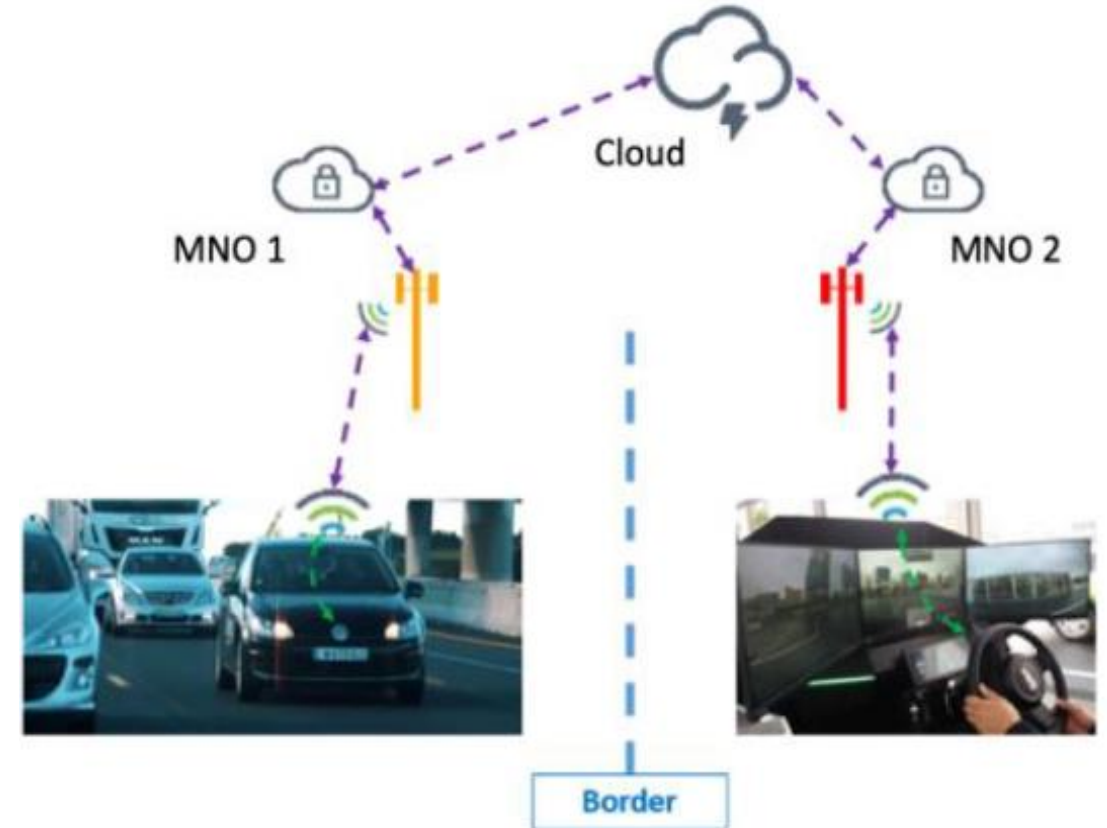
UC1: Remote Driving

Remote control of the vehicle ensuring Dynamic Driving Task (DDT) through 5G cellular network.

Phase 1

- Automated execution of the Minimum Risk Manoeuvre (MRM)

Phase 2

- Teleoperation of the vehicle to reach a safe harbor.

UC2: Road infrastructure digitalization for intelligent management of the connected and automated vehicles mobility

Digitalization of road infrastructure using sensors.

| Level 2 | Global Strategy |

- Innovative Traffic Management Center (TMC2.0)
- Strategies using AI

| Level 1 | Local Actions |

- Low latency network
- **Edge pre-processing**
- Security messages

| Level 0 | Physical and digital infrastructure |

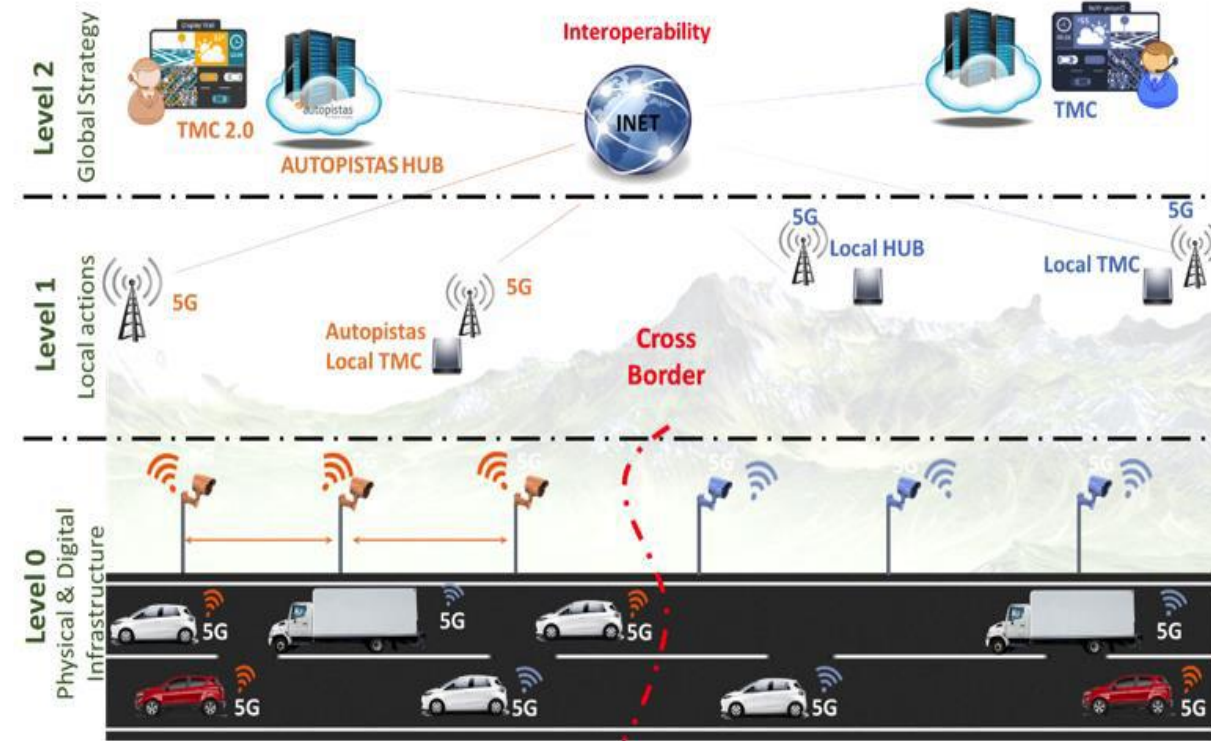- Cameras using a single sensor
- End-end communication

Figure 1-9: Road operator management levels

UC3: FRMCS applications and business service continuity
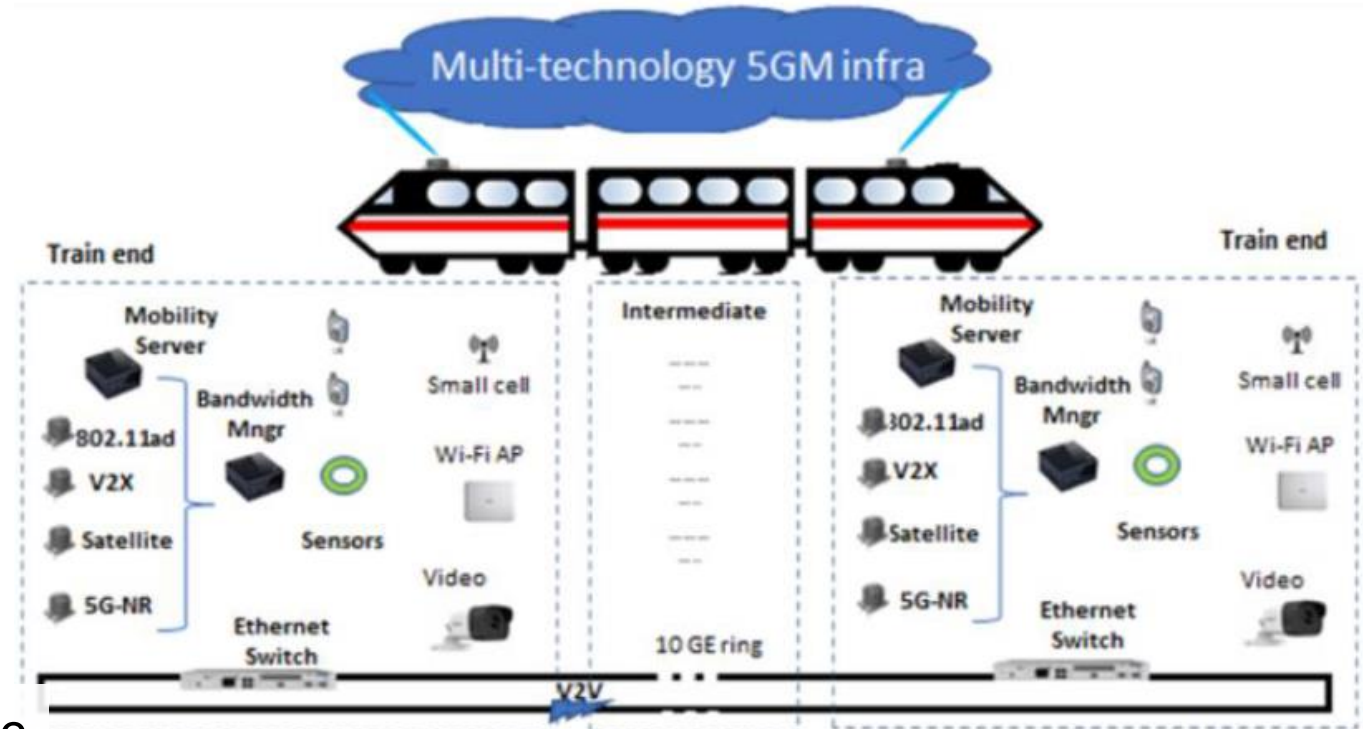
Service types

Critical

- AI computer vision and sensors
- Dedicated Infrastructure

Performance

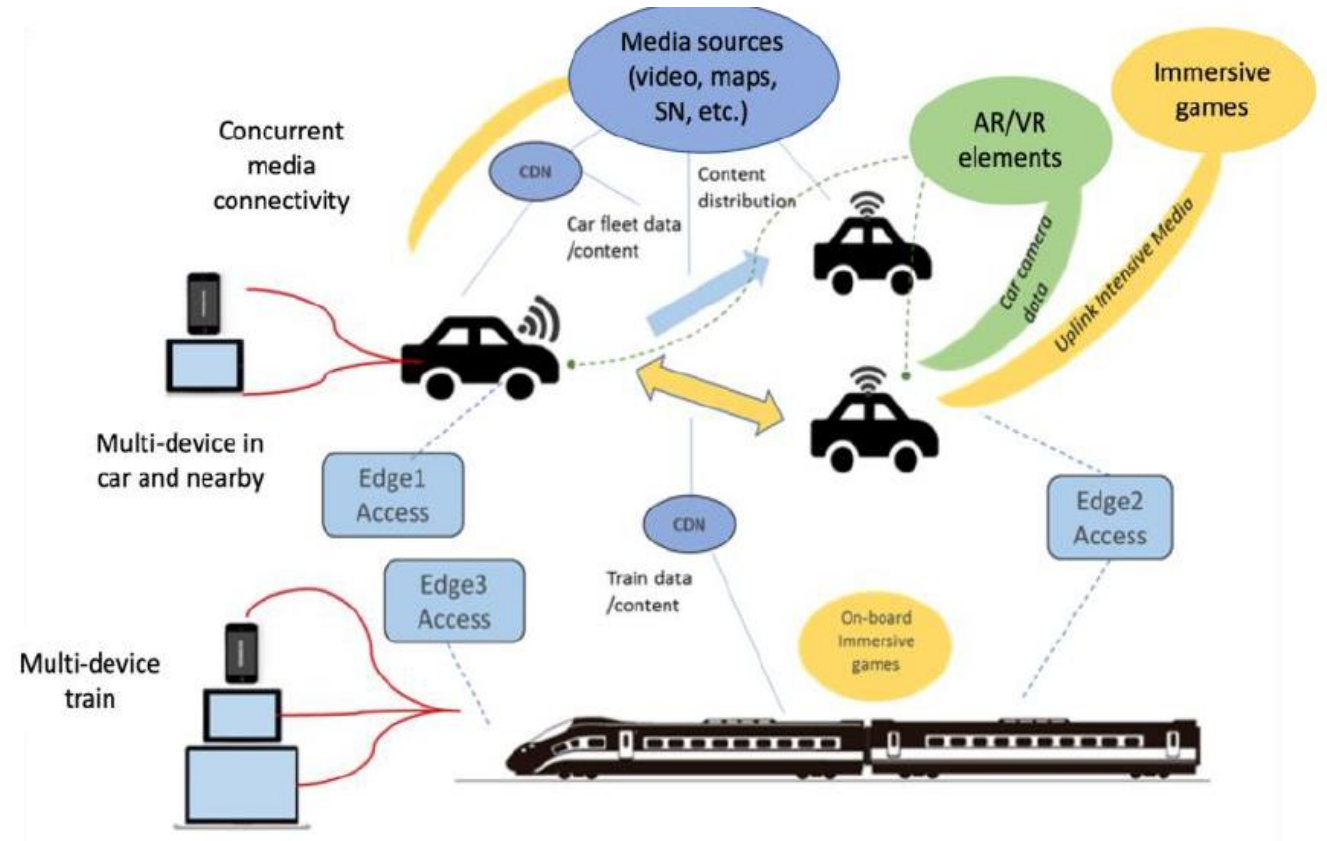- AI computer vision
- IoT monitoring

Business

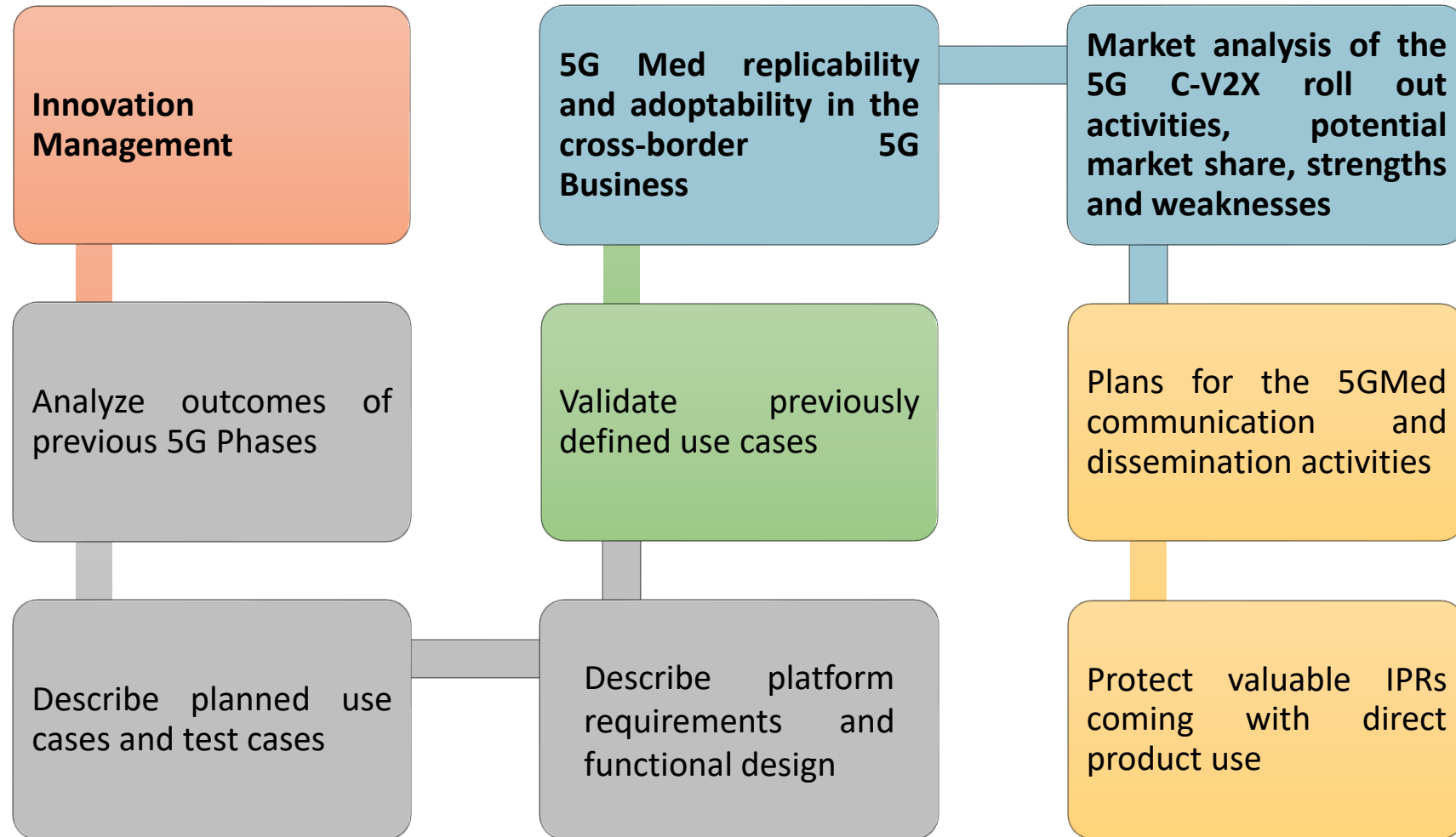- On-board 5GNR network. MNOs become potential clients of train operators.

UC4: Follow-ME Infotainment

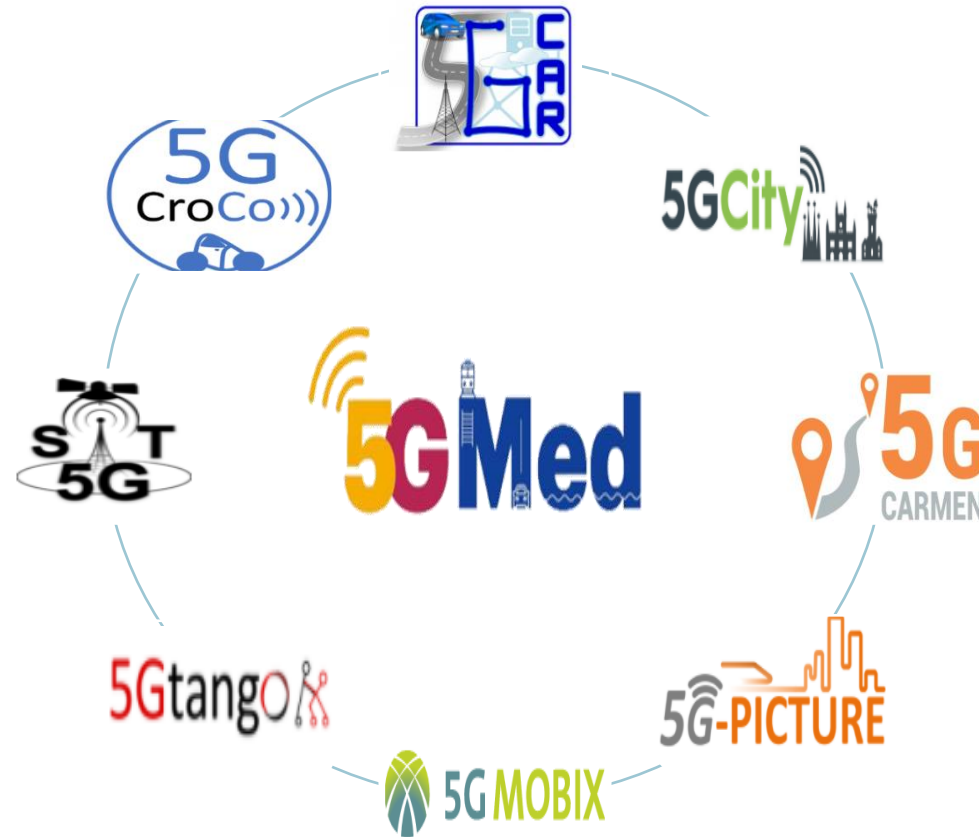Information regarding surroundings and road conditions

❑Virtual reality applications

❑Enriched 3D map models

❑Media modules for content distribution through network edge nodes (Multi-access Edge Computing).

Eight Bells Role in the Project

Innovation Management

5G Med replicability and adoptability in the cross-border 5G Business

Market analysis of the 5G C-V2X roll out activities, potential market share, strengths and weaknesses

Analyze outcomes of previous 5G Phases

Validate previously defined use cases

Plans for the 5GMed communication and dissemination activities

Describe planned use cases and test cases

Describe platform requirements and functional design

Protect valuable IPRs coming with direct product use

European projects relevant to 5GMed

Thank you!

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