AEVAC

Asociación española vehículo autónomo conectado

Welcome to XXI century Intelligent Mobility

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ASOCIACIÓN ESPAÑOLA DEL VEHÍCULO AUTÓNOMO CONECTADO (AEVAC)

Autonomous vehicles changes lives and save lives

Promote the integration and adoptions of Autonomous and Mobility solution that increase the quality of life

Create ecosystems to support and speed the adoption of these technologies

In AEVAC we believe that innovation should change the quality of life of the end consumer, because of this AEVAC role is to represent the consumer and society in the Intelligent Mobility Technological transformation

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AEVAC FOCUS

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Cross border 5G autonomous transport testing pilot

BUDAPEST,
September,2019

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 825496

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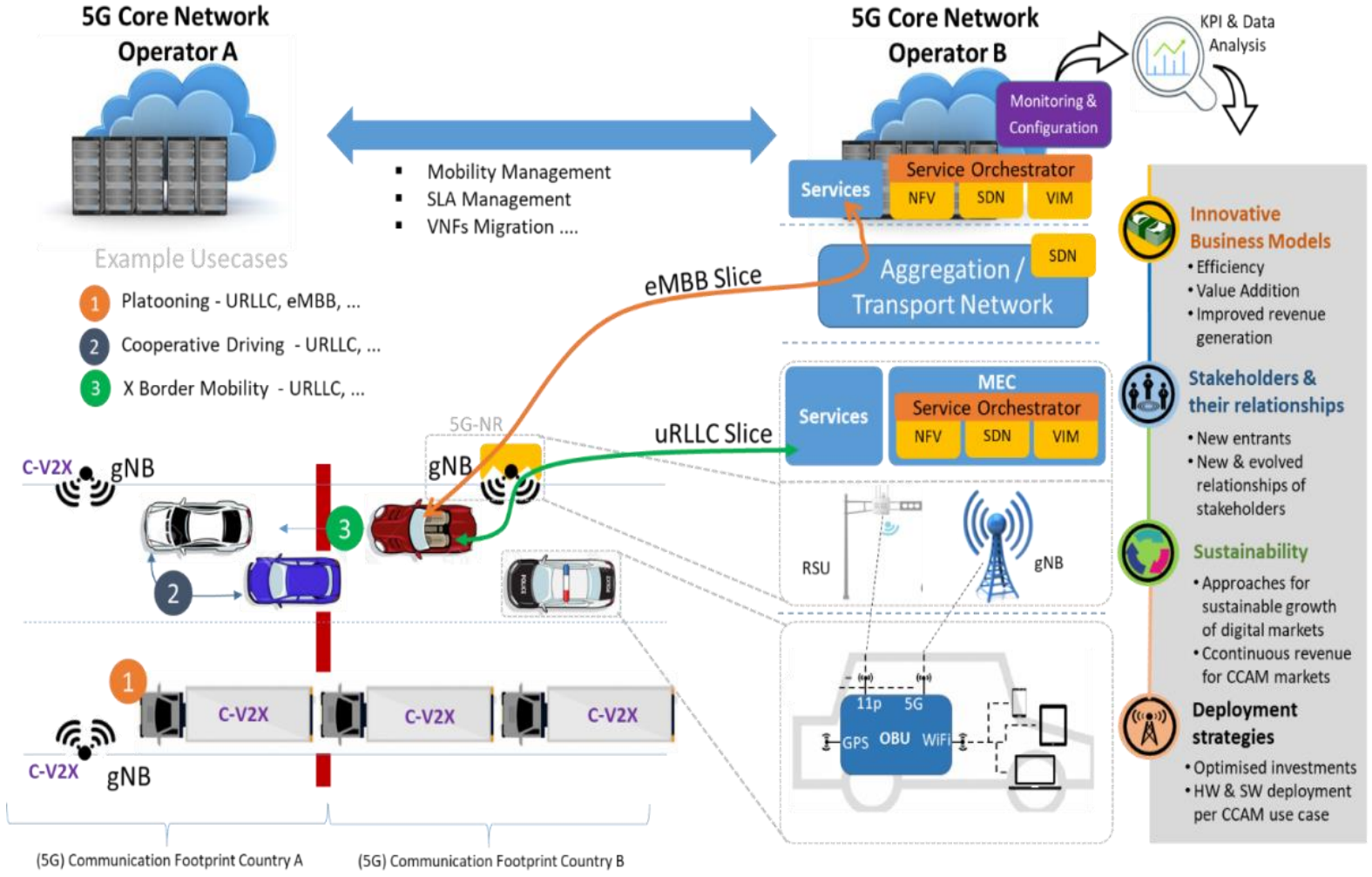
Trials through 2 network slices:

- eMBB for high data throughputs
- uRLLC for low latency connectivity

Local and cross-border trials with challenging Automated driving scenarios:

- Cooperative manoeuver
- Platooning



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5G-MOBIX - Partners

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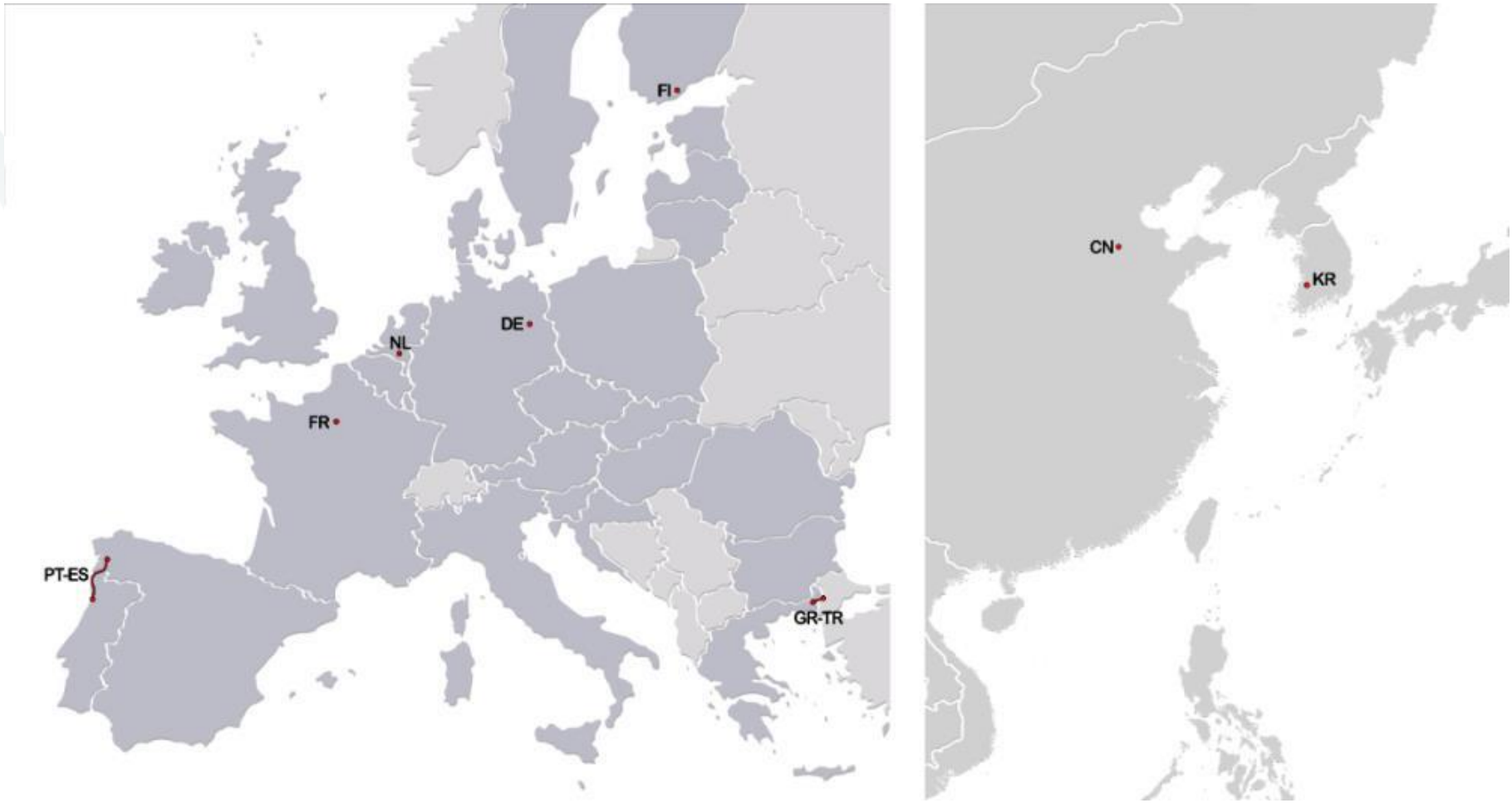
5G-MOBIX – Trial Site



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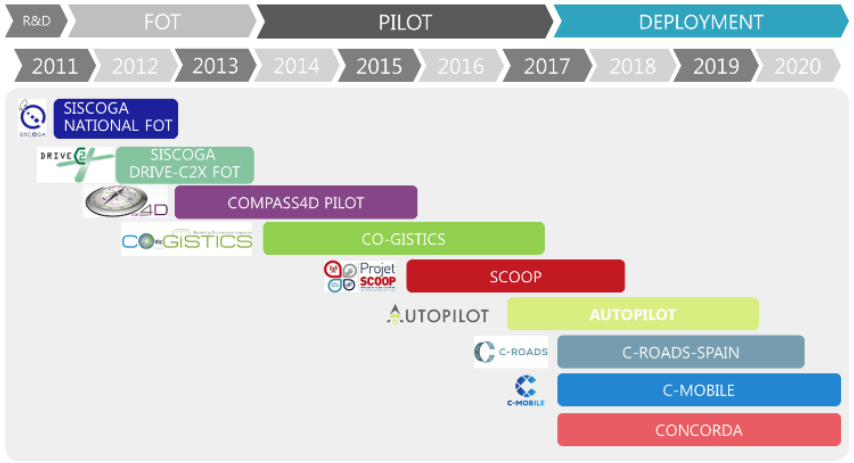
X-Border Trial .Motivation for Spain and Portugal

- Spain and Portugal are strongly committed to and promotes the research, development and deployment of CCAM (Connected and Cooperative Automated Mobility) to improve road safety and road efficiency.
- Important efforts have been done during past years by key stakeholders in the region to pave the way for cooperative and connected automated mobility. Some examples of relevant projects and activities are the following:
  - DRIVE-C2X (Spanish test-site SICOGA)
  - COMPASS4D (Spanish test-site SISCOGA)
  - CO-GISTICS (Spanish test-site SISCOGA)
  - C-ROADS (Portugal and Spain)
  - C-MOBILE (Spanish test-site SISCOGA)
  - SCOOP Phase 2 (Portugal and Spain)
  - AUTOPILOT (Spanish test-site SISCOGA)
  - CONCORDA (Spanish test-site SISCOGA)
- 5G technology, complementing other communication technologies, has a strong potential to support CCAM. Spain and Portugal, together with all its relevant stakeholders in the CCAM domain, are strongly committed to support these technologies, being ICT-18 Call a very important step and an excellent opportunity to move forward in this direction.



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X-Border Trial. Site - Localization & Partnership

Objective: To set up the basis for the deployment of 5G CCAM services and applications and give a strong impulse in both countries towards the development of opportunities around 5G in the ITS sector.

Localization: The Spanish-Portuguese corridor connects the cities of Vigo and Porto, covering a road lenght around 250 Km, and using next roads/highways.

Partnership: car manufactures, telecom companies, public administrations and research institutions.

Spain

Portugal

DGT · CTAG · Telefónica I+D · ALSA · POLITÉCNICA · Infraestruturas de Portugal · IMT · Centro de Computação Gráfica · norte litoral · NOKIA · SIEMENS · Universidad de Murcia · NOKIA Bell Labs · Concello de Vigo · DEKRA · AEVAC · instituto de telecomunicações · OTIS · A-to-Be · NOS

Advisory Board: Telefónica

Associated Partners: Telefónica Móviles · PSA Groupe

Spain:
A55 (65 Km)
AP9 (50 Km)
Urban Roads in the city of Vigo (4 Km)

Portugal:
A3 (100 Km)
A28 Passenger Boat Terminal and Airport (7 Km)
N13 (55km)

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X-Border ES-PT Management

- Coordination and documentation:
  - CTAG has organized the 1st XBSite SP/PT F2F that took place at CTAG HQ (Vigo) in April 10th

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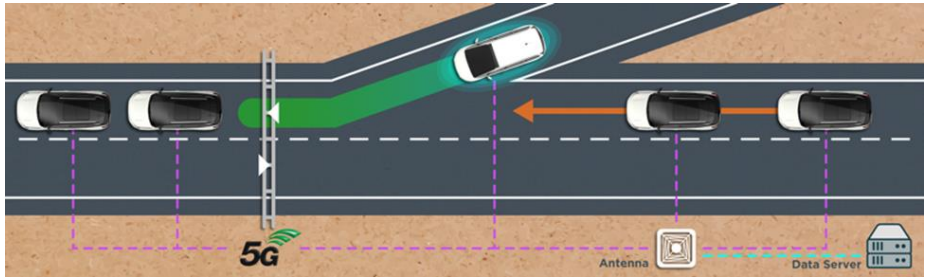
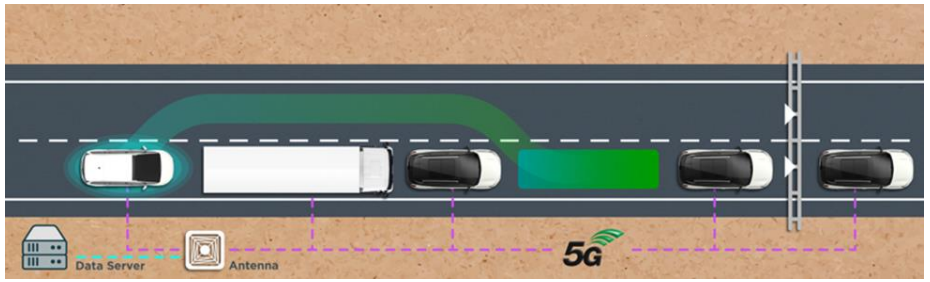
WP 2 – Use Case 1
3 Scenarios

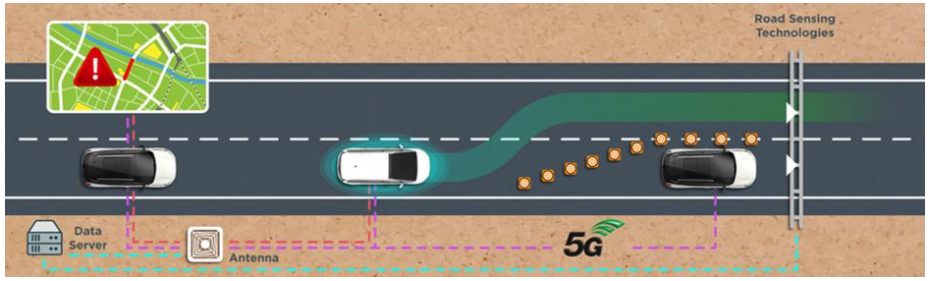
- **Scenario 1: Lane merge for automated vehicles.**
  - Receiving traffic data of vehicles in a line merge scenario will provide an extended perception layer to the automated system for determining the best merge maneuver.



- **Scenario 2: Automated overtaking.**
  - Sharing and receiving perception data from near vehicles before doing an automated overtaking will improve safety in the manoeuvre by enriching the 360º perception layer of the own vehicle.



- **Scenario 3: HD Maps – FCD.**
  - Ability of automated vehicles to modify and update HD Maps in real time based on ITS Centre events and self defined new paths will provide an improvement in safety for other vehicles which can obtain the most updated road data.



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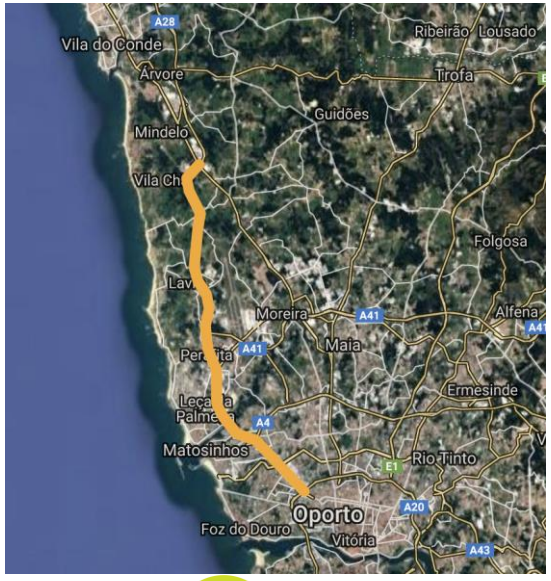
WP 2- Use Case 1

Deployment Spain

- Different test zones are selected for the scenarios of the use case, according to the road needs.
- A lane merge area and a overtaking area has been selected.
- For the HD-Maps-FCD the complete areas for the previous scenarios will be used.

Deployment Portugal

- Lane Merge and Automated Overtaking will be deployed in the A28 road near Porto (Airport and Sea Harbor).
- The same road will be used for HD-Maps-FCD scenario.



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WP 2- Use Case 1
Deployment Crossborder

- For the lane merge scenario, two different areas have been selected in the proximity of the international bridge (one in Spain and the other in Portugal).

- For the overtaking scenario, the international bridge will be used in both directions (Spain to Portugal and vice versa).

- The same areas will be used for the HD-Maps-FCD Scenario.

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WP 2- Use Case 2
Interurban Scenario for Public Transport

- Real time connected services in public transport fleet that connects the cities of Vigo and Porto.
  - Streaming of 4K camera and in-vehicle sensors data to the ALSA Control Centre.
  - Streaming the in-vehicle sensors data to near vehicles and to TMC.
  - User access to high definition multimedia content with great quality of service.

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WP 2- Use Case 2
Deployment

- According to the ALSA bus route, a area will be selected in order to tests the different scenarios of the use cases. This selection will be done according to the coverage extension planned.

Deployment Spain

Deployment Portugal

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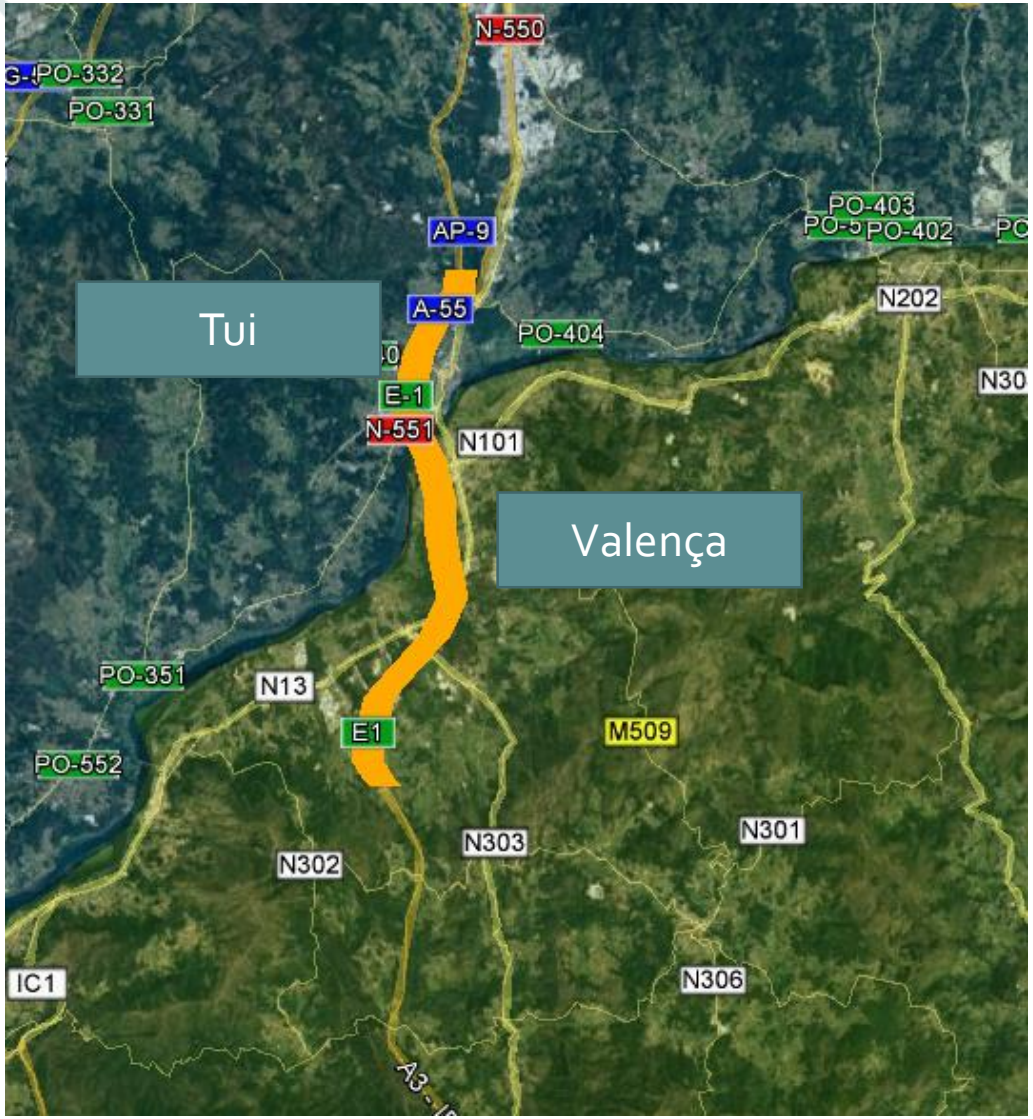
WP 2- Use Case 2
Deployment Crossborder



The crossborder area between Tui and Valença will be used in order to test the scenarios of the use case, analysing the network operator changes in this crossborder area.

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WP2- Use Case 3
Last Mile EV Automated Shuttle vehicles in crossborder and urban environments

- Solutions for Last Mile EV Automated Shuttle vehicles in different environments:
  - **Cross-border environment**: route between Tui (SP) and Valença (PT).
  - **Urban environment**: route in the city of Vigo.

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WP 2- Use Case 3
2 Scenarios

- **Scenario 1: Cooperative automated operation**
  - The EV Autonomous Shuttle will be able to receive information coming from other actors (like a Vulnerable Road User), and adapt its behaviour according to specific needs.

- **Scenario 2: Remote control**
  - The EV Autonomous Shuttle will be remotely controlled by an operator for avoiding an obstacle when its predefined route is blocked.

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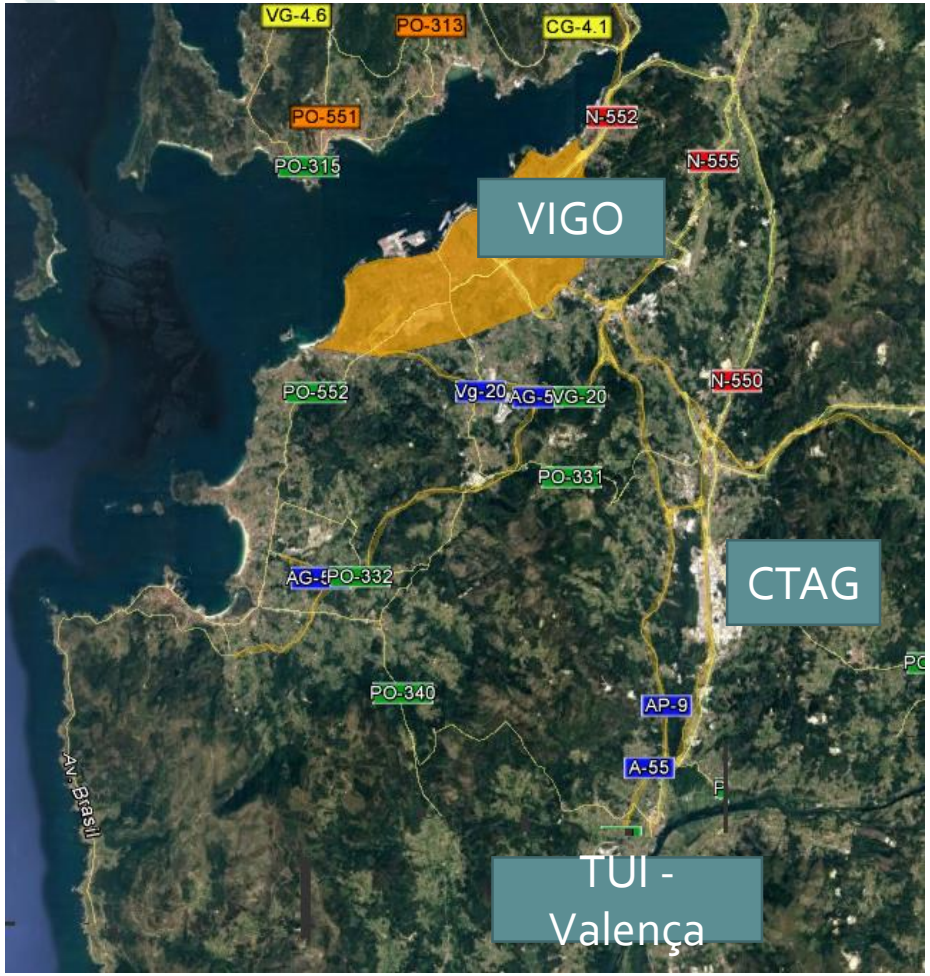
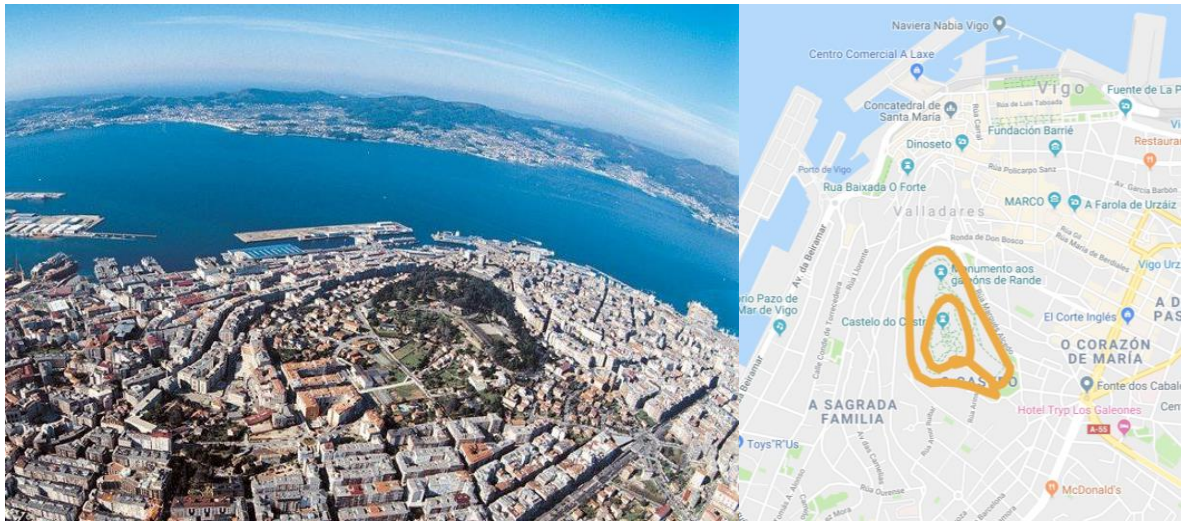
WP2- Use Case 3
Deployment Spain



- The first deployment of this use case will take place at the city of Vigo, within the area where the park "El Castro" is placed.



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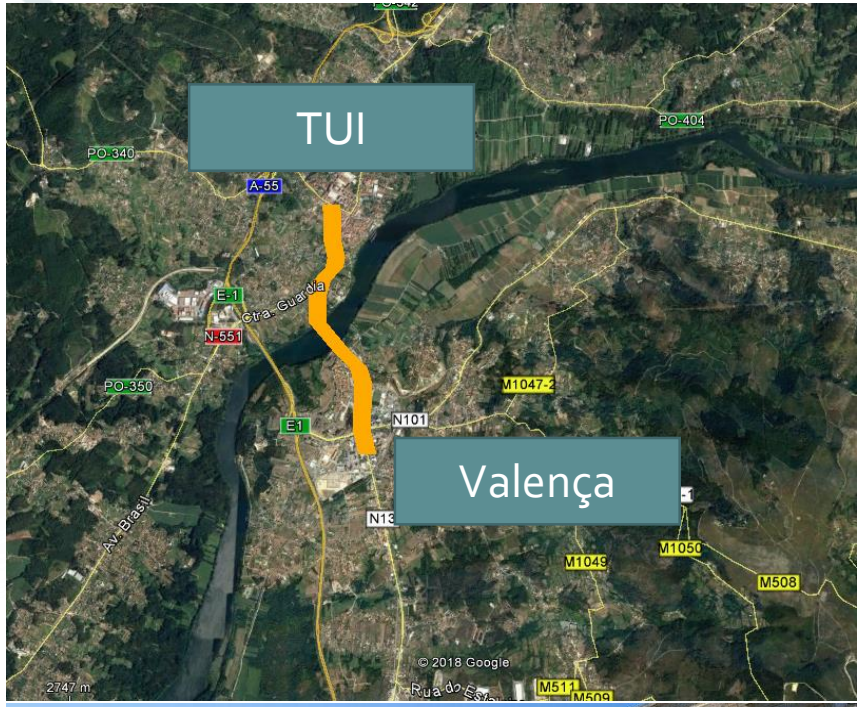
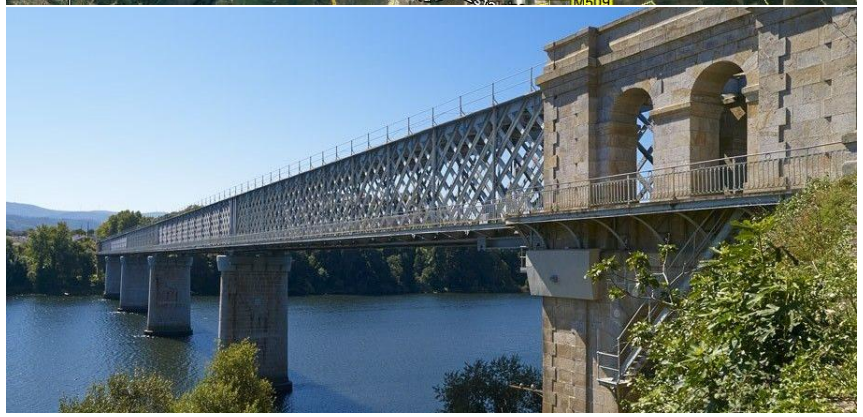
WP2 - Use Case 3
Deployment Crossborder





- For the crossborder deployment, Tui-Valença old bridge has been selected as the test place. This includes the N13 as the access road to the bridge from Portugal.
- A meeting with Tui Council has been made in order to get their support.
- Pending to have the same meeting with Valença Council.

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WP2 - Vehicles

- **ALSA Bus with Premium services:**
  - Interior and exterior cameras.
  - Communication Unit developed by CTAG.
  - Currently legal and in service between the cities of Porto and Vigo.

- **CTAG Shuttle EV Bus:**
  - SAE L4.
  - Real-time remote driving.
  - Communications unit developed by CTAG.
  - Sensors: LIDARs 2D and 3D, cameras, Map Unit, DGPS+IMU.

- **C4-Picasso (Automated Car):**
  - 3 Citroën C4 Picasso, SAE L4 o Automated driving functions.
  - Communications unit developed by CTAG.
  - Sensors: LIDARs 2D and 3D, cameras, Radars, Map Unit, DGPS+IMU.

- **Volkswagen Golf (Automated Car):**
  - Volkswagen Golf, SAE L4.
  - Communications unit developed by CTAG.
  - Sensors: LIDARs 2D and 3D, cameras, Radars, Map Unit, DGPS,+IMU.

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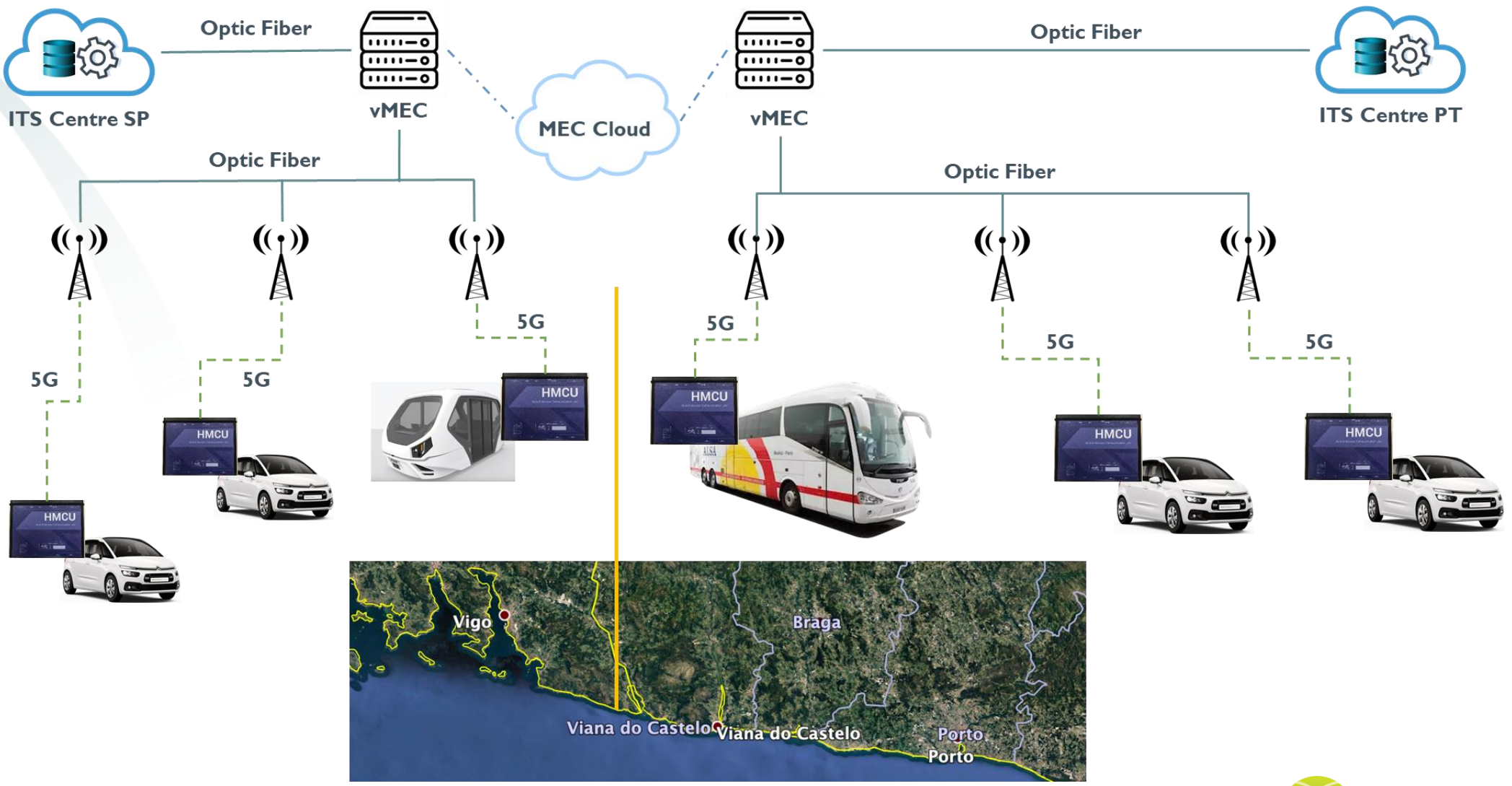
WP2 – Communications Architecture



WP2- Infrastructure Specifications

Spain:

- MEC nodes with additional capabilities for interconnection with MEC nodes from another operator.
- A number of macro / small cells, initially based on 4G LTE but eventually upgradeable to 5G NR, to reinforce the coverage in either a high band (e.g. 3.5 GHz) or a low band (e.g. 800 or 700 MHz).
- A network slicing framework for proper isolation between V2X and eMBB services, based on either SDN/NFV technologies or more traditional means (like e.g. local breakout and QoS differentiation).
- A number of SIM cards properly registered in Telefónica's provisioning systems for access to V2X services.

Portugal:

- MEC.
- 5G base stations. BTSs, subject to detailed radio planning.
- 5G core.
- Optical fibre interconnections.
- IP/MPLS fixed network.
- Energy power supply .
- Supply and install sensors and RSUs.
- Development of software wrappers eventually required for seamless integration of the systems.

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WP2- Evaluation Activities. KPIs

TECHNICAL

- Area traffic capacity.
- Availability.
- Bandwidth.
- Connection density.
- Control plane latency.
- Coverage area probability.
- End-to-end latency.
- Packet error rate.
- Transmission rate.
- Positioning & timing accuracy.
- Information age.
- Message payload.
- …

IMPACT

- Number of journeys.
- Length of journeys in distance.
- Proportion of use of each transport mode for journeys.
- Travel time per distance of journeys.
- Route of journeys.
- Route choice.
- Acceleration / deceleration.
- Emissions (Nox, PM, HC) / fuel consumption per 100 km.
- Speed (mean).
- …

USER ACCEPTANCE

- Percentage of goals achieved.
- Percentage of users successfully completing task.
- Time to complete task.
- Tasks completed per unit of time.
- Monetary cost of performing the task.
- Mental Workload.
- Rating scale for satisfaction
- Frequency of discretionary use.
- …

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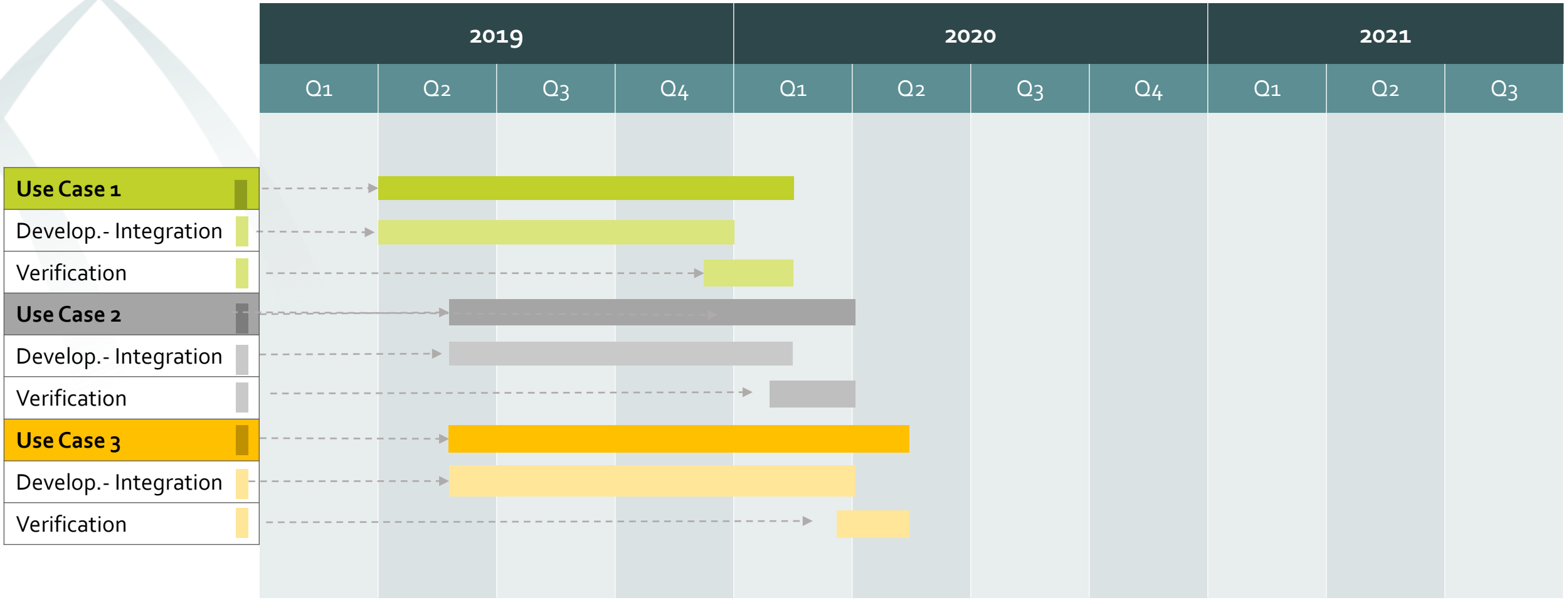
WP3 - Tasks
Task 3.1 - 5 G Corridor roll out and coordination



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WP3 - Tasks

Task 3.2 -Vehicle adaptation for CCAM use cases

- Vehicle adaptation for CCAM has been started, including the integration of the different systems:
  - Communication Unit
  - ADAS System
  - HD Map Unit
  - HMI
- Application development has also started according to the defined Use Cases.

Task 3.3 - 5G Integration

- CTAG has started to integrate 5G technology into CTAG Communication Unit.
- 5G Chipset suppliers have been contacted in order to acquire documentation & roadmaps.
- WNC is a potential supplier, which provides the Qualcomm 5G Module Supplier.

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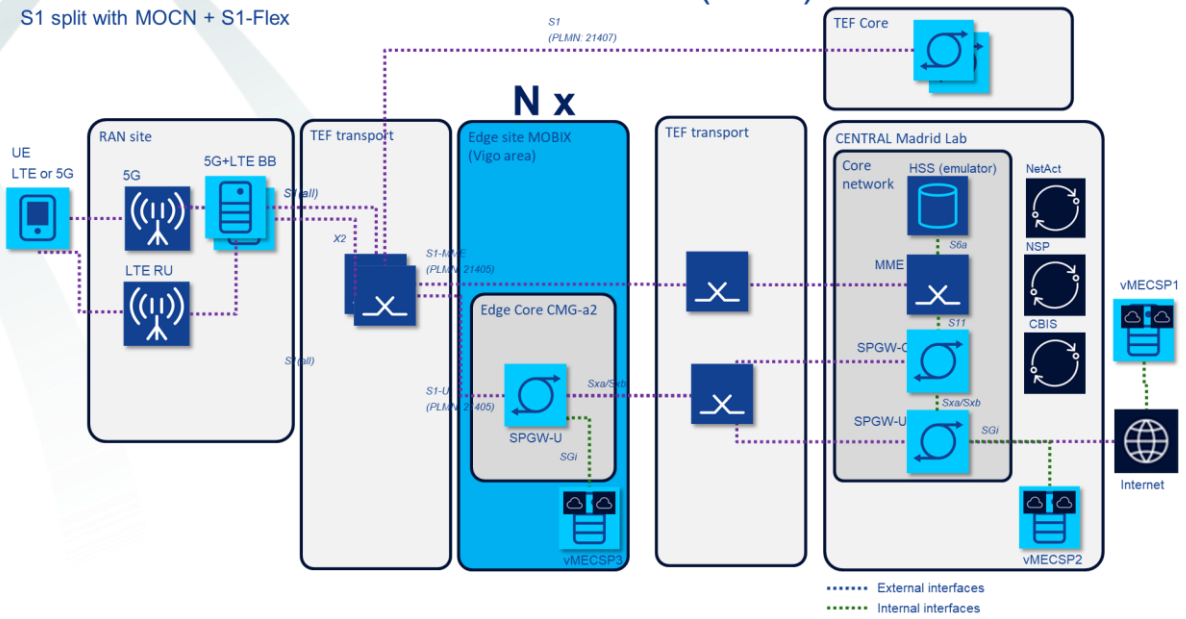
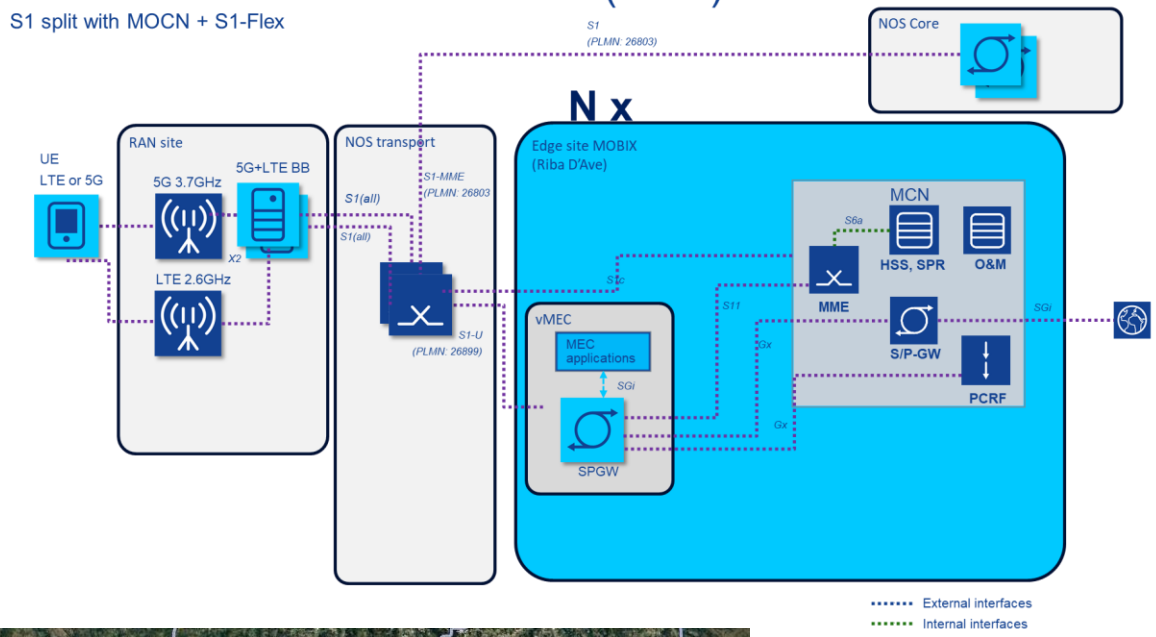
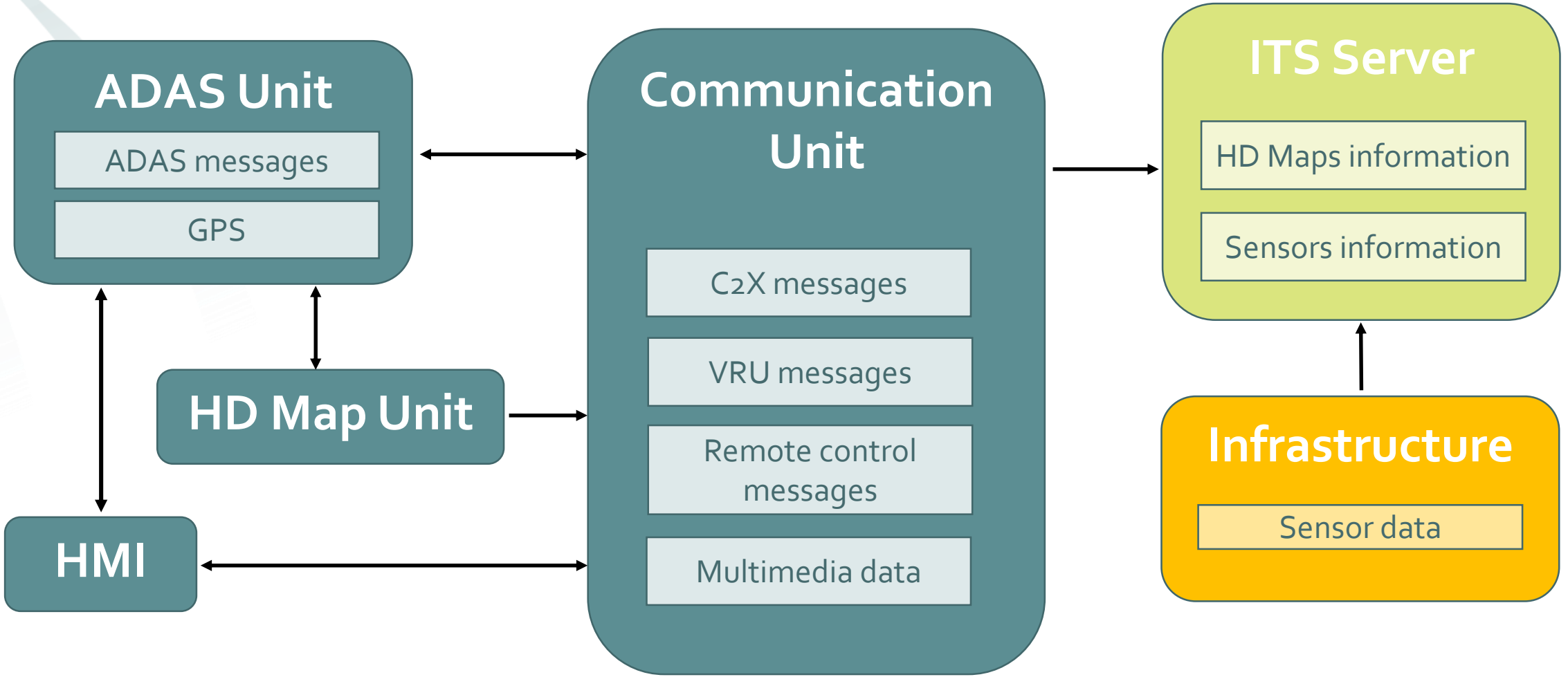
WP3 - Tasks
Task 3.4 - Corridor infrastructure development and integration





WP3 - Task 3.5 Evaluation data collection and management



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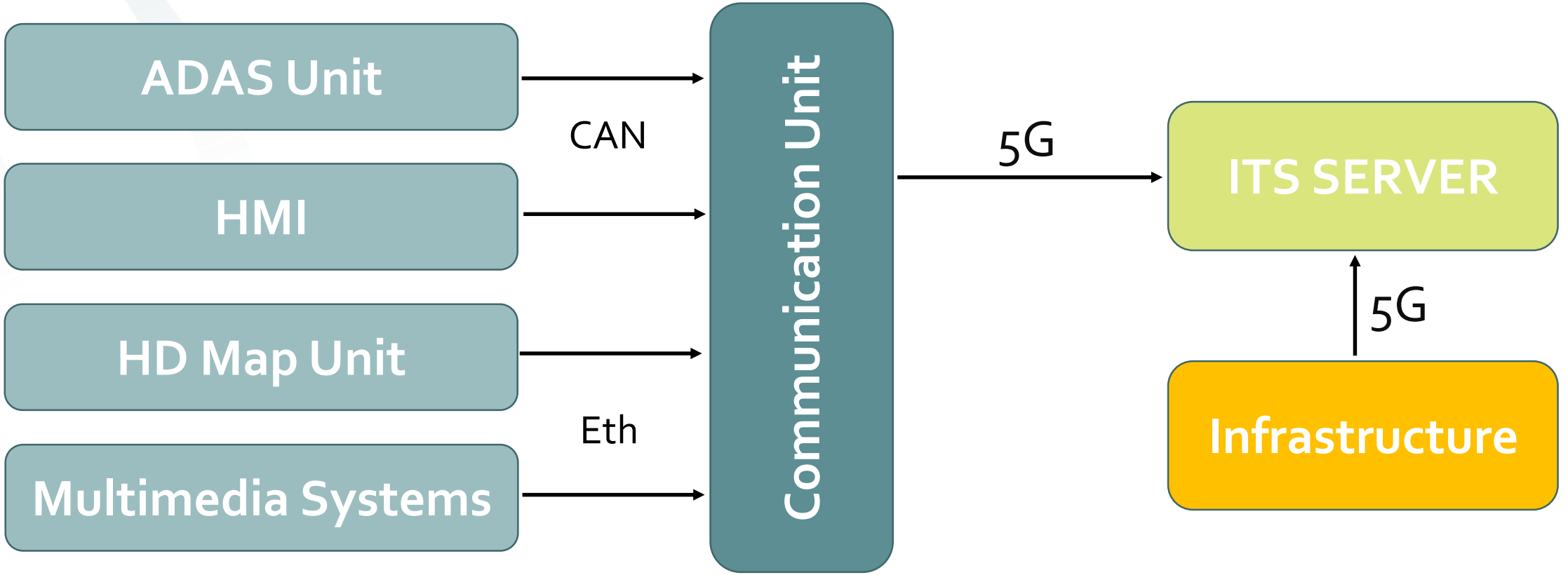
WP3 - Task 3.6 Verification

Verification of applications in devices and quality of network communications.



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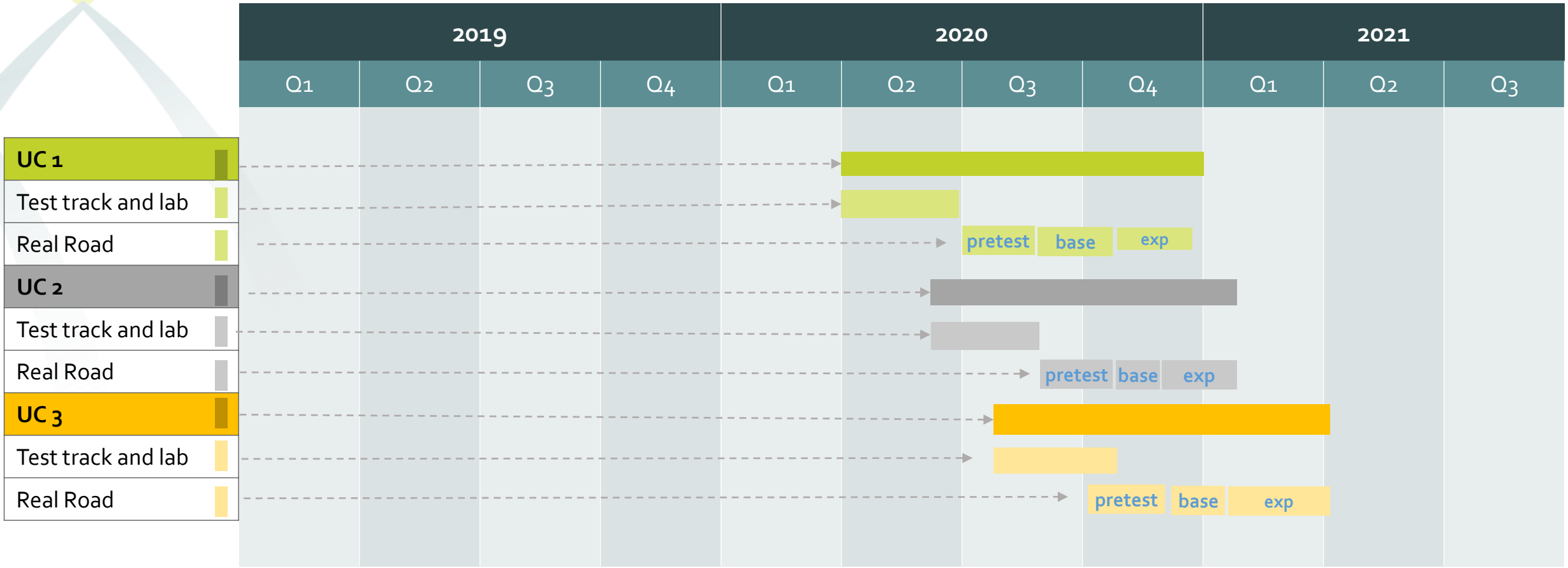
WP4 - Trials agenda Spain-Portugal



- **Key dates:**
  - **M18** : ready for 1st trials execution (**April 2020**)
  - **M30** : end for trails, data collection completed (**April 2021**)

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