Submitted by the expert from France

Informal document **GRVA-15-39**
15th GRVA, 23-27 January 2023
Provisional agenda item 3

PRISSMA

French « Grand Défi program » : AI Assessment pillar

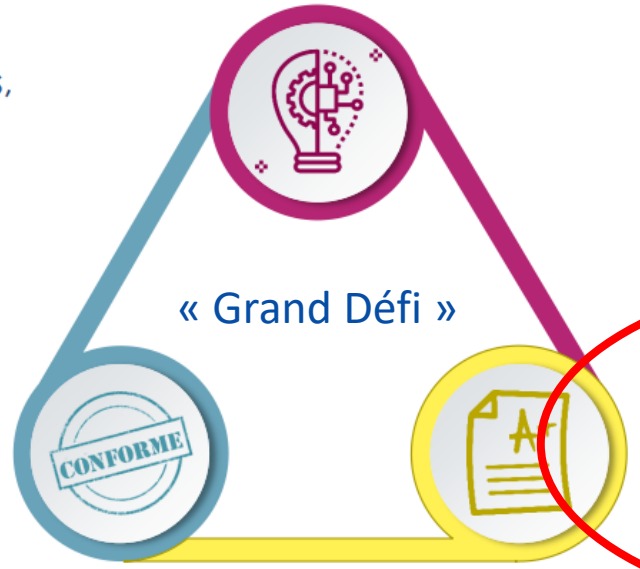
Project objectives & distribution

Technological pillar 1

DATAS, AI ALGO, SW, SYSTEMS engineering to design, deploy and maintain AI based critical system

… industry strongly involved in programs, especially AI Manifesto members

… Cooperation with French basic research Initiatives, such as Aniti or DataIA, and academic research



Norms pillar

Norm, standard and regulation environment toward certification

CEN CENELEC ETSI
European Standards Organizations

Applications conformity assessment Pillar 2

Ensure the right operational exploitation

PRISSMA

PRISSMA is the response proposed to the Application conformity assessment Pillar issued by the « *Grand Défi* » in partnership with the Ministry of Ecological and Solidarity Transition : security, safety, reliability dedicated to AI-based systems evaluation & validation.

Targets

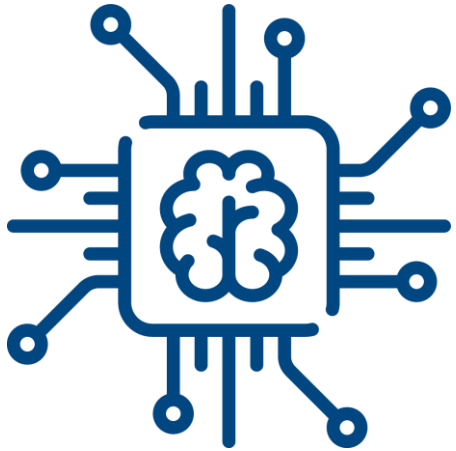
✓ MAIN GOALS

- Identify safety and security issues for AI-based autonomous mobility systems.
- Propose an evaluation and validation environment related to AI issues based on the existing certification framework.
- Validate the chosen strategy through the implementation of proofs of concept.

✓ USE CASES

- Level 4 automated shuttles.
- Delivery droids.

Part of indentified specifications



The integration of AI into different layers (detection, decision-making, supervision) of an automated mobility system requires a global consideration of AI to move from :

- A guarantee of the performance of the components of a vehicle to the approval of a vehicle in its environment (system of systems approach).
- A guarantee of deterministic systems to the guarantee of stochastic systems.
- A guarantee of static systems to the guarantee of highly scalable systems.
- A guarantee focused on physical testing to a guarantee taking advantage of simulation (for a more systematic exploration of risk situations for example).
- A passive infrastructure to a connected infrastructure, participating in decision-making and ensuring security.

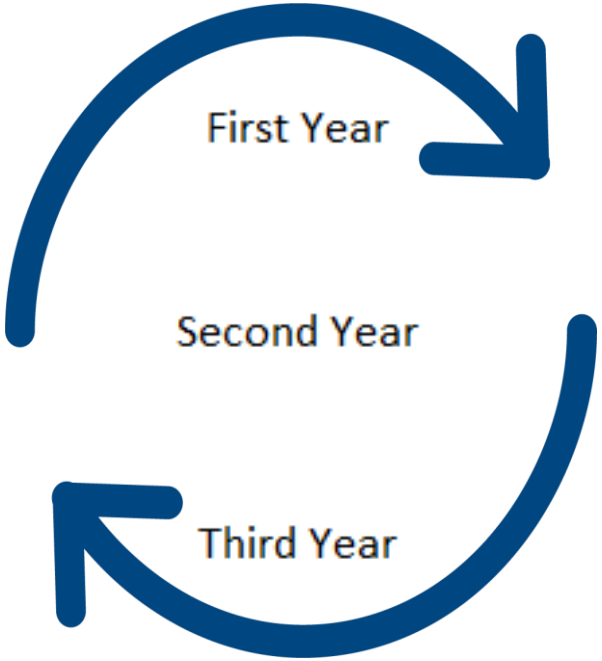
Combined approaches

Top-down declination

1/ Definition of a common baseline

2/ Preliminary evaluation methodology

3/ Final evaluation methodology



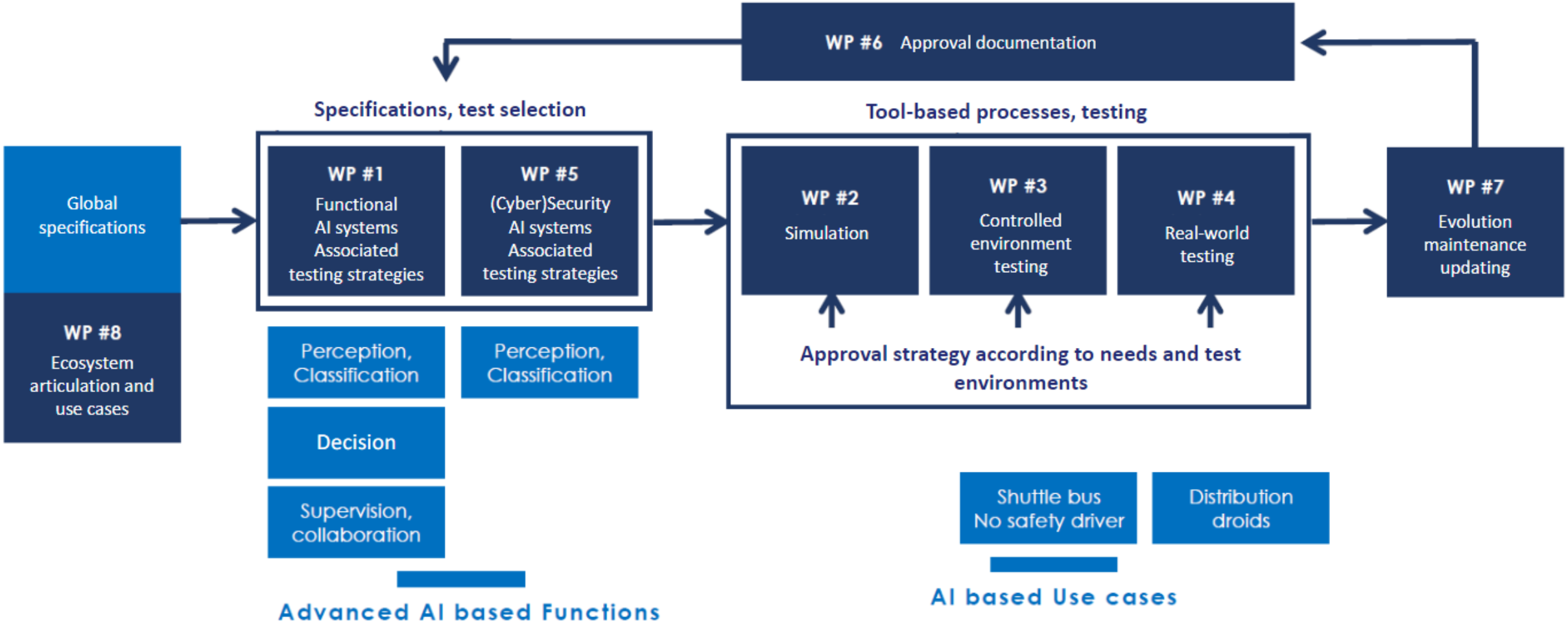
Bottom-up declination

1/ Definition of common pilot cases and test architecture (simulation)

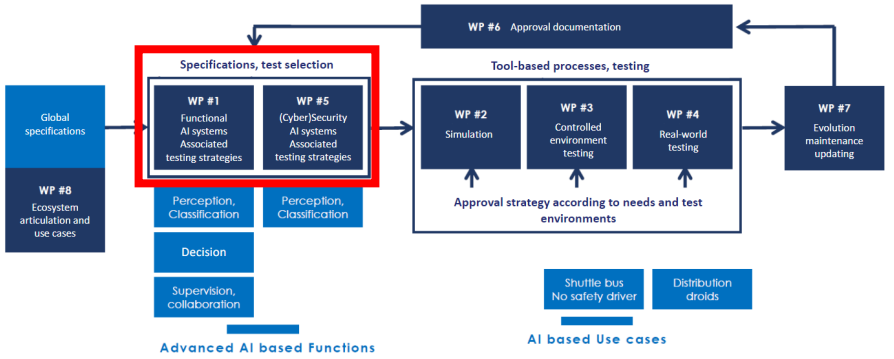
2/ First experiments

3/ Experiments close to commercial deployment

Project Structure



Specifications & test sélections (WP1 & WP5)



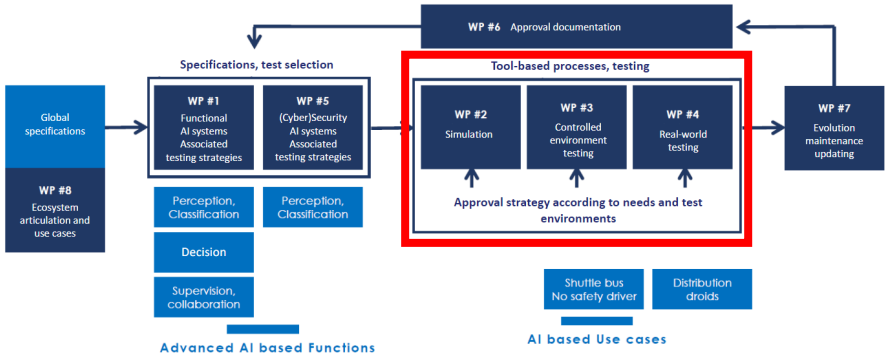
Delivered

- **WP1 :** state of the art of the situation and identify the different **methodologies for evaluating and approving AI**
- **WP5 :** analysis of **cybersecurity threats ,** definition of **cybersecurity objectives ,** examination of ecosystem **reliability issues**

On going

- **WP1 : Final report** state of the art of the situation and identify the different **methodologies for evaluating and approving AI. Provide a set of recommendations**
- **WP5 :** Report on the implementation on a test platform of safety for AI-based systems

Tool based processes, testing (WP2, WP3 & WP4)



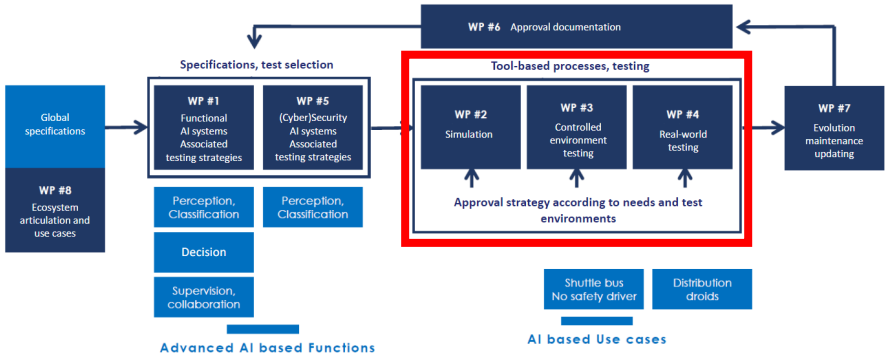
Delivered

- **WP2 : simulation to evaluate and approve automated mobility**
- **WP3 : inventory of existing "controlled" test environments**
- **WP4 : real-world tests on already equipped route**

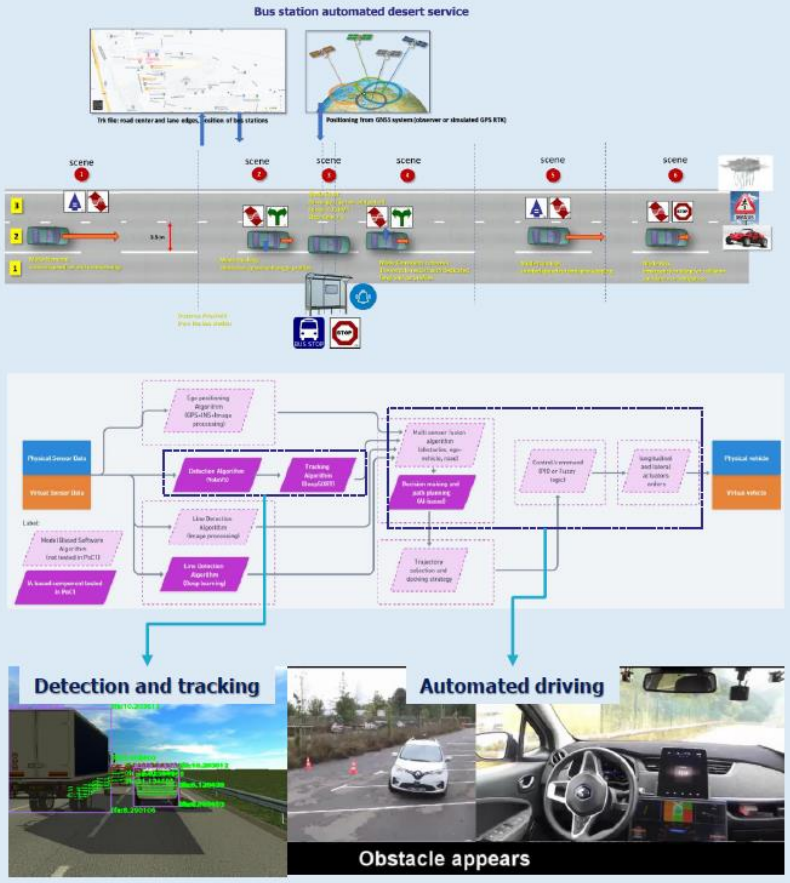
In progress

- **WP2 : Interconnection and communication** of platforms
- **WP3 : test matrix definition, evaluation and validation of protocols**
- **WP4 : relevant test scenarios on the chosen test cases**

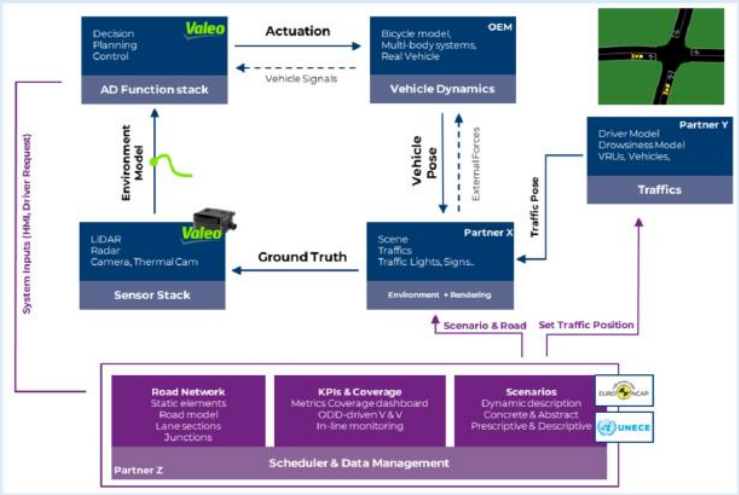
Proofs Of Concept (WP2) – Simulation

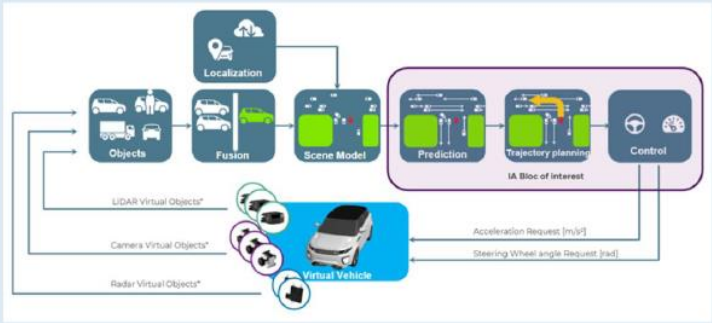


POC 1 : Bus Station Automated Desert

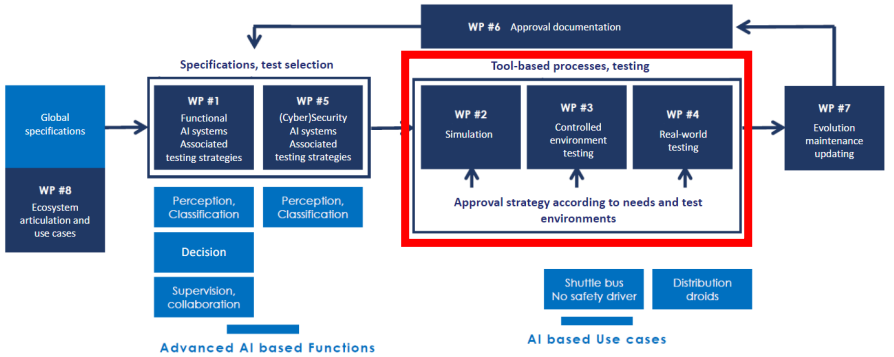


POC 2 : Urban Driving Virtual&real

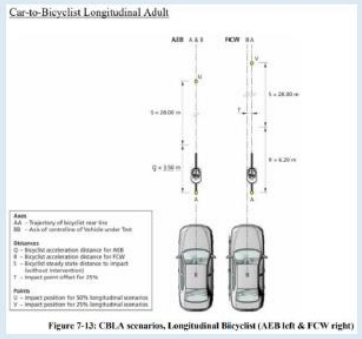


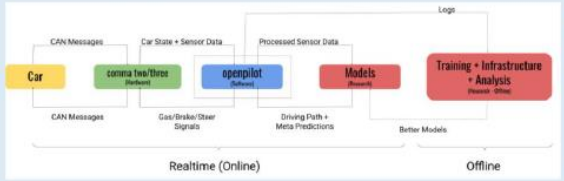


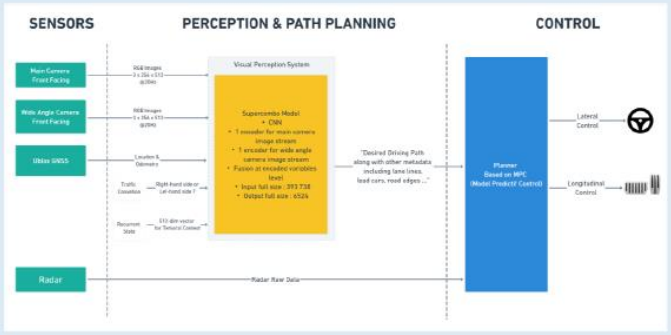
Proofs Of Concept (WP2) – Simulation



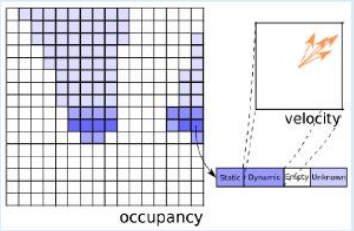
POC 3 : UTAC ViL Virtual&Real

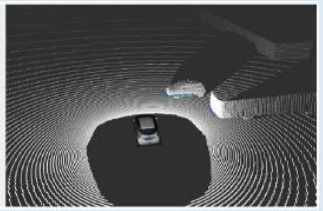


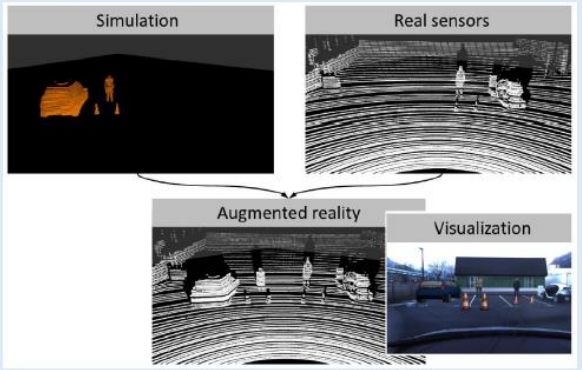




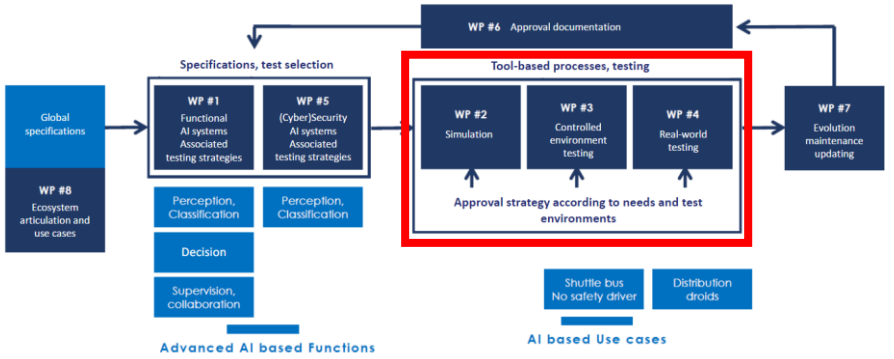
POC 4 : ViL and Augmented reality







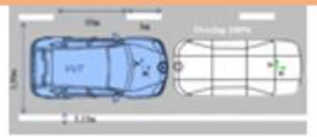
Proofs Of Concept (WP3) - Testing



Development of repeatable/measurable test protocols/metrics

- Repetability, robustness, (& explicability after tests/modelization/simulation)

AEB & Stationary obstacle/car/VRU



Wheather

- Pré-critical scenario to complete critical scenarios : anticipation, difficulty management,…

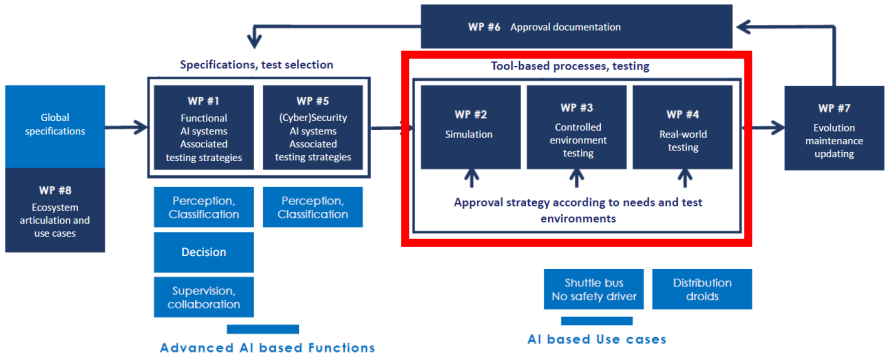
Risk of hidden pedestrian crossing

Strong curve

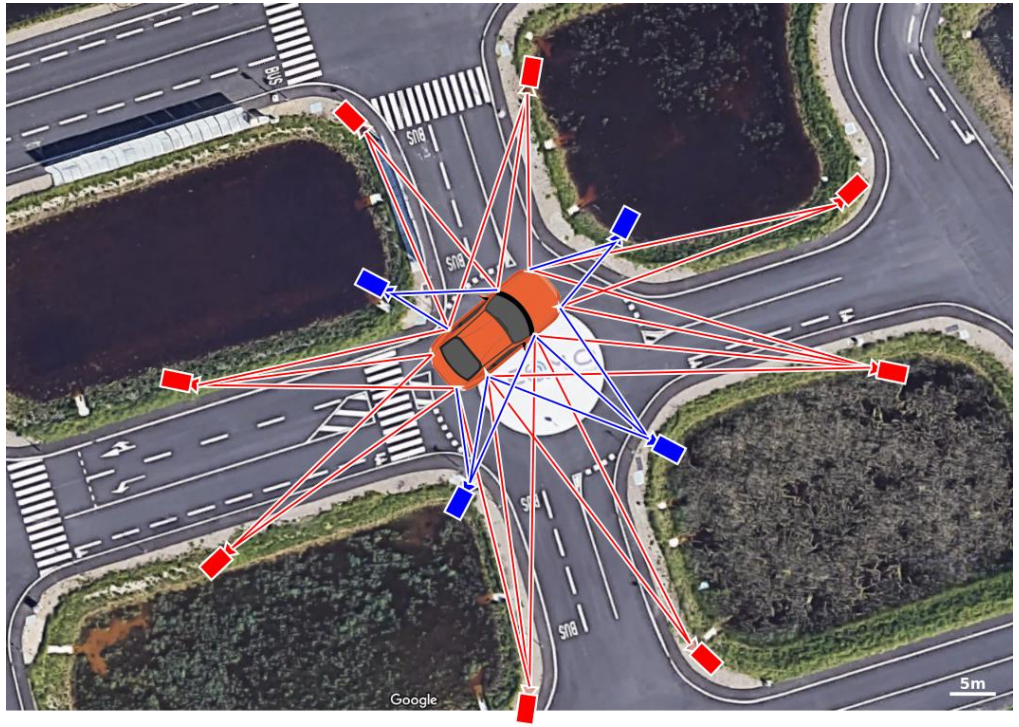
Strong situation

- Random/unknown scenarios
  (to complete official scenario & to avoid overfitting)

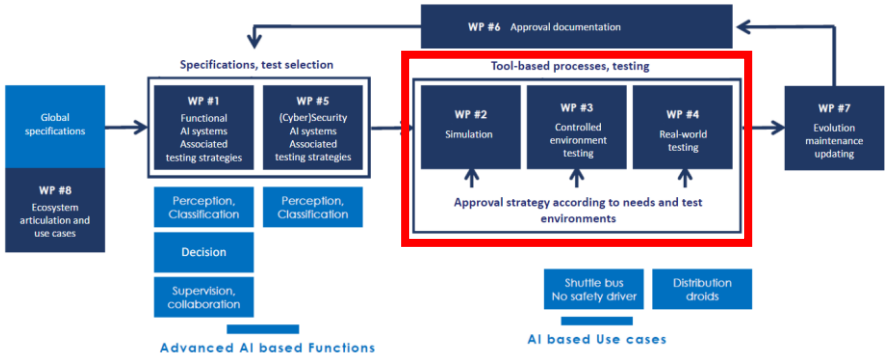
Proofs Of Concept (WP3) - Testing



Production of metrics to evaluate the behavior of an autonomous vehicle in a controlled environment. Centimetric estimation by photogrammetry and topometry of the vehicle trajectory to derive metrics.

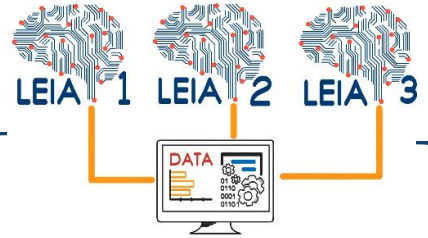


Proofs Of Concept (WP3) - Testing



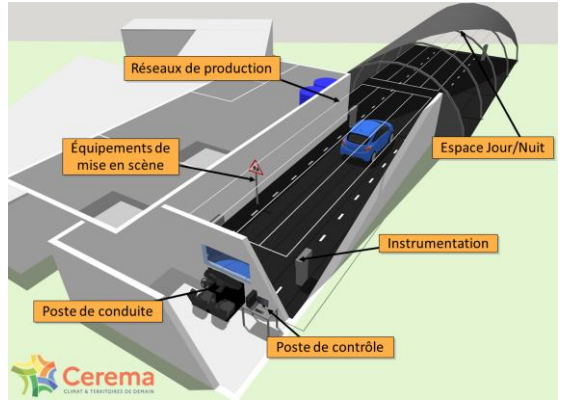
Test bench (compromise exhaustivity / realistic data)
Use of dedicated tools to evaluate data and AI-based APIs preparation for AI models education and use them in a turnkey environment.

exhaustive

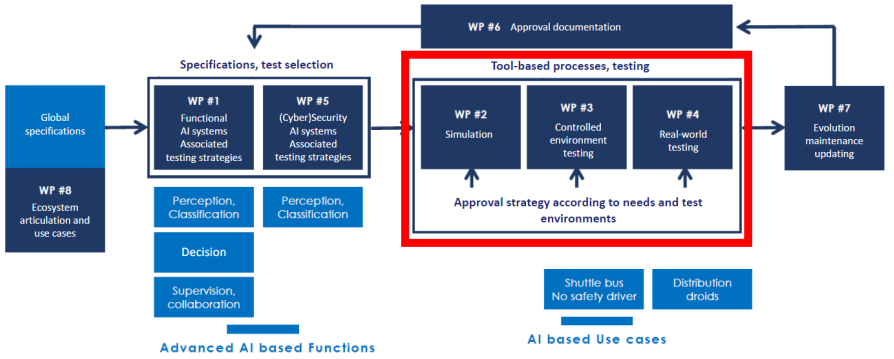


Tests data base

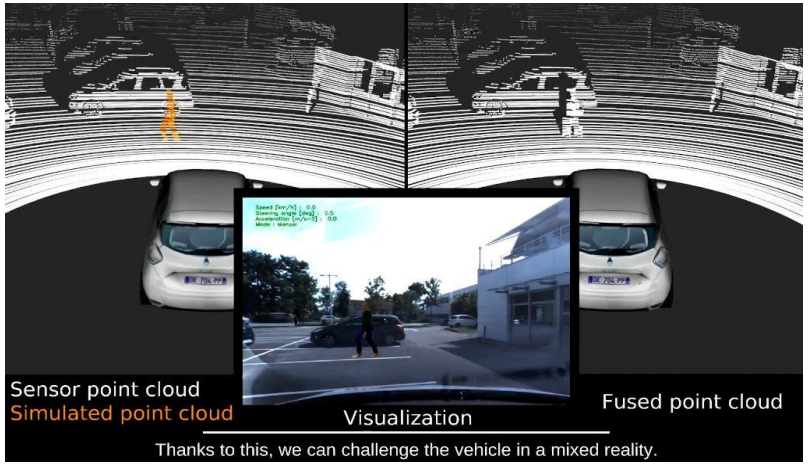
realistic



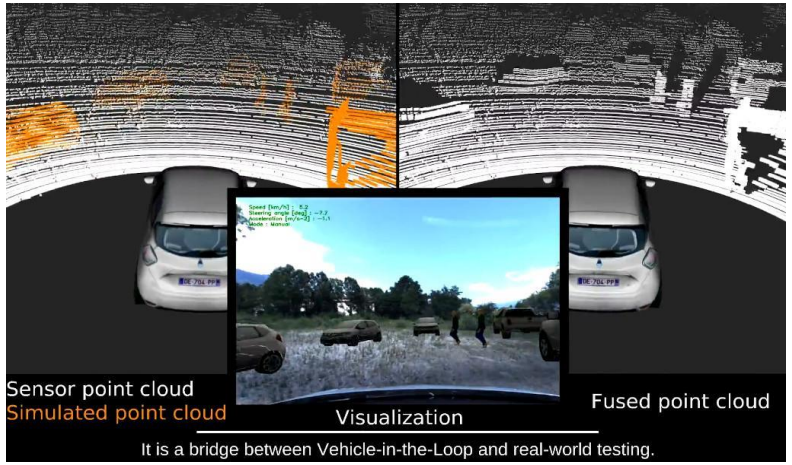
Proofs Of Concept (WP3) – Testing



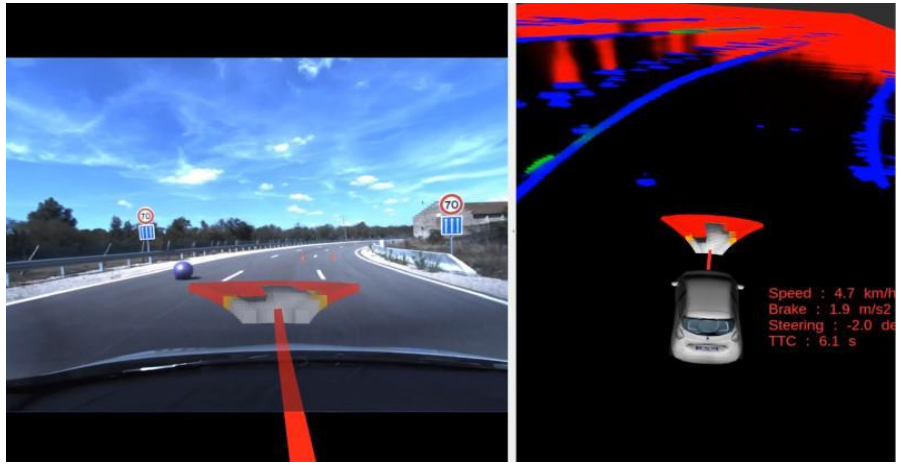
Reproduction of scenarios validated in simulation
Real vehicle on track, virtual obstacles
Data injection at the sensor level
Evaluation of the perception chain



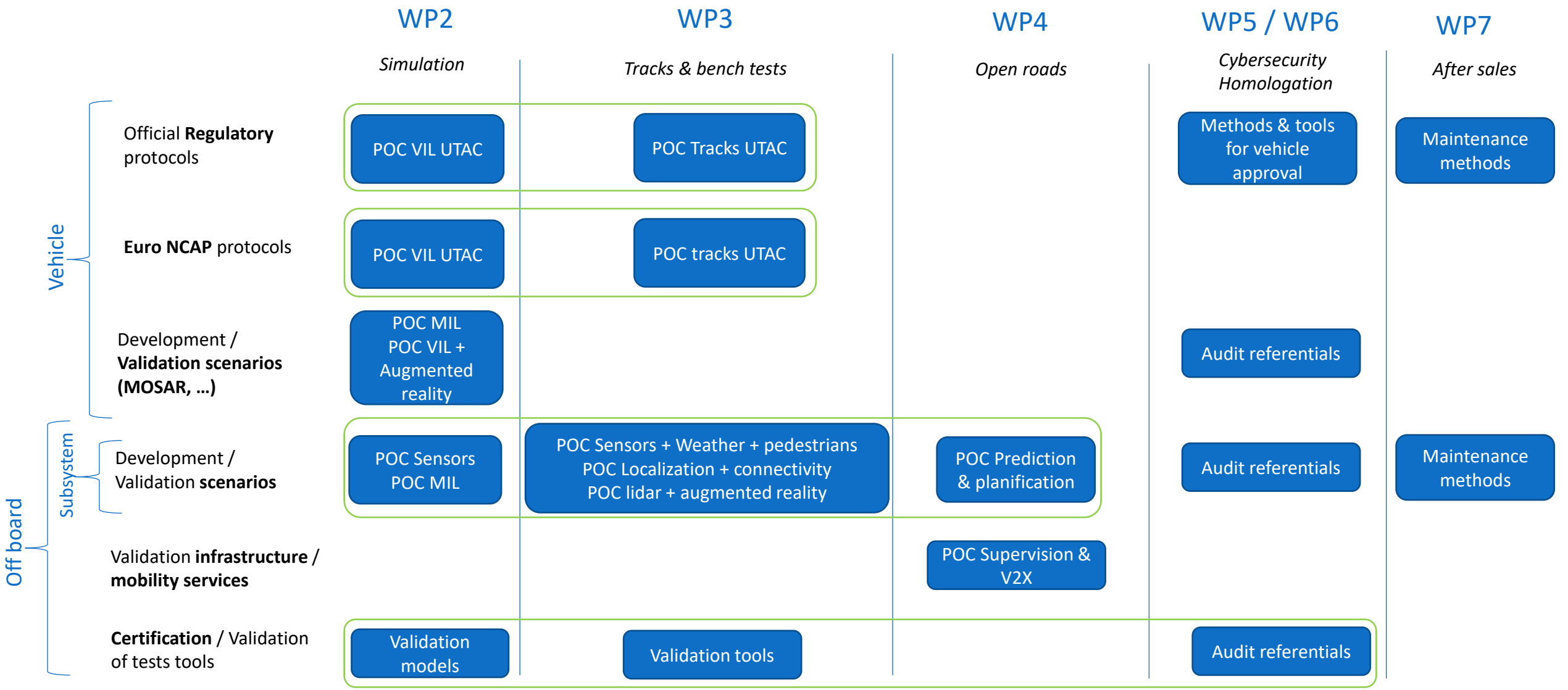
Thanks to this, we can challenge the vehicle in a mixed reality.



It is a bridge between Vehicle-in-the-Loop and real-world testing.



Synthesis


WP2
WP3
WP4
WP5 / WP6
WP7
Simulation
Tracks & bench tests
Open roads
Cybersecurity
Homologation
After sales
Vehicle
Official **Regulatory** protocols
POC VIL UTAC
POC Tracks UTAC
Methods & tools for vehicle approval
Maintenance methods
Euro NCAP protocols
POC VIL UTAC
POC tracks UTAC
Development / **Validation scenarios (MOSAR, …)**
POC MIL
POC VIL + Augmented reality
Audit referentials
Off board
Subsystem
Development / Validation **scenarios**
POC Sensors
POC MIL
POC Sensors + Weather + pedestrians
POC Localization + connectivity
POC lidar + augmented reality
POC Prediction & planification
Audit referentials
Maintenance methods
Validation **infrastructure** / **mobility services**
POC Supervision & V2X
Certification / Validation of tests tools
Validation models
Validation tools
Audit referentials

Current views

- **Ai-based technology bring a lot of additional specifies compared to more classical embedded technology (non determinist, stochastic behaviour)**

- **These specifies require additional dedicated evaluations both for :**
  - **the “safety management” including data management / biases control / model definition & validation / security**
  - **for the “safety assessment” including testing / simulation against black box**

- **Amendment of the existing or coming validation methods seems more adapted than a dedicated Regulation for AI technology**