ECSEL Joint Undertaking

AI4CSM Overview at the glance

AI for Connected and Shared Mobility

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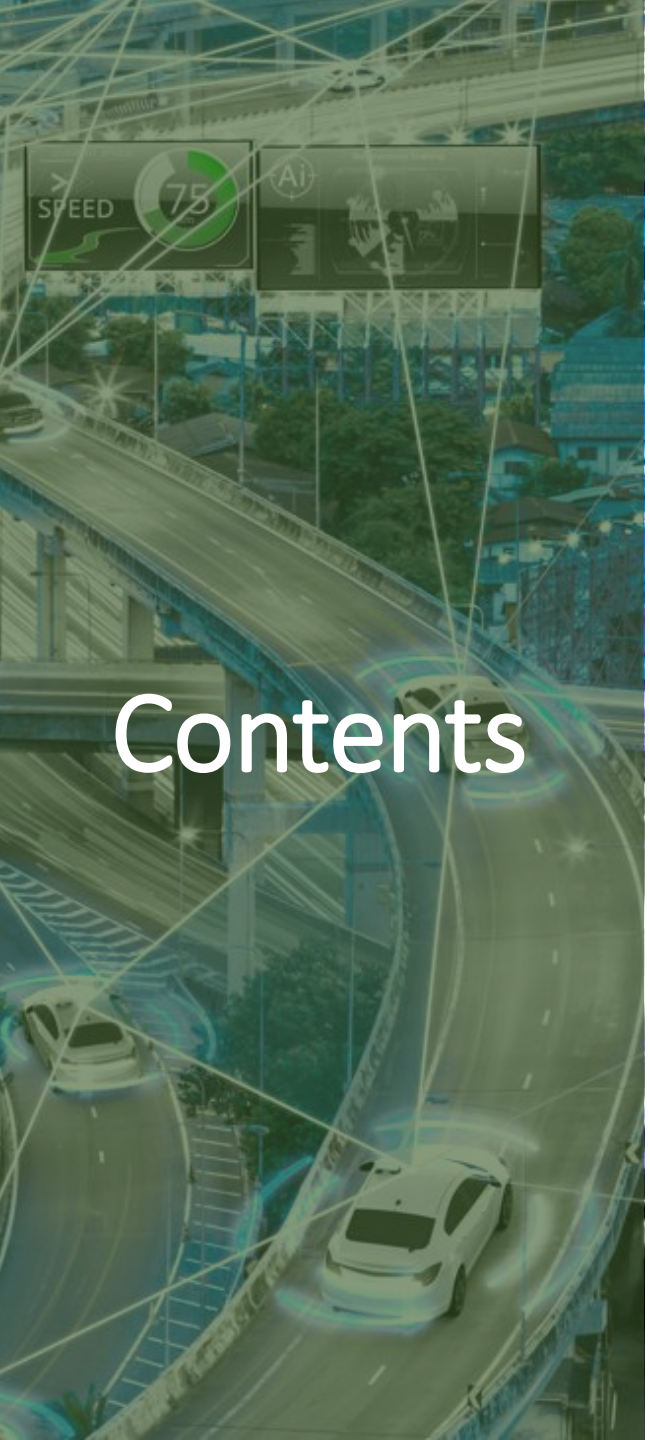
AI4CSM receives funding within the Electronic Components and Systems For European Leadership Joint Undertaking (ESCEL JU) in collaboration with the European Union's Horizon2020 Framework Programme and National Authorities, under grant agreement No. 101007326



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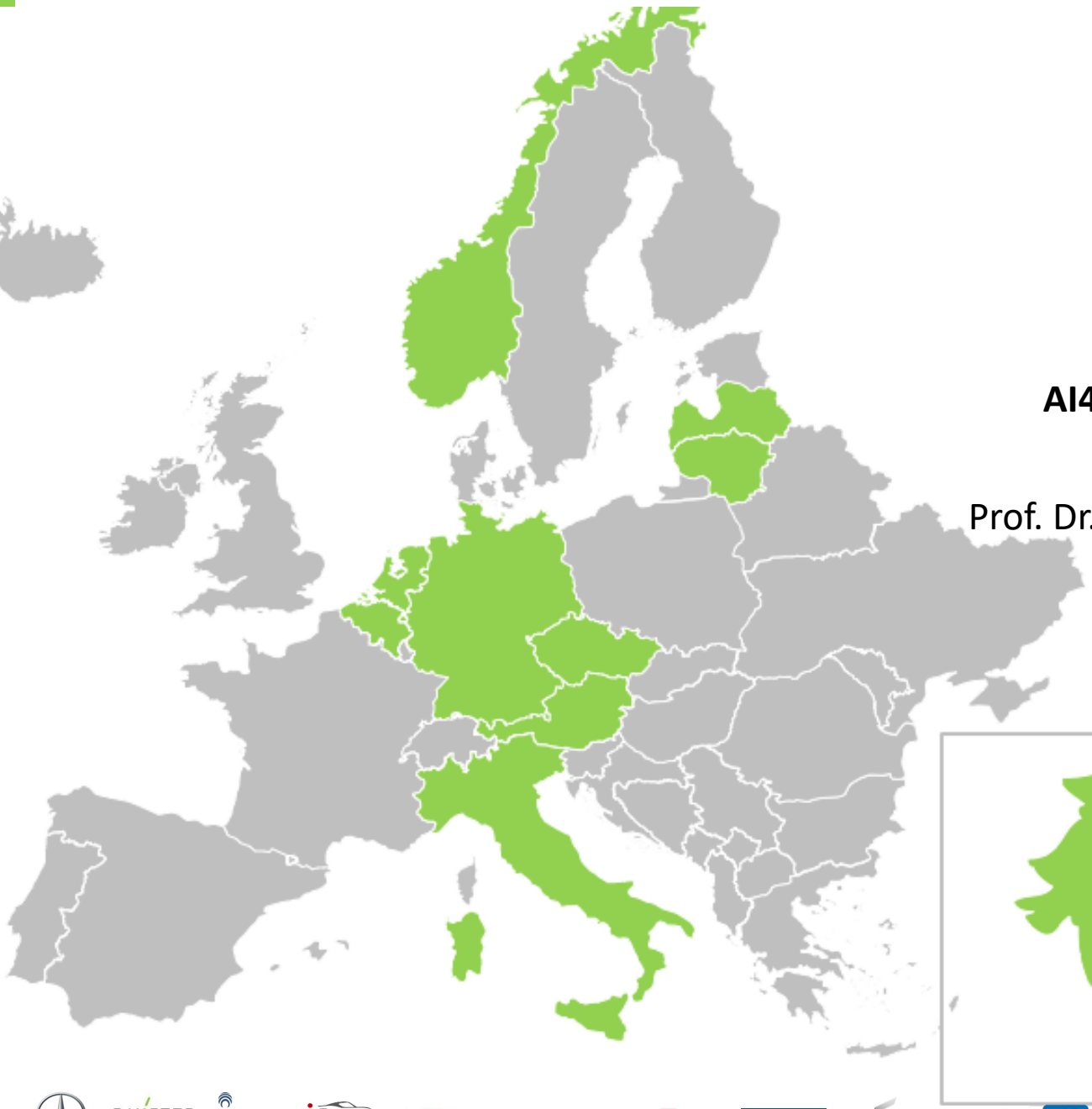
The AI4CSM consortium



AI4CSM is coordinated by Infineon Technologies Germany AG.

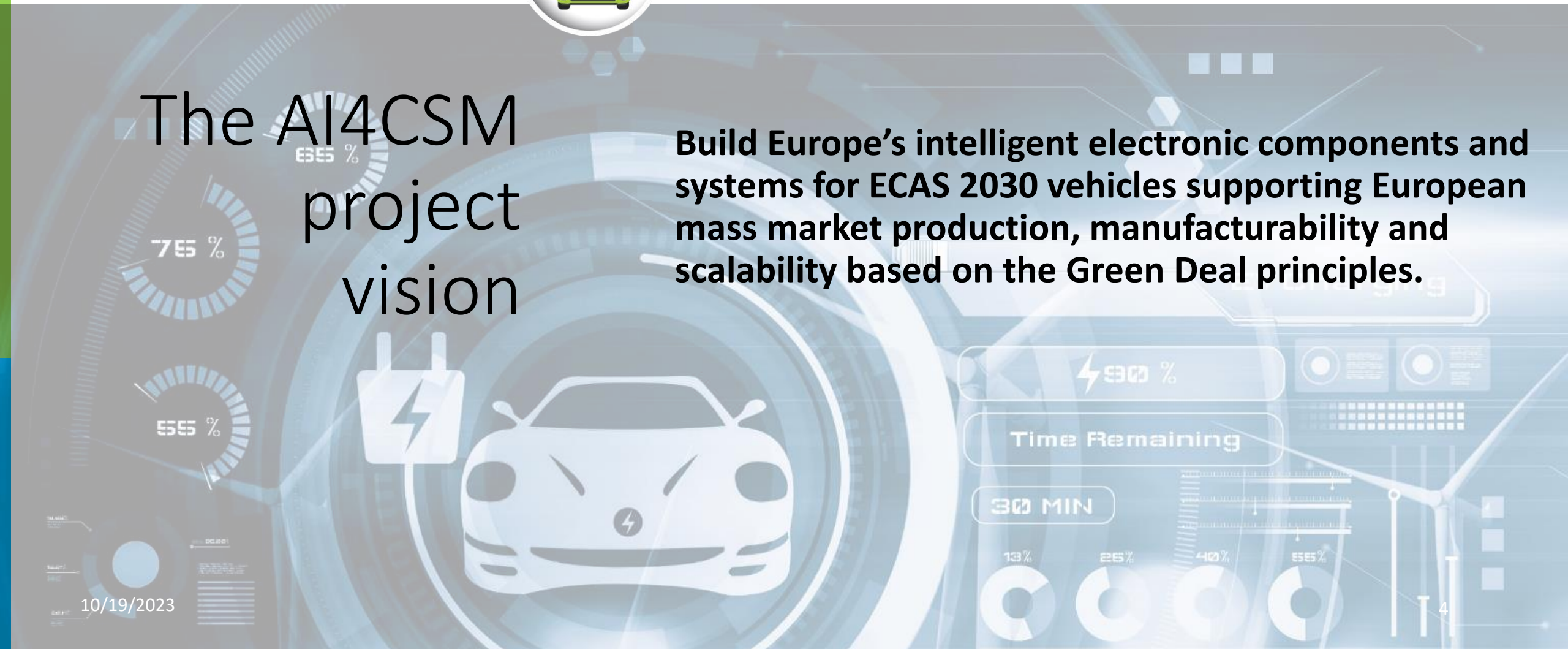
Dipl.-Ing.(FH) Jochen Koszescha – Project Coordinator
Prof. Dr. Eng. George Dimitrakopoulos – Executing Project Manager

41 project partners from 10 countries:

- Leading automotive OEMs
- Semiconductor companies
- Technology partners
- Universities and research institutes

The AI4CSM project vision

Build Europe's intelligent electronic components and systems for ECAS 2030 vehicles supporting European mass market production, manufacturability and scalability based on the Green Deal principles.



Project positioning on ECSEL/KDT

- ECSEL-2020 call
- Research and Innovation Action (RIA)
- Project No: 101007326

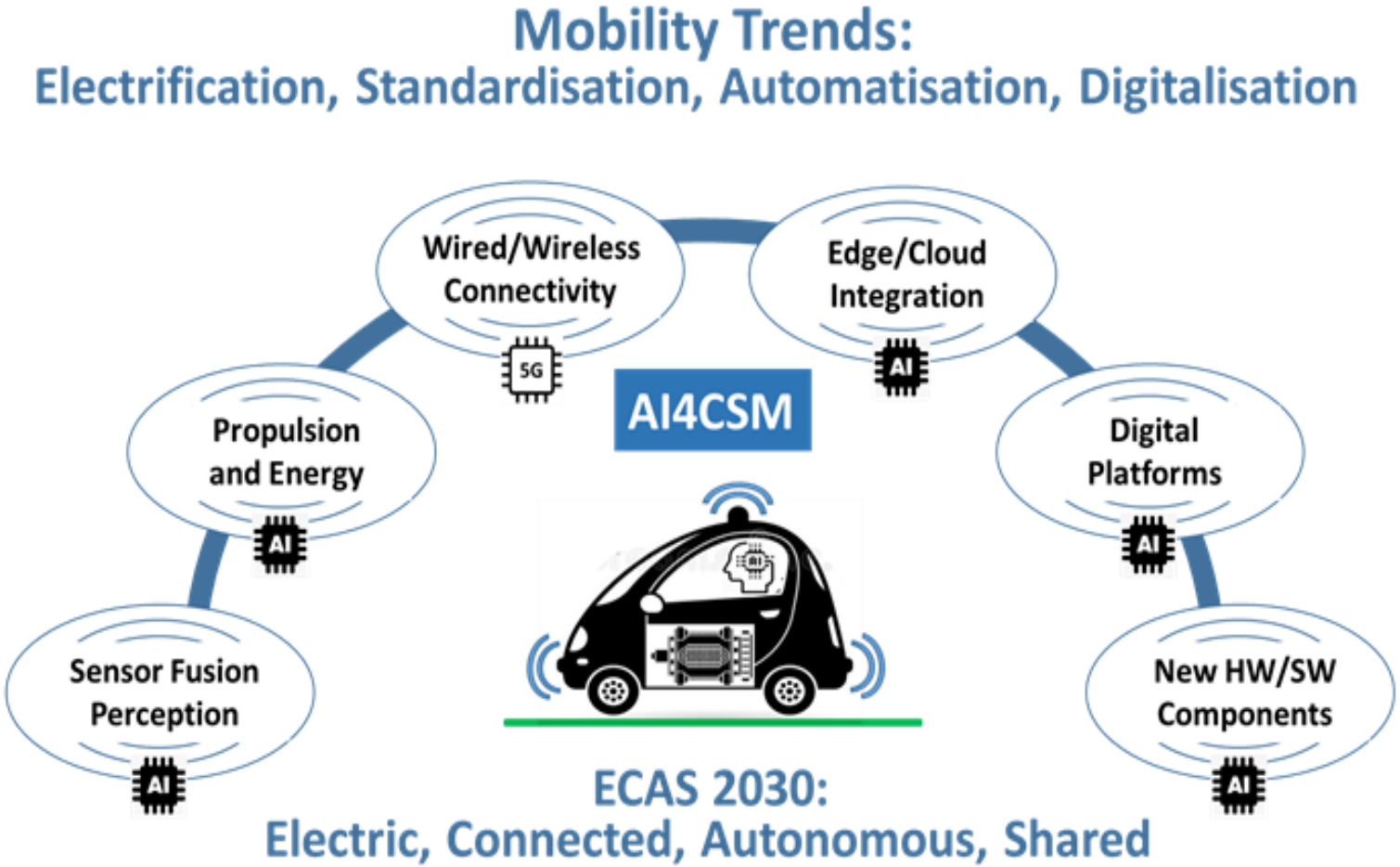
		ESSENTIAL CAPABILITIES				KEY APPLICATION AREAS	
		6. SYSTEMS & COMPONENTS: ARCHITECTURE, DESIGN & INTEGRATION	7. CONNECTIVITY & INTEROPERABILITY	8. SAFETY, SECURITY, & RELIABILITY	9. COMPUTING & STORAGE	TRANSPORTATION & SMART MOBILITY	DIGITAL LIFE & PUBLIC SPACES
#	OBJECTIVE						
1	Robust & Reliable mobile platforms			●		●	●
2	Scalable embedded intelligence		●	●	●	●	
3	Silicon for Decision and Learning	●	●		●	●	
4	Trustable AI			●	●	●	●
5	Functional integrated ECS	●		●	●	●	
6	EV5.0 for the Green Deal	●		●		●	●

Project positioning – Digital transformation

A significant enabler for attaining the sustainability goals of the European Green Deal

Sectors of interest:

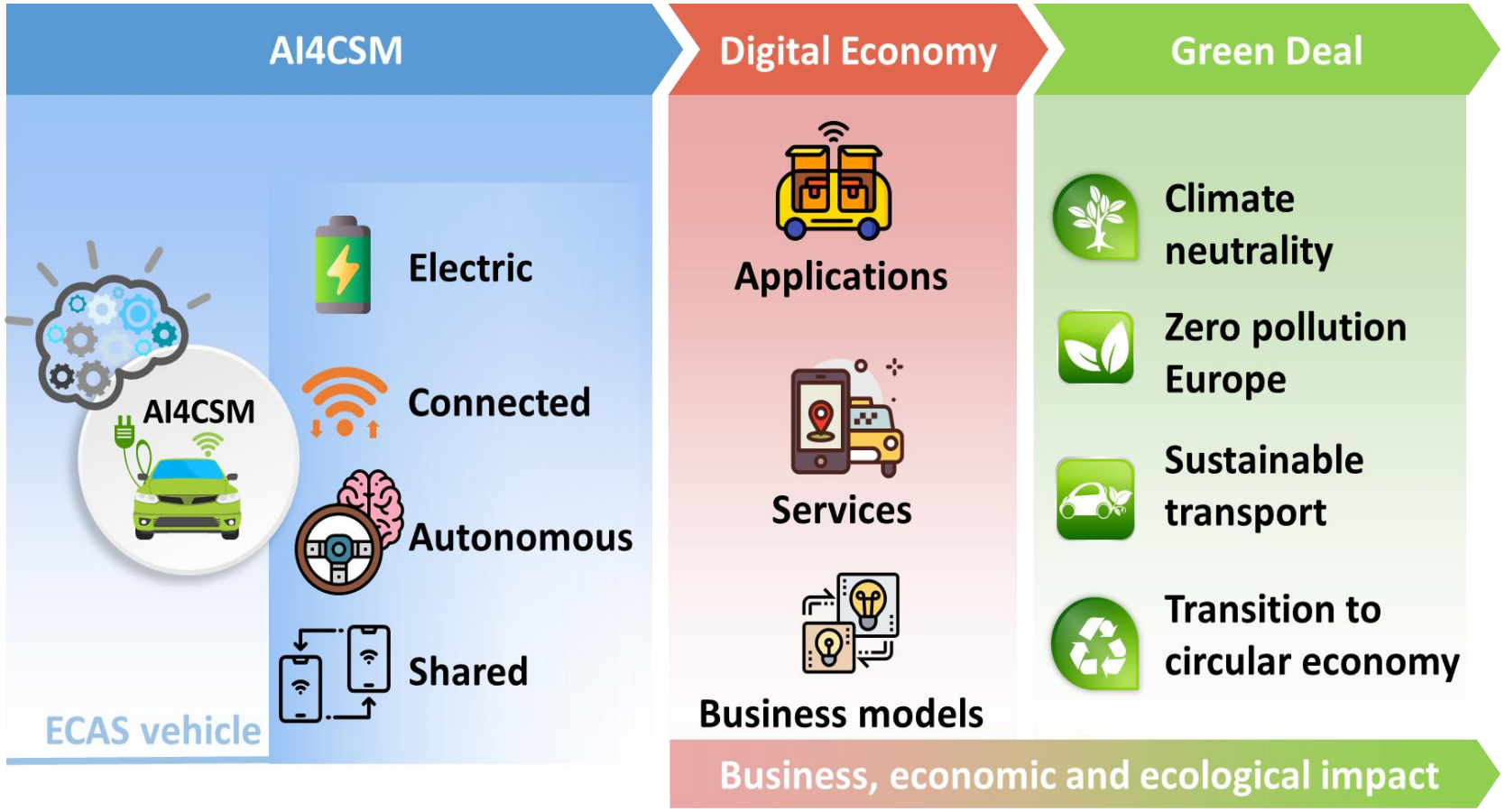
- Mobility
- Transportation



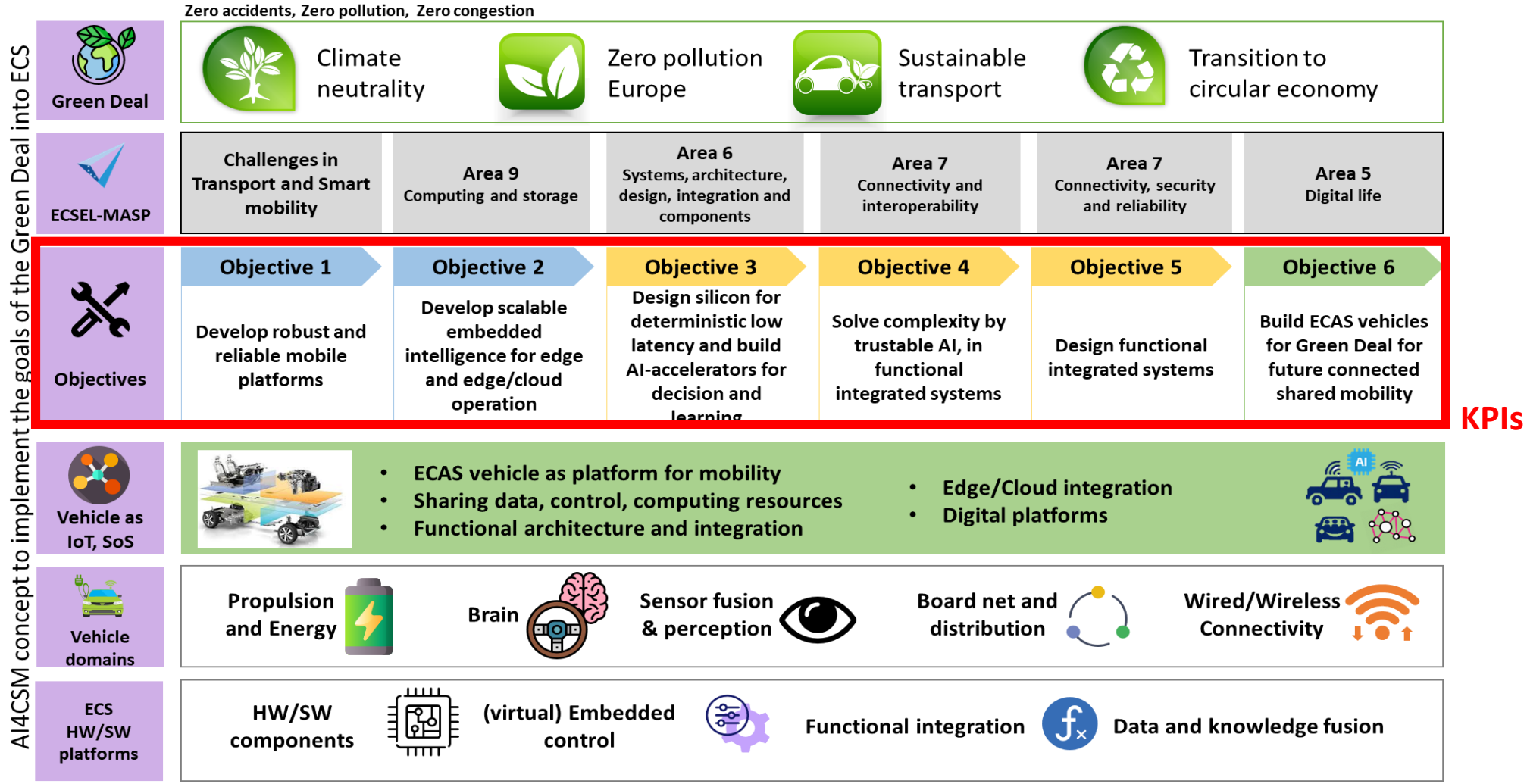
Project positioning – Digital economy

Transition towards the digital economy

- New applications and services, together with the implementation of new business models.
- Electric, connected, autonomous and shared (ECAS) vehicles.



Project mission – how to realize the vision



Project mission – Indicative outputs

Robust and reliable mobile platforms

- Increase the reliability of ECS to 99.9 %
- New sensor redundancy concepts
- Increase of semiconductor availability by at least 25%
- New technologies for "live" scenario monitoring and validation

Scalable embedded intelligence

- Cooperative edge/cloud approaches for environment perception and vehicle intelligence
- Digital twin supporting design, development, V&V, and operation of connected shared mobility
- Cloud AI-based city routing based on for example digital twins
- Secure, scalable, and robust communication architectures and systems between agents and cloud
- A layered processing approach for robust, reliable, and secure perception and vehicle intelligence
- Testing, verification, and validation approaches

Silicon for deterministic low latency and AI accelerators

- Specialised processors for the efficient acceleration of cognitive functions in silicon
- Scalable computational framework that can realize intelligence
- Federated intelligence across multiple layers of the sense-control chain
- Optimisation of autonomous systems

Project mission – Indicative outputs

Trustable AI

- Explainable AI methods over larger number of applications
- Methods to predict the decision-making when using learned models or models with adversarial inputs
- A method which predicts the classification outcome of a system based on separate inputs
- Rigorous AI design approaches, for improved safety guaranteed already at design time

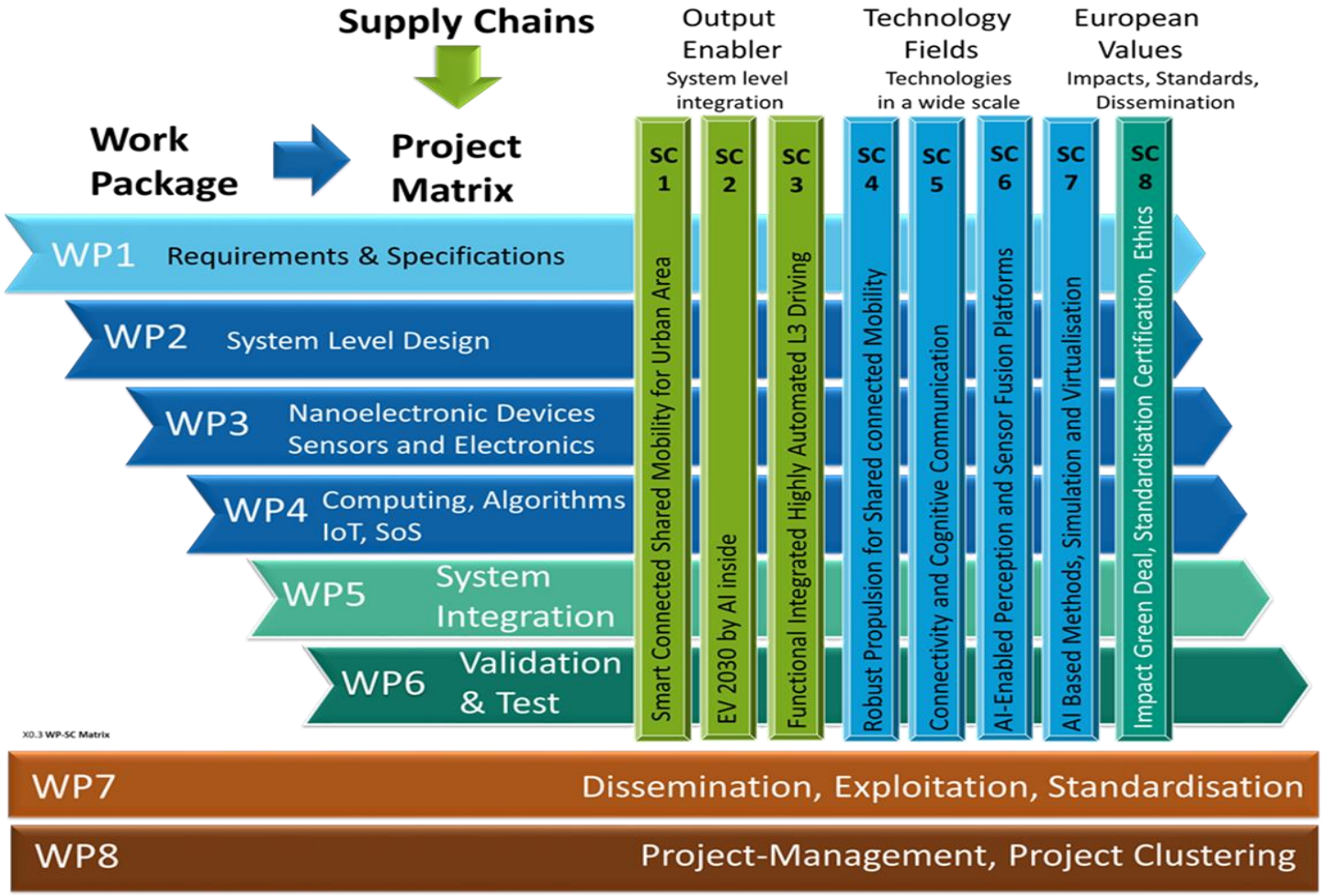
Functional integrated systems

- Innovative technologies for open platforms to bring AI into safety-critical systems
- Integration of hardware for AI processing
- Mechanisms to ensure freedom of interference between AI-based and safety-critical software components
- Demonstration of architectural concepts to increase the reliability of AI
- Enabling autonomous driving and support of digital cockpit, drivetrain functions in manufacturing

ECAS vehicles for Green Deal

- Demonstration and quantification of the reliability and robustness of driver assistance
- Active safety and fail-operational behaviour
- Demonstration of the impact of shard mobility concepts on the Green Deal emissions targets
- Cost reduction of the vehicles updates and upgrades
- Higher energy efficiency

How objectives are reached – working in supply chains (SCs)



SC1 Smart Connected Shared Mobility for Urban Area

Develops smart edge and cloud-based building bricks for autonomous mobility interconnected with secure communication architectures and systems.

Innovation

- Secure Edge/Cloud data utilization
- Event based fleet learning
- Smart city routing

Demonstrators

SCD 1.1: Lessons-learned based (critical scenario) update of ADAS/AD Controller (lead: AVL)
SCD 1.2: Robo-taxi (lead: VIF)
SCD 1.3: Virtual city routing (lead: OTH)

SC2 EV 2030 by AI inside

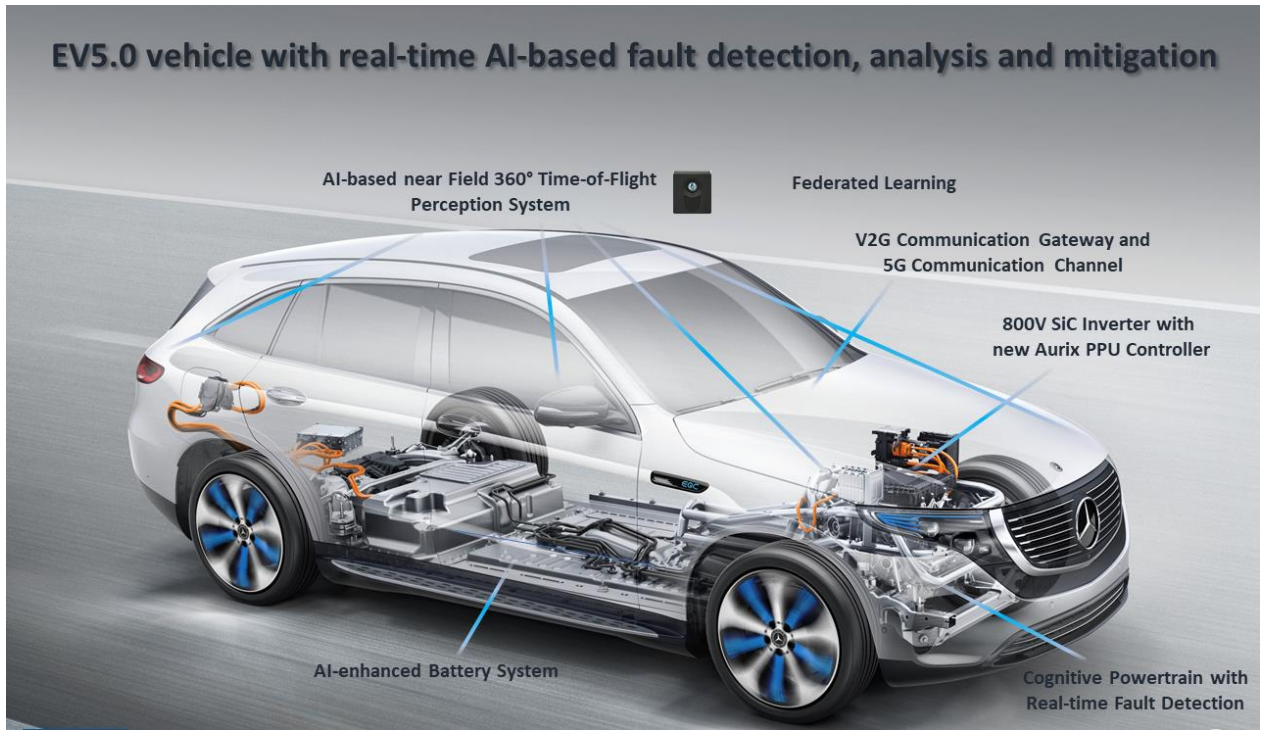
Builds an electrical passenger car (EV) to demonstrate AI based fault- detection, analysis, mitigation for the powertrain in real time operation.

Innovation

- AI based fault-detection, analysis, mitigation for the powertrain in real time operation
- System architecture with reduced redundancy

Demonstrators

SCD 2.1: EV5.0 vehicle with real-time AI-based fault detection, analysis and mitigation (lead: MBAG)



SC3 Functional integrated highly automated L3 driving

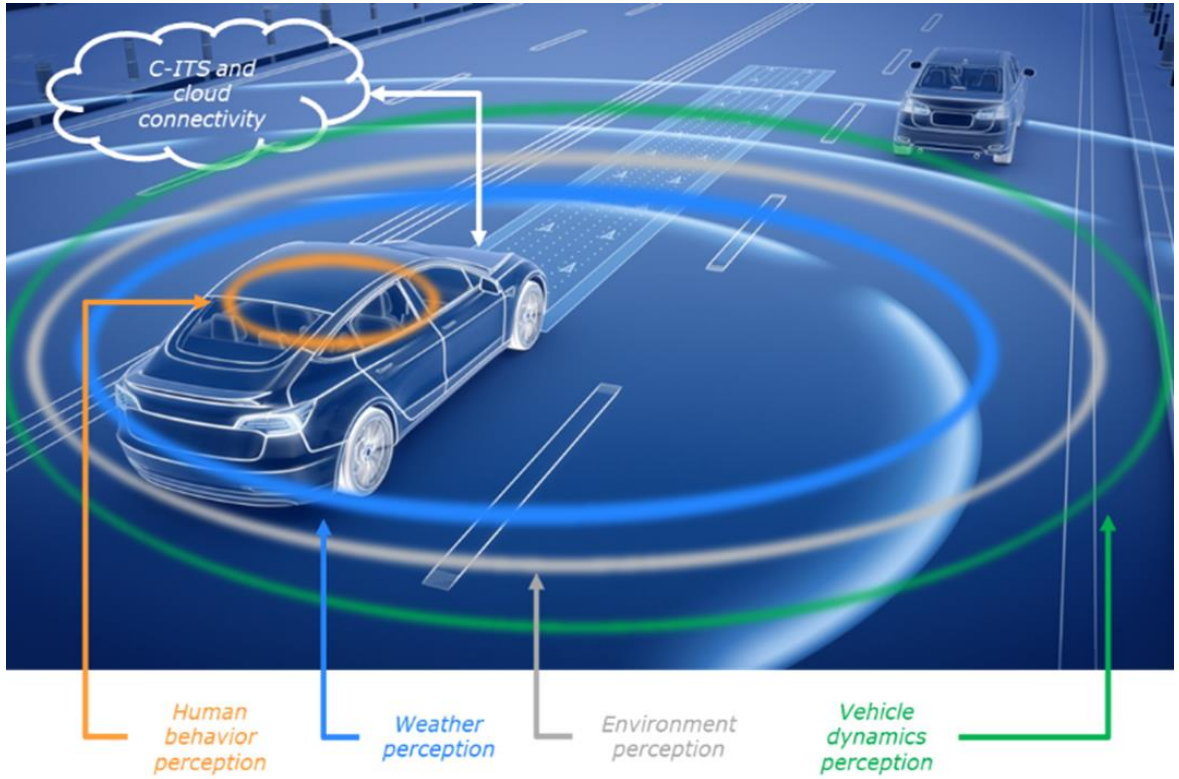
Focuses on coexisting-human operated vehicles and autonomous systems, and the dynamic interaction between them.

Innovation

- Human feedback loop “Behavioral Planning”
- Multi-Modal mobility
- Weather-in-the-loop

Demonstrators

SCD 3.1: Demo vehicle to demonstrate L3 automated with a Driver’s Monitoring System (lead: UNIMORE)
SCD 3.2: L1e vehicle with natively integrated telematics (lead: FEDDZ)



SC4 Robust Propulsion System for Shared Connected Mobility

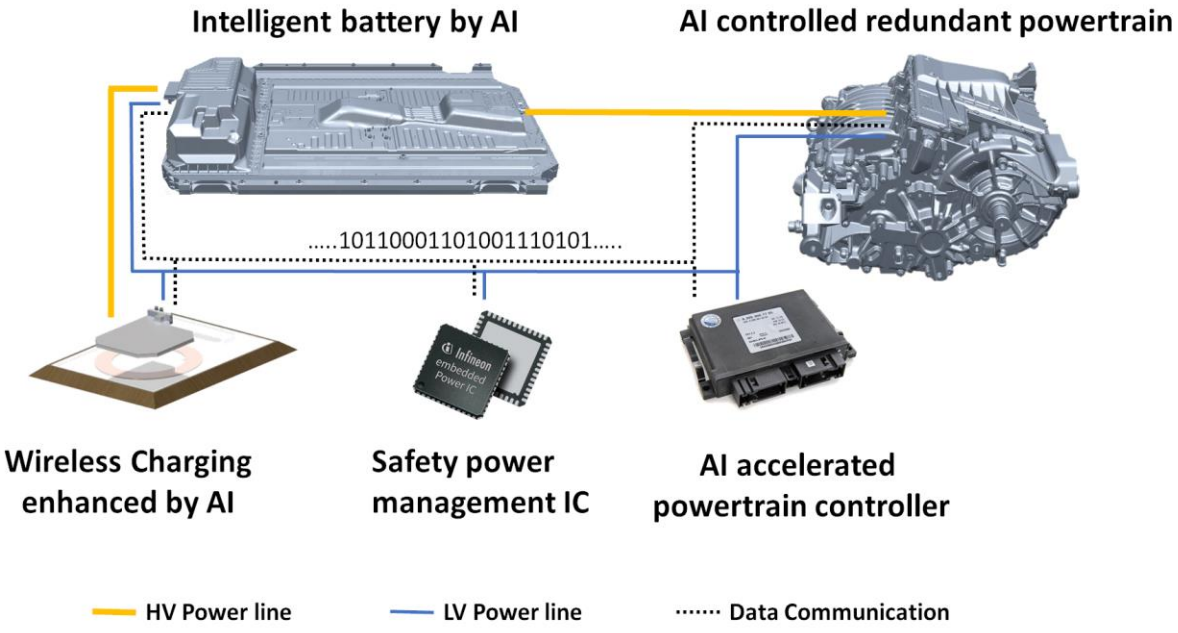
Research and demonstrate a powertrain for xEVs including inverter with AI - based health assessment. AI techniques will be used for AI-based functionalities for the battery management as well as detection of foreign objects by wireless chargers.

Innovation

- AI in monitor
- AI for control
- GaN for Inverter

Demonstrators

SCD 4.1: AI controlled redundant powertrain (lead: ZF)
SCD 4.2: AI accelerated powertrain control (lead: IFAG)
SCD 4.3: Intelligent battery by AI (lead: FHG)
SCD 4.4: Safety power management IC (lead: IFI) SCD
SCD 4.5: Wireless Charging Enhanced by AI (lead: TUD)



SC5 Connectivity and Cognitive Communication

Research and demonstration on secure external communication, with high data rates (5G) and bandwidth. The cloud fusion of edge perception results into the digital twin as well as fast and reliable wireless communication channels based on 28 GHz mmW technology.

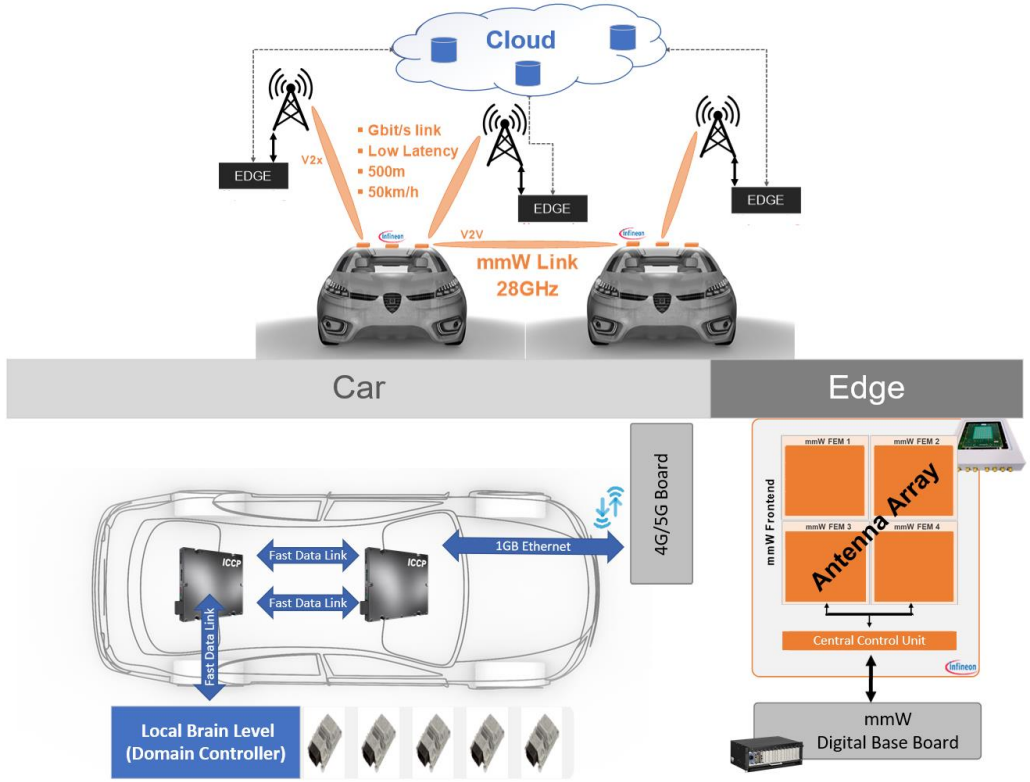
Innovation

- Communication System Architecture
- Robust low latency technology
- AI-enabling communication tech.

Demonstrators

SCD 5.1: Proof-of-concept communication platform (lead: TTTAuto)

SCD 5.2: Proof-of-concept demonstrator novel wireless data transmission (edge/cloud) (lead: IFAG)



SC6 AI-Enabled Perception and Sensor Fusion Platforms

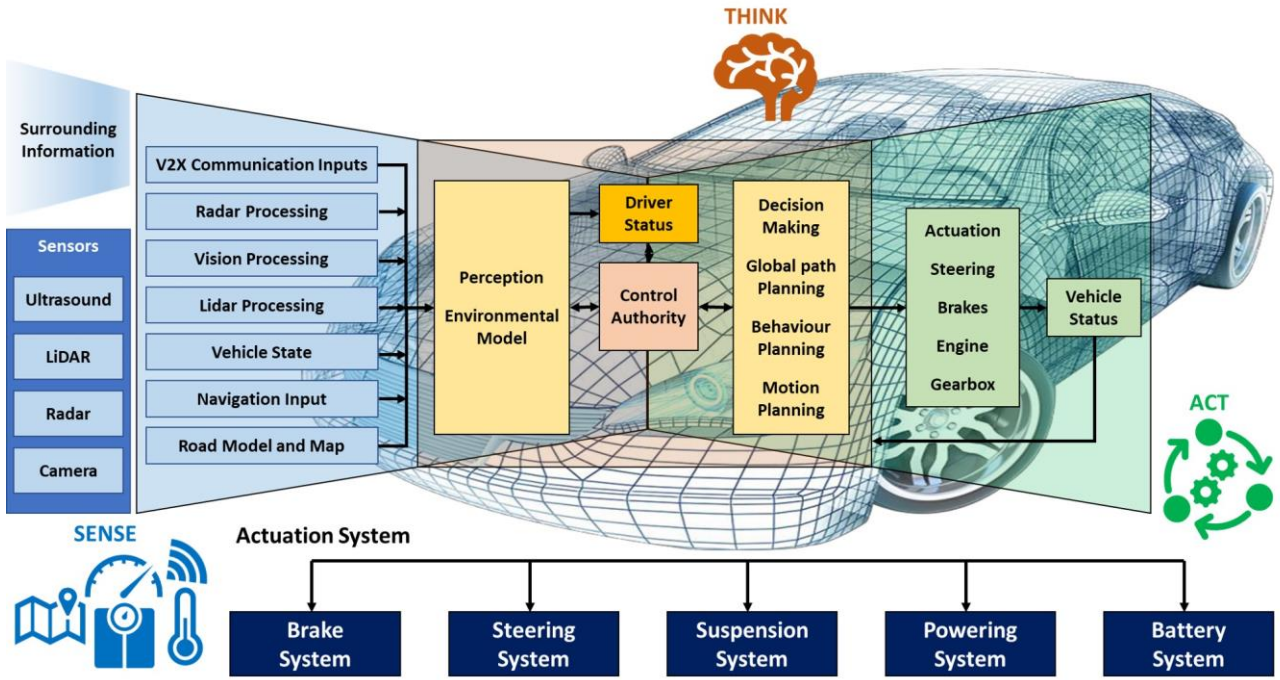
Research and demonstration on AI based perception and sensor fusion, new scalable AI-enabled platforms for autonomous mobility interconnected with secure communication architectures and systems.

Innovation

- Sensor network fusion
- AI enabled perception

Demonstrators

SCD 6.1: Perception and vehicle intelligence platform (lead: NXPN)
SCD 6.2: Neuromorphic sensor fusion (lead: IMEC)
SCD 6.3: Affordable AI-enabled perception (lead: SINTEF)
SCD 6.4: Localisation and 3D mapping (lead: BUT)
SCD 6.5: 3D Time of Flight with Aurix PPU (lead: IFAG)



SC7 AI-Based Methods, Simulation and Virtualization

Research and demonstration for methods, tools and processes for a trustable AI-based connected shared mobility with focus of trustworthiness, simulation and virtualization.

Innovation

- Automated cloud based learning and scenario generation
- Standardized data exchange for digital twins

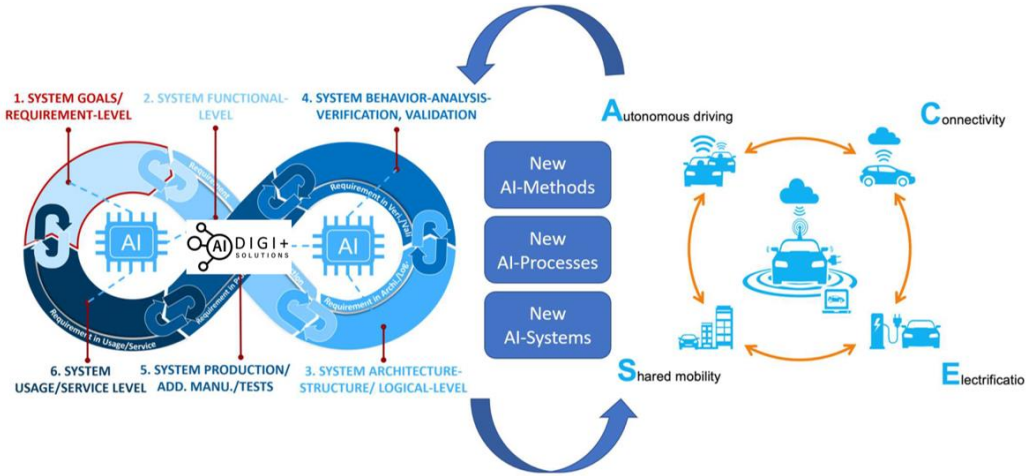
Demonstrators

SCD 7.1: Enriched virtual models based on standardized real-world data (lead: AVL)

SCD 7.2: Virtualized time and latency critical AI processes on the in-car computing platform (lead: TTTech)

SCD 7.3: AI based simulation and virtualization for multimodal mobility for virtual Smart Cities (lead: AIDG)

SCD 7.4: Reinforced virtual learning for real world driving (lead: EDI)



SC8 Impact Green Deal, Standardization, Certification, Ethical Aspects

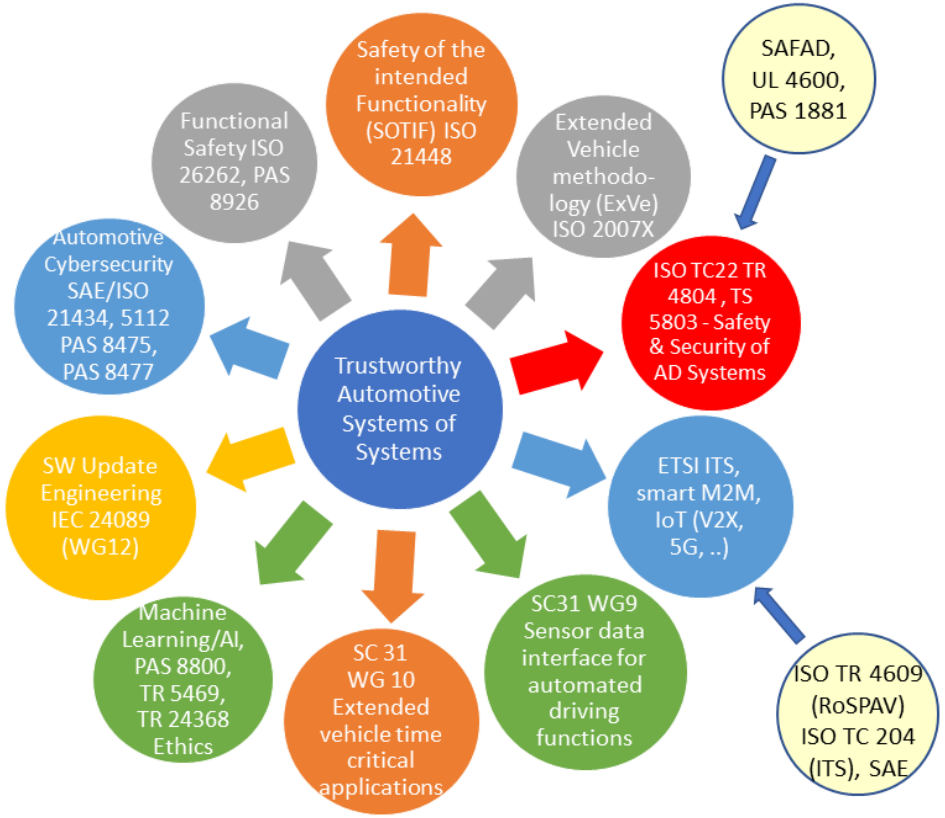
Contribute to Europe's vision of climate neutrality by 2050 for the automotive and the semi-conductor sector. Furthermore, it makes sure that the developments within AI4CSM are conform with current and upcoming standards as well as to support their activates in driving new AI related knowledge into the standards.

Innovation

- As of SC1 to SC7
- Green Deal

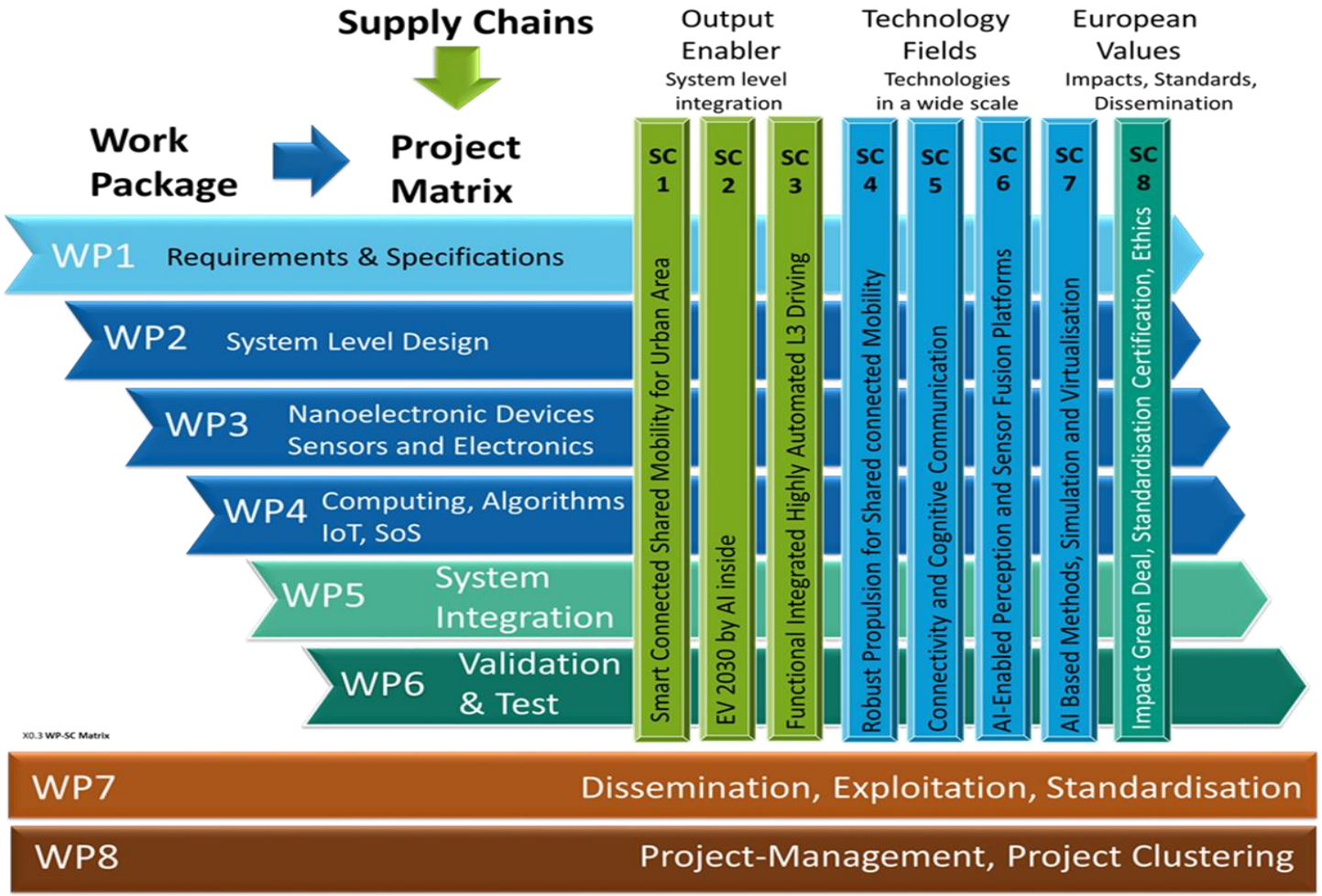
Demonstrators

SCD 8.1: Green Deal (lead: AIT & TUD)
SCD 8.2: Standards (AIT, all)



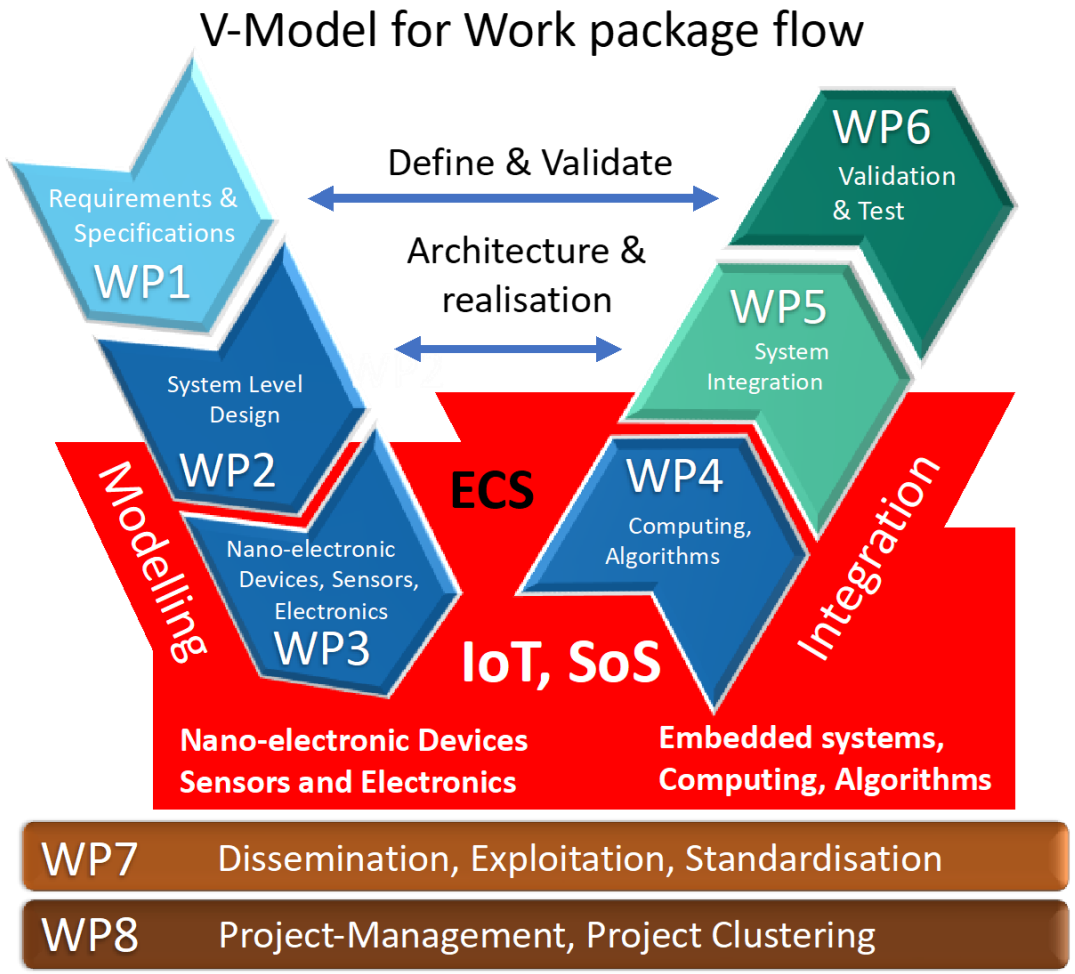
Confidential

SCs execute their work over the AI4CSM WPs



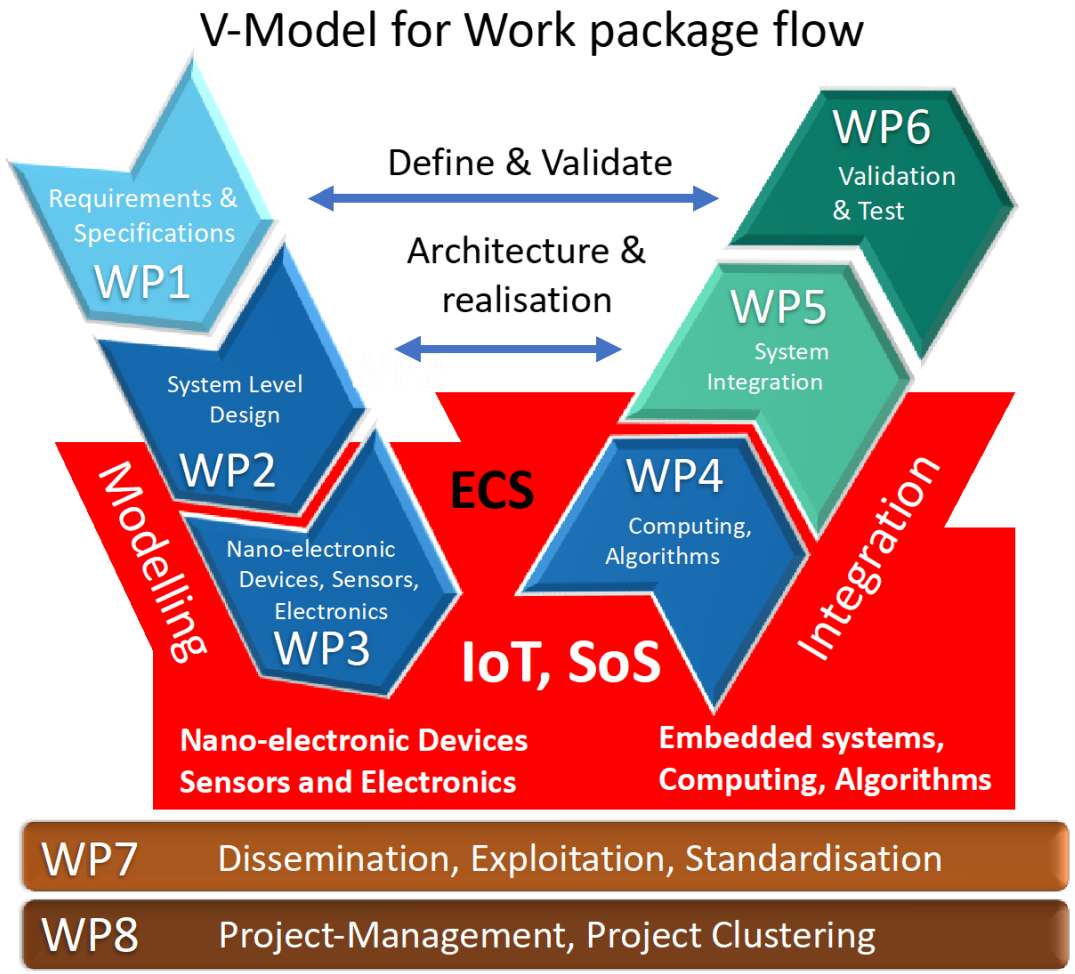
Work-packages (1/2)

- WP1
  - WP1 defines the system requirements as well as the use cases and validation methodologies
- WP2
  - WP2 is dedicated to the system level design based on modelling and simulation of several architectures for intelligent automated vehicles with the purpose of providing cost-efficient and reliable solutions to the market.
- WP3
  - WP3 will evaluate and design the semiconductor devices and modules for subsystems and systems and includes also qualification related topics.



Work-packages (2/2)

- WP4
  - WP4 covers the development of AI based and cognitive embedded systems and computing algorithms.
- WP5
  - WP5 cares about the system integration for all technological supply chains.
- WP6
  - Within the frame of WP6 validation and testing of the SC demonstrators takes place.
- WP7
  - WP7 covers exploitation, dissemination, standardization and market trends monitoring to analyse the solutions developed by competitors.
- WP8
  - WP8 performs the overall project management, including monitoring and all financial & contractual aspects.



Funding

AI4CSM project has received funding from the ECSEL Joint Undertaking (JU) under grant agreement No 101007326. The JU receives support from the European Union's Horizon 2020 research and innovation programme. It is co-funded by the consortium members and grants from Germany, Austria, Norway, Belgium, Italy, Netherlands, Czech Republic, Latvia, India.

Summary of the AI4CSM project

AI4CSM will build intelligent electronic components and systems for ECAS 2030 vehicles supporting European mass market production, manufacturability and scalability based on the Green Deal principles.

Thank you!

Dipl.-Ing.(FH) Jochen Koszescha
Infineon Technologies AG