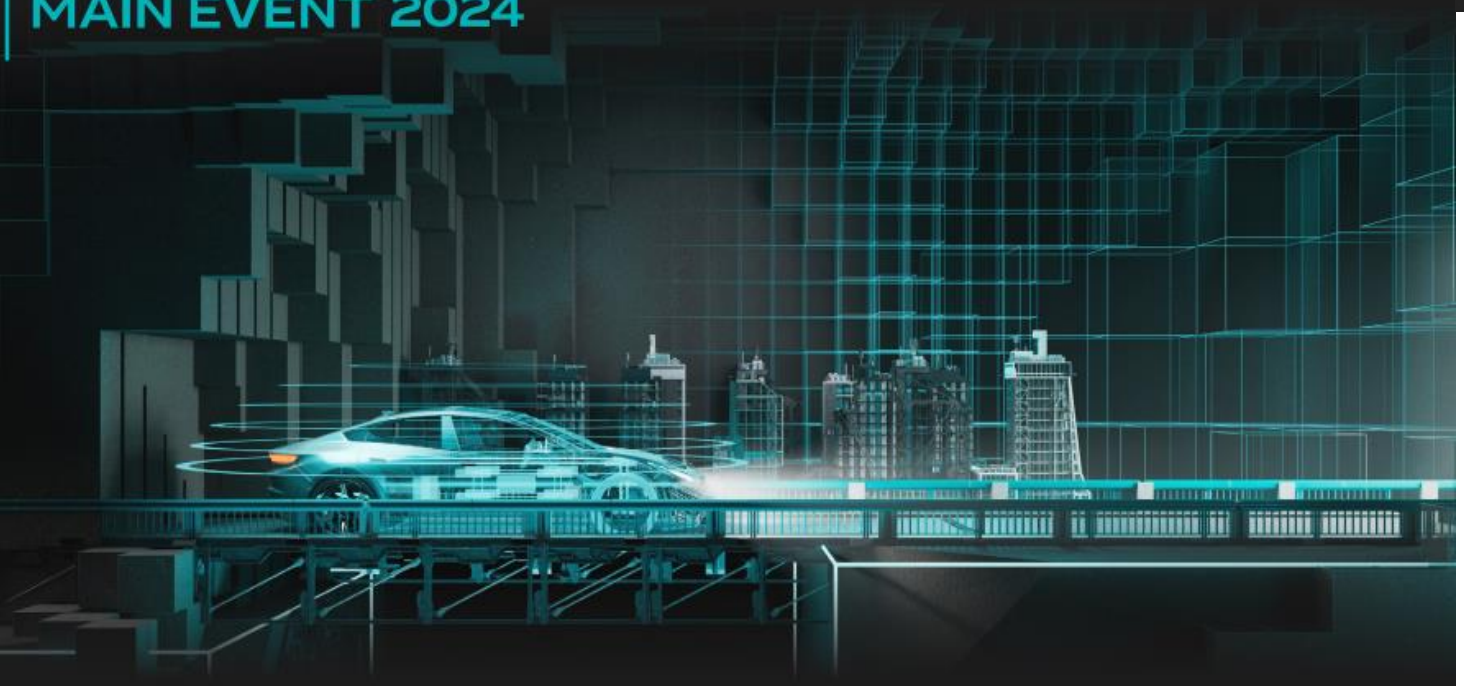
THE AUTONOMOUS
MAIN EVENT 2024



CUTTING NO CORNERS:
Bridging the gap in AV Safety

September 23-24, 2024

Vienna & virtually

TTTech

Key Themes for 2024

- Autonomy beyond automotive – areas of synergy
- Safe Paths: Building Safe and Fail-Operational Architectures for Autonomous Vehicles
- Navigating the regulatory landscape of autonomous vehicles
- Understanding risks and rewards in Software-Defined Vehicles

Autonomous Conference,
Vienna 25.09.2023 16:15 CET

Reiner John AVL List, Austria
Ovidiu Vermesan Sintef, Norway

Challenges and opportunities of Europe`s automotive industry

navigating a complex landscape

Strategic Goals:

1. **Retaining Europe's Position:** keeping Europe as a prime location for car production amidst global competition. Foster competitive advantages by technology leadership in safety critical systems
2. **Converging Ecosystems:** integrating mobility solutions with infrastructure and energy systems (MIE) to create a seamless ecosystem in order to boost economy of scale, seamless technology stack integration –> Autonomy beyond automotive – areas of synergy
3. **Green Deal Objectives:** balancing growth and sustainability by focusing on decarbonization through electrification, while mitigating the decline in direct investments -> growth
4. **Addressing the competition -> Gadget Trend:** build cars for the markets -> responding to consumer demand for increasingly tech-integrated vehicles.

Technological Key Challenges:

1. **Energy Efficiency:** optimizing energy usage in electric and hybrid vehicles for the ecosystems MIE
2. **Safety and Data Privacy:** Maintaining rigorous safety standards while managing data privacy concerns.
3. **Complex System Integration:** Ensuring seamless integration of steadily increasing high performant and complex components within the vehicle architecture.
4. **Scalability and Regulation Compliance for safety critical systems:** Developing scalable solutions that comply with evolving regulations.

ECSEL / KDT European funded projects in the ECO system of Mobility, Infrastructure & Energy

ECO Design, Efficiency, Material substitution, reduce yield losses

Carbon debt visibility, environment impact bill, supply chain resources

Components and data for cyclic economy

ECA 2030 — clean → connected → collaborative — Society 5.0 — Mobility 5.0 — Sustainability,

www.mobilitye.eu

ECSEL Joint Undertaking
Electronic Components and Systems for European Leadership

2009 **E3Car**
2010 **Castor** (EGVI European Green Vehicles Initiative)
2012 **Motorbrain**
2014 **3CCAR**
2016 **AutoDrive**
2019 **Architect**

Standardization
Life time monitoring
Certification framework

Fail-aware
Fail operational
Complexity
Redundancy
Multiphase
Multi-propulsion
Functional Integration
Efficiency

New Control
Prystine
2017 2018
Sensors & platforms

Electric Car

MOBILITY>E LIGHTHOUSE

Propulsion | **Perception** | **Connectivity** | **L3, L4, L5 Control**

Complexity explosion

2023 **Cynergy4MIE** — Convergence of Eco systems MIE
2022 **Archimedes** — Sustainability
2022 **A-IQ Ready** — Emergence
2020 **AI4CSM** — Scalable embedded Intelligence for Edge and edge/cloud operation
2018 **AI4DI**

Multi-domain

Fleets
Vehicle in Traffic
Emergence
Cyclic economy
Green Deal
Ecosystems

Complexity solved by trustable AI

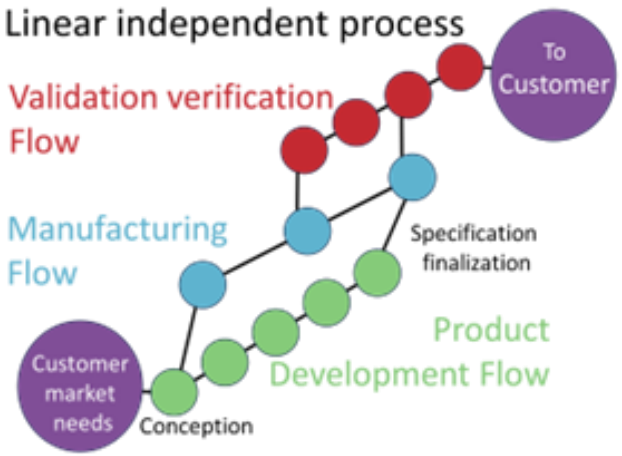
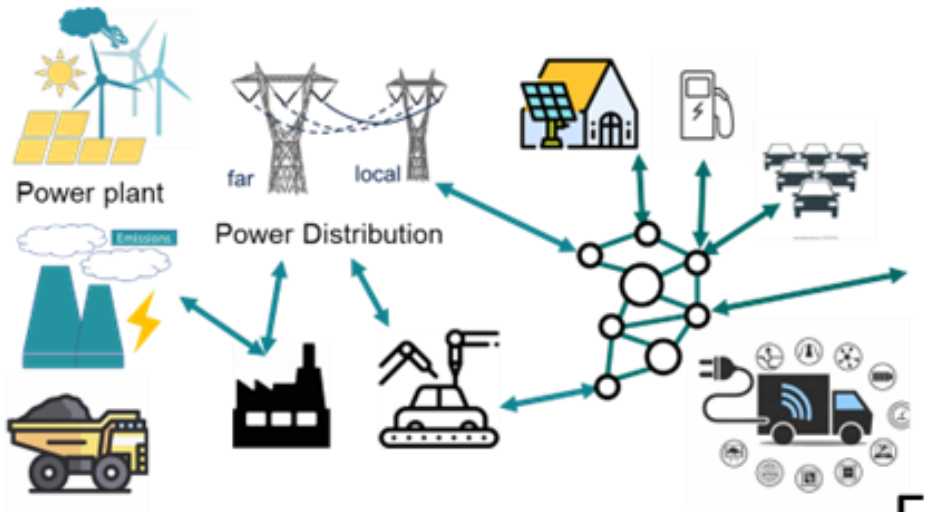
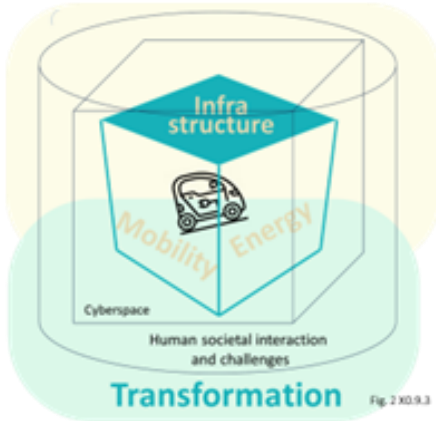
Quantum encryption
Quantum sensor
Quantum computing

Chips JU

Autonomous | **Digitalization**

KDT JU
KEY DIGITAL TECHNOLOGIES JOINT UNDERTAKING

Complexity evolution by multi domain requirements

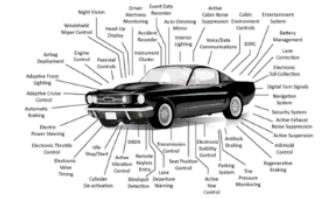
Today	**Tomorrow**	**Future**
Domain centric	Convergence of domain	Domain Fusion / Human centric
		
centralized	Distributed, multi domain	Emergent, multi-domain, virtual
AI	Collaborative-AI	Synergetic-AI
Cyber Physical systems	Collaborative-Cognitive Cyber Physical systems	Synergetic/Emergent Cyber Physical systems

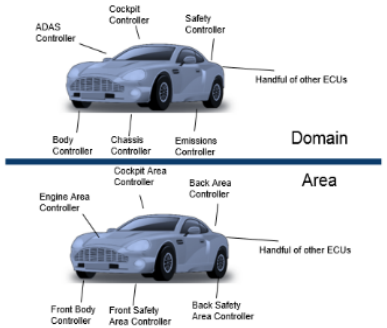
x0.9

AI for Controlled Complexity in Propulsion Systems

ECU Consolidation

Into a distributed central compute platform





TODAY

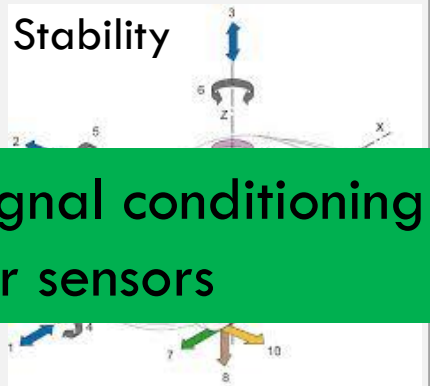
- 60-100 ECUs
- 6-8 operating systems
- Isolated operations
- Increasing cost & complexity

TOMORROW

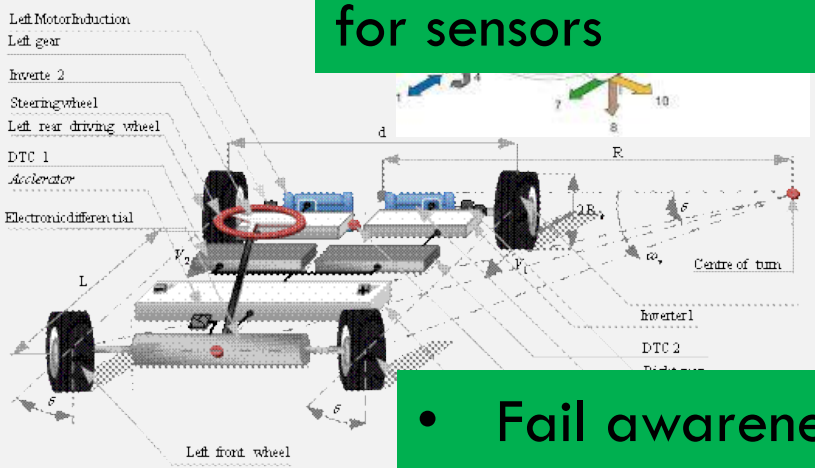
- 6-10 Domain/Area Mega-controllers
- Consolidated software system
- Coordinated operations
- Reduced weight, cost, & complexity

Domain control -> higher Control / computing power -> certified and safe and available control platfor

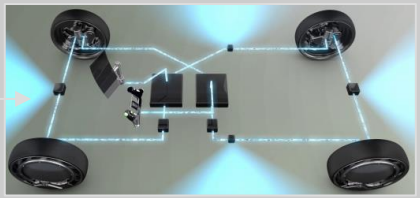
Stability



Signal conditioning for sensors

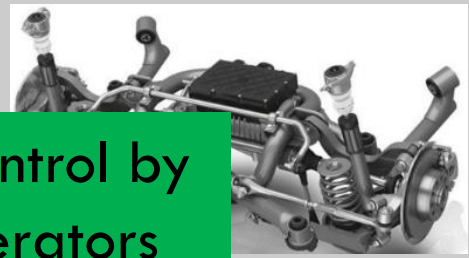


E/E Architecture Evolution



Electro-mechanical integration

- E-Motor
- Brake
- Damp
- Steer
- Gear



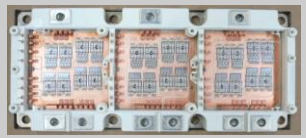
Electronic System integration

AI in Control by accelerators

Sensors

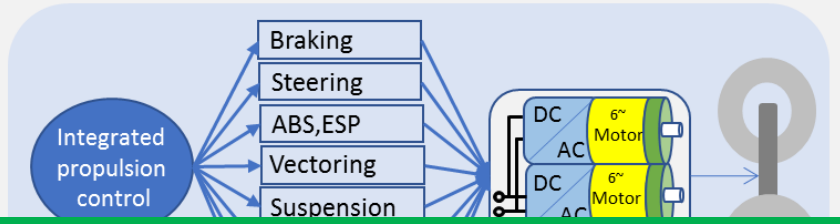
Multicore

PowerModule



System health Prediction for power components and sensors

Propulsion domain: Functional integration



- Fail awareness of propulsion system
- Predictive maintenance

Propulsion domain

Propulsion system

2x250KW

Aspects of the future of mobility: Immersive driving and beyond

Keynote Presentation on Challenges and Innovations in the Automotive Industry

THE AUTONOMOUS

Aspects of the future of mobility: Immersive driving and beyond

Automated and Autonomous vegicles has to overcome the safety challenges of developing and deploying autonomous vehicles on a global scale.

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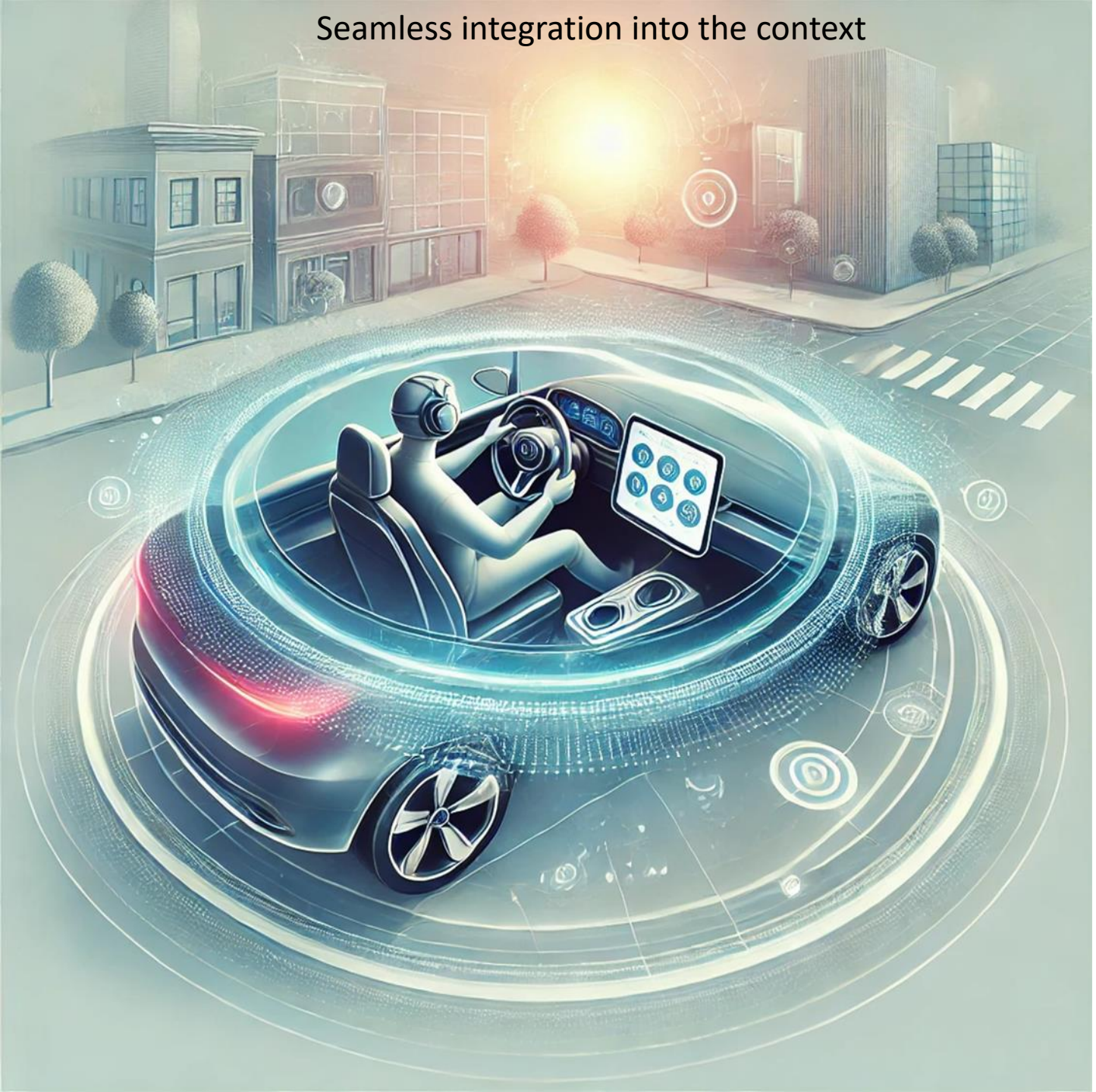
Human intuitive decision making in complex context situations

The big challenge for AI

Human driver are capable to manage extremely difficult weather conditions based on experience, context and foreseen scenarios.

How to drive this car automatically ?



Borderless View:
A New Driving Experience

The 'Borderless View' concept replaces traditional opaque areas like the A- and B-pillars and the roof with integrated displays and external cameras.

This approach enhances:
Safety: Eliminating blind spots for a full 360-degree view
Comfort: Providing seamless interaction between driver, vehicle, and environment
Control: Enabling adaptive views based on driving conditions

Core technologies enabling the Vision of 'Experiencing Driving'

Seamless integration into the context

Experiencing Driving

represents a groundbreaking transformation of the vehicle technology, making the driving experience truly immersive.

Basic Features to explain an intuitive example:

- 'Borderless View’: a 360-degree uninterrupted view using displays and cameras
- Integration of AI, VR, and XR to adapt to driver needs in real-time
- Enhanced safety and control, providing a stress-free and relaxed experience

Vision: "Experiencing Driving" as seamless integration into the context and the environmental conditions

The vision of "Experiencing Driving" describes a driving experience that is seamlessly embedded into the environment and prevailing conditions. This means that modern vehicles can respond to external factors such as traffic, weather, infrastructure, and other dynamic environmental influences in real-time and adapt accordingly.

Goal of this Vision:

- **Harmony:** Driver and vehicle operate in sync with their surroundings, making driving more intuitive, safe, and enjoyable.
- **Real-Time Response:** The vehicle adapts instantly to changes around it for an optimal driving experience.

Key Technologies on the way to autonomous systems

- **Adaptive Assistance Systems:** Continuously support driving through real-time analysis and adjustment.
- **Environmental Analysis:** Sensors and cameras monitor surroundings in real-time.
- **Intelligent Communication: Vehicles and infrastructure exchange information on traffic, hazards, and routes.**

Benefits:

- **Safety:** The vehicle responds to dangers before the driver notices them.
- **Comfort and Ease:** Seamless interaction between vehicle and environment reduces stress and enhances driving intuition.
- **Environmental Impact:** Efficient driving and smart traffic management lower emissions and fuel consumption.
- This integrated driving vision transcends technology, offering a smarter way to drive by harmonizing with environmental conditions.

What's new?

this vision is the holistic approach, which not only focuses on in-vehicle technology but also integrates interaction with the entire environment to create a fully integrated driving experience. This goes beyond autonomous functions and aims at a seamless merging of vehicle, infrastructure, and surroundings in real-time.

Immersive driving experience & examples of involved technologies

1. Intuitive Cognitive decisions for drive control
2. Decision systems and platforms in multi-redundant propulsion and perception systems to enhance safety, efficiency and functionality Edge AI,
3. Advanced sensors, AI-powered systems, and innovative displays turn the car into an extension of the driver.
4. Automated safety features, innovative headlights, and vehicle-environment integration are key.
5. The synergy of VR, XR, and AI redefines the driving experience.
6. Cutting-edge technologies like 360-degree displays are core to this vision.
7. Robustnest, longlivity, economic value

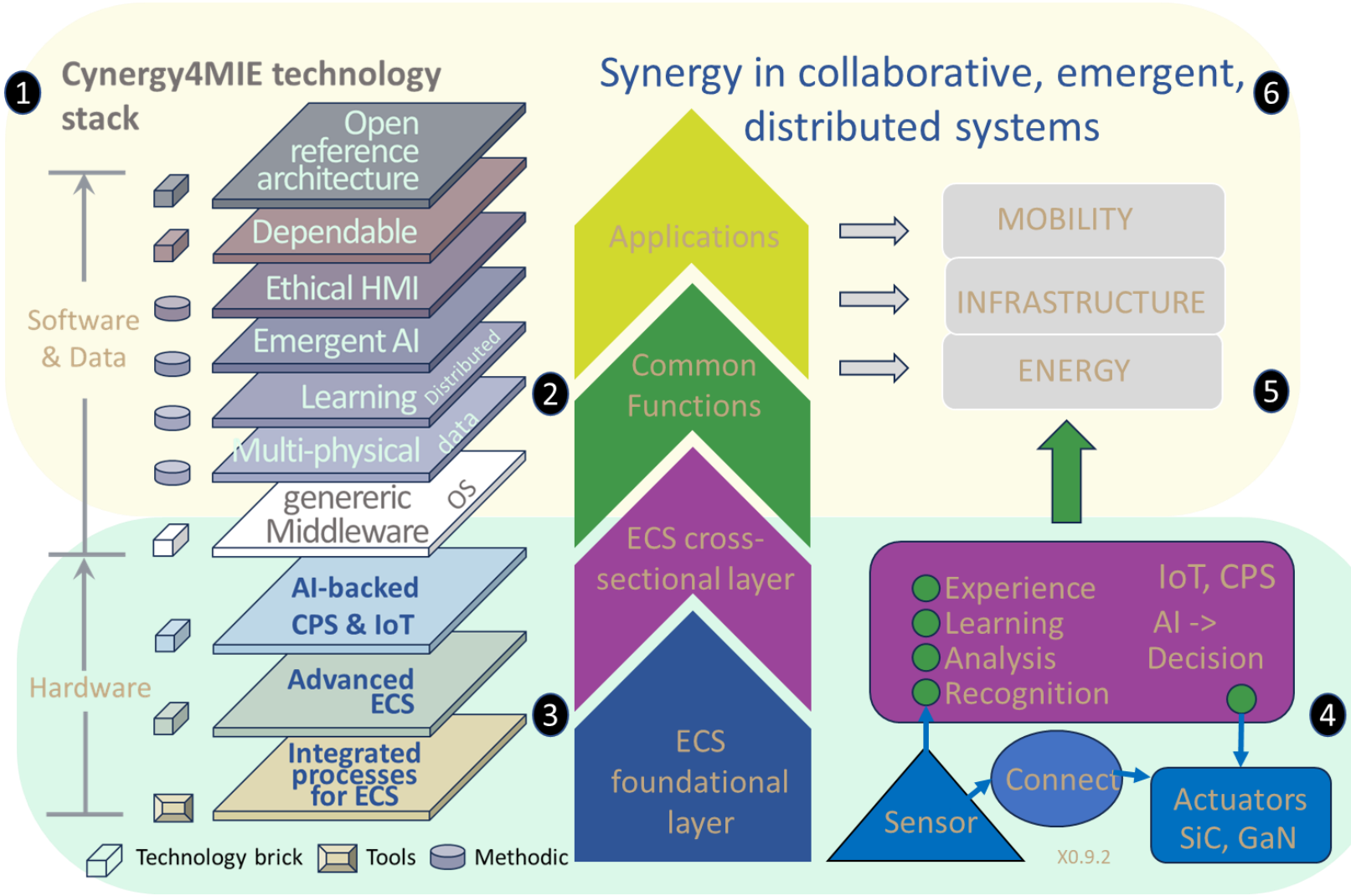
Complexity of Implementation of 'Experiencing Driving' Solutions -> **Technology Stack – SDV (Federate)**

SDV enables an "intelligent connected edge computing on wheels," utilising the specifics of the vehicle to provide multisensory experiences based on an intelligent connected computing platform.

With multiple displays and a network of hundreds of sensors and actuators, the SDV combines domains like infotainment, autonomous driving, intelligent body, cabin and comfort, energy, and connected car services, providing a new driving experience.

Stack technologies for collaborative, emergent distributed systems

New research trends: Open-source hardware (e.g., RISC-V), open-source software, and open-source AI.



- Microservices and APIs
- Containerization
- Software development practices
- Vehicle service-oriented architecture (SOA)
- E/E Architecture Transformation
- Vehicle Multilayered SOA
- Functional Safety in the Vehicle Multilayered SOA

Example: Post-Quantum Security (PQC) in SDVs

- Quantum computers threaten current public-key cryptography (RSA, ECC) widely used in automotive cybersecurity.
- Post-quantum cryptography (PQC) is essential for ensuring secure communication and OTA updates in future SDVs.
- Early integration of PQC is key to cost efficiency and safety.
- This is just one example of how software and security play an increasing role in modern vehicle development.

Summary & Call to Action
Strengthening European Competitiveness

- Europe must differentiate itself from global competitors like China and America by focusing on his key strength such driving experiences, especially in safety critical applications
- Europe has the potential to lead in mobility technologies by focusing on sustainability, convergence and innovation.
- The future of mobility is immersive, intelligent and secure.
- European innovation must lead the way in addressing global mobility challenges.
- Build synergies in the eco-systems mobility, infratructure and energy
- Innovation through collaboration between OEMs, researchers, and policymakers is crucial.