

# SmartCorners

*User-centred Optimal Design of Electric Vehicle with Smart E-Corners*

Walter LUKESCH – AVL DiTEST



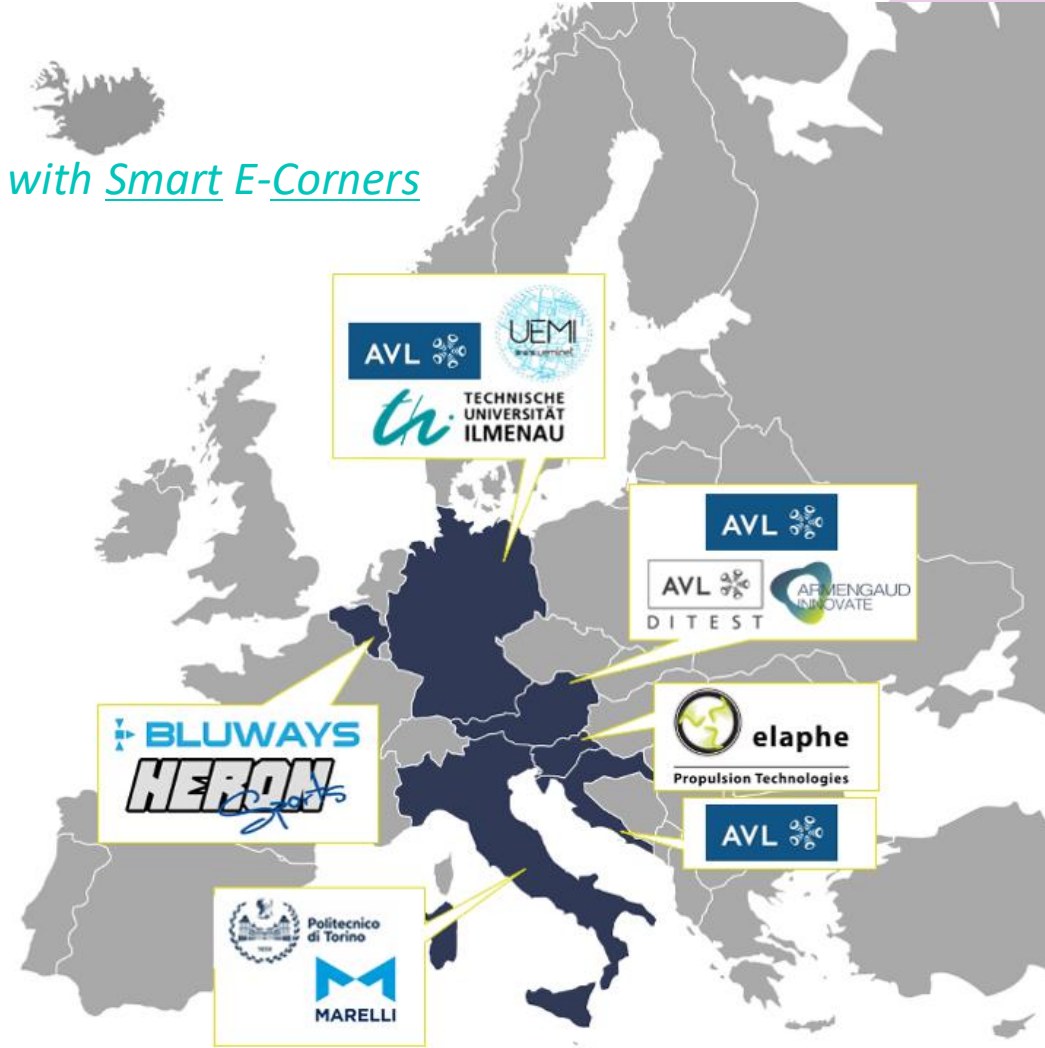
# Overall project presentation





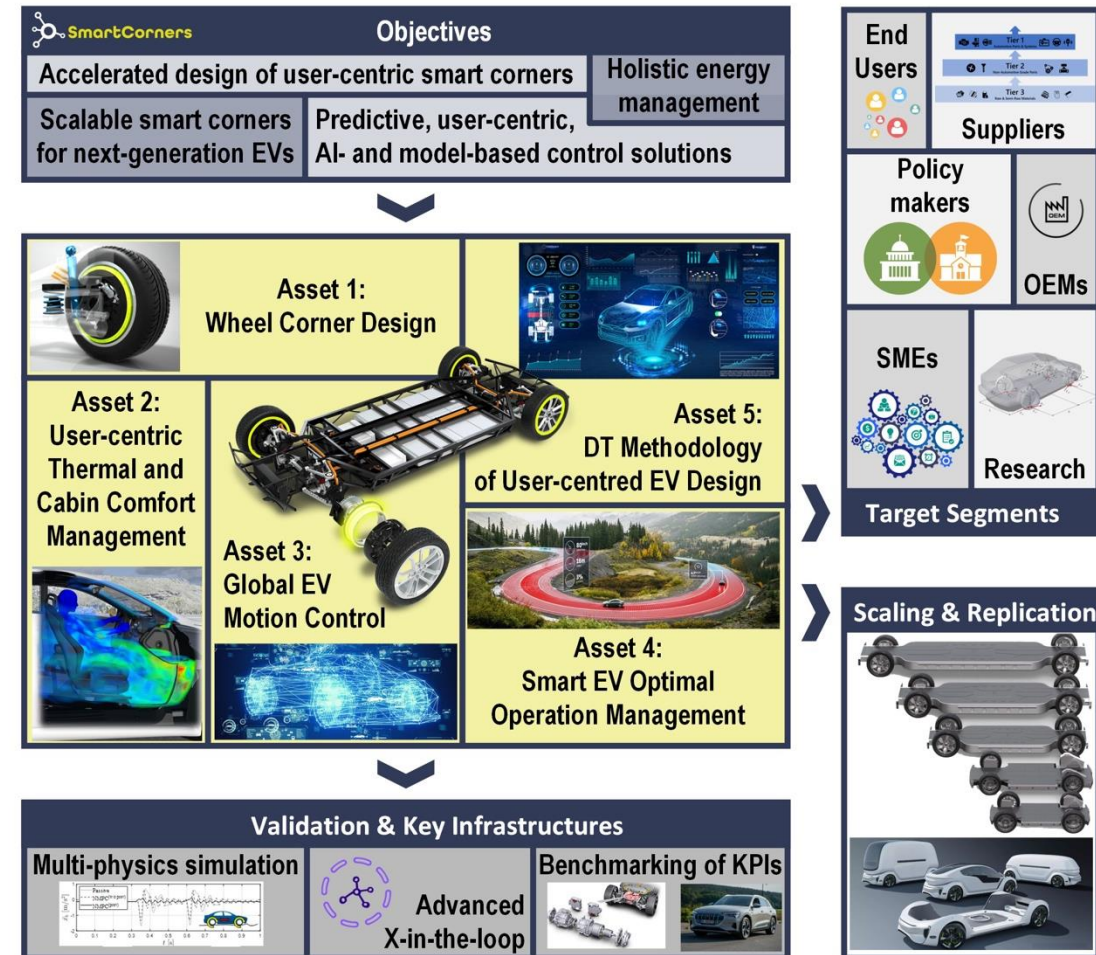
# SmartCorners – Fact sheet

- SmartCorners: *User-centred Optimal Design of Electric Vehicle with Smart E-Corners*
  - Funding scheme: HORIZON-CL5-2023-D5-01-01
  - Status: Project started by January 1<sup>st</sup>, 2024
  - Duration: 3 years
  - Consortium: 12 partners
  - Total budget: approx. 6.317 k€ (funding: 4.575 k€)
  - Coordinator: AVL DiTEST GmbH



# Expected Outcomes

- **Accelerated uptake of affordable and more energy efficient electric vehicles (EVs)** through the development of innovative and holistic user-centric solutions, optimized system concepts and components sizing
- **Increase comfort and safety** (e.g. de-misting) functions' effectiveness and leading to a **real-world range increase of 20%** (compared to the State-of-the-Art donor vehicle or demonstrator) at external temperature of 0°C
- Component sizing and performance matched to vehicle reliability and performance requirements to **reduce costs by at least 5% at vehicle level**
- **Reduced development time at vehicle systems and components by 30%** using AI for advanced design support and control algorithms in EV holistic thermal management and powertrain systems





# Results presentation

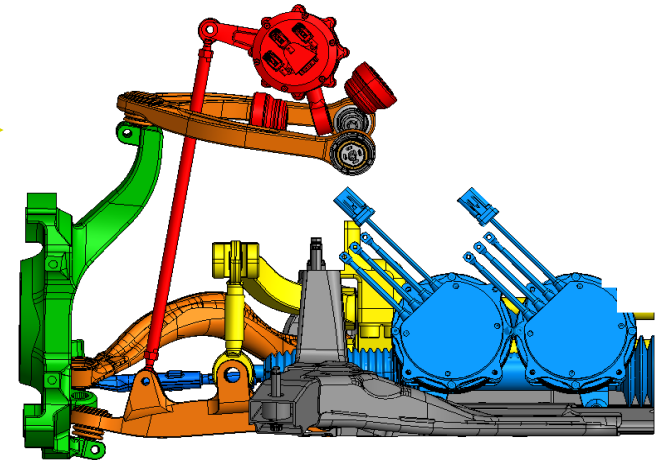
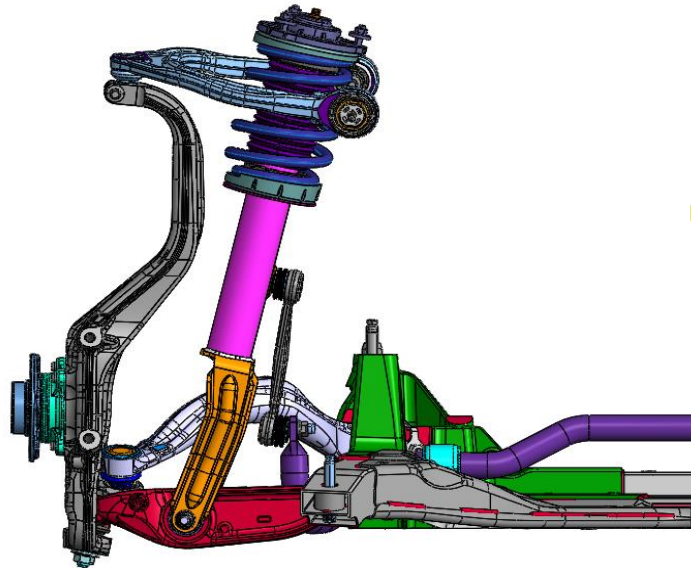


# Wheel Corner Design

- Skateboard Platform & SCS
- Integration of traction, steering, braking and suspension control

Strong influence	Secondary influence	No influence
PP	P	O

	In-wheel motor	Active shock absorber	Active camber and toe control	Sensorised suspension arms
Safety	P	PP	P	PP
Comfort	PP	PP	O	P
Handling	PP	PP	PP	P
Efficiency	PP	PP	P	O
Tire management	P	PP	PP	P





# Design, Control & Optimal Operation

- Integrated software platform for powertrain and chassis controllers
- Predictive operation
  - Vertical tire force-vectoring control
  - Wheel kinematics control
  - Pre-emptive chassis control framework (NMPC and AI)
- Fail-safety control and redundancy securing
- Digital twinning on component and system level

# AI supported thermal and cabin comfort control

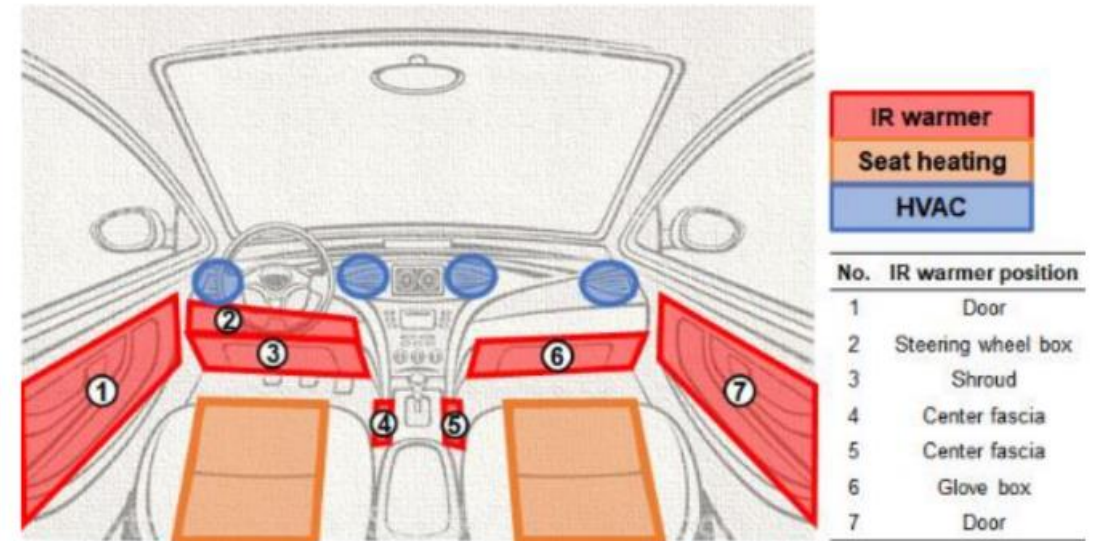
## New, independent controllable heater configurations

Smart pre-conditioning

Tracking of user preferences

AI model optimization

Validation





# AI supported thermal and cabin comfort control

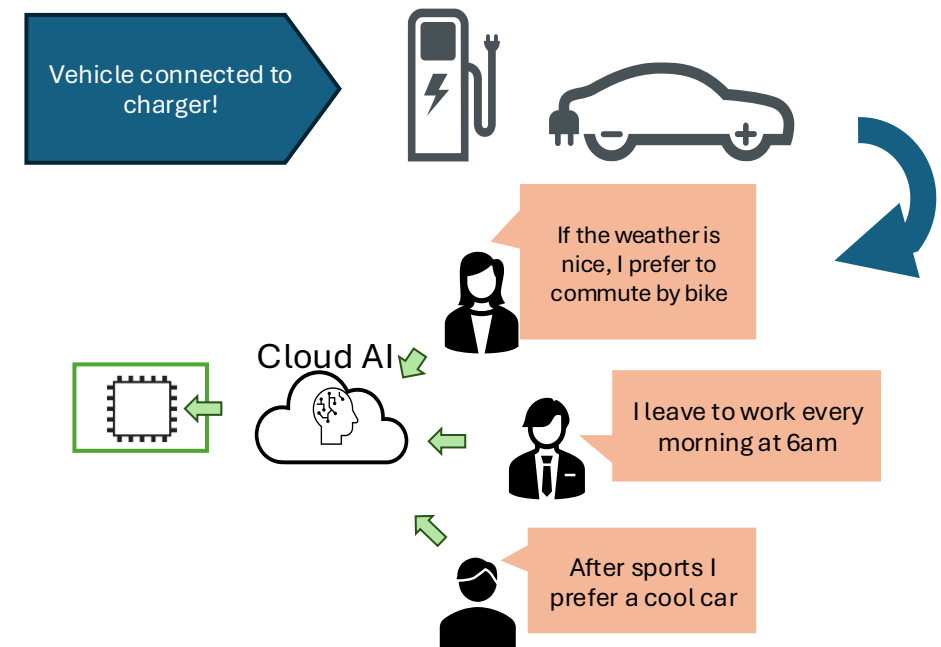
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Preconditioning of battery and cabin while connected to the grid →  
Increase range and comfort.

# AI supported thermal and cabin comfort control

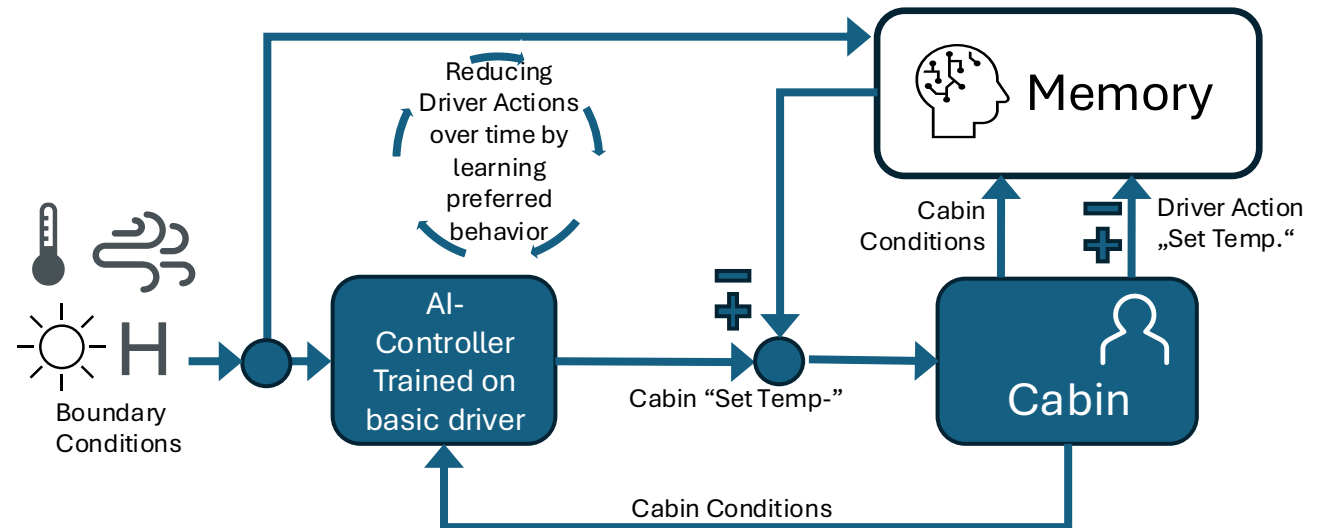
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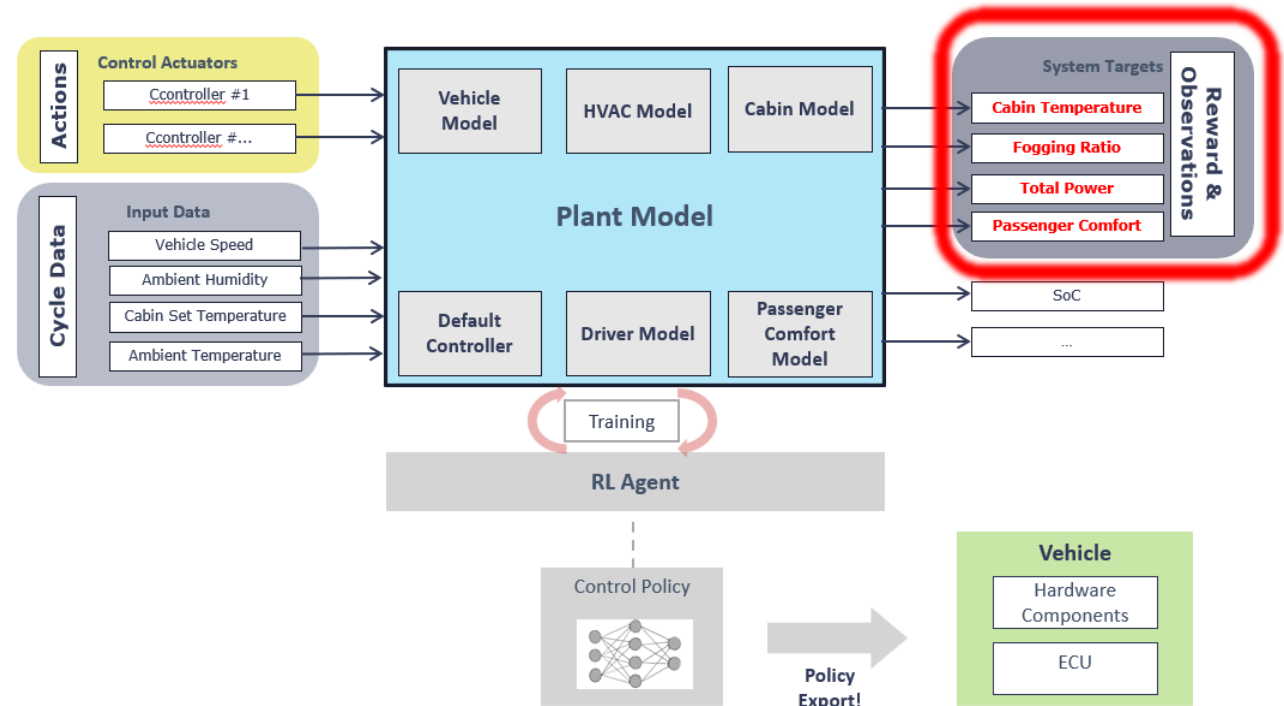
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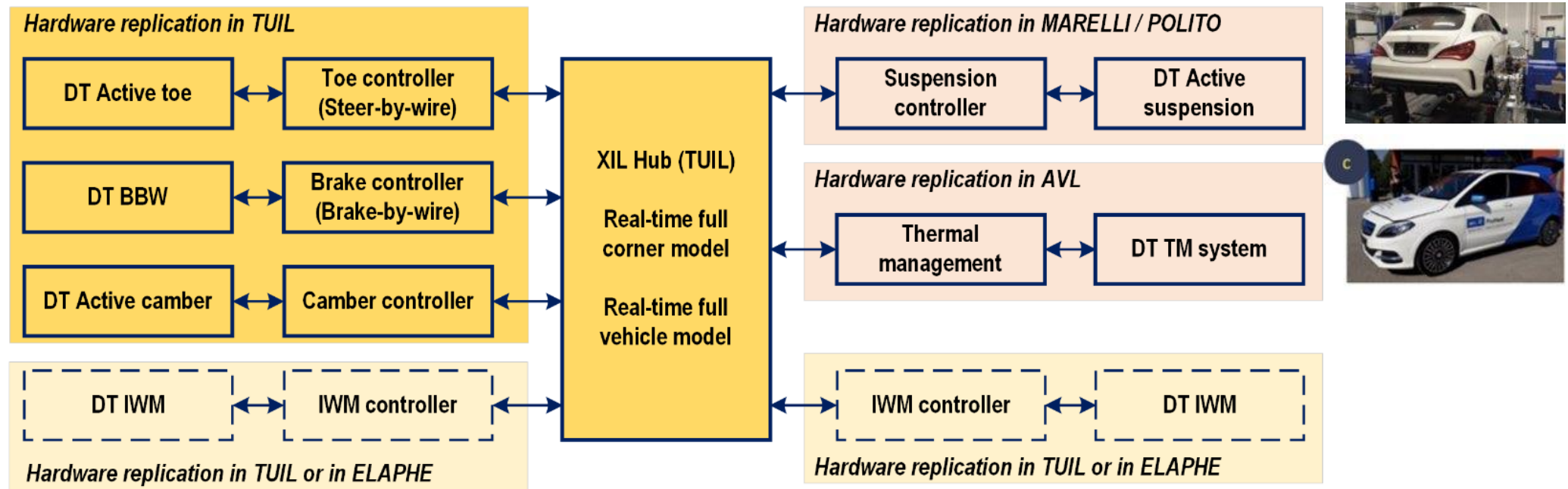
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**Validation**



# XIL with Digital Twins

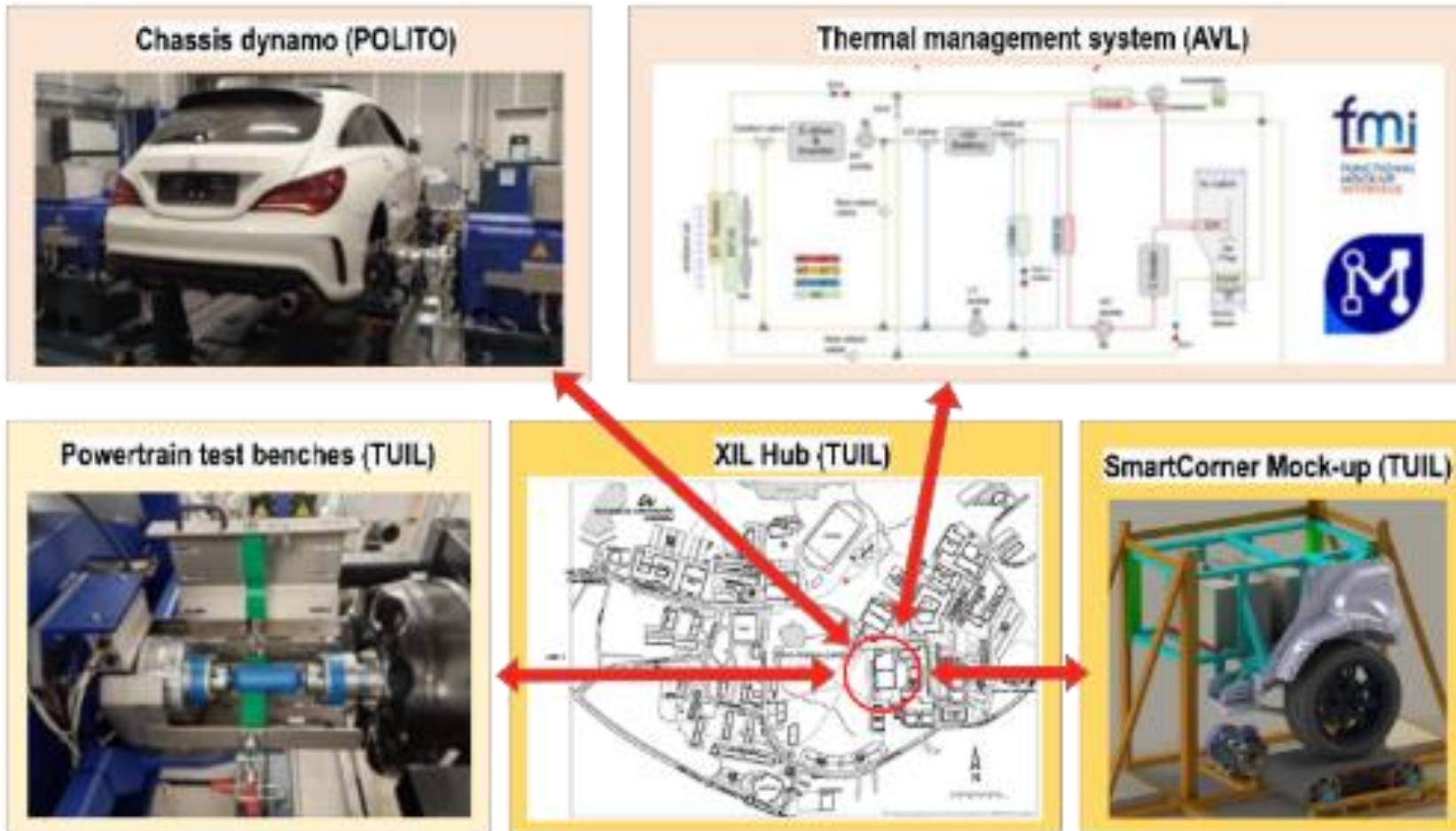


Driver model (POLITO)

Vehicle model (IONIQ5 from Elaphe, CarMaker or Matlab fcn)

Full corner model (STELVIO from POLITO)

# XIL with Digital Twins – A distributed Lab





# Cross-project collaboration

- Utilization of the E-VOLVE cluster outreach for joint communication and dissemination activities
- Joint publication submitted to TRA 2026 with ten R&D projects / E-VOLVE cluster members involved
- Joint activities on e.g., standardization, regulations, and policies with technical committees / working groups of standardization organisations
- Collaboration on vehicle demonstrator with skateboard corner architecture (CODE4EV)

# Mid to long term expected impacts of the project



# Expected impact

- Societal impact: GHG and emissions reduction; increased EV acceptance with overall positive environmental effect
- Economic impact: overall cost reduction of EVs by 5...10%
- Technological impact: new design of SCS as components of promising EV architectures; new methods of digital twin-based validation of EV technologies (with >30 % reduction of the development time).
- Scientific impact: new concepts for user-centric EVs, their novel multi-physics development as well as the relevant manufacturing decision-support framework.





#RTR2026

# Thank you for your attention!

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With the support of

