

ECS SRA Chapter 1

Transport & Smart Mobility

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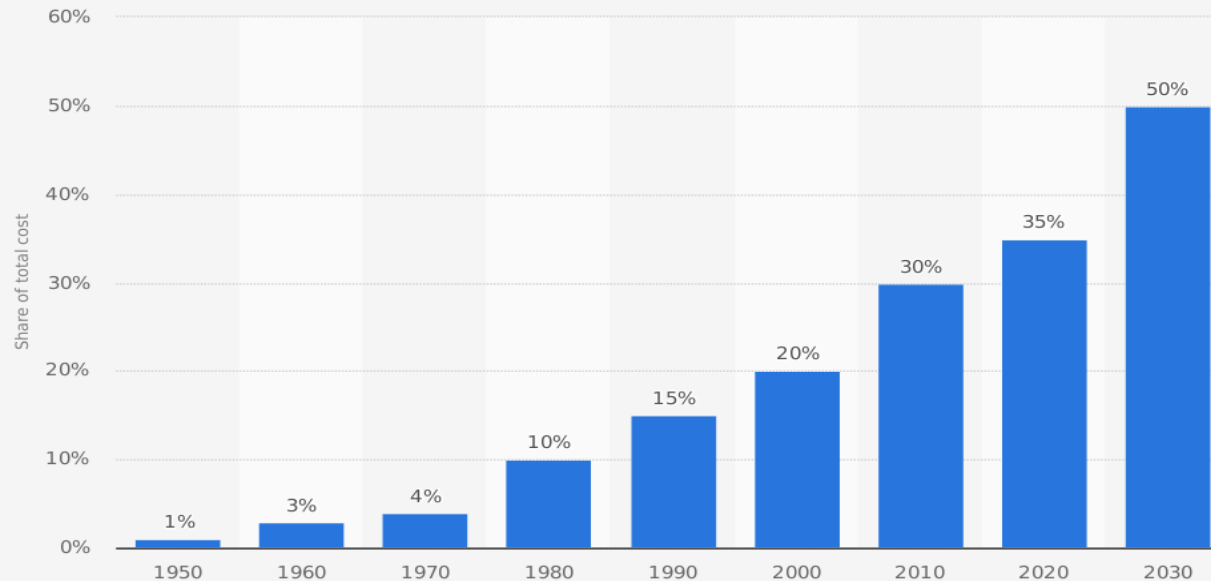
The UL ECS logo, with 'UL' in a stylized white font and 'ECS' in a larger, bold white font.
Our digital future
2018

Organised by:
AENEAS, ARTEMIS-IA, EPoSS, ECSEL-JU &
European Commission

Associated organiser:
EUREKA

Motivation

Automotive electronics cost as a percentage of total car cost worldwide from 1950 to 2030



Source
PwC
© Statista 2018

Additional Information:
Worldwide

EU Auto Industry :

Employment : 13.3
Mio people (6.1 %
of workforce)

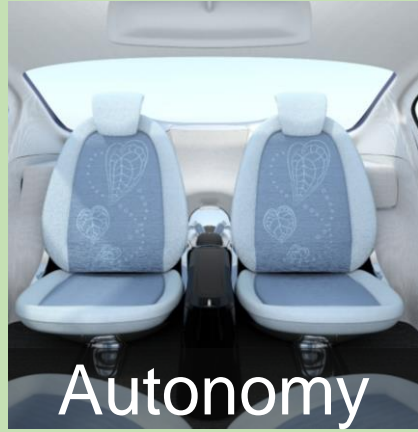
6.8% of EU GDP

54 Bio private R&D
investment

Auto Semicon :

5 in top 10 are EU
> 35% market share

Motivation



Autonomy



Electrification



Connectivity

Safe and Secure Mobility
More than **tripling** the **semi value per car**
(from \$380 in 2017)

The same applies
in other domains :

SHIPS

TRAINS

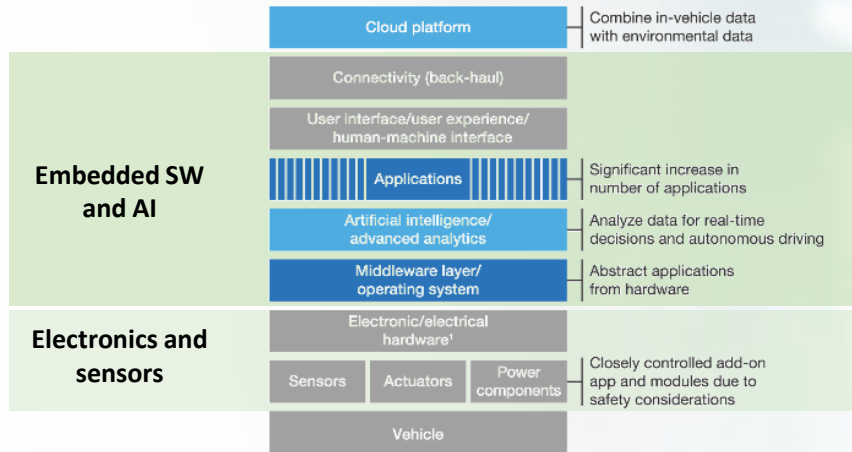
PLAINS

NEW

New : Share of Embedded SW in Vehicles exponential increasing

Future layered in-vehicle and back-end architecture

■ Existing layer ■ Modified layer ■ New layer



¹Including operating system in status quo.

Future factors for brand differentiation:

- Infotainment features requiring "plug and play" capabilities
- Autonomous capabilities including sensor-fusion algorithms as a complement to hardware
- Safety features based on "fail-operational" behavior
- Software will move further down the stack to hardware (smart sensors)
- Stacks become horizontally integrated
- New layers will be added to the stack

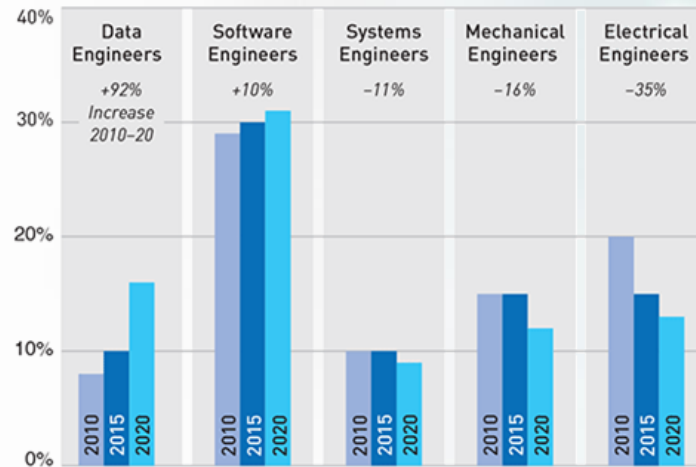
Electronics, sensors and **especially embedded SW and AI** are key technologies in next gen vehicles

Source: McKinsey&Company

(<https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/rethinking-car-software-and-electronics-architecture>)

New : Share of Embedded SW in Vehicles exponential increasing

Percent of companies where the largest engineer employee group is...



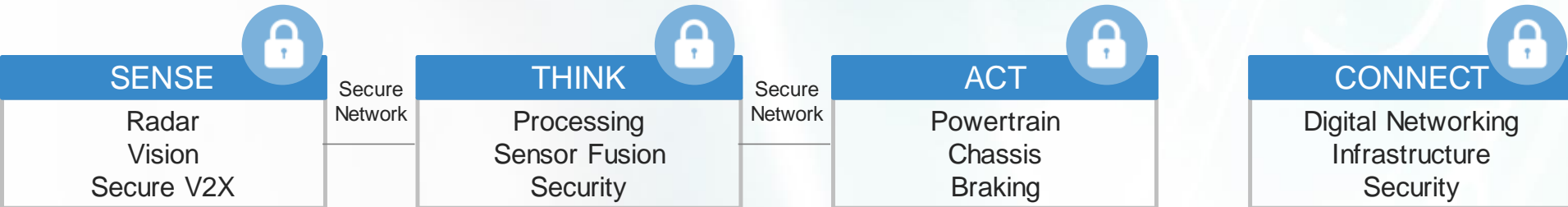
R&D in companies is shifting from classical disciplines to (embedded) SW and data

Source: Strategy & analysis

(<https://www.strategy-business.com/feature/Software-as-a-Catalyst?gko=7a1ae>)

But there are still remaining hardware priorities for covering the challenges

- **Sensing** modalities like radar, lidar, camera with increasing performance
- **Communication** needs are massively expanding (like in-car or wireless networking)
- **Processing** needs continue to grow massively (general purpose as well as dedicated accelerators like for AI/ML or sensor processing)
- **Intelligent control systems** (battery & energy management)



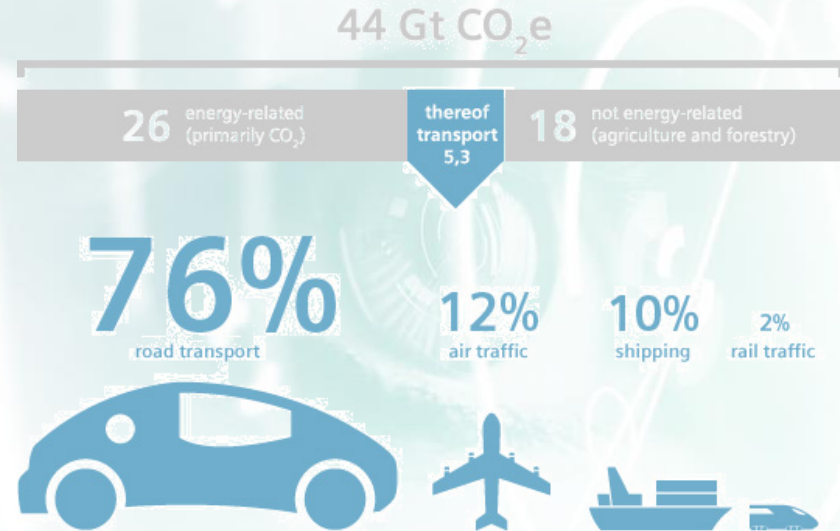
Key Challenges

- Clean, affordable and sustainable propulsion
- Secure connected, cooperative and automated mobility and transportation
- Interaction between humans and vehicles
- Infrastructure and services for smart personal mobility and logistics.



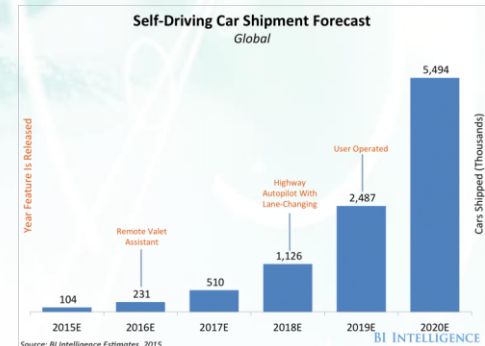
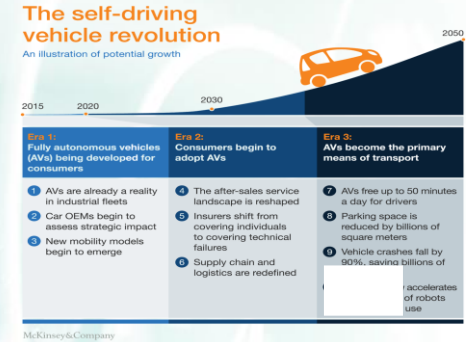
Clean, affordable and sustainable propulsion

- Energy Efficient Architectures (HW/SW)
- Energy & Power Storage & Management
- Control Strategies & Predictive Health
- Smart Sensors & Actuators
- **NEW : Maritime : Multi-Fuel Engines**



Secure, connected, cooperative & automated mobility and transportation

- Environment recognition
- Localization, Maps & Positioning
- Control Strategies (incl. Artificial Intelligence)
- Communication Inside & Outside
- Swarm Data Collection & Continuous Updating
- Functional Safety & Fail-Operational Architectures
- **NEW : Smart & Autonomous Ships & Connected Maritime Systems incl. Automated Transport**



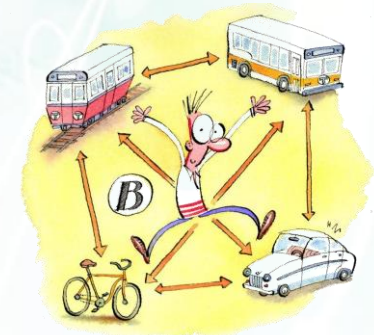
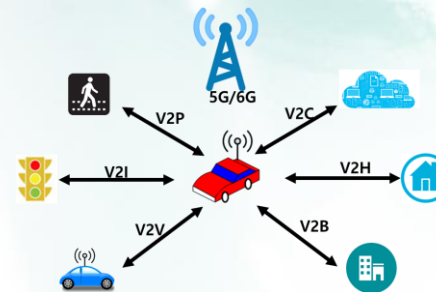
Interaction between humans and vehicles

- Driver Activities & Vital Signs Monitoring
- Future Human Interaction Technologies & Concepts
- “Online” Personalization of Vehicles
- Smart mobility for
 - Elderly, very young or non-technical-affin people
 - Digital natives
 - Handicapped people

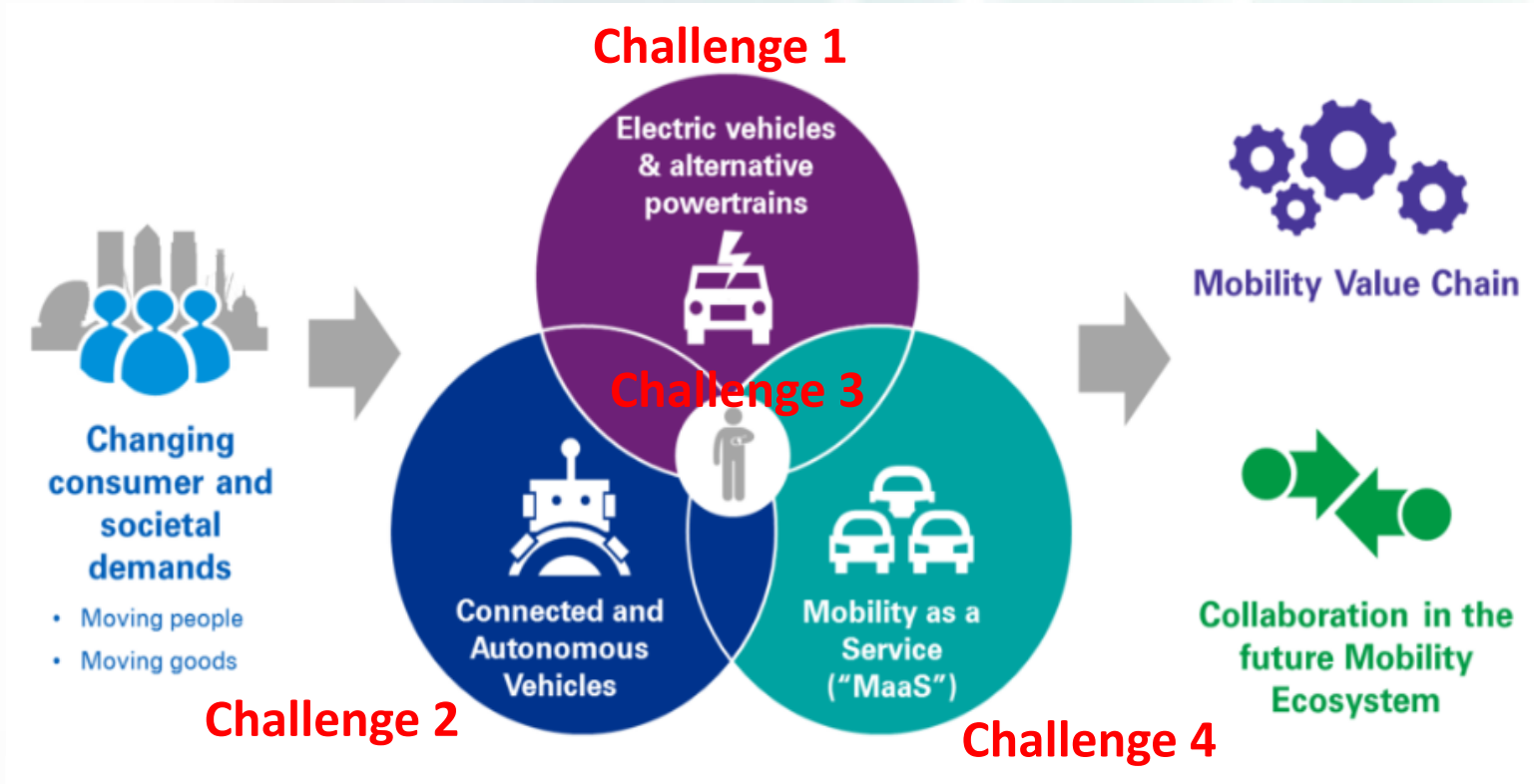


Infrastructure and services for smart personal mobility and logistics

- V2X incl. security & reliable availability
- Guidance Systems (Remote drones, trucks, ships,...)
- Mobility Platforms for “Mobility as a Service”
- Predictive & Remote Maintenance
- Efficient Logistics in Freight & Goods



Summary



Multi-modal traffic of the future ?

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Thank you for your Attention

