Trends in semiconductors for mobility

Dr. Matthias Illing

Program coordinator collaborative R&D
Automotive Electronics, Robert Bosch GmbH

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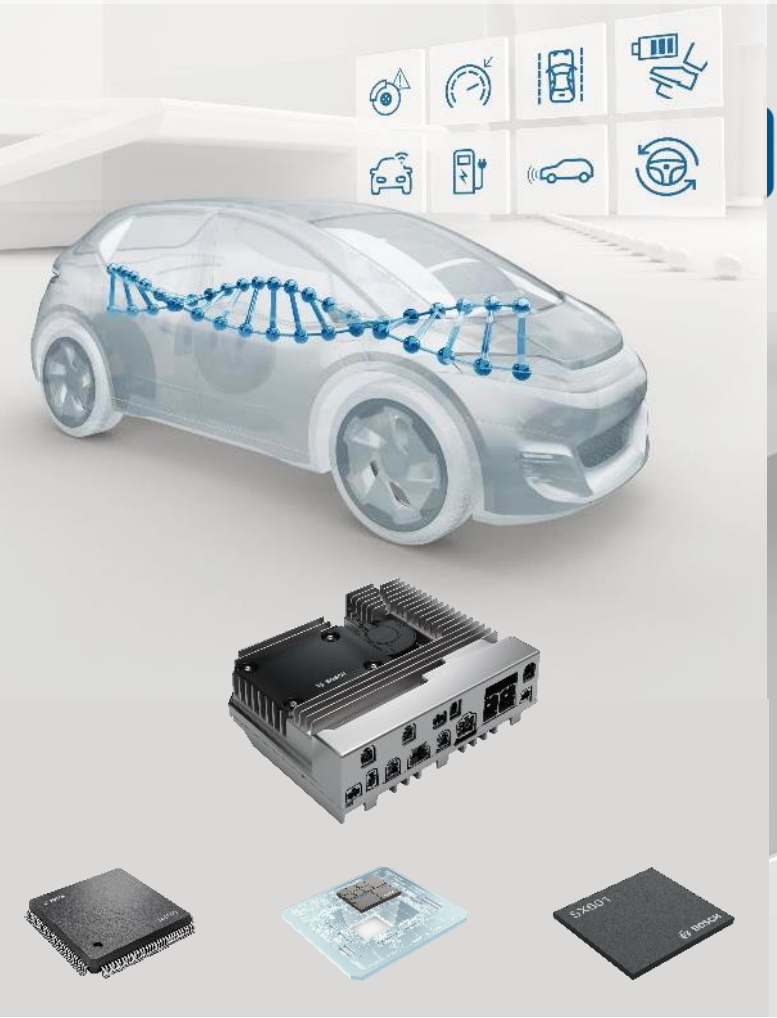
Software-defined vehicle



Electrification

Autonomous driving

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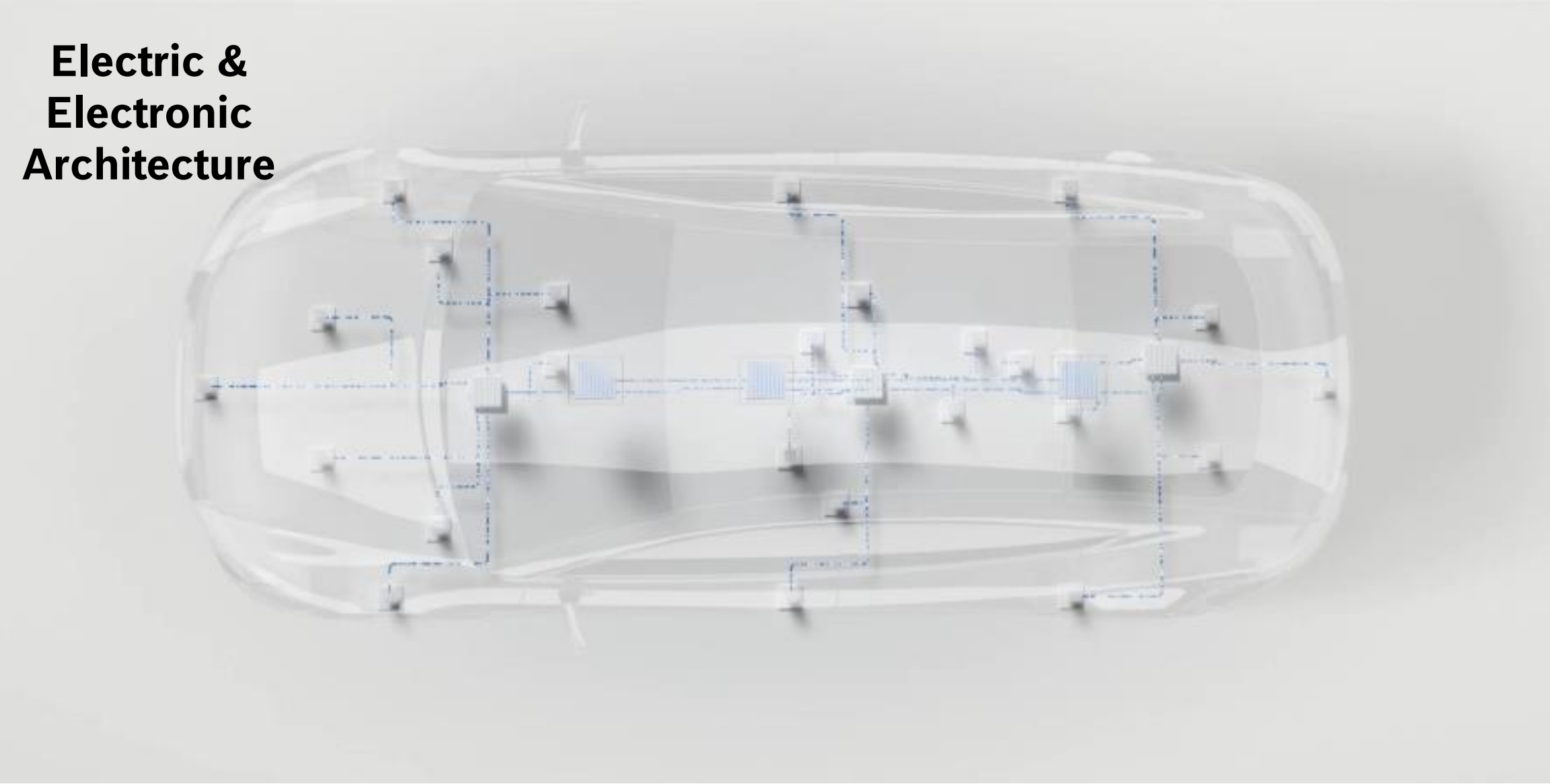
Electric & Electronic Architecture

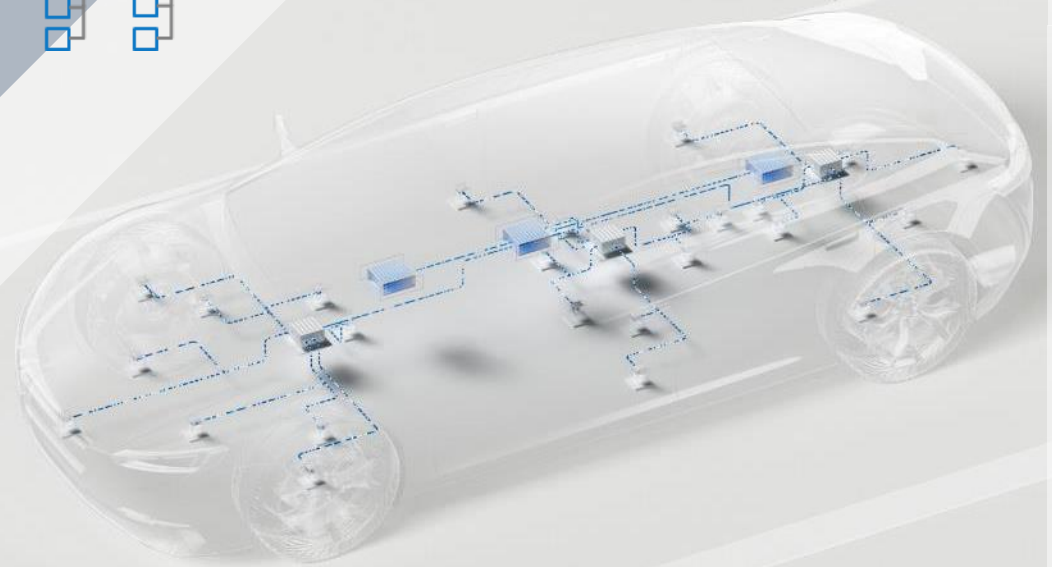


Electric & Electronic Architecture

Distributed

Domain-centralized

Vehicle-centralized



Vehicle computers

Zone controllers

Sensors & actuators

Integration of software and I/O parts from fixed-location ECU *(e.g.,window control ,...)*

Integration of dedicated hardware functionalities *(e.g., body, climate,...)*

I/O connection of simple sensors and actuators (e.g., seat, window,...)

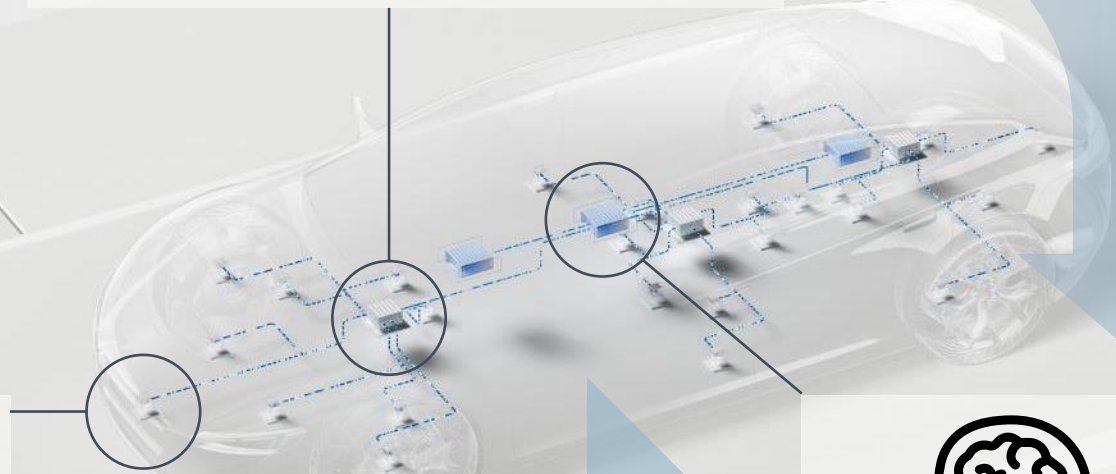
Zone controllers

SW Updates

Hardware dependency

Safety and homologation relevance

High-performance SW features that define vehicle-level functions *(e.g., ADAS,...)*



Sensors & actuators

I/O connection of high-data-rate sensors *(e.g., camera streams, ...)*

Vehicle computers

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Mobility specifics

E/E integration

Supply chain

Safety

Security

Scalability

Life cycles

Semiconductor design

The compute dilemma

PCB
Board-level integration

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- Functions in cost-optimized chips
- Exchangeability & scalability

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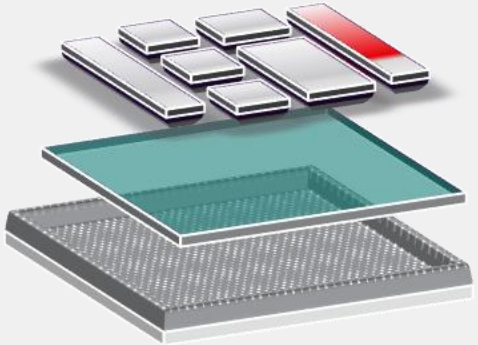
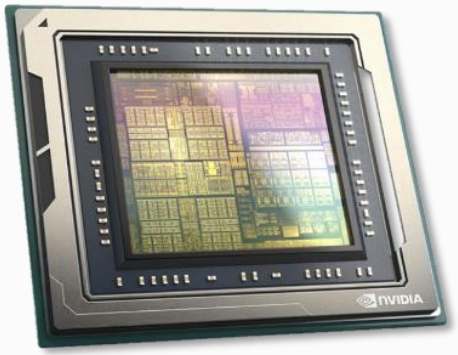
- Interconnect bandwidth & complexity
- Area consumption

Chiplets
Package-level integration



SoC
Chip-level integration



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- High performance
- Dense integration
- Best efficiency

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- Reticle size & yield
- R&D cost & TTM
- Single process node

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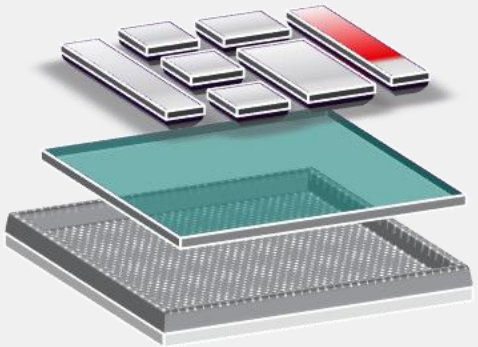
Automotive Chiplet Systems

Semicon. technology
EDA tools
Interconnect standards
Packaging technology
Semicon. manufact.
Functional innovation
Testing
Die-to-die interfaces
Drivers
Fast-paced cycles

Capabilities of **semiconductor industry**



Require-ments
System integration
Variance & scalability
Reliability engineering
Functional safety
Just-in-time assembly
Life cycle mgmt.
HW design & SW stack
Security architecture
Validation& verification

Capabilities of **mobility industry**

Value chain

Chiplet system design	Chiplet design	Chiplet manufacturing	Chiplet system integration	Vehice computer	Software
Architecture incl. middleware	IP & design incl. low-level drivers	Technology incl. processing & testing	Packaging incl. validation	Board-level integration incl. validation	Application software

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Vision:
Open Ecosystem for
Automotive Chiplet Systems

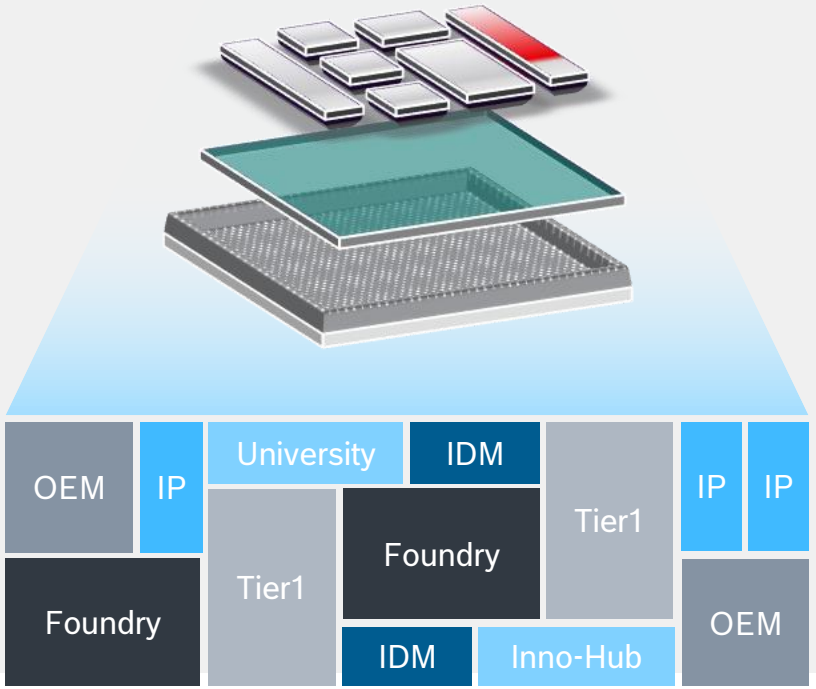
Key characteristics

Clearly defined **standards** and **interfaces**

Multiple players at each value-chain step

Multi-vendor integration of chiplets

Modular and scalable architecture



Major benefits

Larger impact on **design decisions**

More **design choices**

Higher **flexibility** "mix-and-match"

Differentiation via tailored systems

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