Lecture: Software-defined Vehicle
Gilles Mabire, Automotive CTO
June 14th

Transformation of Mobility is our heartbeat
Global Trends revolutionizing E/E Vehicle Architecture

Automated Driving

Cloud Services

IoT

UX Applications

Shared Mobility

36 %

Cars with over-the-air capabilities by 2026

2026

66% of OEMs plan to partner with software firms and system integrator firms

+400 %

New vehicles based on common software platforms grow from 7% today to 35% by 2031

$640 billion

By 2031 software-based features and services will be a market worth $640 billion

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Public

The Software-defined Vehicle
Our Definition

In a Software-defined Vehicle, functions are enabled by software. Decoupling software from hardware enables swift and continuous development & implementation of new functions and software updates throughout vehicle lifetime.
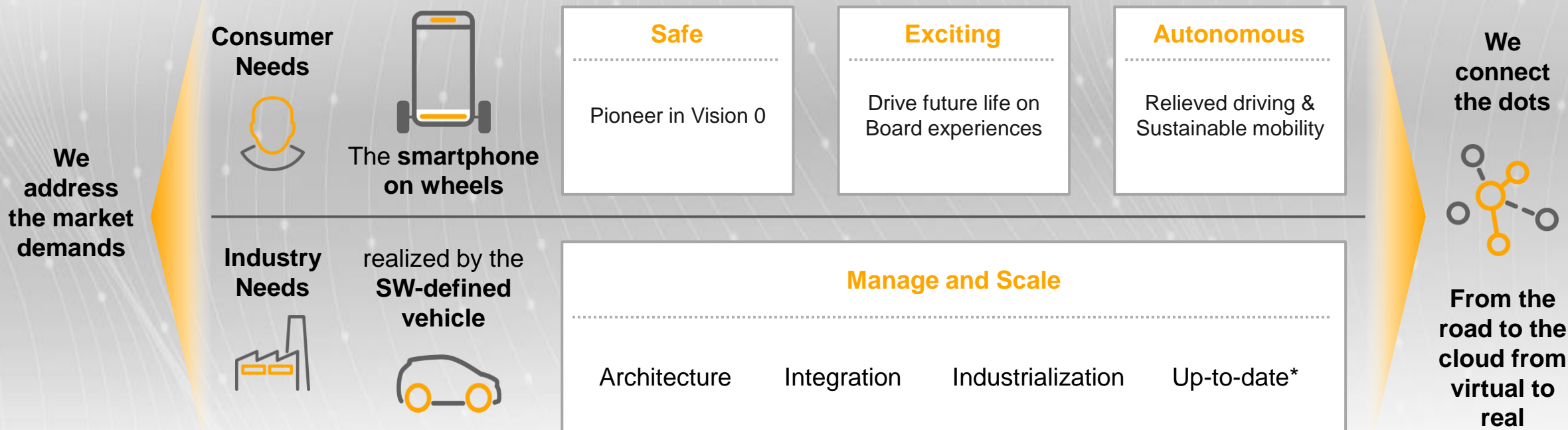
The automobile, which until a few years ago was a self-contained system, has become part of a much more complex software-centric ecosystem – the IoT.

The focus is no longer only on hardware, which nevertheless has a significant importance, but more and more on software.

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We Are Connecting The Dots
Experience software-driven future mobility

We address the market demands

Consumer Needs

The **smartphone on wheels**

Industry Needs

realized by the **SW-defined vehicle**

Safe	**Exciting**	**Autonomous**
Pioneer in Vision 0	Drive future life on Board experiences	Relieved driving & Sustainable mobility

Manage and Scale

Architecture	Integration	Industrialization	Up-to-date*

We connect the dots

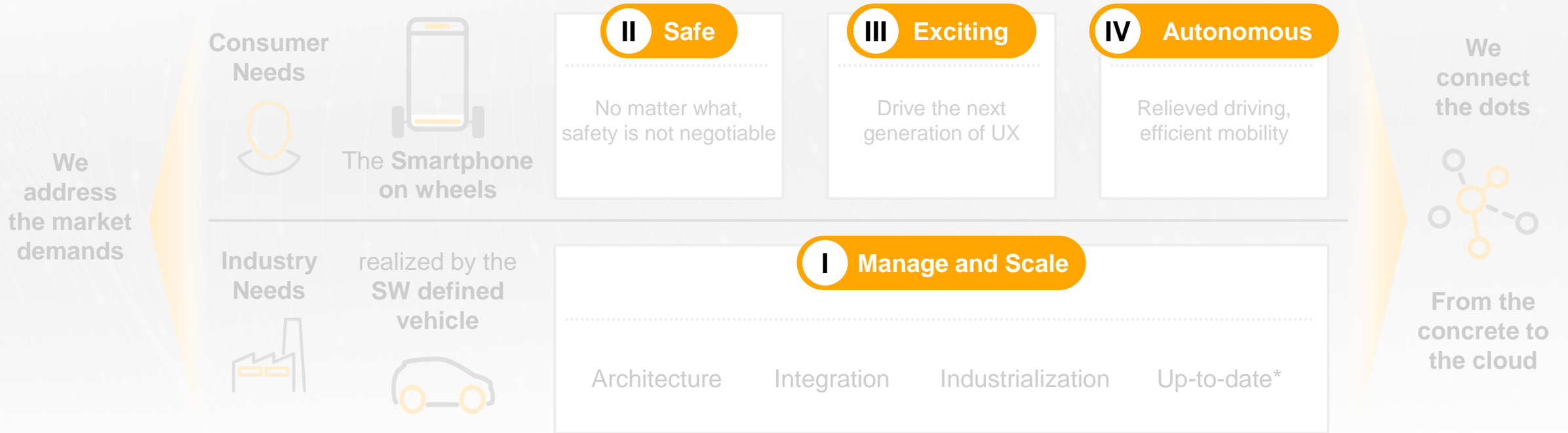**From the road to the cloud from virtual to real**

With our expertise across the entire ecosystem, we are the only one able to **connect all the dots** and provide dedicated solutions to support our customers, realize their vision.
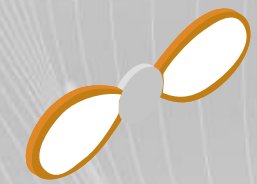
* incl. Connected, Cyber Secured, OTA

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We Are Connecting The Dots
Experience software-driven future mobility

TechShow 2023
Experience Forward Thinking

Consumer Needs

We address the market demands

The **Smartphone on wheels**

II Safe

No matter what, safety is not negotiable

III Exciting

Drive the next generation of UX

IV Autonomous

Relieved driving, efficient mobility

We connect the dots

Industry Needs

realized by the **SW defined vehicle**

I Manage and Scale

Architecture   Integration   Industrialization   Up-to-date*

From the concrete to the cloud

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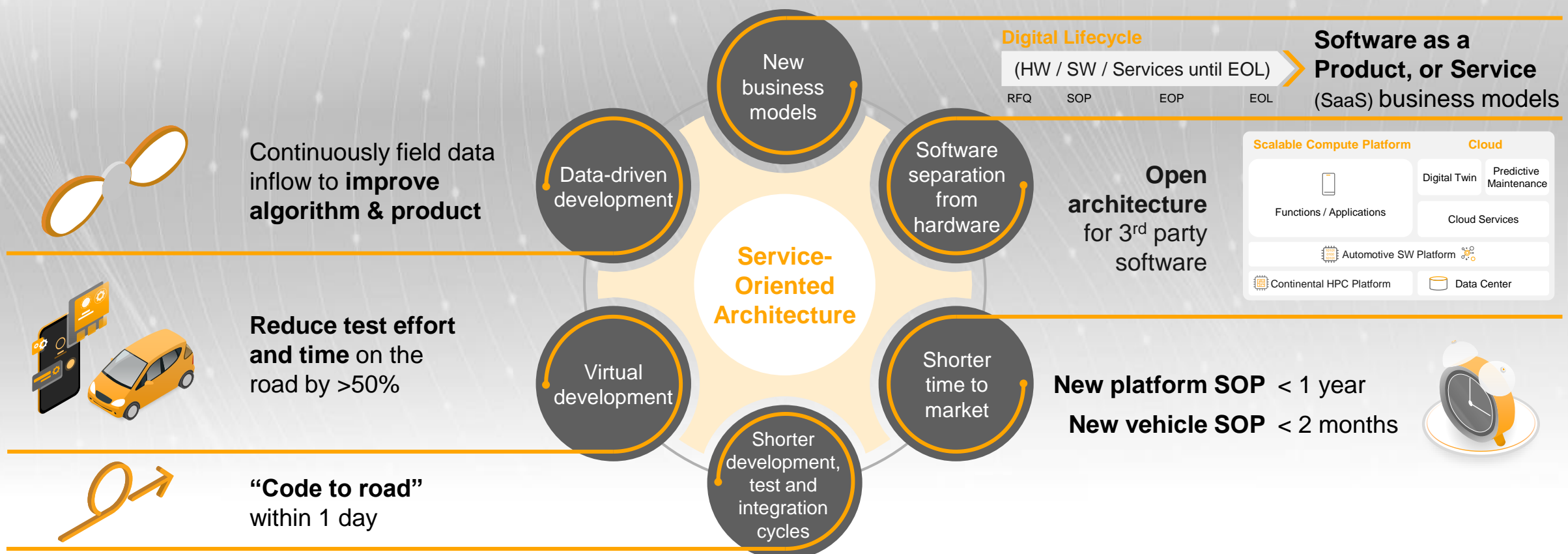
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The Software-defined Vehicle
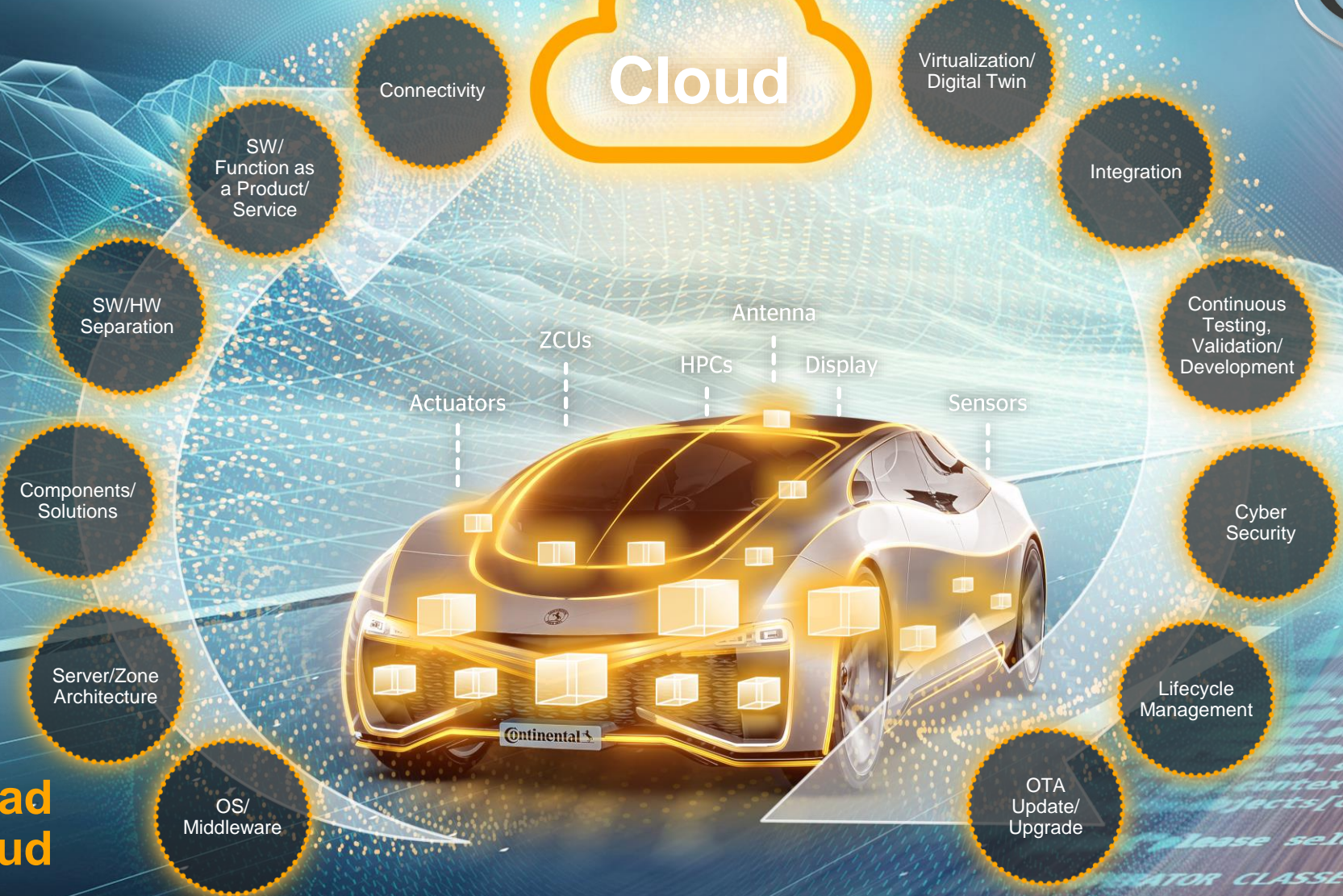## What to accomplish with the Software-defined Vehicle?

TechShow 2023 — Experience Forward Thinking

I **Manage and Scale**

Continuously field data inflow to **improve algorithm & product**

Reduce test effort and time on the road by >50%

"Code to road" within 1 day

Service-Oriented Architecture

- New business models
- Software separation from hardware
- Shorter time to market
- Shorter development, test and integration cycles
- Virtual development
- Data-driven development

Digital Lifecycle (HW / SW / Services until EOL)

RFQ   SOP   EOP   EOL

Software as a Product, or Service (SaaS) business models

Open architecture for 3rd party software

Scalable Compute Platform		Cloud
Functions / Applications		Digital Twin / Predictive Maintenance
		Cloud Services
Automotive SW Platform		
Continental HPC Platform		Data Center

New platform SOP < 1 year

New vehicle SOP < 2 months

Manage and Scale

TechShow 2023
Experience Forward Thinking

Cloud

Connectivity

Virtualization/ Digital Twin

SW/ Function as a Product/ Service

Integration

SW/HW Separation

Continuous Testing, Validation/ Development

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ZCUs

HPCs

Display

Actuators

Sensors

Components/ Solutions

Cyber Security

Server/Zone Architecture

Lifecycle Management

From virtual to real

From the road to the cloud

OS/ Middleware

OTA Update/ Upgrade

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New Architecture with Introduction of HPCs
A radical shift in the automotive industry

I Manage and Scale
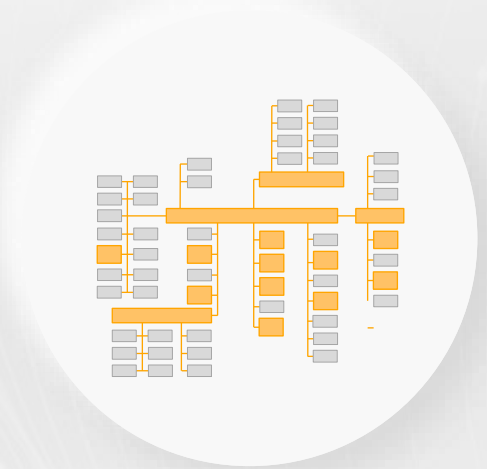
REVOLUTION
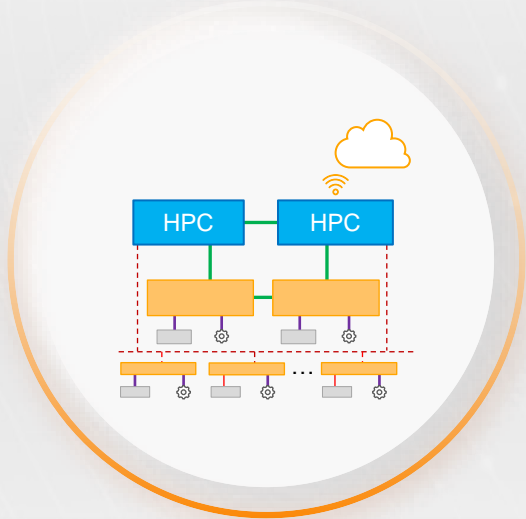
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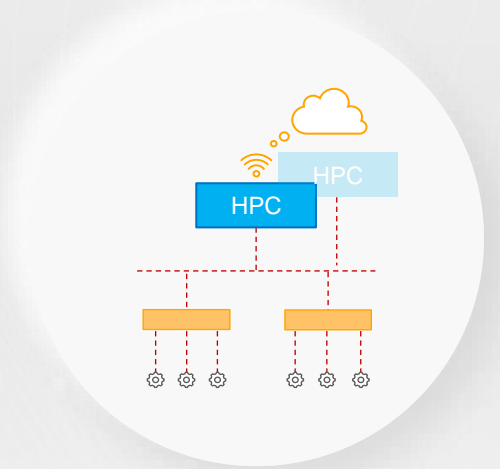
PAST
Distributed Architecture

TODAY
Server-Zone Architecture with domain / x-domain HPCs

FUTURE
Server-Zone Architecture with Central HPC

*HPC: High-Performance Computer

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# Plug & Play HPC and Fluid Cooling Solution
Flexible and scalable concept

I **Manage and Scale**

Housing Solutions

› Modular family concept

› Scalable for one up to four modules

› Electrical interconnection between the modules

› Integrated fluid cooling

Single HPC

Stack HPC

Rack HPC

Cooling Solutions

› Different cooling solutions

› NEW: flexible fluid cooling pad

  › No TIM* foil necessary

  › Easy module exchange in service garage
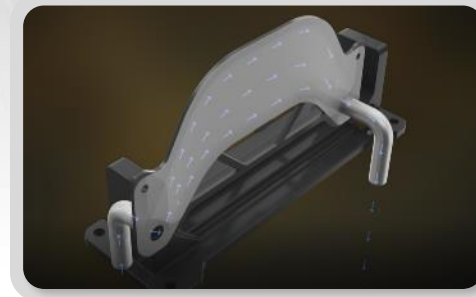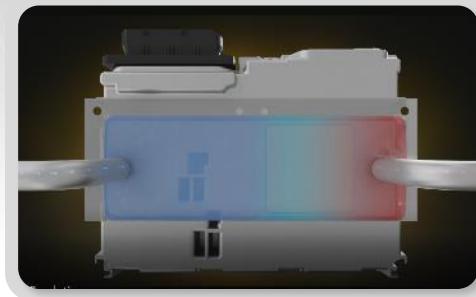
*TIM: Thermal Interface Material

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Use Case
Holistic Motion Control

II Safe **III Exciting**

Driving Functions

- Safety and Stability
- Manual Driving
- Assisted & Automated Driving
- Selective Driving DNA

Logical architecture

Smart Sensors | Driving Function Interfaces | Holistic Motion Control | Smart Actuators

Trajectory
Vehicle Dynamics
Driving Request
Chassis Dynamics

Vehicle Module | Chassis Module | Wheel Module
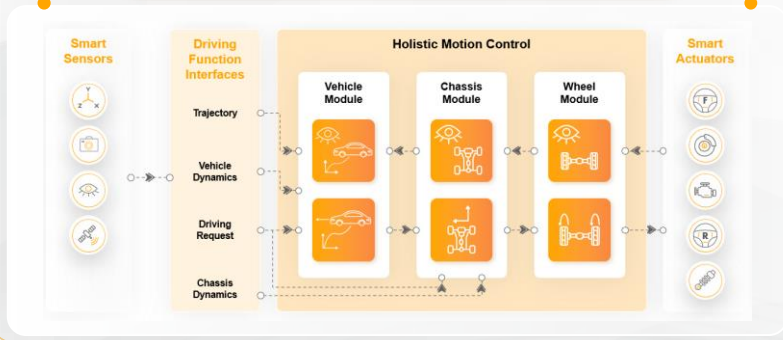
Holistic Motion Control Software

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Benefits & Features

› **Scalable**
SW product to match stakeholder needs and interfaces

› **Configurable**
Main- or fallback path for all driving functions

› **Host independent**
Application SW as a Product

› **Harmonization**
Between all driving use cases with integrated stability support

› **Reduced verification**
No sequential application

› **Smart centralized control allocation**
   › Orchestrates all motion actuators
   › Enables actuator redundancy
   › Realizes OEM specific DNA
   › Supports energy efficient approach
   › Optimized for all driving functions

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Use Case
Driver Identification Display

III Exciting

PAYMENT RECEIVED
THANK YOU

trinamiX X Continental

CES INNOVATION AWARDS 2023 HONOREE

Face Scan

Secure Payment

Refueling completed · · · Face Identification confirmed · · · Payment completed

Weather

**Convenient, touchless and secure solution
for driver authentication and mobile payment.**

Use Case
SHM AFEELA

III Exciting

› Elektrobit software, services and expertise helped industry newcomer SHM Sony Honda Mobility to realize the innovative AFEELA prototype

› Cockpit computers and displays powered by Elektrobit software and integrated by Elektrobit engineering services enable unique, next-gen mobility experience

› Partnership flips the script on traditional vehicle creation, with software as "the starting point" of development.

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Use Case
Aurora System Setup

ALL SENSOR MODULES FEATURE

Cleaning

Sensor **heating**

Wire **harness** with central **connector**

Easy to **maintain** and **replace**

1x Top Sensor Module

With the unique **Aurora lidar** industrialized by Continental, and a combination of long range **imaging radars** and **cameras** from Continental´s portfolio

2x Side Sensor Module

Combination of long range **imaging radars, far looking cameras** and mid-range **lidar sensors**

Automated Driving Control Units

4 Layers of **Automated Driving Control Units** ranging from main compute (high performance) to basic vehicle controls

3x Sensor module low range

Combination of surround range **radars,** narrow and wide view **cameras** from the Continental portfolio and near-range **lidar**

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THANK YOU