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The future of diagnostics in a connected world

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Agenda

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1 **MAHLE Group at a glance**

2 Industrial trends

3 Changed requirements of the market

4 Conclusion

1 MAHLE Group at a glance

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170
production locations

TOP 20
automotive supplier in the world

15
research and development locations

76,000+
employees

6,000+
engineers

EUR 11.5 bn
sales

1 MAHLE Group at a glance

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GLOBAL EXPERTISE IN ENGINE AND THERMAL MANAGEMENT

SOLUTIONS PROVIDER FOR REPAIR SHOPS AND TRADE

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2 Industrial trends

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Vehicle

Increasing vehicle complexity and (semi-) autonomous driving

- Increasing number of ECU's
- New driver Assistance Functions
- Complex Repairs
- Data access is crucial for new services and business models
- Several powertrain technologies have a future

Infrastructure

Increased connectivity and communication infrastructure

- 4G and 5G lead to high-bandwith and low latency communication
- WiFi will be widely spread in the urban areas
- Vehicle will constantly communicate with each other and the infrastructure (V2X)

Business Models

New business models arising

- Pay as you go
- Data/SW vs. Hardware
- Additional End-User Services
- Car Sharing

Impact to the future of diagnostics

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3 Changed requirements of the market

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Increasing vehicle complexity and (semi-) autonomous driving

Strategic rationale

- ➔ New powertrain technologies like E-Car, Hybrid and
- ➔ Consumer trend to increased Safety and Comfort driving vehicle increased complexity

Vehicle

Problem definition

- ➔ Difficulties to “get the job done” in every Dealership and Aftermarket Workshop
- ➔ Need for simplified Solutions for the Technicians to manage the complexity
- ➔ Need for new Tools Technologies to diagnose the new systems

Solution

- ➔ Full availability of RMI and use case relevant data and functions for all Workshops and Dealerships
- ➔ Ease of Use:
  - Visual Representation of complex vehicle networks like problem based Vehicle Topology
  - Augmented Solutions

3 Changed requirements of the market

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Increased connectivity and communication infrastructure

Strategic rationale

- ➔ Merge of “House” and “Car” Ecosystems
- ➔ Need for V2V and V2I communication for real time data

Problem definition

- ➔ How to get access to a vehicles data for all Diagnostics Solutions?
  (Online vs. Offline Solutions)
- ➔ How to ensure security to car and data access?

Solution

- ➔ Remote Diagnostics
- ➔ Use-Case relevant RMI data (machine readable, standardized data format)
- ➔ Security Standards have to be defined jointly between OEM’s and Diagnostics/Data Solution providers
- ➔ OEM external server or neutral server to standardize data access

Infrastructure

3 Changed requirements of the market

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New business models arising

Strategic rationale

New business models based on
- ➔ new Technologies
- ➔ long term market success

Problem definition

- ➔ Markets and customers behavior are changing based on Internet, Connectivity and Legal Requirements
- ➔ New customers are moving into the market to disrupt the traditional business
- ➔ Market Consolidation
- ➔ How to handle “Big Data”?

Solution

- ➔ Fair Competition
- ➔ Utilize “state of the art” Technologies like
  - ➔ Remote diagnostics (High Bandwith, Low Latency)
  - ➔ Augmented Solutions
  - ➔ New HMI/UX Concepts (e.g. Topology Testing/View)
  - ➔ Predictive Information/Solutions based on crowd data

Business Models

3 Changed requirements of the market

Topology diagnostics

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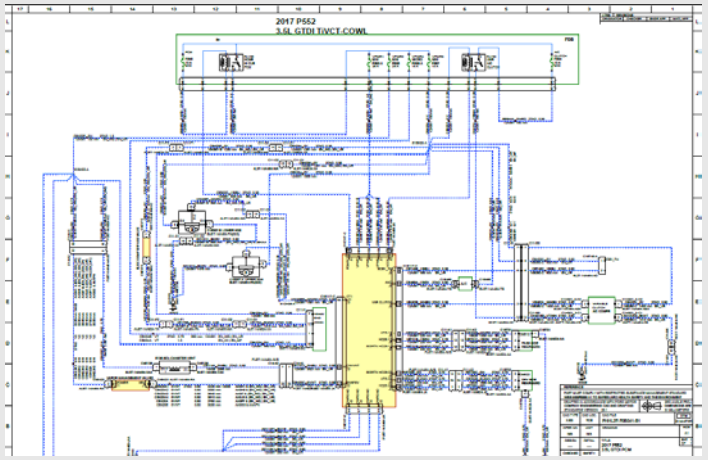

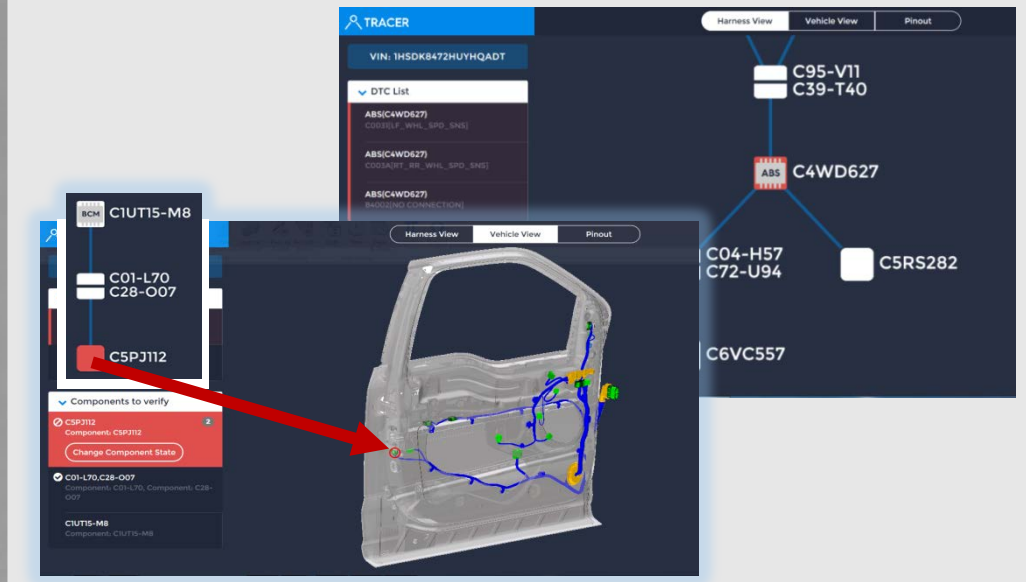

- ➔ Reduced Time to Repair or Diagnostics Time
- ➔ Less collateral damage
- ➔ Reduced vehicle backlog
- ➔ Easier transition due to new systems or technician turn over
- ➔ No new or special hardware needed

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4 Conclusion

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Future diagnostics solutions driven by MAHLE

1

- MAHLE developed from a **piston producer** to an **adaptive company** to address future trends in a connected world.
- MAHLE as **technology leader** with production competence
- MAHLE Aftermarket as a **solution provider** for the full repair and maintenance value chain

2

- **Megatrend** development results in impact on repair and maintenance incl. parts compared to today's existing business models
- **New diagnostics concept are mandatory**
  - **Topology diagnostics**
  - Support of complete diagnostics and testing value chain
  - Augmented Solutions

3

- Legal Framework for **fair competition** need to be established
- **Security issues** are **"real"** and need to be addressed accordingly
- Important that the industry (whole value chain) **works together on a joint solution**