DIGITAL TWIN CONCEPTS
APPLIED TO VEHICLE DATA

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Digital Twin Concepts Applied to Vehicle Data

We are working on the Data Driven Life Cycle

Data integration across product lifecycle, enables **Data Driven Business and Operations**

Closing the loop ...
Bosch is currently active in manufacturing with its digital twin. With the increasing relevance of the integrated life cycle management, manufacturing, supply chain and logistics.
Digital Twin Concepts Applied to Vehicle Data

Interoperability of Digital Twins needs open standards

- Open aspect models
- Open ontology layer
- Digital Twin 2nd Generation

Digital Twins can be built on top of ontologies and offer data via standardized APIs.

Master Data

Aspect Implementation

Query

Ontologies provide integrated data

PCB
Products
Vehicle

Let's close the loop ... beyond production
Digital Twin Concepts Applied to Vehicle Data
Lifecycle Interaction Beyond Production

Key Facts

- Use statistical robustness of vehicle fleets for real world fitting
- Vehicles are part of extended development and validation environment
- Optimize Hard- & Software
- Speed up SW development and innovation Cycles
- Establish digital twin based services

End-2-End Service Architecture Mandatory for Secure & Safe Handling of Data / Configuration / Code
Digital Twin Concepts Applied to Vehicle Data
End-2-End Service Architecture

<table>
<thead>
<tr>
<th>Hardware</th>
<th>Computation Layers</th>
<th>Properties of Architecture</th>
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<tbody>
<tr>
<td>IT</td>
<td></td>
<td>From cloud extension to architecture fusion between cloud &amp; vehicle</td>
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<tr>
<td>VC</td>
<td></td>
<td>Continuous X framework (deployment, integration, testing) for cloud and computing layer</td>
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<td>ECU</td>
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<td>Advanced analytics distributed over all computation layers</td>
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<td>Predominance of data based technologies in computing layer</td>
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<td>Connect Embedded Layer with effect chain based algorithms to computing layer</td>
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</tbody>
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- **Cloud**
  - Data Storage / Computing
  - Vehicle / Component Abstraction

- **Vehicle**
  - Data Fusion
  - Services (OEM/Tier1/3rd)
  - Abstraction-Layer (CVII/ OEM-OS)

- **Embedded**
  - Data Pre-Processing
  - Service Specific Code (OEM, Tier1 or 3rd party)

- **Computing Layers**
  - Code & Config
  - Data

SW building blocks are distributed over all computation layers from embedded to cloud.