Business Transformation for SW-Defined Vehicles

prostep ivip Tokyo SE Summit
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Jens Krueger, NTT DATA
Agenda

01 SDV Introduction

02 Business Transformation

03 SDV Product Transformation

04 Engineering Transformation

05 Transformation Management

06 Summary
A software-defined vehicle provides SW-based functions through an integrated in-car and backend architecture.

The term software-defined vehicle refers to a transformation where the physical and digital components of an automobile are decoupled (HW / SW separation) and features, functionality, and operations are defined through software.

In a fully programmable car, digital components—such as modules for safety, comfort and infotainment, and vehicle performance—would be regularly developed and deployed through over-the-air updates.

(Source: Eclipse SDV)
The SDV business case: additional software-enable revenue over the lifetime from a large fleet of connected vehicles
The SDV operates in a system-of-systems context and requires transformation of business capabilities and engineering processes / methods / tools.

<table>
<thead>
<tr>
<th>Context</th>
<th>System of Systems</th>
<th>Business Transformation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smart City</td>
<td>Environment / Sustainability</td>
<td>Society</td>
</tr>
<tr>
<td>V2X</td>
<td>Charging</td>
<td>Parking</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SDV</th>
<th>Incar</th>
<th>Network</th>
<th>Backend</th>
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</thead>
<tbody>
<tr>
<td>Incar Apps</td>
<td></td>
<td>Service</td>
<td>Cloud Apps</td>
</tr>
<tr>
<td>Middleware</td>
<td></td>
<td>OTA</td>
<td>Middleware</td>
</tr>
<tr>
<td>OS</td>
<td></td>
<td>Data -&gt;</td>
<td>OS</td>
</tr>
<tr>
<td>E/E (HPC)</td>
<td></td>
<td></td>
<td>E/E (virtual ECU)</td>
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</table>

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<tr>
<th>Engineering</th>
<th>Business Model Innovation SoS</th>
<th>MBSE &amp; Agile</th>
<th>Cloud-native Toolchain</th>
<th>Data-driven engineering</th>
<th>…</th>
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</thead>
</table>

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Standards allow for flexible business model innovation through decoupling of domains and layers
Product Development in a System of Systems

MOBILITY
- Smart Charging
- Smart Fueling
- Connected services

TELCO
- 5G readiness

INSURANCE
- Usage-based insurances

BANKING
- Mobile payment
- In-car payment

UTILITIES
- Energy Management
- E-mobility ecosystem

SDV

MOBILITY

BANKING

INSURANCE

UTILITIES
SDV requires new business capabilities

NTT DATA ACES ALM Business Capability Model (Layer 1 + 2)
Acceleration through shifting of software-based functions into upper layers of the stack

**Shift North**

- **to Cloud**
  - Backend
    - Cloud Apps
    - Middleware
    - OS
    - E/E (virtual ECU)

- **to Edge**
  - Incar
    - Incar Apps
    - Middleware
    - OS
    - E/E (HPC)

**Hardware / Software separation and abstraction**

**Distributed federated computing models**

**Standardized platform architecture**

**Seamless digital user experience across channels**

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Acceleration through shifting of activities to earlier phases of the engineering process

Virtualization

(MB)SE

Data-driven engineering

Digital-first

Security & Compliance by Design

Platforms & Modular Architectures
Integrated, Cloud-Native DevOps Toolchain

Data-Driven Feedback

Requirements
- SoS
- Vehicle
- Software

Architecture
- Functional
- Logical

Develop
- IDE with Copilot
- Reuse

Integration & Test
- Build automation
- Test automation incl. simulation & xll
- SW quality

Deploy (OTA)
- Cloud
- Edge
- (virtual) HPC
- (virtual) ECU

Operate
- Monitoring & Analytics
- SW Maintenance
- Security Operations

Support
- Project Management
- Configuration & Change Management
- Collaboration
Enterprise Architecture Management supports a holistic transformation of the business capabilities for SDV
## Summary

**Business Case**
- SDV promises software-enabled revenue
- Transformation requires massive investment

**Standards**
- Standards and open source allow for flexible business model innovation

**(MB)SE**
- Systems engineering supports system-of-systems development
  - Addition of agile methods

**Shift North**
- Decoupling of SW and HW
- Chip-to-Cloud Architecture

**Shift Left**
- Virtualization
- Cloud-Native DevOps Toolchain

**Transformation**
- Enterprise Architecture Management supports a holistic transformation of the business capabilities for SDV
# NTT Group at a glance

**Facts and Figures**

<table>
<thead>
<tr>
<th>$108B</th>
<th>$3.6B</th>
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</thead>
<tbody>
<tr>
<td>in total revenue 2021</td>
<td>R&amp;D investment with NTT Group supports customers in their transformation through consulting, industry solutions, business process services, IT full stack services, including application development, managed ICT, through their companies worldwide</td>
</tr>
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<tr>
<th>330,000+</th>
<th>5,000</th>
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<tr>
<td>Employees worldwide 2021</td>
<td>dedicated R&amp;D professionals</td>
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| 80+ |
| Countries & regions |

| Top 5 |
| Global IT Service Provider |

| >75% |
| of Fortune Global 100 companies choose NTT |

| #2 |
| in global data center sites |

| #1 |
| Customer satisfaction |

In Whitelane study (five times in a row)
NTT DATA Global Engineering
At a Glance

~500 Consultants with Engineering focus

Locations
# Germany, Spain, Italy
# Japan, India, China

> 100 Mio € IT + consulting revenue per year

Focus topics
- Systems Engineering
- Compliance in Engineering
- Digital Twin
- PLM
- ALM
- Engineering IT strategy & architecture
- Data-driven Engineering / AI
- SDV
- Smart Factory

Key skills
- Business Consultants
- Requirements Engineers
- DevOps SW Developers IT experts
- Product Owner
- Test Mgmt & Execution
- Enterprise & Solution Architects
- Project Leads

Key clients

Partners

<table>
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<tr>
<th>Partner Company</th>
<th>Focus</th>
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<tbody>
<tr>
<td>Dassault</td>
<td>3DExperience PLM</td>
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<td>PTC</td>
<td>Codebeamer ALM</td>
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<td>Siemens</td>
<td>Teamcenter PLM *</td>
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<td>Aras</td>
<td>Innovator PLM</td>
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<tr>
<td>Atlassian</td>
<td>ALM</td>
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<td>Collaboration Factory</td>
<td>cplace Project Management</td>
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<td>LeanIX</td>
<td>Enterprise Architecture Management</td>
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<tr>
<td>Conweaver</td>
<td>Enterprise Knowledge Graph</td>
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<tr>
<td>Azure, AWS</td>
<td>Public Cloud</td>
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* Frame contract
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Automotive & Manufacturing - Engineering
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