OSGi™ Alliance
2004 World Congress
BarcelonaSPAIN October 11-15, 2004

Hans-Ulrich Michel

BMW Group
Forschung und Technik

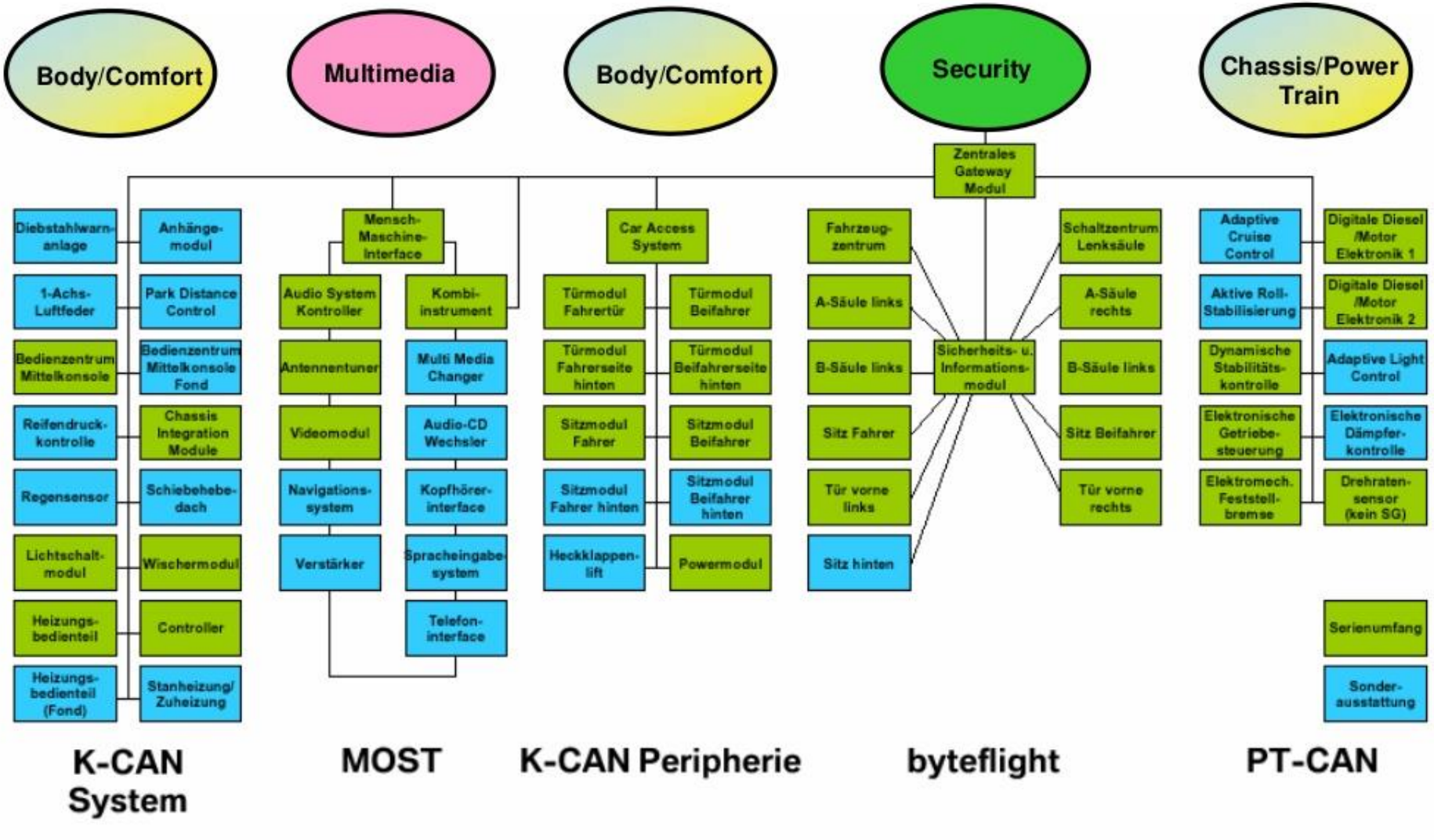
Principles of a Vehicle Infotainment Platform

Managed by Global Inventures

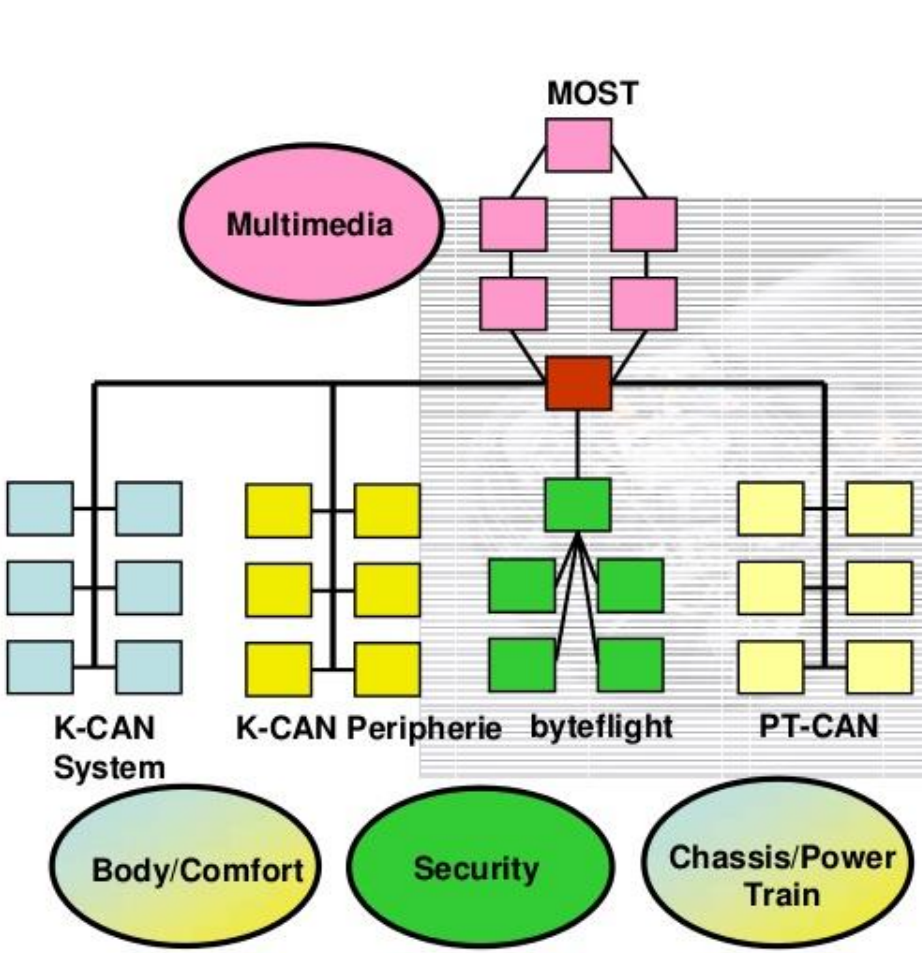
Agenda

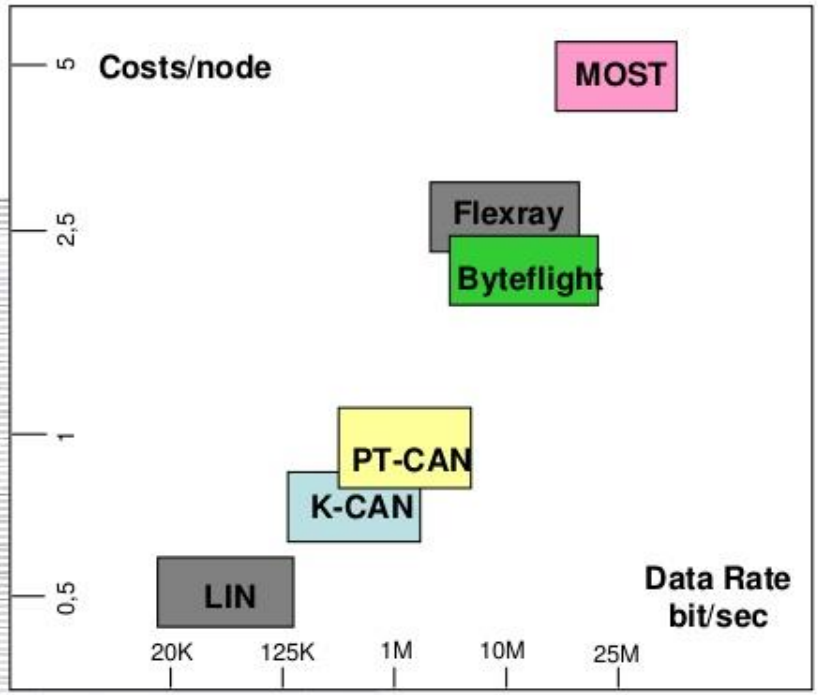
- Vehicle System Architecture
- Trends In Vehicle Industry
  - The Infotainment Domain
  - Service Platform Architecture
- Autosar and OSGi Technology
- Software-Download
  - Opportunities and Challenges
- End2End-Standardization: GST
- OSGi Technology in 5-, 6-series
- Wrap up

Vehicle System Architecture 7-series



Vehicle System Architecture





Vehicle System Architecture ECU Design

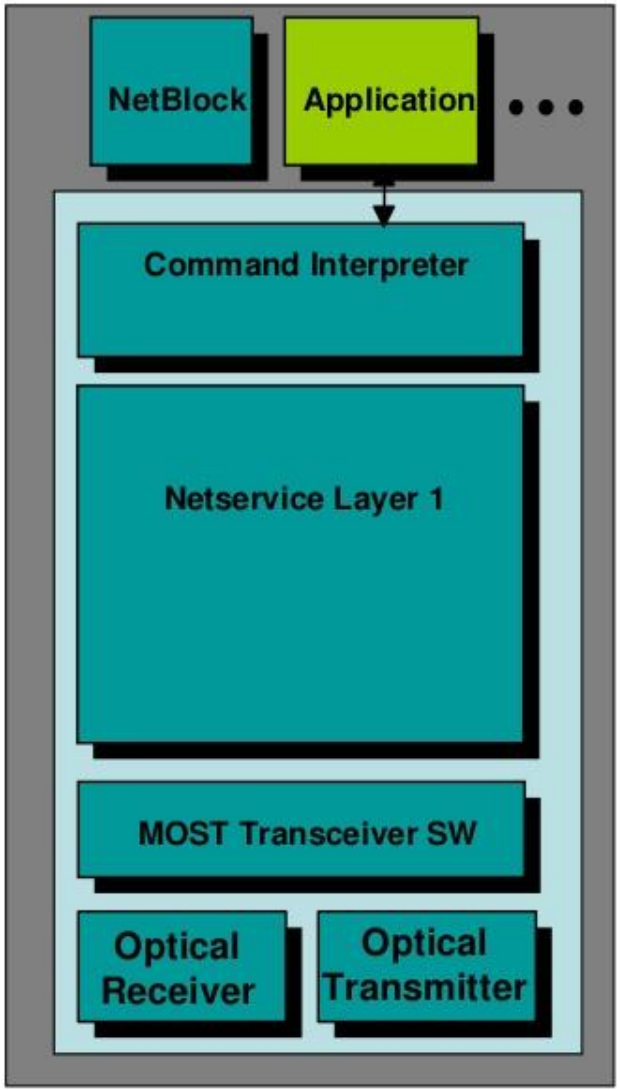
- Looking at the design of ECU´s:
  - Standardize network management functions and communication services in different domains to reduce software development costs:

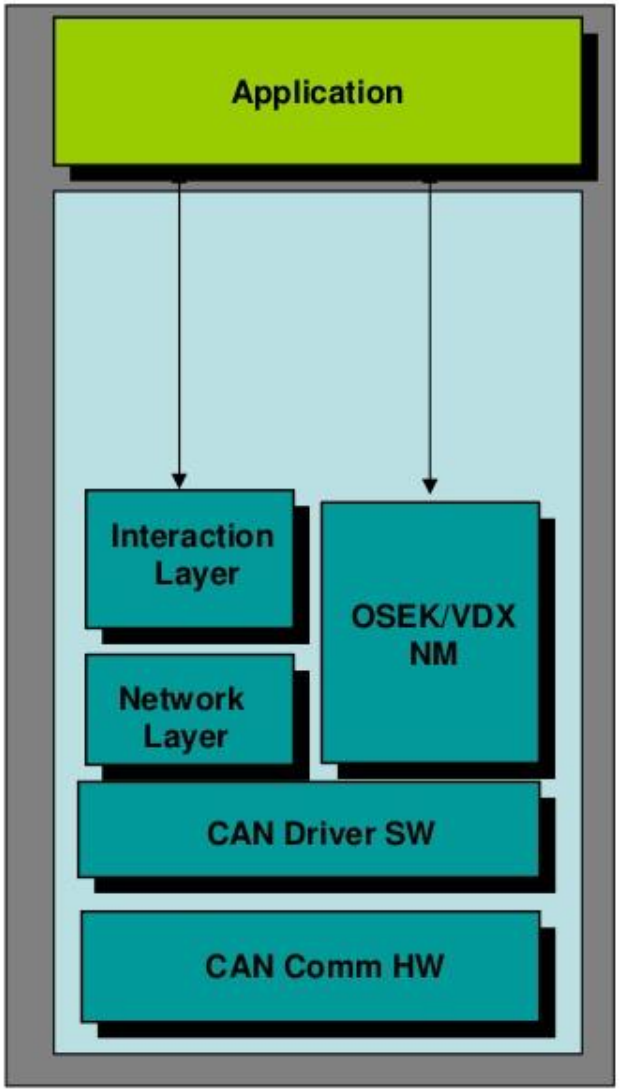
- First step to an open system design

Vehicle System Architecture
ECU Design

ISO/OSI Model of Communication

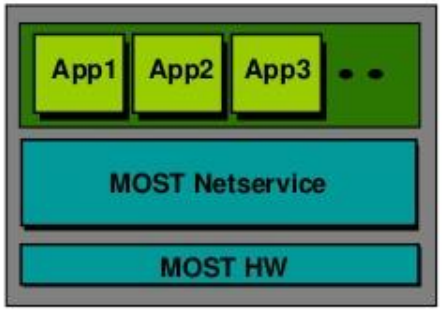
- 7: Application Layer
- 6: Presentation Layer
- 5: Session Layer
- 4: Transport Layer
- 3: Network Layer
- 2: Data Link Layer
- 1: Physical Layer

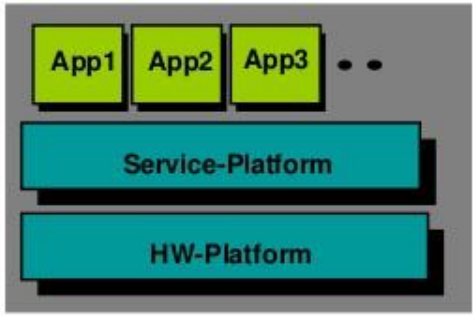




Trends In Vehicle Industry

— From a “black box” —  — to a service platform —





- Supplier Black-Box development
- HW/SW-monolith

- Integrated SW/HW-development
- Flash-Update of SW, complete image generation

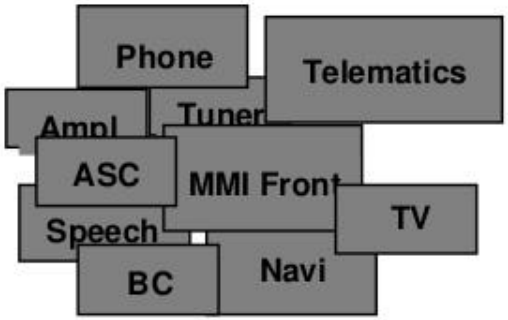
- Independent SW/HW-Development
- Software Component-Update

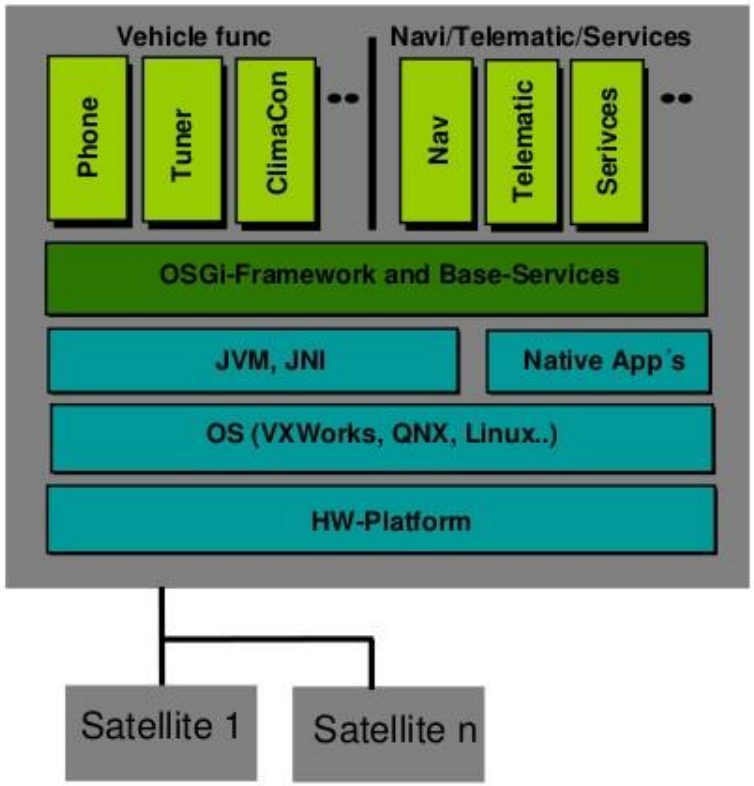
OSGi Alliance 2004 World Congress

Managed by Global Inventures

Trends In Vehicle Industry: The Infotainment Domain

OSGi Standard - an enabling technology





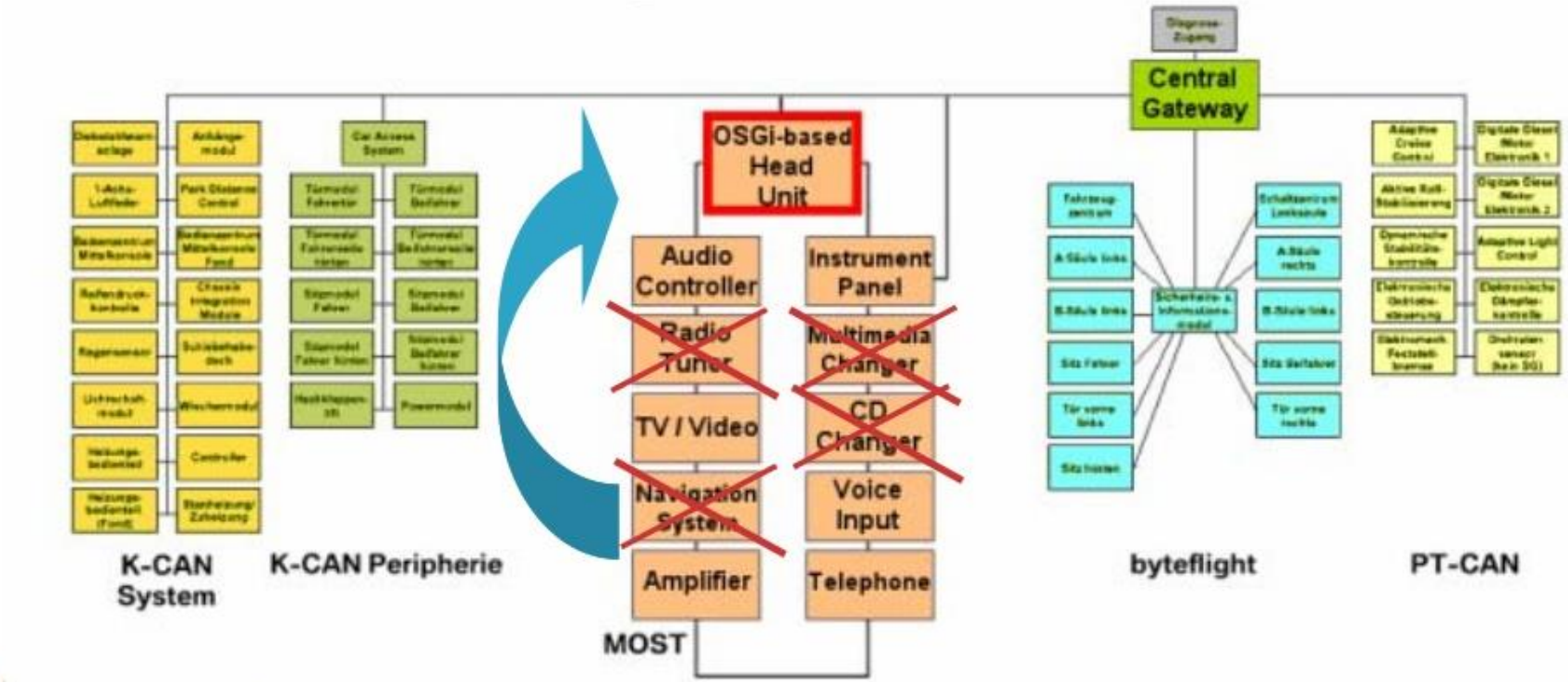
- Concentrate functionality
- Country specific solutions
- Life cycle mismatch
- Scalability

OSGi Alliance 2004 World Congress

Managed by Global Inventures

Trends In Vehicle Industry: The Infotainment Domain

— OSGi Standard —  - an enabling technology -

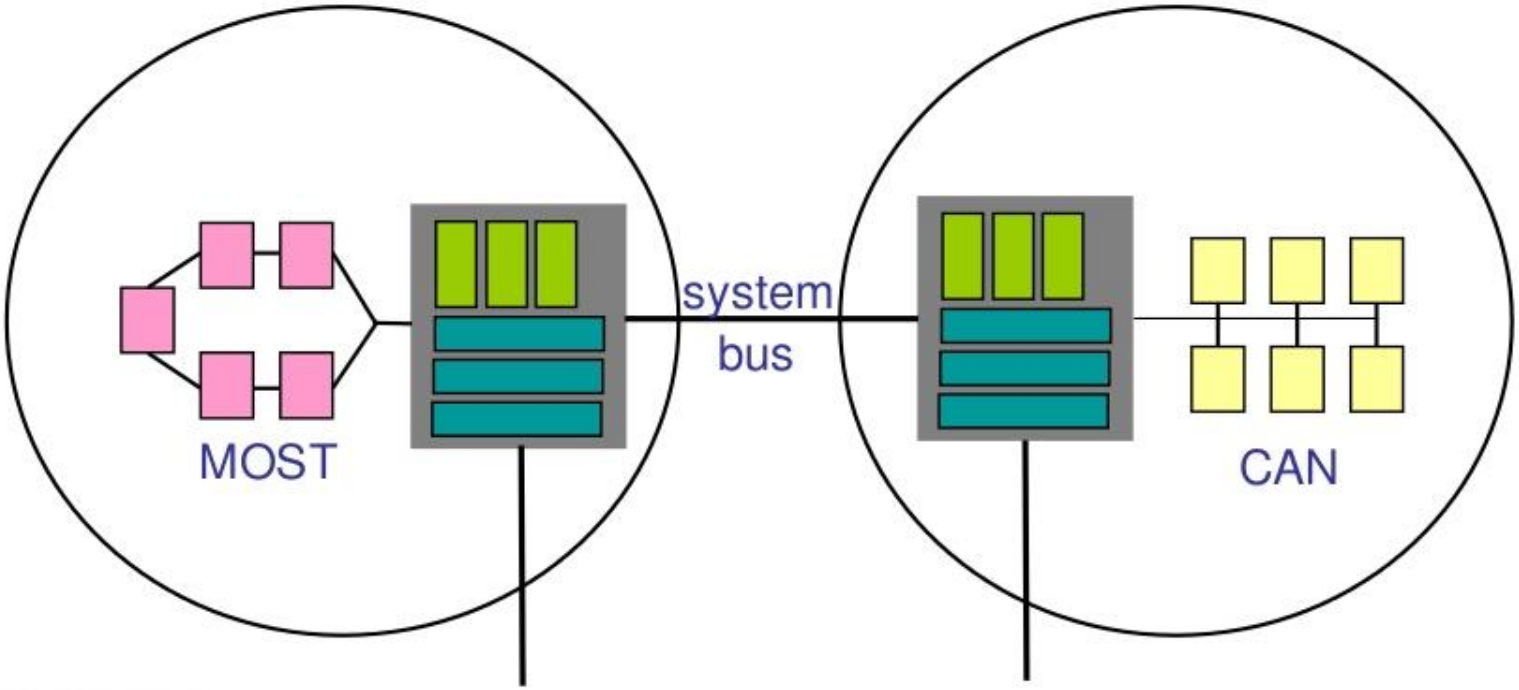


OSGi Alliance 2004 World Congress

Managed by Global Inventures

Trends In Vehicle Industry: Service Platform Architecture ?

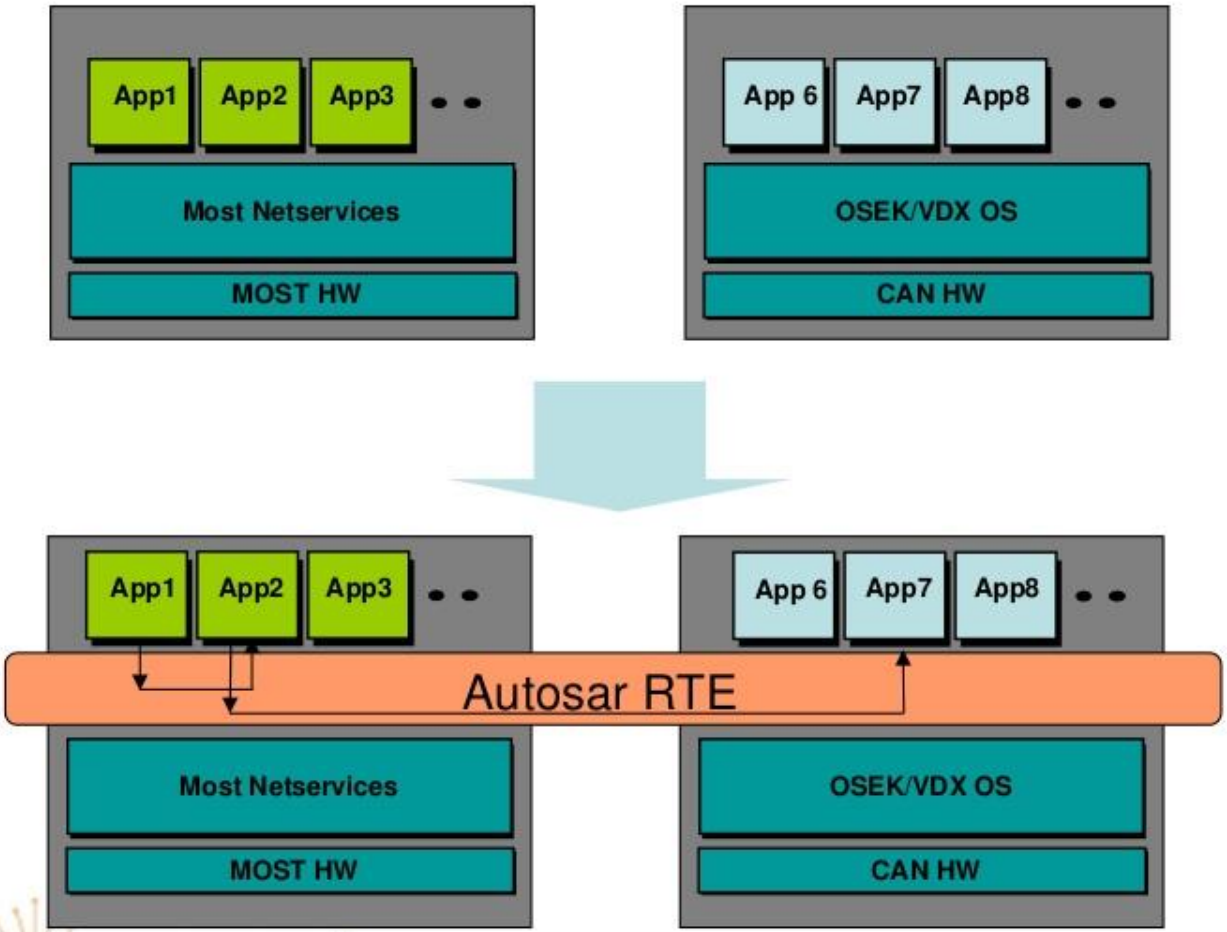
— OSGi Standard —  - an enabling technology -



OSGi™ Alliance 2004 World Congress

Managed by Global Inventures

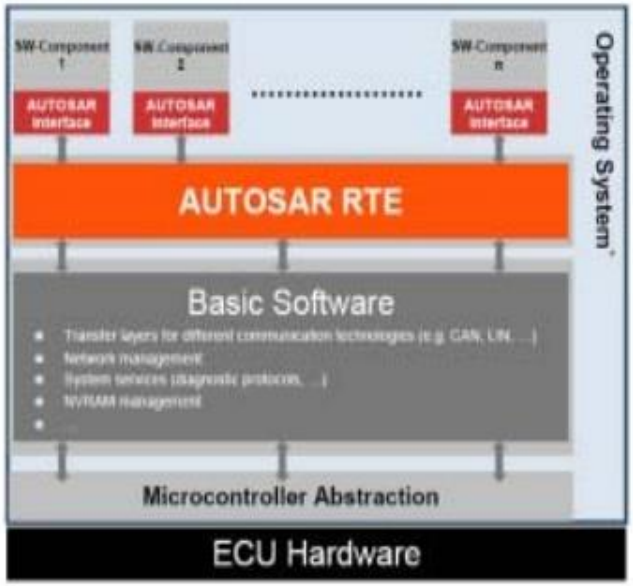
Autosar Standardization



Autosar-RTE is a middleware to abstract from bus-specific logic

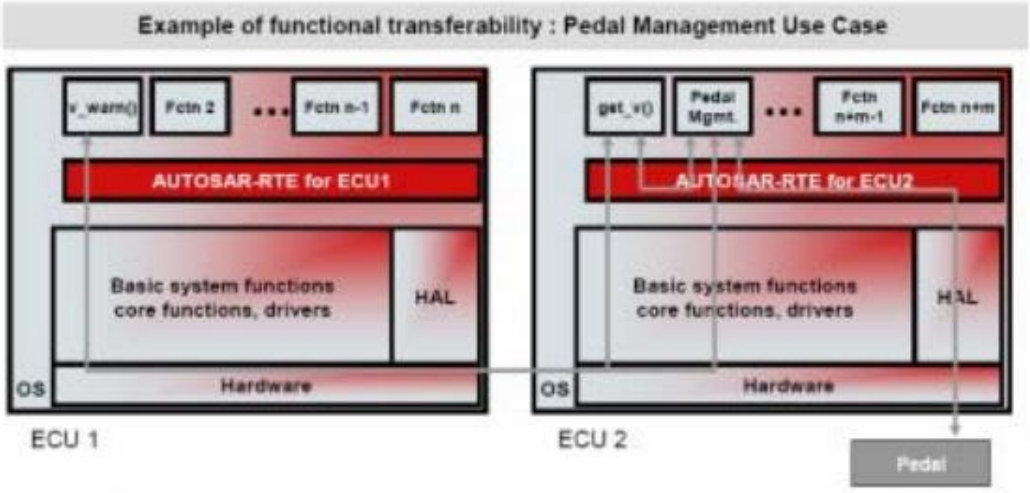
Autosar Standardization

- The goal of the Autosar process:
  - Virtual, independent description of ECU´s, SW-components and system constrains
  - Mapping of software to hardware depending on quality factors and system constrains

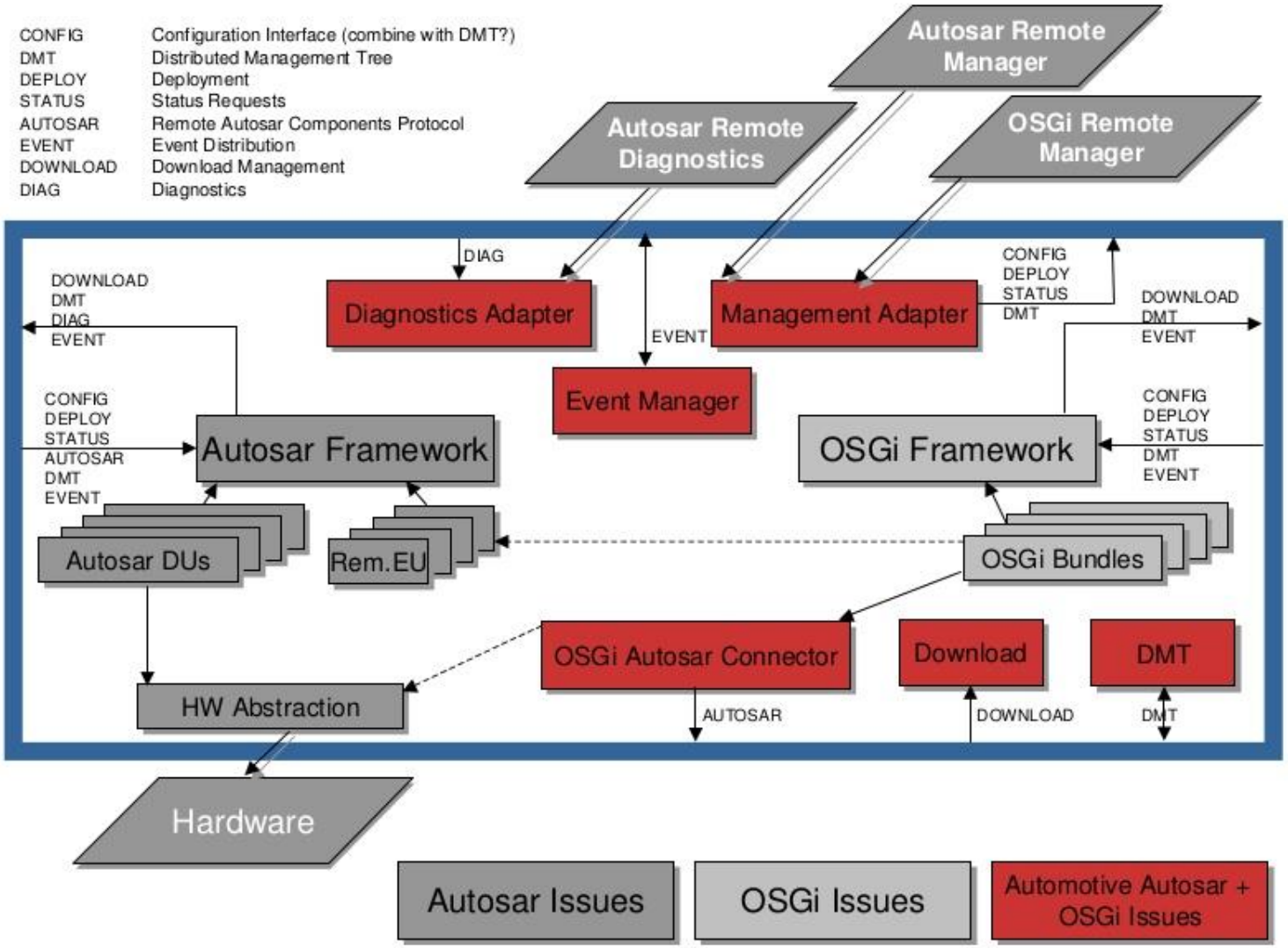


Autosar and OSGi Technology

- OSGi is execution environment for a single device to support a standard deployment model
- Autosar is a distributed environment, static after generation, designed for multi-language use and supports hard real-time. Autosar defines a process for system creation



Autosar and OSGi Technology



SW Download - Opportunities

- Independent SW/HW-development process: Supplier independence, reduced costs, increased flexibility
- Software-Upgrades after production for long-term, simplified maintenance
- Remote Diagnostics
- SW-Update/Upgrade before resale
- Software-based option for vehicle individuali-zation and customer personalization in production, on dealer level or via E2E-service chain delivery: “Software as a Product”

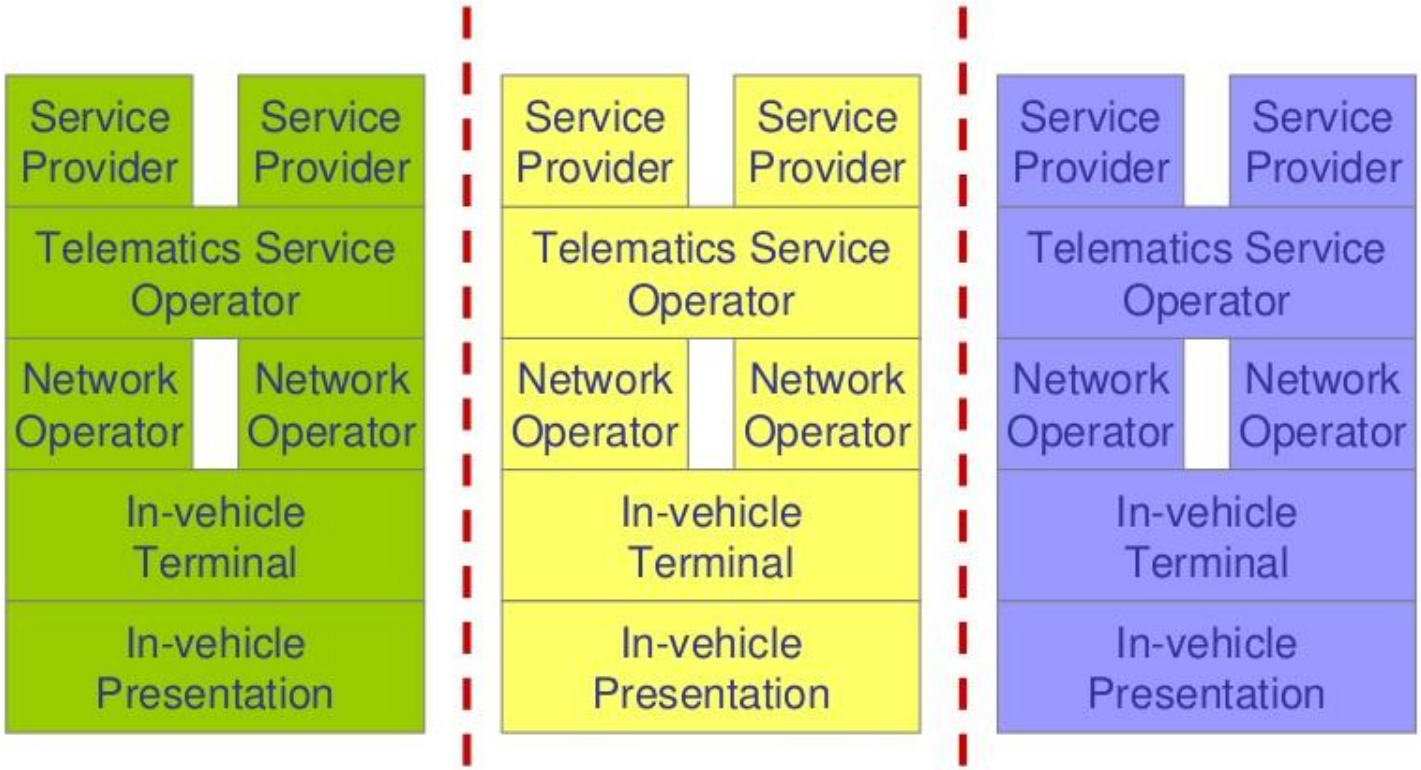
OSGi Alliance 2004 World Congress

Managed by Global Inventures

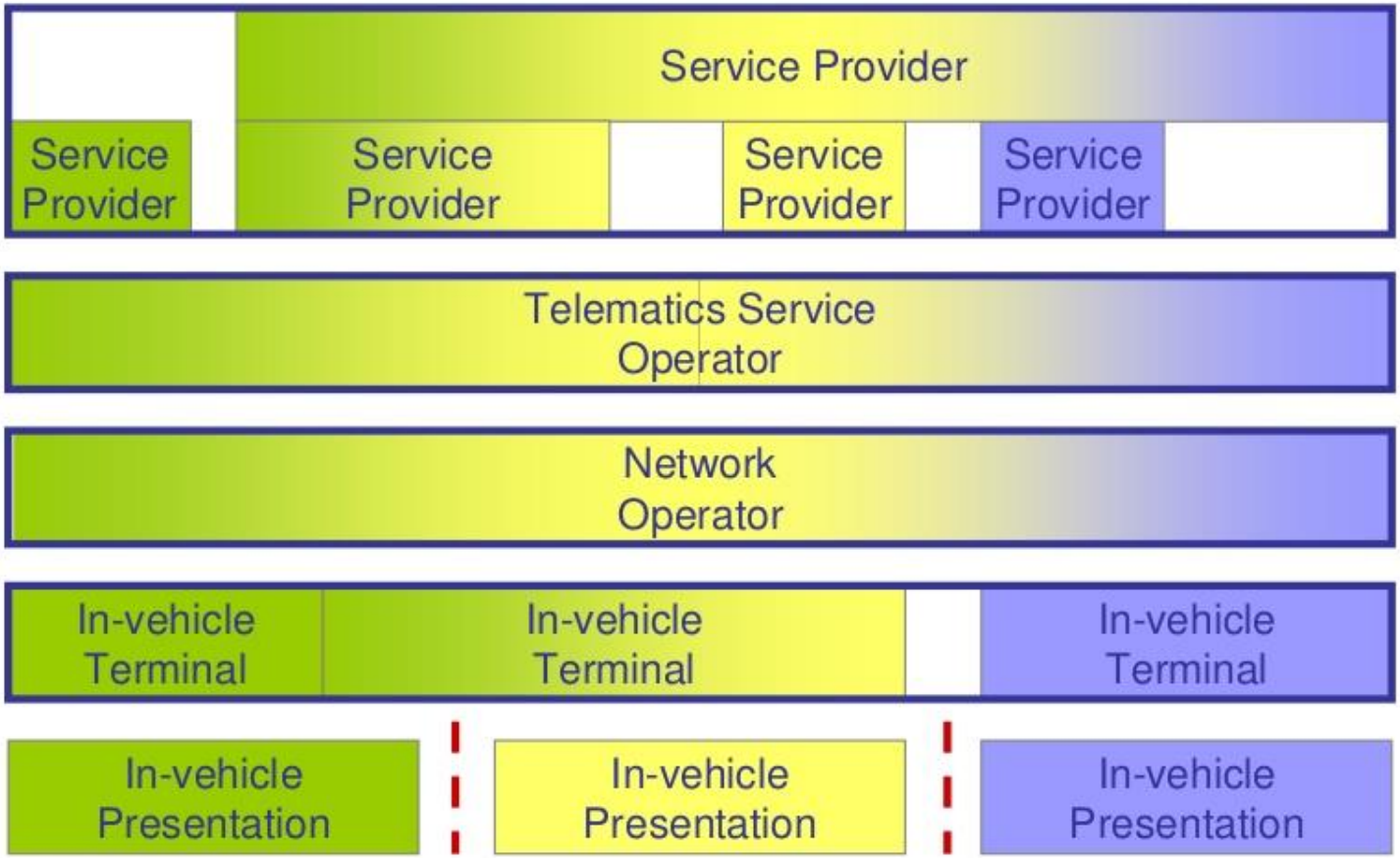
SW Download - Challenges

- Enable seamless software-development process (Supplier, OEM, Third-Party)
  - Model-Based Development
  - Integrated Product-Data and SW-Configuration-Management
  - Change-Management / Control Compatibility / Testing
  - Security Infrastructure, graduated Firewall-Concept (AA), Certification Mechanism for Software and HW
- Software as a Product: Open E2E-delivery chain ?

End2End Standardization: GST
Status Quo



End2End Standardization: GST
Horizontal Market Evolution



End2End Standardization: GST
Open Platform Beyond The Vehicle

- Need to harmonize many private, proprietary, isolated, costly solutions
- Need for a common provider of high quality content
- Need for European standards in formats

Service Provider

- National scope
- European harmonization

Delivery Platform Operator

- National scope
- Open service delivery platform
- Harmonized access network profiles
- Protocol standardization

Open In-vehicle Platform

- Open, but secure runtime environment
- User interface
- Vendor-independent minimum vehicle access
- Interface and platform standardization

OSGi Technology in 5-, 6-series

- Service Platform Concept
- High End – 2DIN-system Head Unit with 16:9 widescreen and Controller, Integration of DVD / CD-Drive
- Integrated Modules (GPS, Gyro,..)
- Microprocessor: 32bit SH4 166MHz/300 Mips
- OS: VX-Works RTOS
- Integration Vehicle functionality (Tuner, CD, Speech I/O, Phone, Navigation etc.) and ConnectedDrive-Services (BMW Assist, BMW Online)
- MOST, CAN Interface for networking
- Jeode VM, P-Java Runtime
- Based on TLA-architecture

Wrap Up

- Trend to concentrate functionality in service platforms and to reduce the number of ECU´s
  - OSGi Standard is an enabling technology !
- The automotive industry is changing to an industry mainly driven by electronics and SW:
  - new development process
  - match this to organizational structure
- SW-Download offers a lot of opportunities
- Standardization is an important issue
- BMW is addressing this issues in different standardization activities and projects