



OSGi Technology in the Vehicle

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Agenda

- Starting point: Importance of Standardization
- Open Infotainment Systems
- How does BMW tackle standardization ?
- In-vehicle OSGi-integration
- BMW ConnectedDrive and Research Vehicle

Some Resulting Challenges...

Manage increase in system complexity, save costs – handle the variety forced by the market in the most efficient way !

- Optimize vehicle system architecture:
 - ressource sharing: shared functionality in the network
 - dynamic partitioning: flexible integration of functions in ECU's
- Increasing Configuration Management
- Achieve reusability of hw / sw-components in different product lines
- Enable “easy” maintenance of components
- Solve lifecycle mismatch between consumer hardware / software and vehicle
- Reduction of development time, Software-Downlaod

Standardization

- Open E/E-Architecture
- Open Infotainment Platform



The Open System Approach at the SEI (Software Engineering Institute)

What is an Open System?

An open system is a collection of interacting software, hardware, and human components

- designed to satisfy stated needs
- with interface specifications of its components that are fully defined available to the public
- maintained according to group consensus
- in which the implementations of the components are conform to the interface specifications



Open Infotainment Platform: Part of an End-to-End System Framework

“Entities”:

- Customer (with his personal appliances)
- In-vehicle infotainment platform
- “Outside” network infrastructure (GSM, GPRS, DVB-T, Bluetooth, WLAN,..)
- Backend Server infrastructure (Service-Provider, Content-Provider etc.)
- “Inside” network infrastructure (CAN, MOST,..) with ECU components

„Open“ on 2 different levels: - e2e-system level
- platform level

“Open” on system and platform level

Some Characteristics of an open e2e-system:

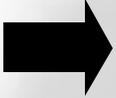
- Seamless availability of services on different platforms
- Personalization of services
- Use of heterogenous networks and backend infrastructure (seamless roaming between service provider)

Some Characteristics of an open platform:

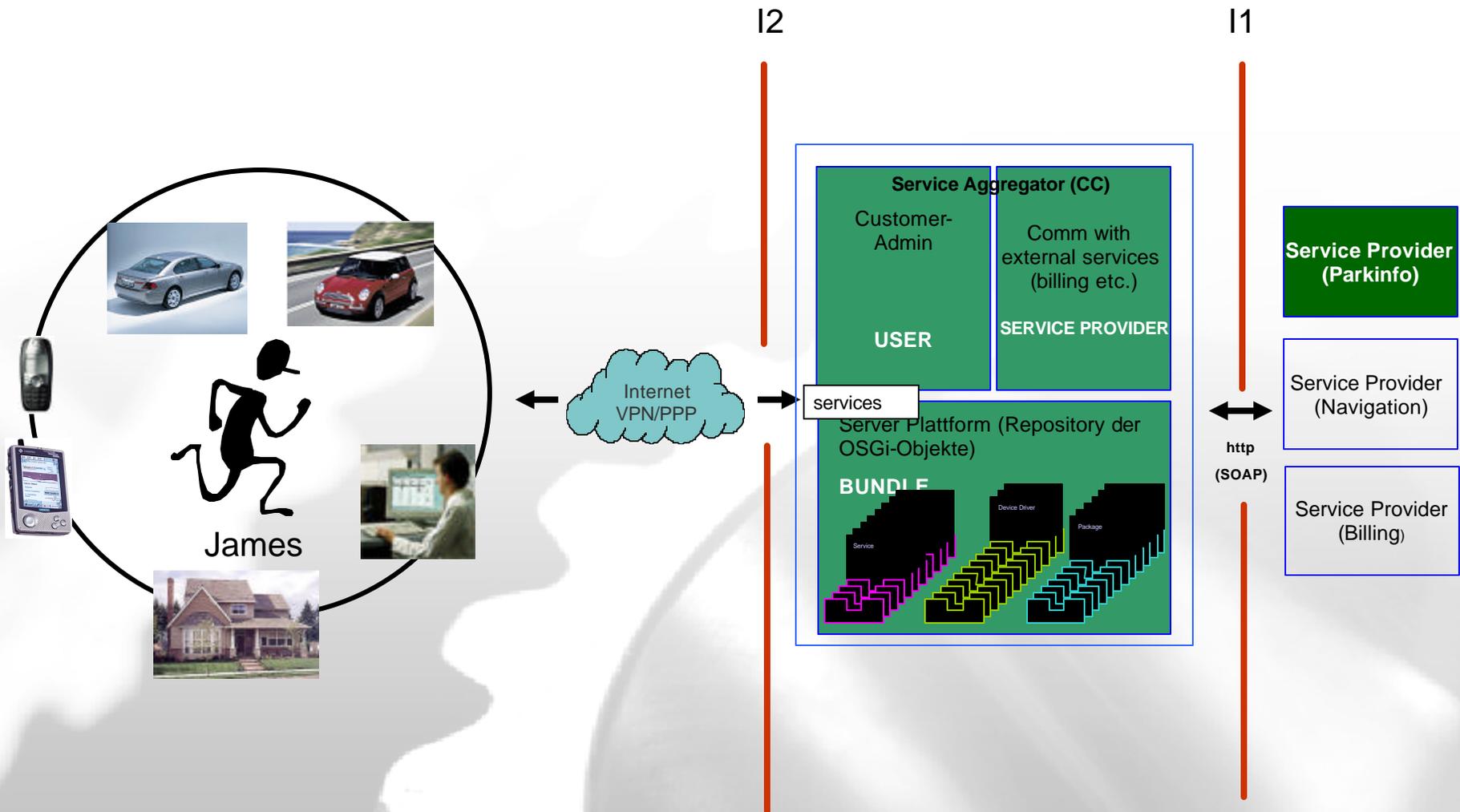
- Dynamic extendable functionality on the infotainment platform
- Reusable library of basic functionality – creation of new app's
- Open interface specification that enables different supplier implementations

Standardization Effort

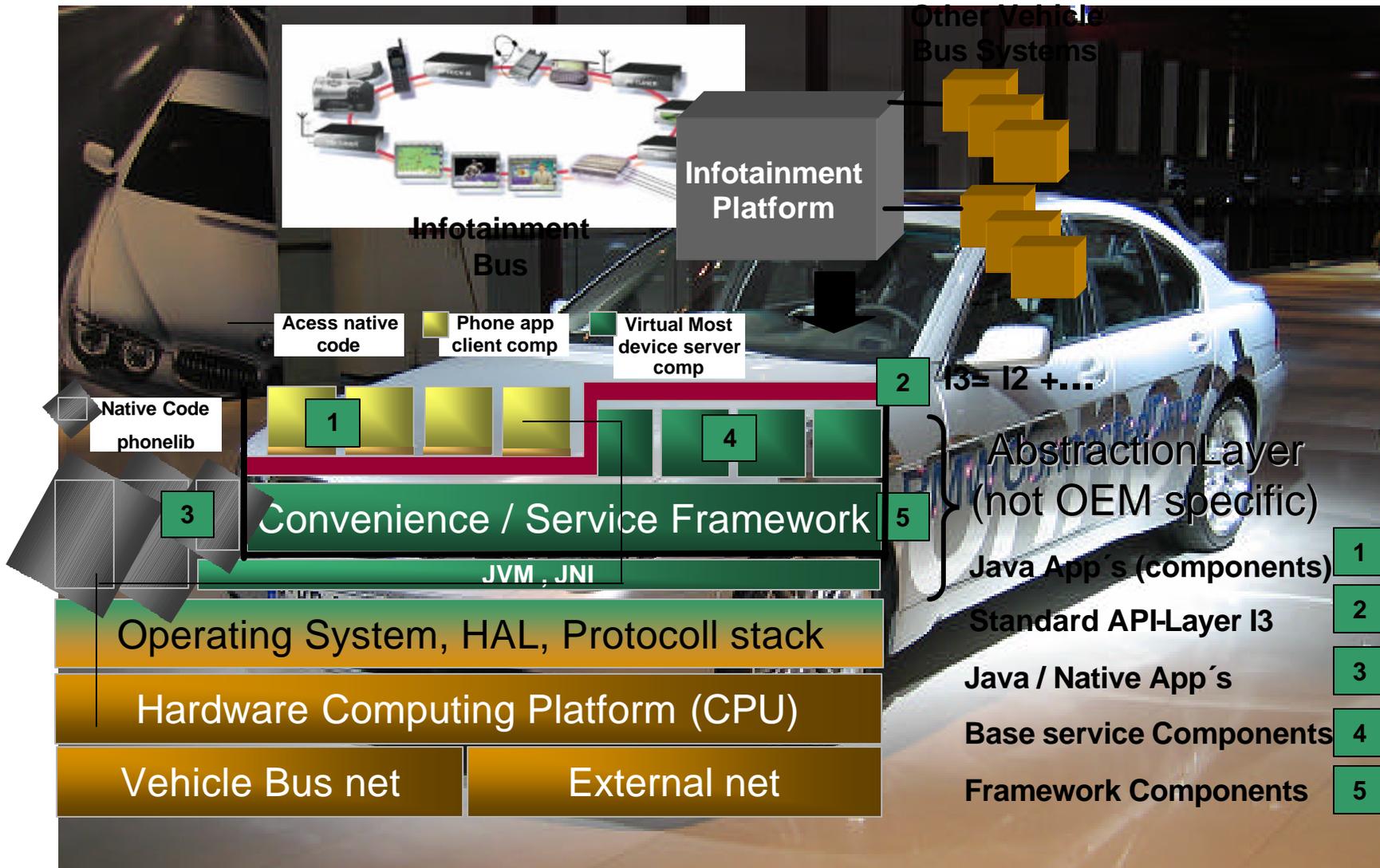
- Standardize the interfaces between the different, independent entities
- Standardize on platform level

More visual 

Open Infotainment System: "Outside World"



Open Infotainment System: "Internal World"



How does BMW tackle standardization ? – Examples

Industry consortium

OSGi Alliance



Information for the millions



Media Oriented Systems Transport



Third Generation Telematics



Automotive Open System Architecture

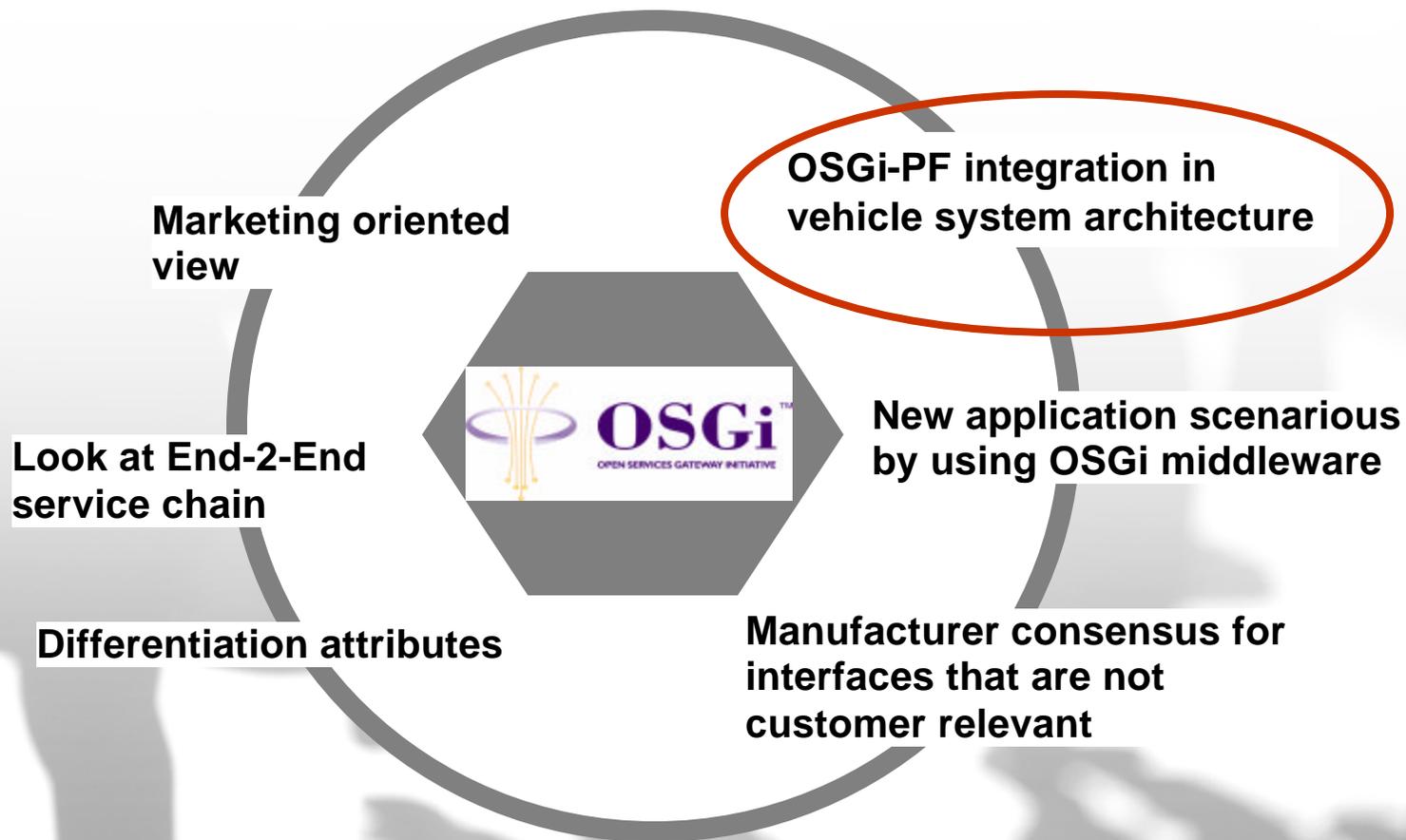


Global Systems Telematics

EU-Projects

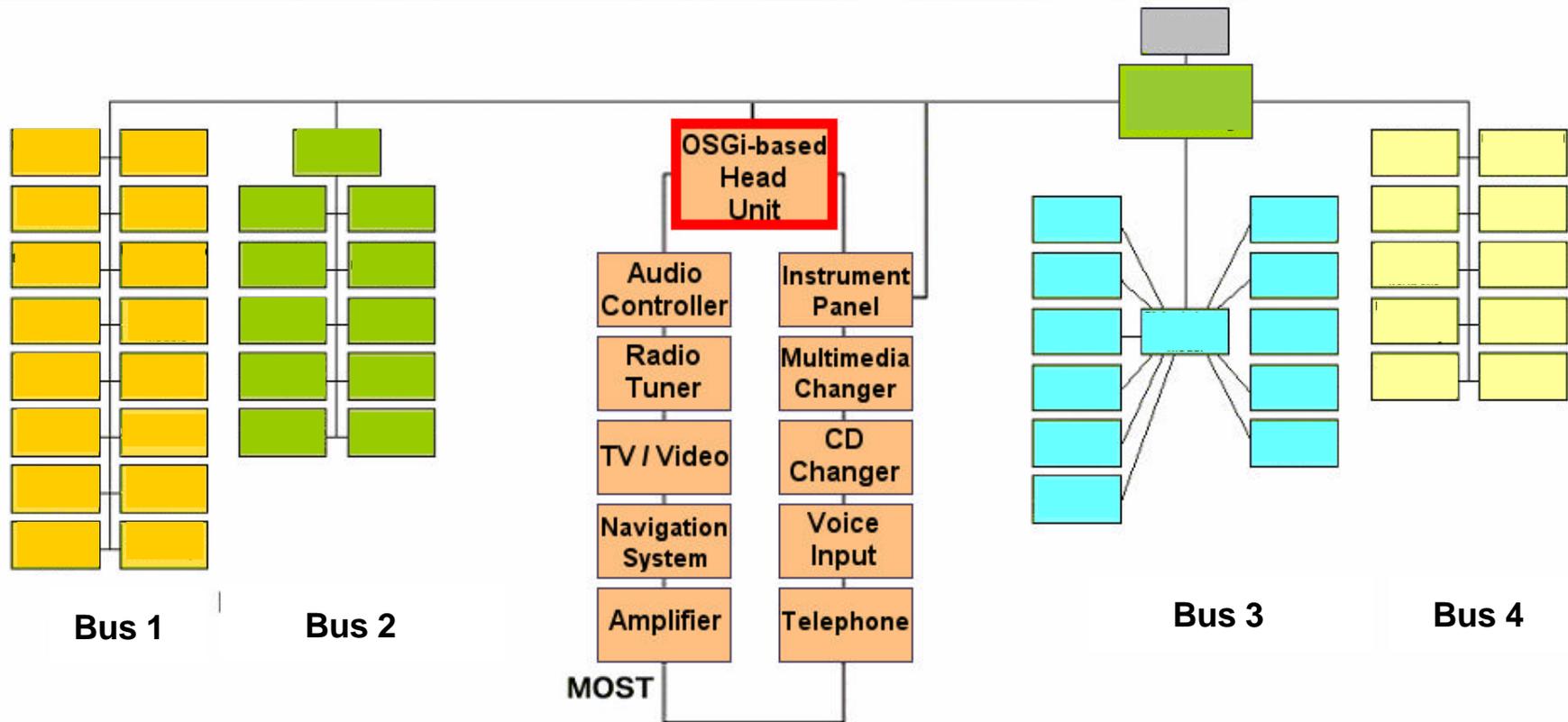


Focal Points for requirements and prioritization of OSGi standardization



In-vehicle OSGi integration

Case 1: OSGi “Head-Unit”



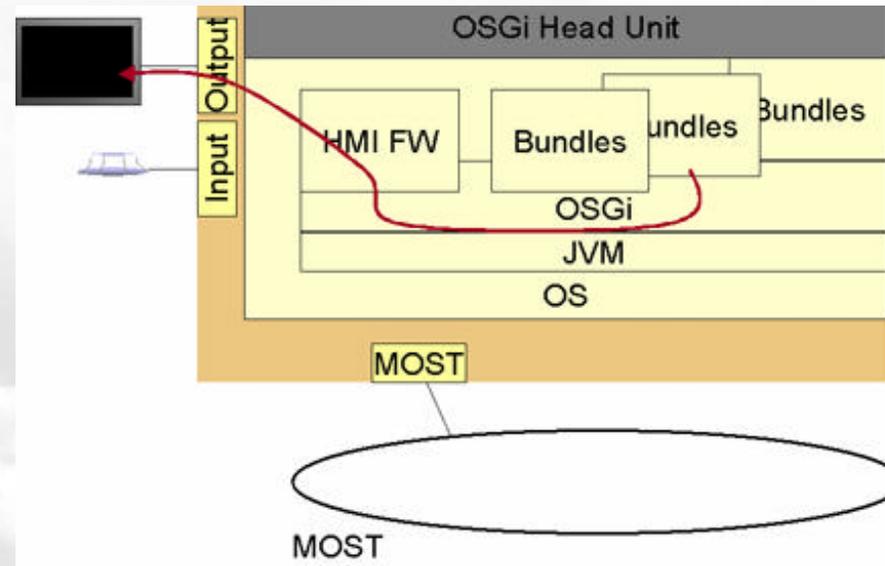
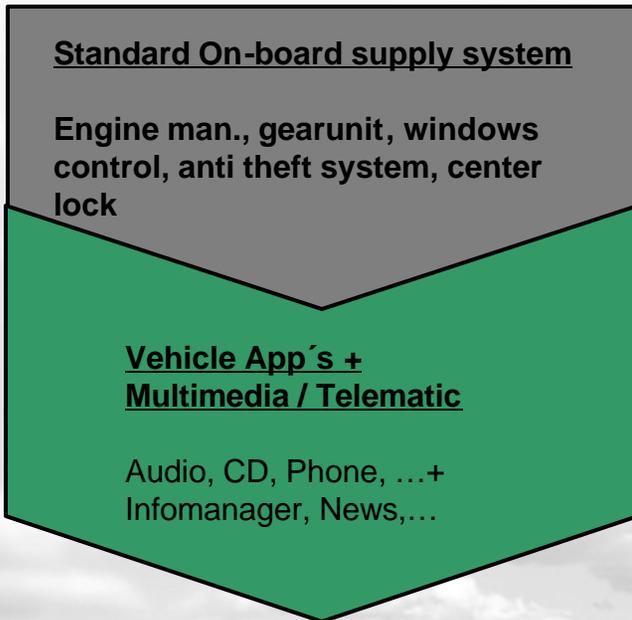
Roles:

- Bus Gateway, Remote Access Gateway, Service PF with App business logic functionality,
- Head Unit – Terminal with complete HMI functionality



In-vehicle OSGi integration

Case 1: OSGi “Head-Unit”



- Separation of stable on-board supply system
- Merging of basic vehicle-app's with multimedia/telematic world

Advantage:

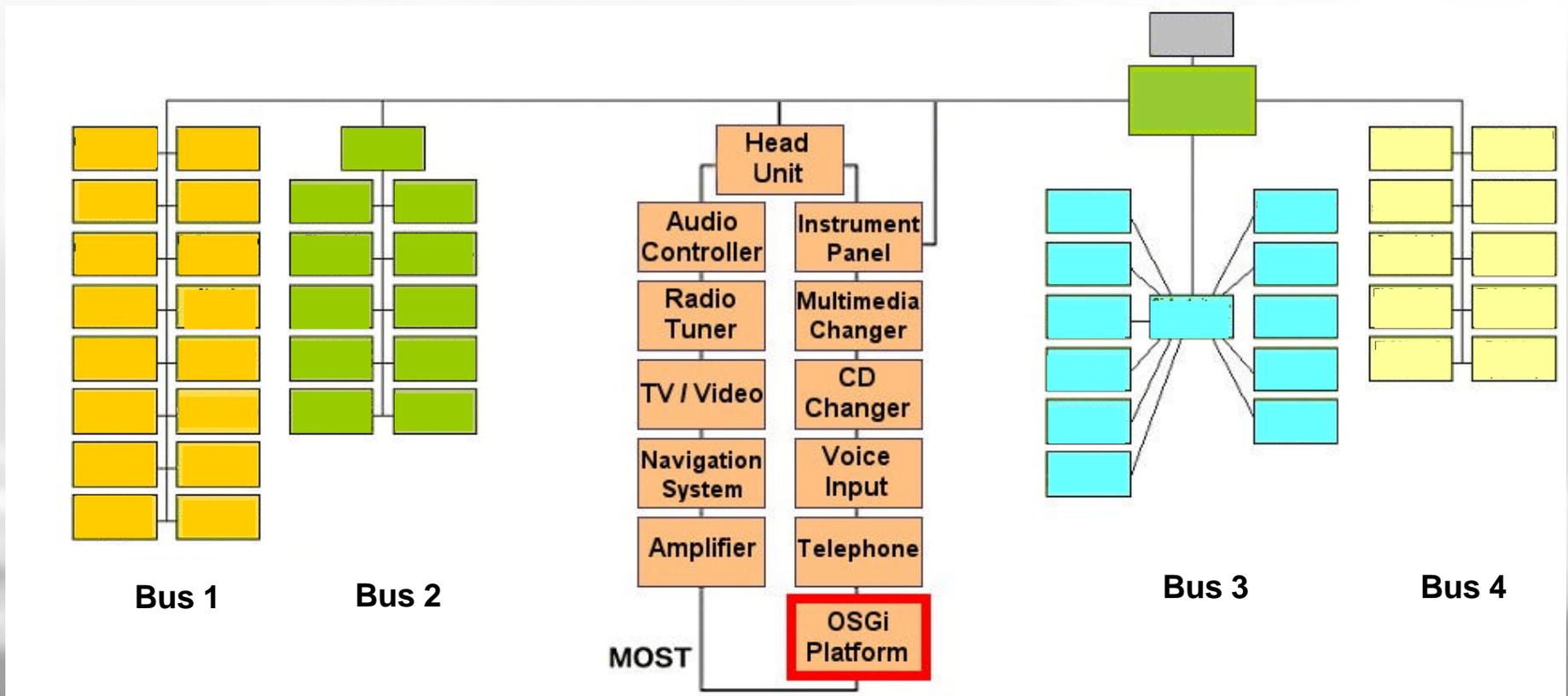
- One platform (costs)
- Possible reduction of number of ECU's
- One HMI „for all“ is slightly easier to implement

Risks:

- High effort in system integration
- Performance
- Startup / Shutdown behaviour
- Safety / security more difficult

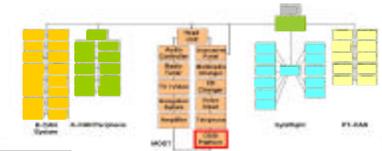
In-vehicle OSGi integration

Case 2: OSGi “Advanced ECU”



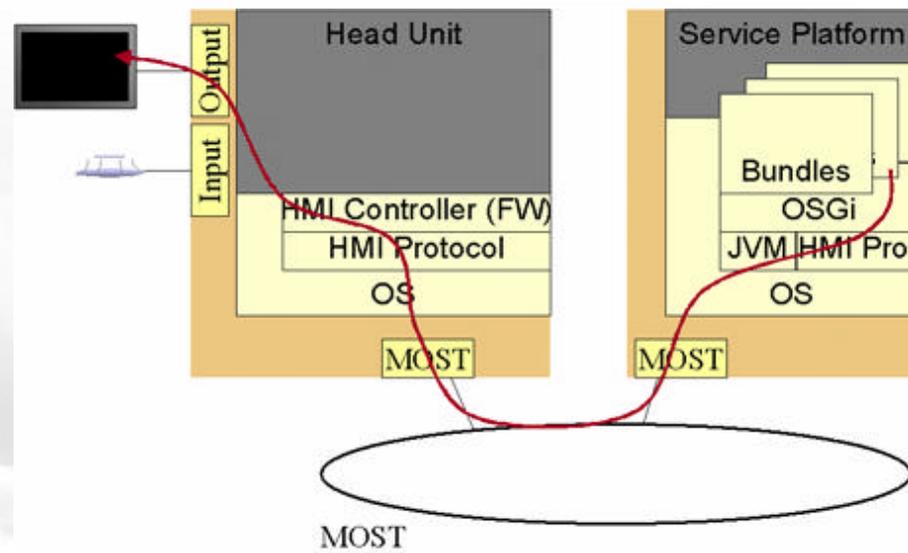
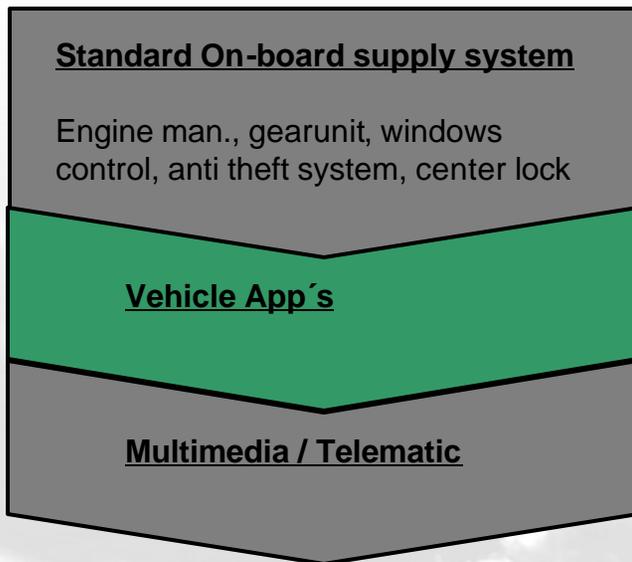
Roles:

Remote Access Gateway, Service PF with App business logic functionality



In-vehicle OSGi integration

Case 2: OSGi “Advanced ECU”



- Separation of stable on-board supply system
- Head unit for vehicle application world
- Separation of multimedia and telematic world

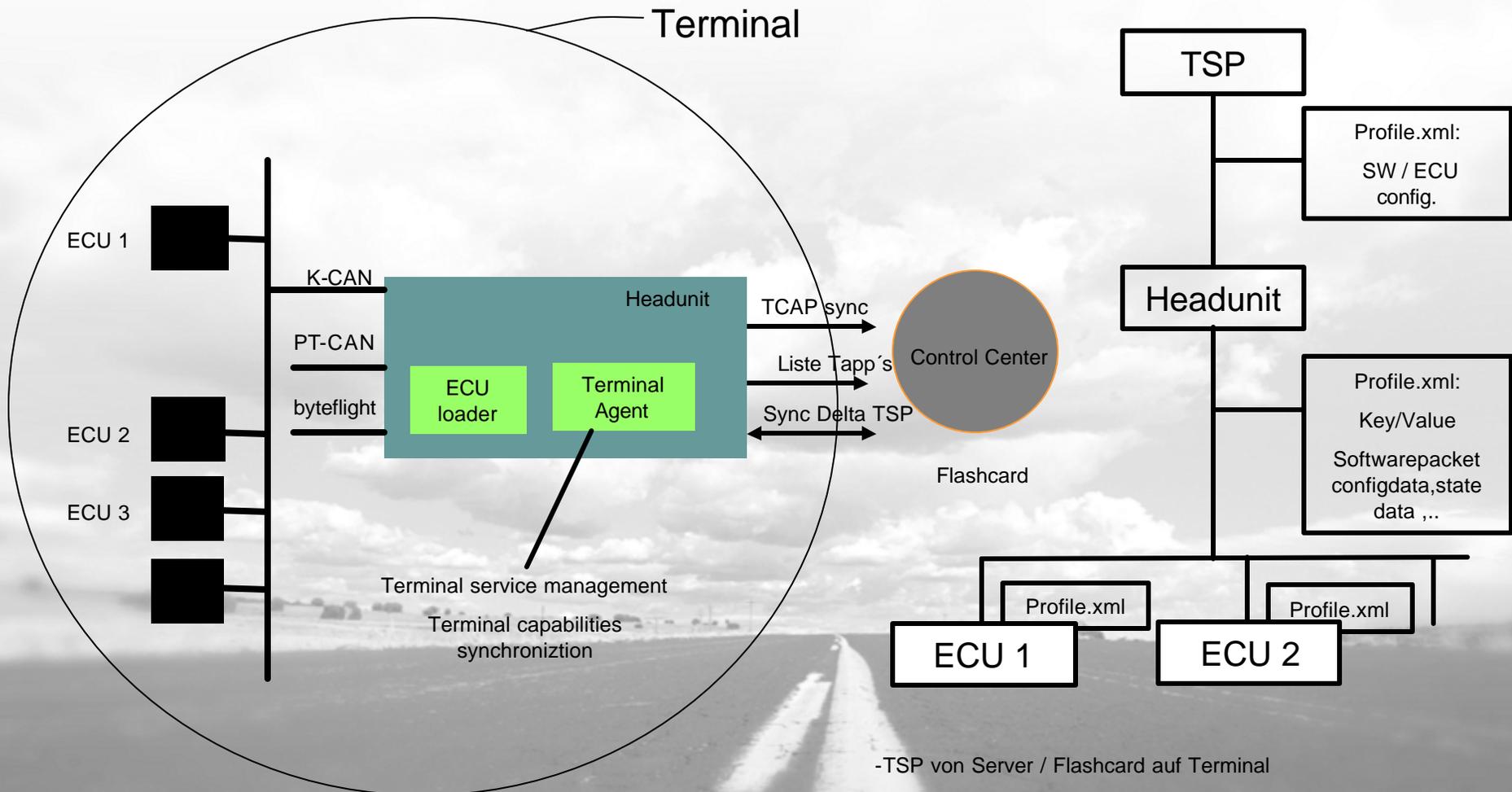
Advantage:

- Clear separation of stable vehicle functionality from the dynamic multimedia / telematic applications
- Security easier to achieve

Risks:

- Cost penalty
- HMI communication
- Another ECU....

Example New App-Scenario: ECU Software Download



- TSP von Server / Flashcard auf Terminal
- Server hat Masterkopie von TSP
- SW wird immer von Server zum Fahrzeug abgeglichen (Server entscheidet)



BMW ConnectedDrive: Networks Driver, Vehicle and Environment

An Innovative concept which interconnects information, communication and assistance systems inside and outside the vehicle, location based and destination oriented.

- BMW Assist
- BMW Online
- Driver Assistance





BMW Research Vehicle – The Future



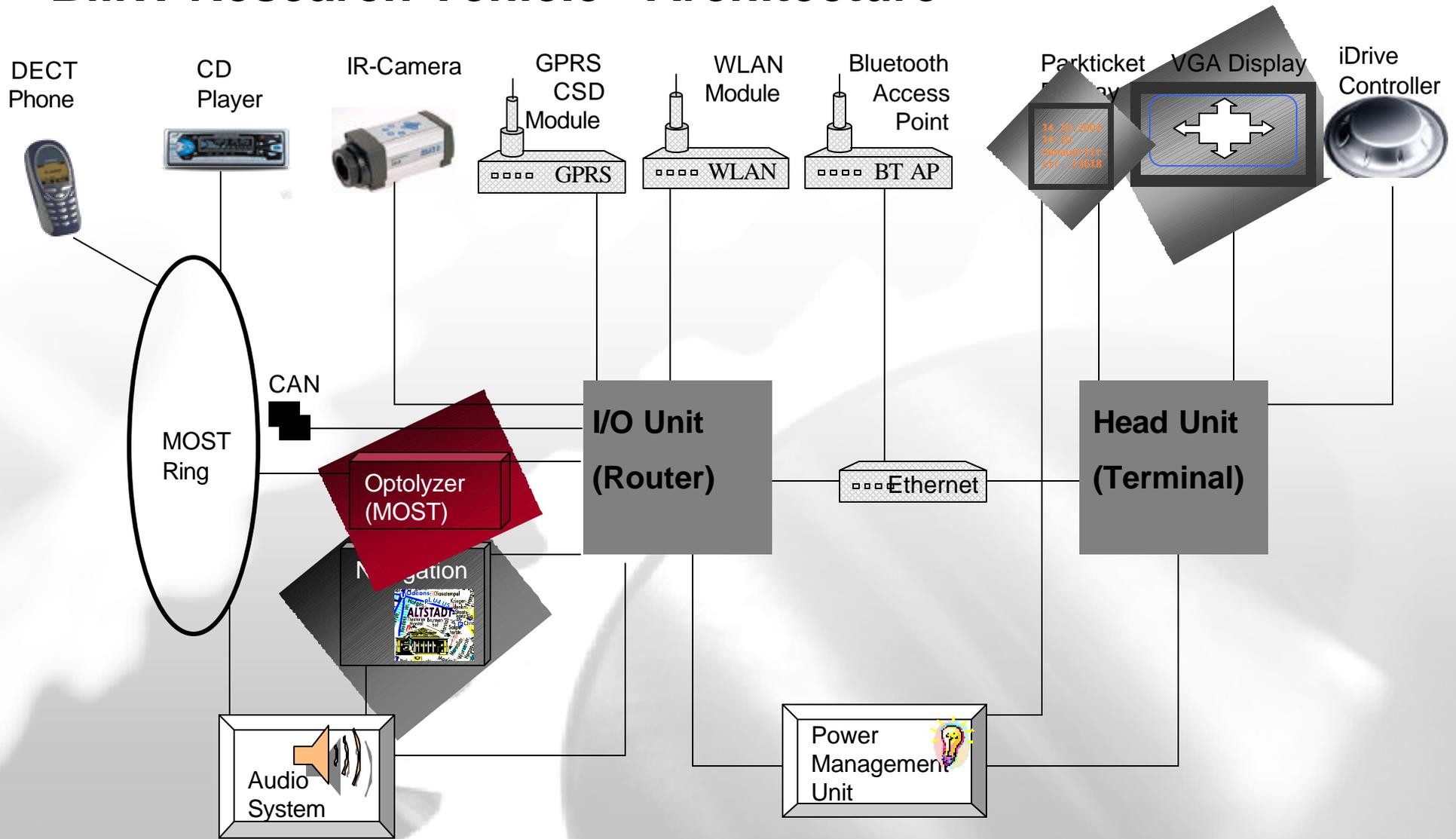


Main Goals

- Use OSGi-Platform and implement End-2-End service chain with a software management architecture that enables software download (3GT-based)
- Show different car networking situation:
 - car to backend server
 - car to personal appliances, (PDA, mobile)
 - car to car (Ad-Hoc networking)



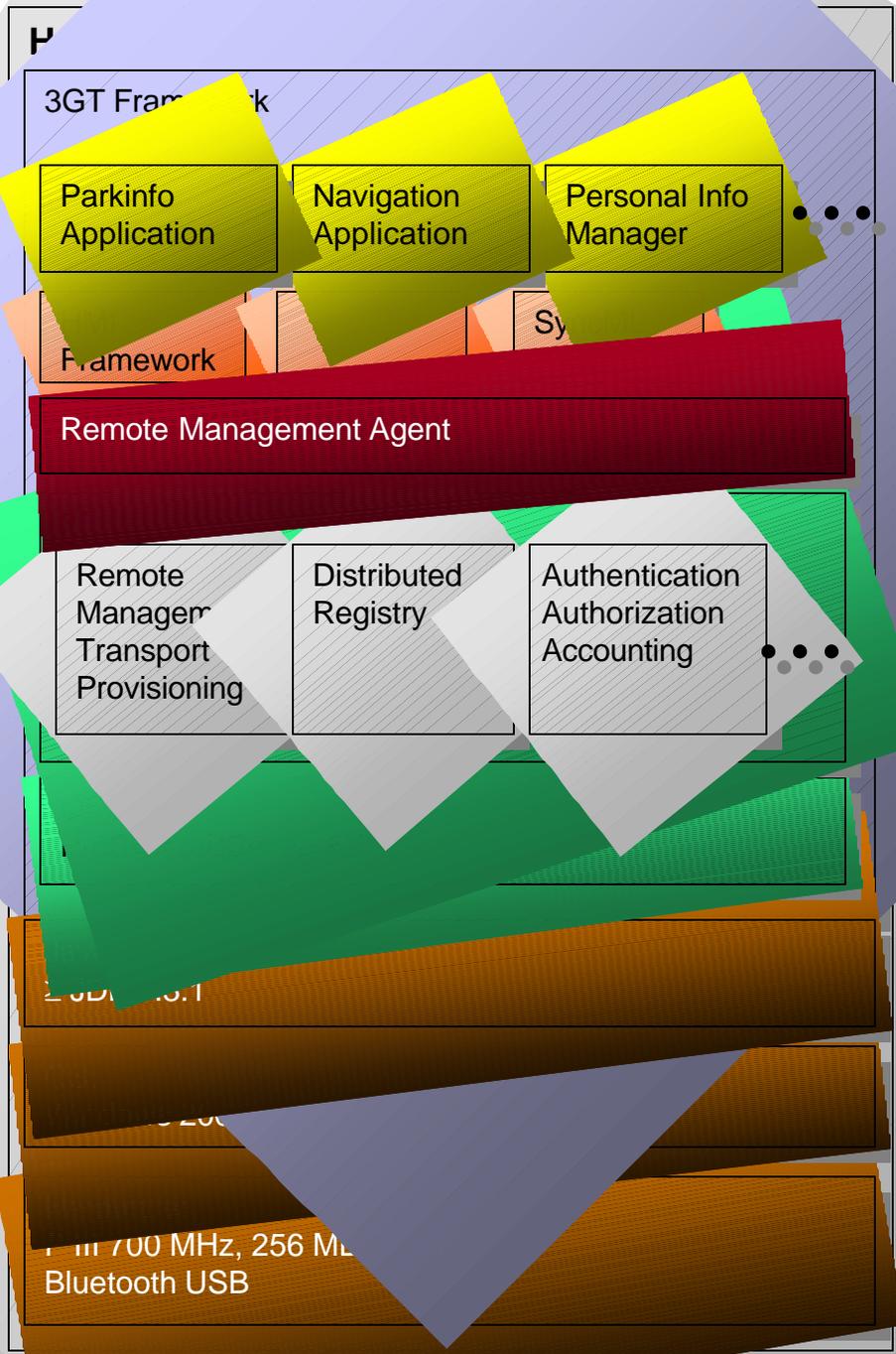
BMW Research Vehicle - Architecture





BMW Research Vehicle – The Future



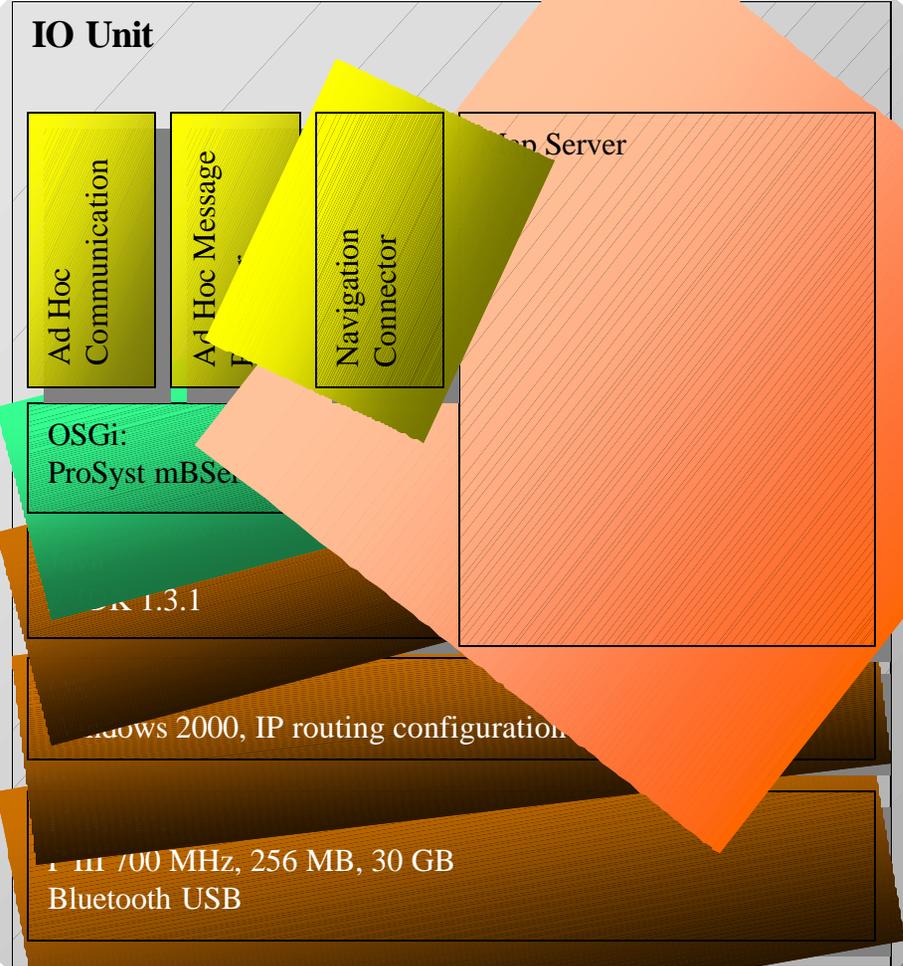
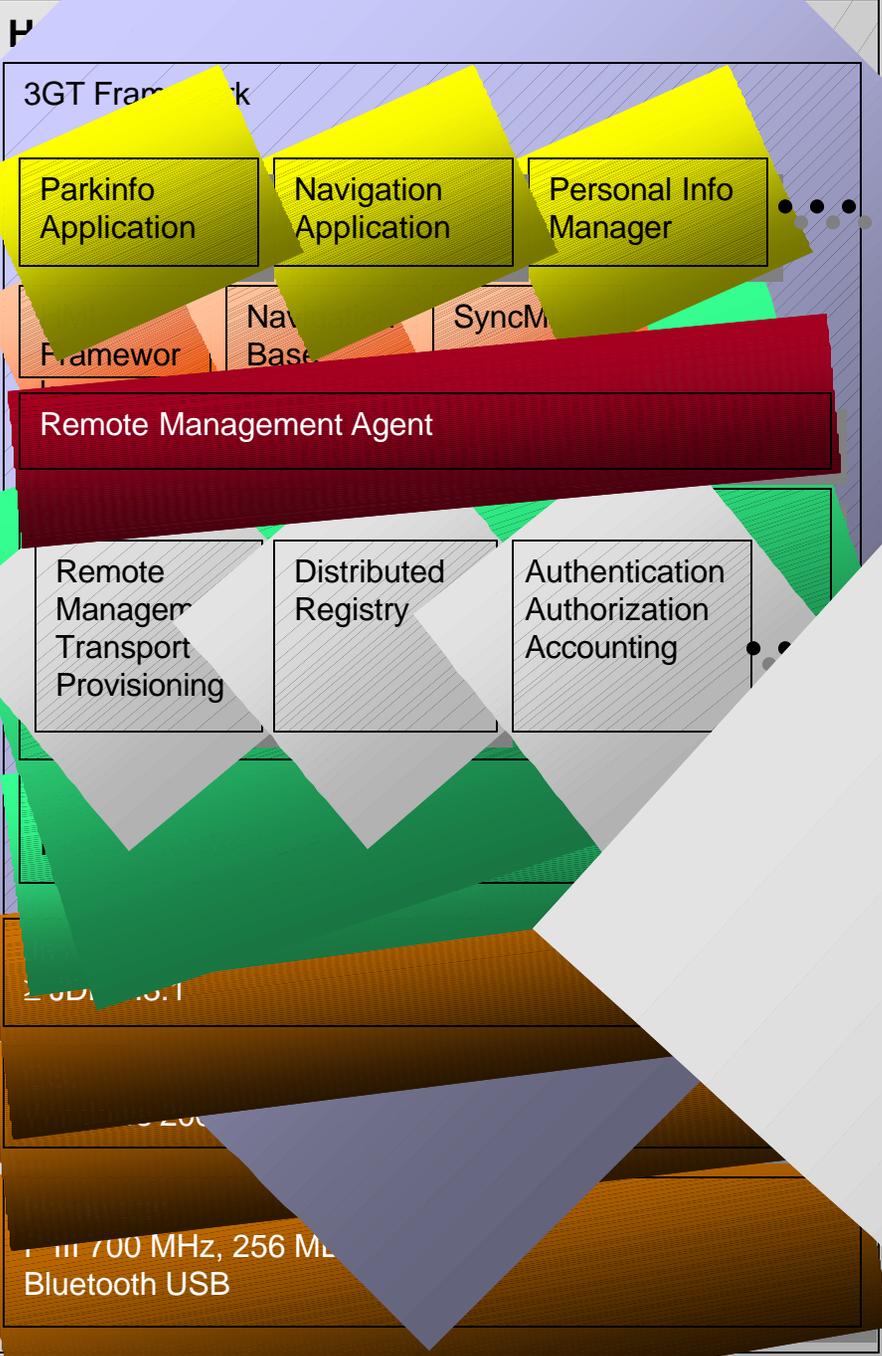


} User Application Layer

} Terminal Application & Managed Service Layer

} Initial Provisioning Layer, I2

} Preinstalled (Unmanaged) Bundles



BMW Research Vehicle – Applications Infomanager

Personal Information Management

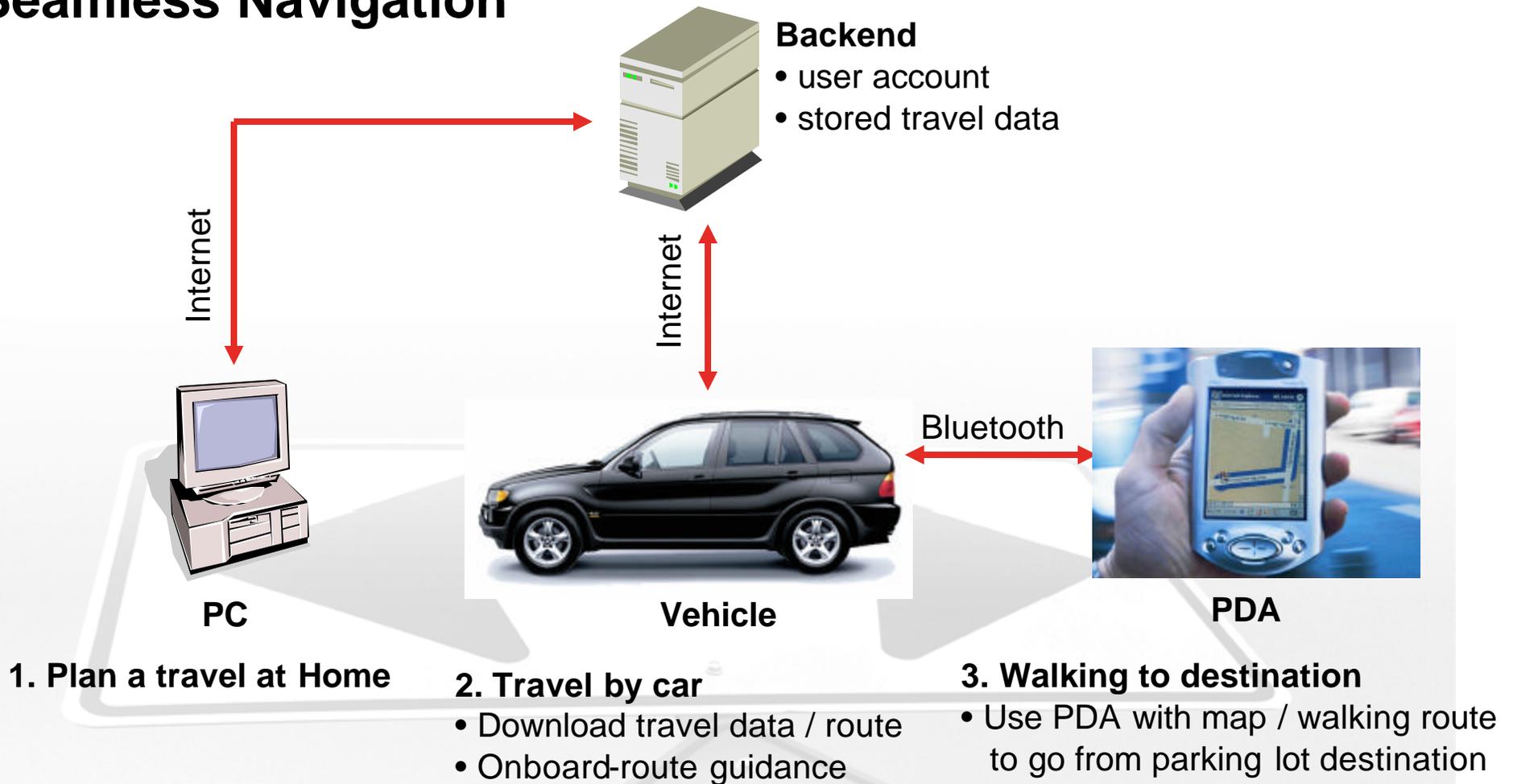


Synchronized data in all devices

**Adresses, calender, email,
tasks,..**

BMW Research Vehicle – Applications

Seamless Navigation





BMW Research Vehicle – Applications

Seamless Navigation

Sound
Navigation
Services
Logoff

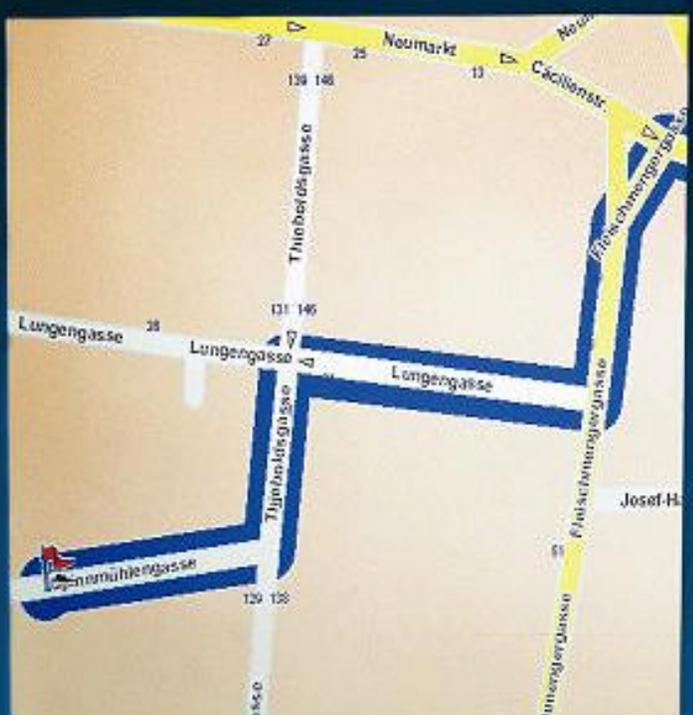
PIM

Player

Fußweg

IV-Info

ParkInfo



Fußweg-Info:

Zeit	Weg	Anweisung
00:00	0 m	Cäcilienstraße 32 50667 Köln
00:00	12 m	rechts abbiegen auf Cäcilienstrasse
00:01	122 m	links abbiegen auf Flämengerstrasse
00:02	142 m	rechts abbiegen auf Cäcilienstrasse
00:03	212 m	links abbiegen auf Fleischmengergasse



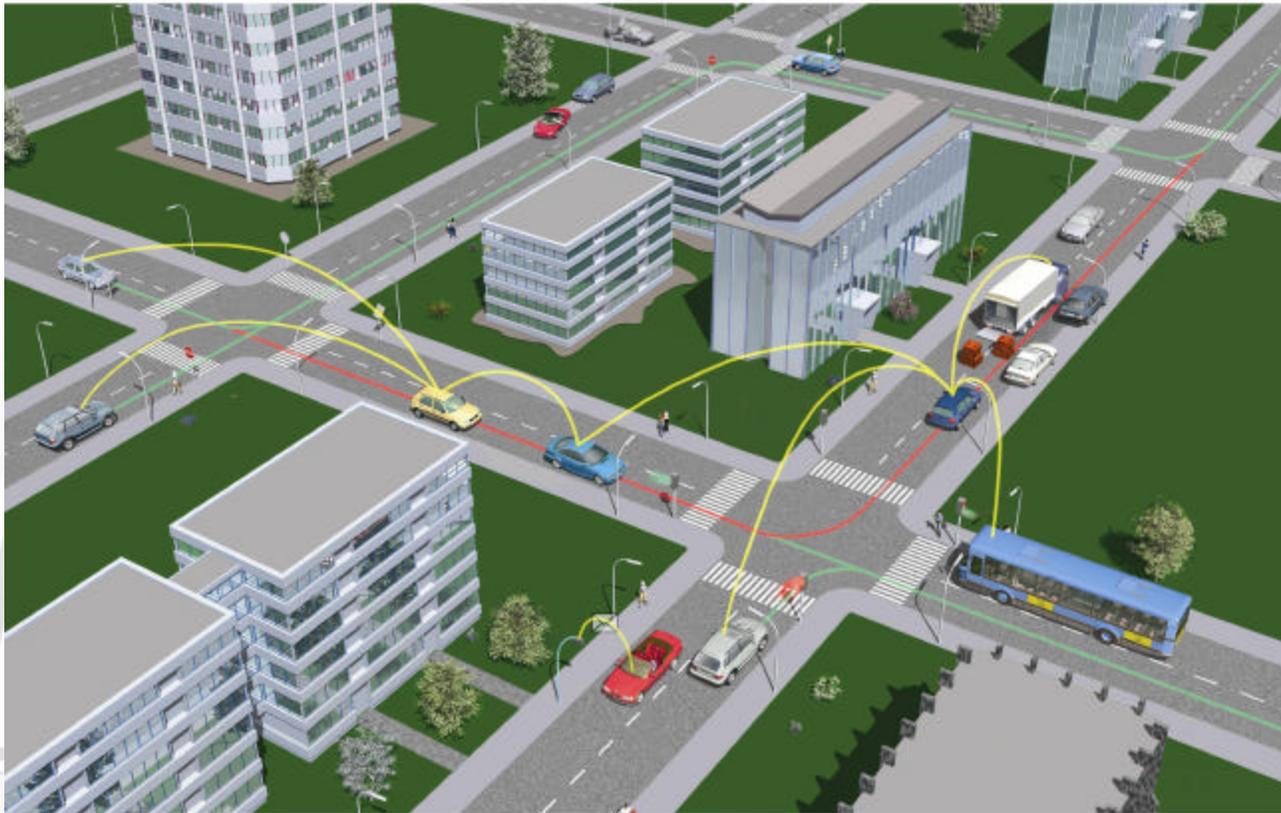
BMW Research Vehicle – Applications Seamless Navigation





BMW Research vehicle – Applications

Car-2-Car Communication





Thank you for paying attention





We are
open for discussions for
open communication platforms and
open standards.



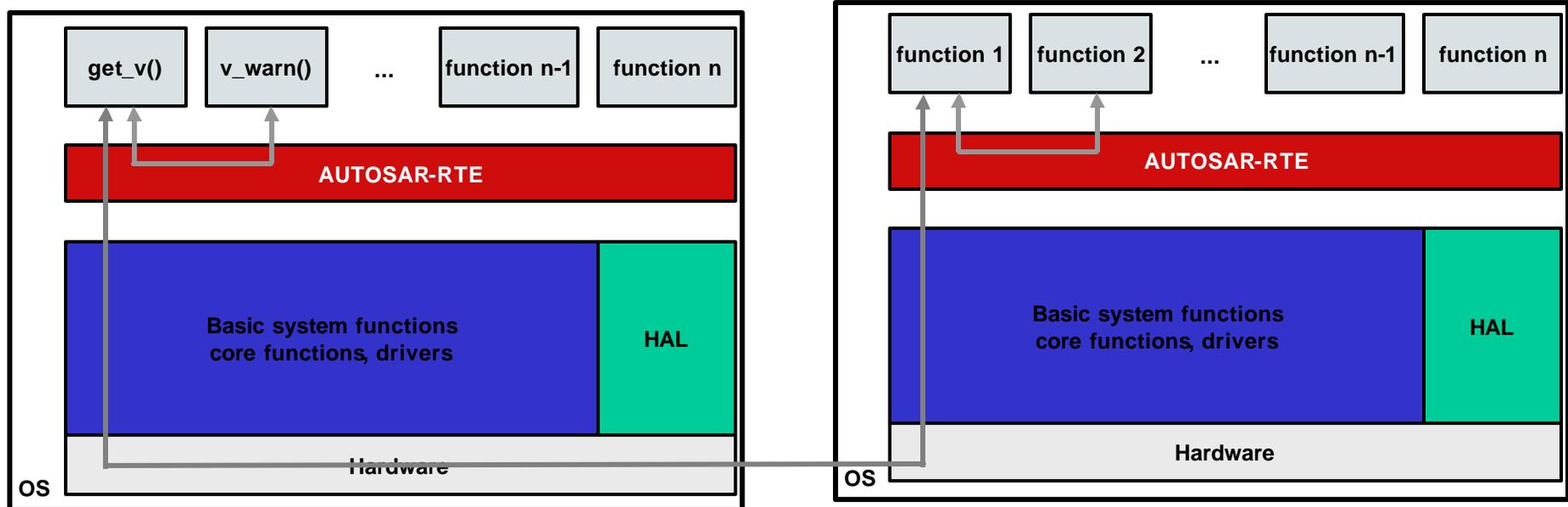


Questions?

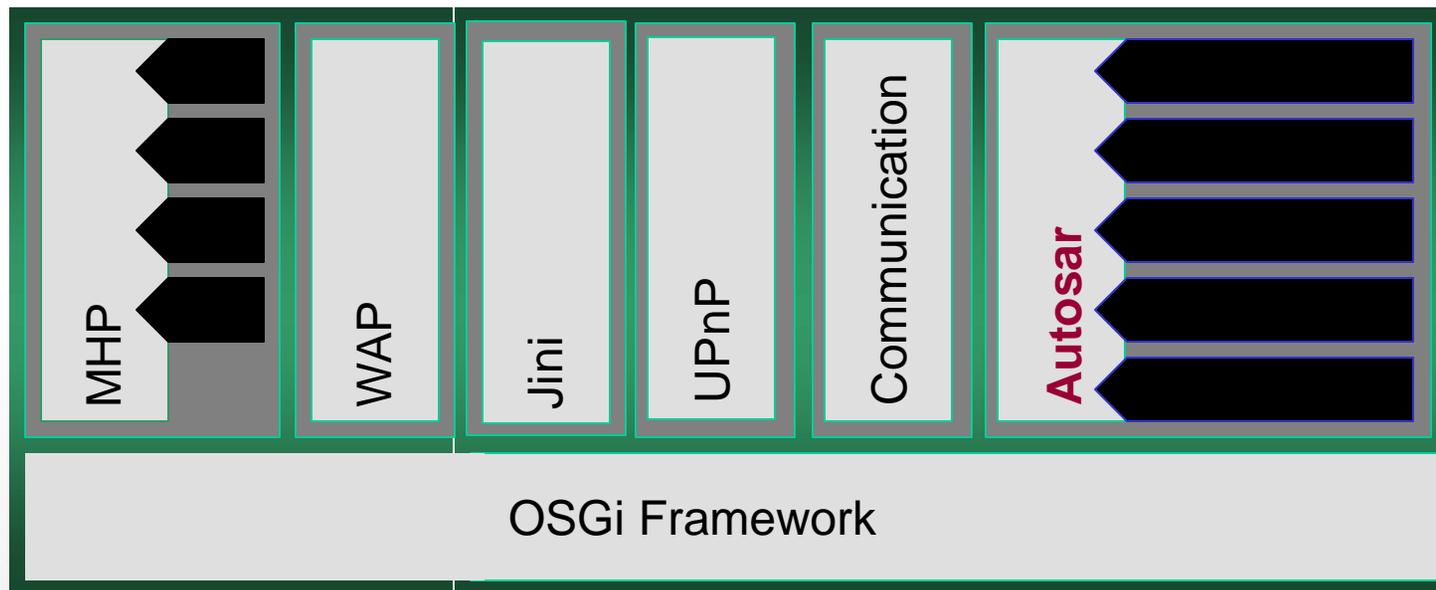


Backup

AUTOSAR Architecture



OSGi Integration Platform and Autosar - What is possible...



Main Goals

Automotive Open System Architecture (AUTOSAR)

- Specification of interfaces
- Standardized, openly disclosed interfaces
- HW-independent SW-layer
- Transferability of functions
- Redundancy activation

AUTOSAR RTE:

by specifying interfaces and their communication mechanisms, the application are decoupled from the underlying hardware and basic software, enabling the realization of standard library functions

Functional Domains

