Networked Embedded Systems

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Overview

- **Introduction**
- **Middleware**: Run-Time Environment
- **HW-Abstraction**: Basic Software
- **Scheduling**
- **Multicore** extentions
- **Conclusion**

Introduction

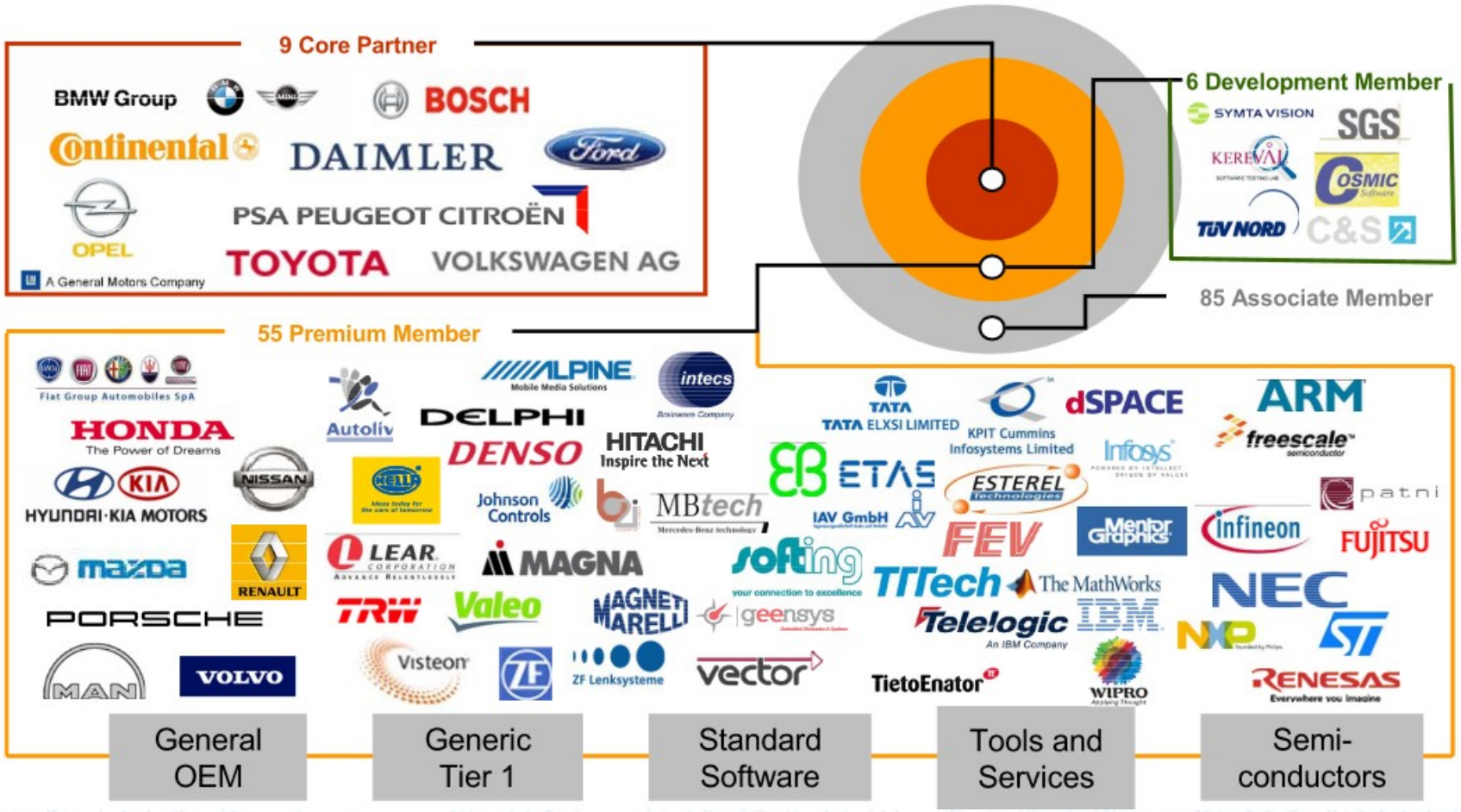
- **AUT**omotive **O**pen **S**ystem **Ar**chitecture
- Initial Release: 2005
- Backward compatible to OSEK (Time)

"Cooperate on standards,
compete on implementation."

➡ Efficiency and Quality

Partner & Member

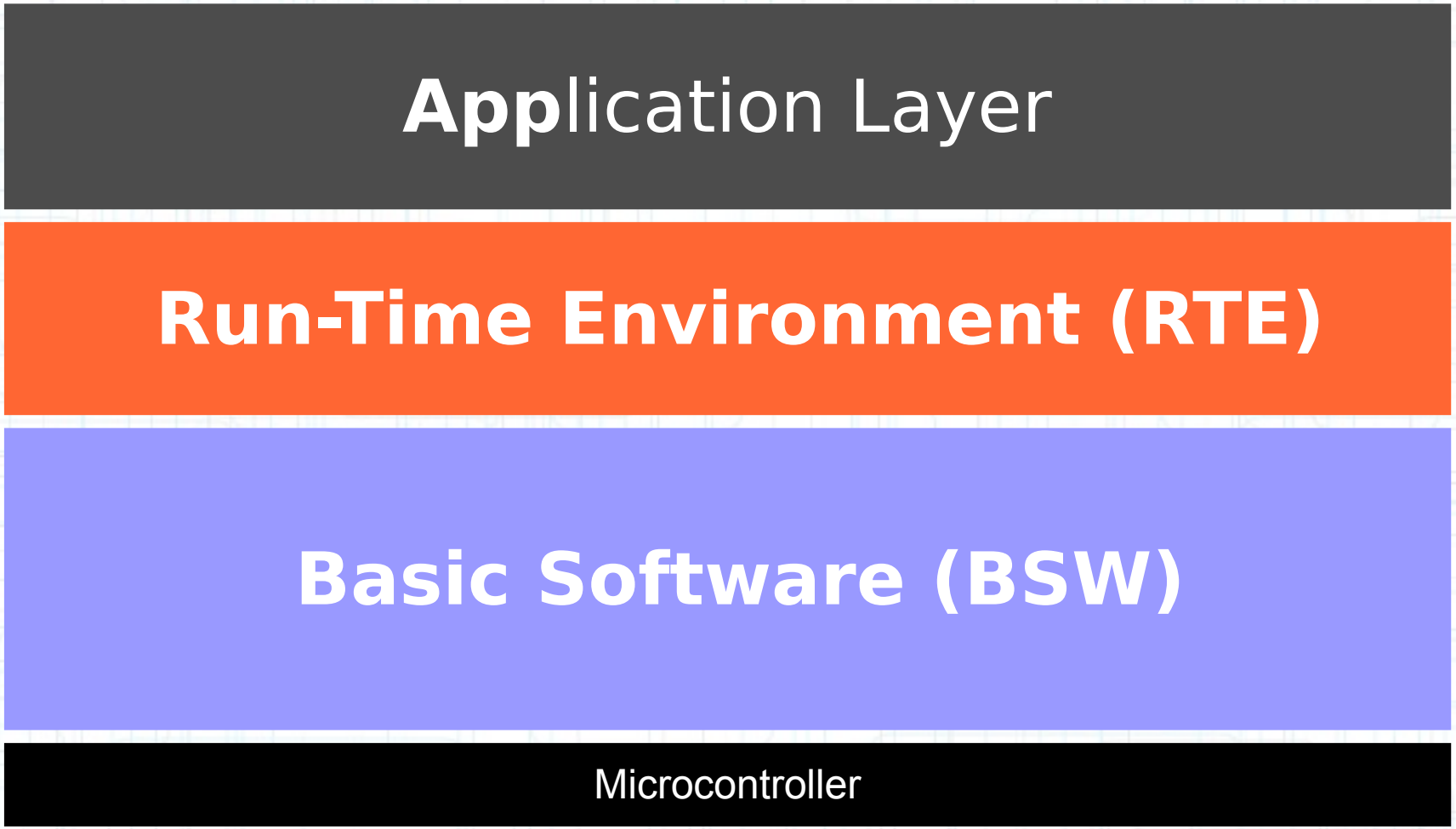
Status: 10th October 2008 [Tut3]



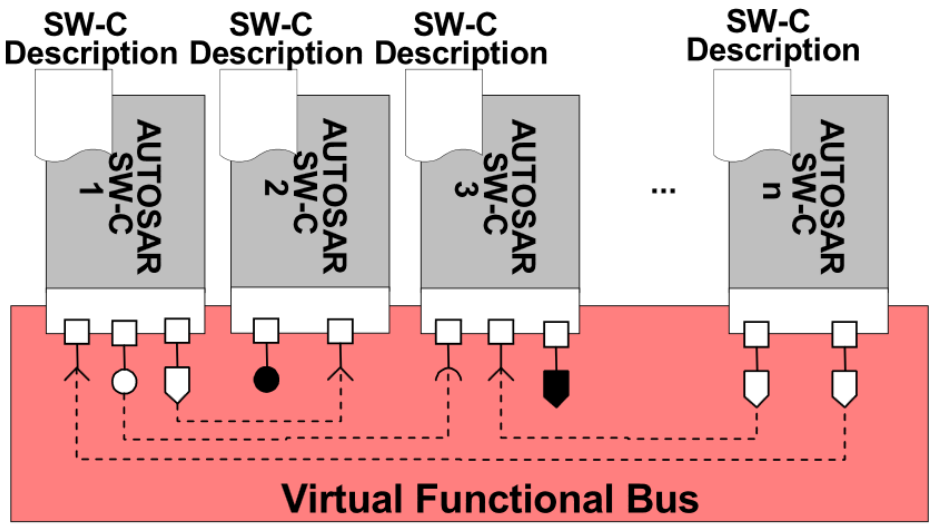
Goals

- Efficiency
- Quality
- Scalability
- Managing Complexity
- Maintainability
- Transferability
- Standardization

Architecture



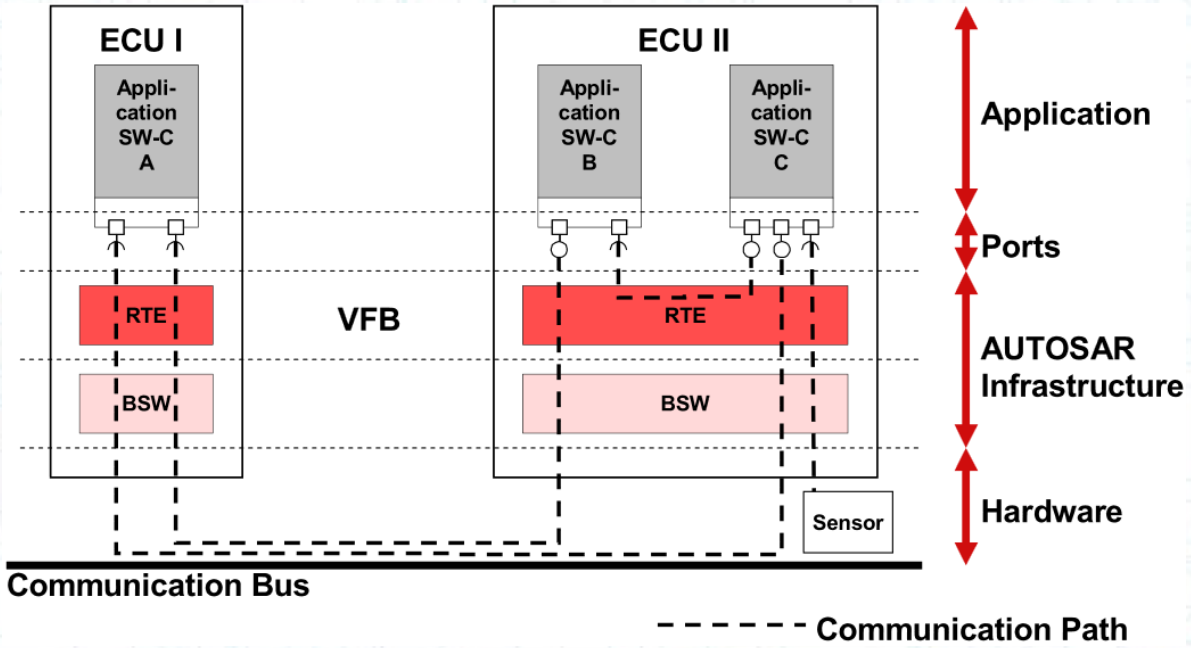
VFB



- Decoupling of software and infrastructure
- Application = interconnected **SW-Cs**

Soft**W**are **C**omponent

Communication

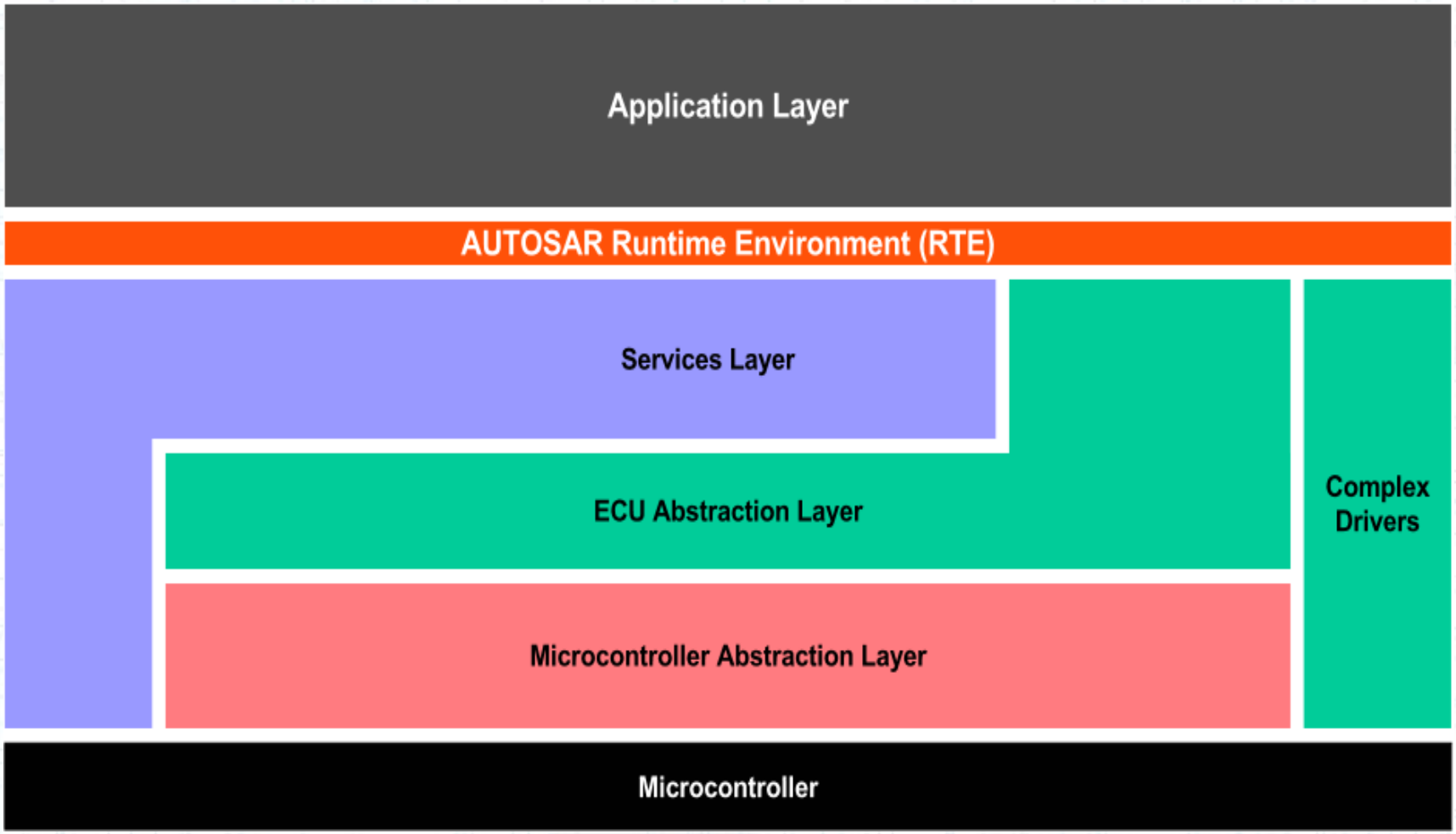


- Channeling communication via RTE
- Hiding communication in BSW

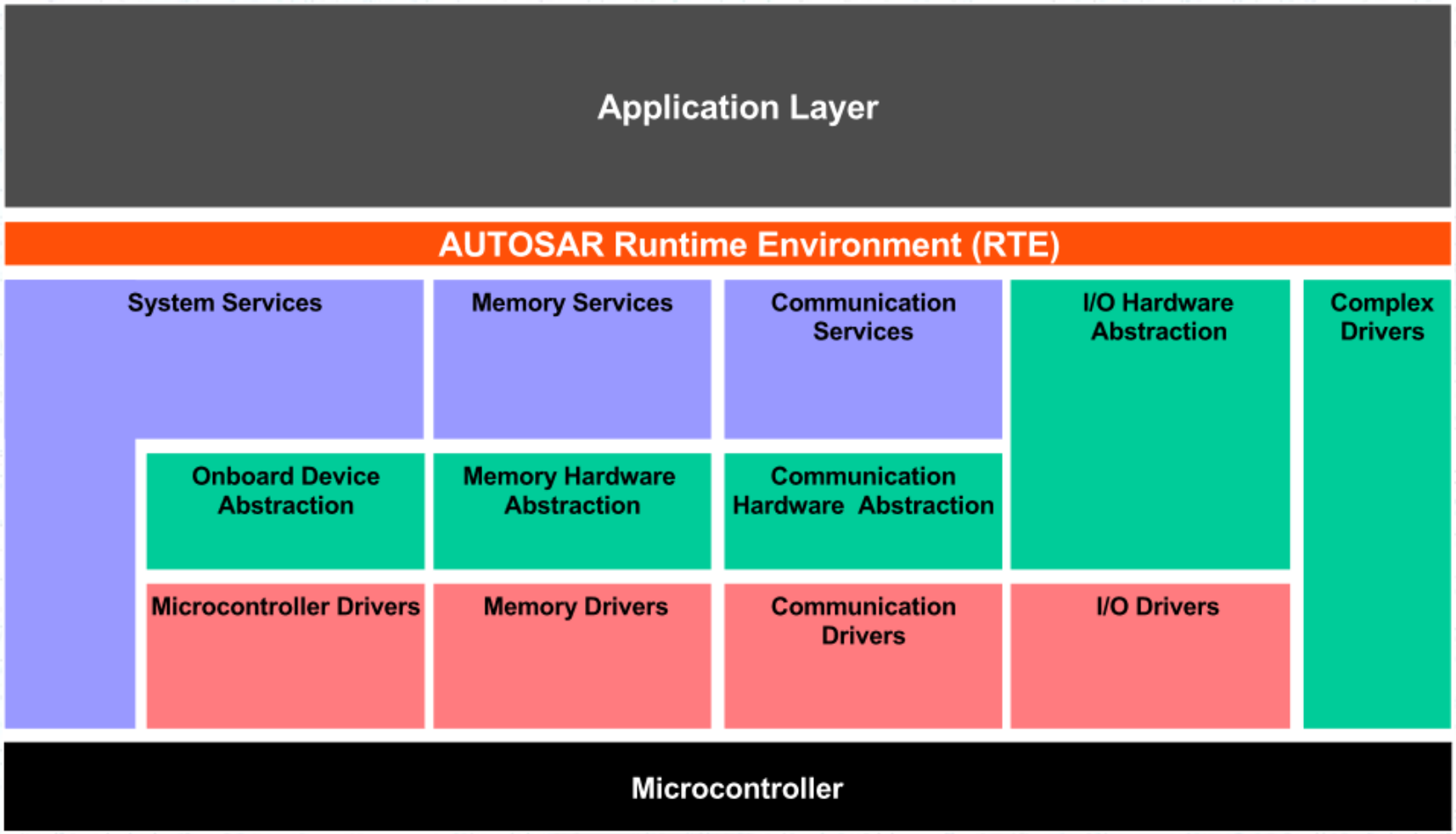
Communication

- Patterns:
  - Sender-receiver
    - Mode: explicit/ implicit
  - Client-server
- Signal
  - triggered/ pending
  - data (*queued*) or event (*unqueued*)

Basic Software



Basic Software



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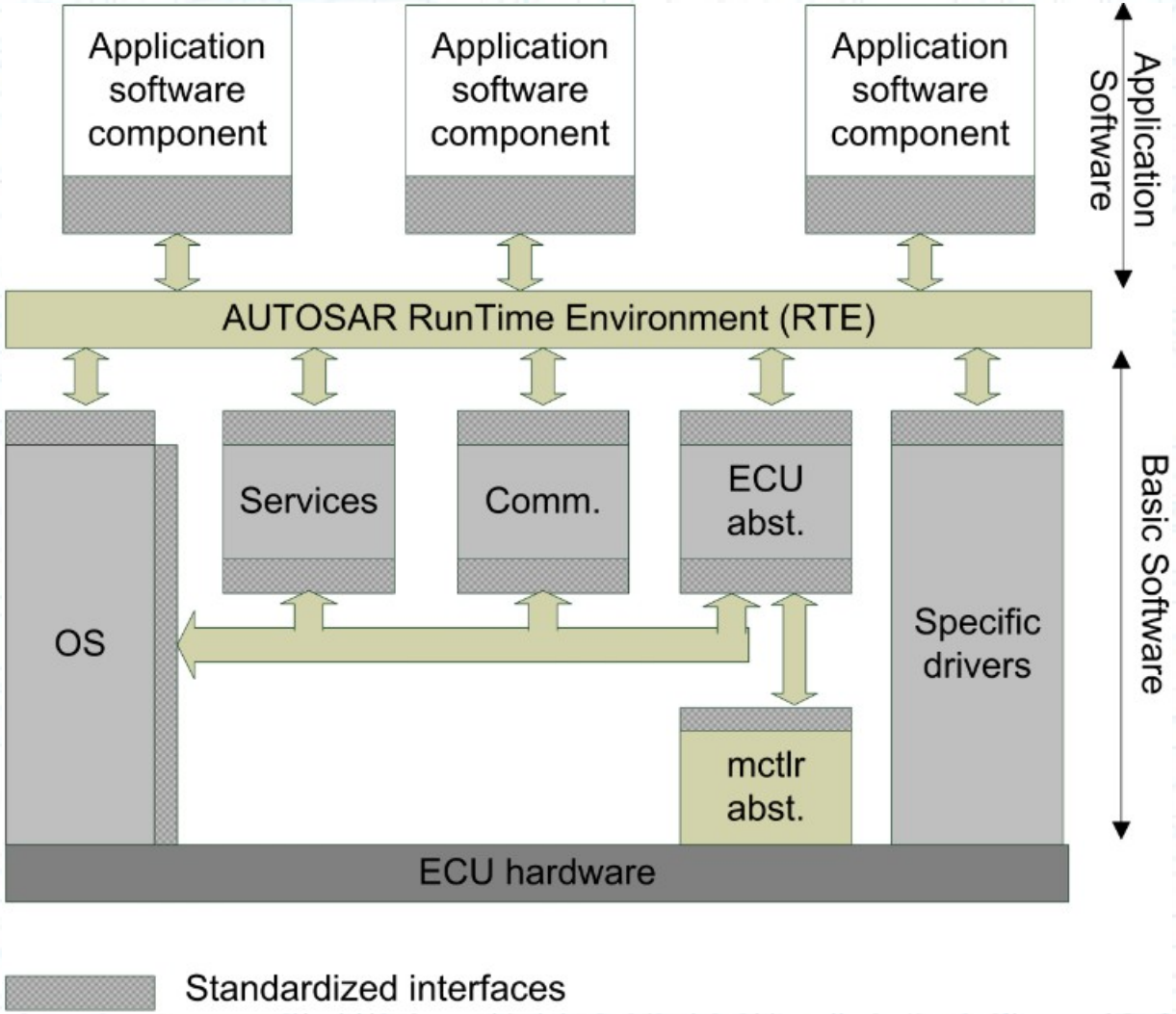
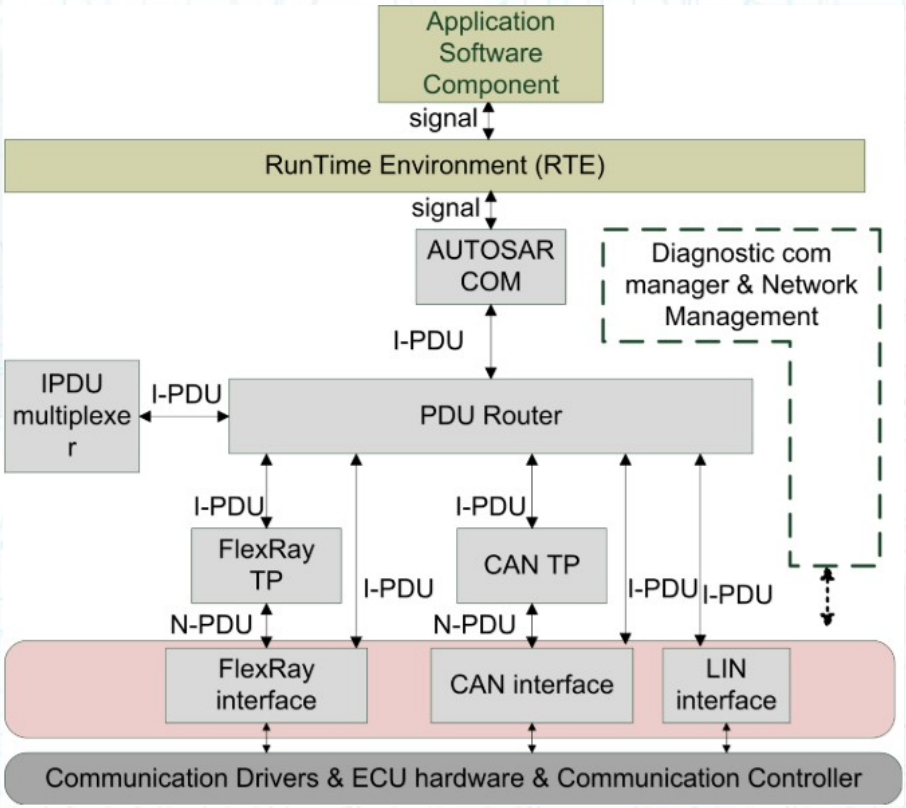
Simplified View



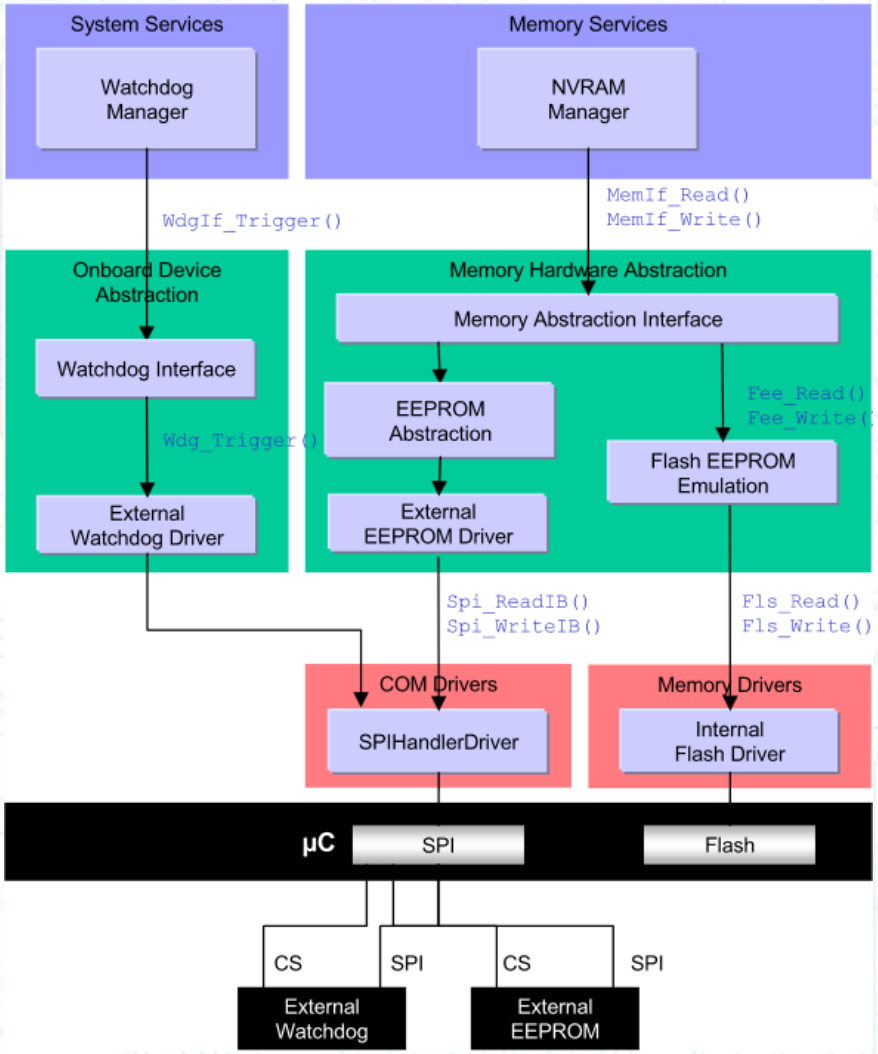
Communication

- Behavioural and timing properties
- Signal
- I-PDU: Interactional
- N-PDU: Network
- L-PDU: Data Link
- Local Transmission on same ECU

Overview on some communication modules

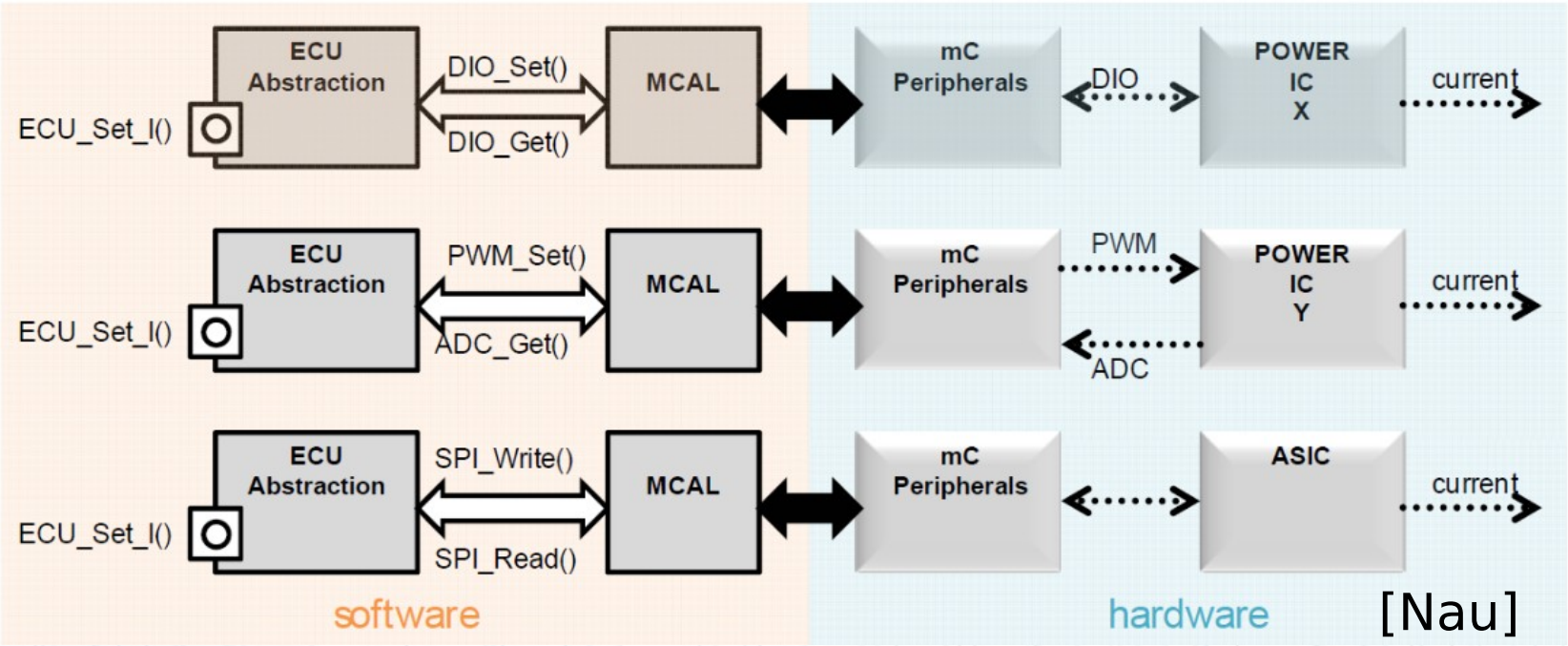


Interaction of Layers



ECU Abstraction

- 1 command 3 different implementations



Scheduling

- Timing Protection Service
- Priority Ceiling Protocol
- Schedule table

Scheduling: Policy

- OSEK concepts:
  - Highest Priority, FIFO
  - Recource groupes
- **Timing Protection** Service
  - Excution time **>** WCET (predefined)
  - Holding shared resource too long
  - Violate arrival rate (time spent in time frame)
    - Periodic server concept

Scheduling: Schedule table

- Like alarms linked to a counter
- Single-shot or cyclic
- Offline scheduling techniques
- Activation points of all tasks
- No preemption

V4.0 Multicore Architecture

- LE: Locatable Entities
- Multi-core startup/ shutdown
- IOC: **Inter**-OS-**App**clication **Com**municator
- SpinlockTypes

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Questions

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