EB Assist Robos
A Standard Architecture for Driving Automation

Elektrobit

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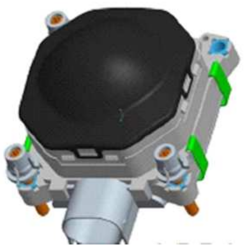
EB TechDay, Farmington Hills, Dec 03/15

Agenda

- Complexity for ADAS development
- EB Assist Robos:
  A Standard Architecture for Driving Automation
  - Architecture
  - Example Robos modules
  - Application
- Applying and extending EB‘s Software Factory for Robos
- Conclusion

An ADAS Developer‘s World in 2002.


Radar

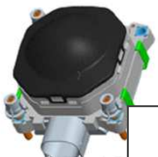

Steering
Wheel Angle


Motor Speed
Control

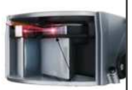

Head Unit

Items to specify: 4.

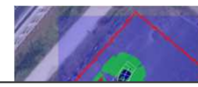
A Driverless Car Developer‘s World in 2015.


Radar


Camer

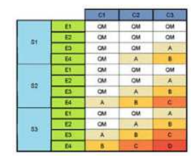

LIDAR

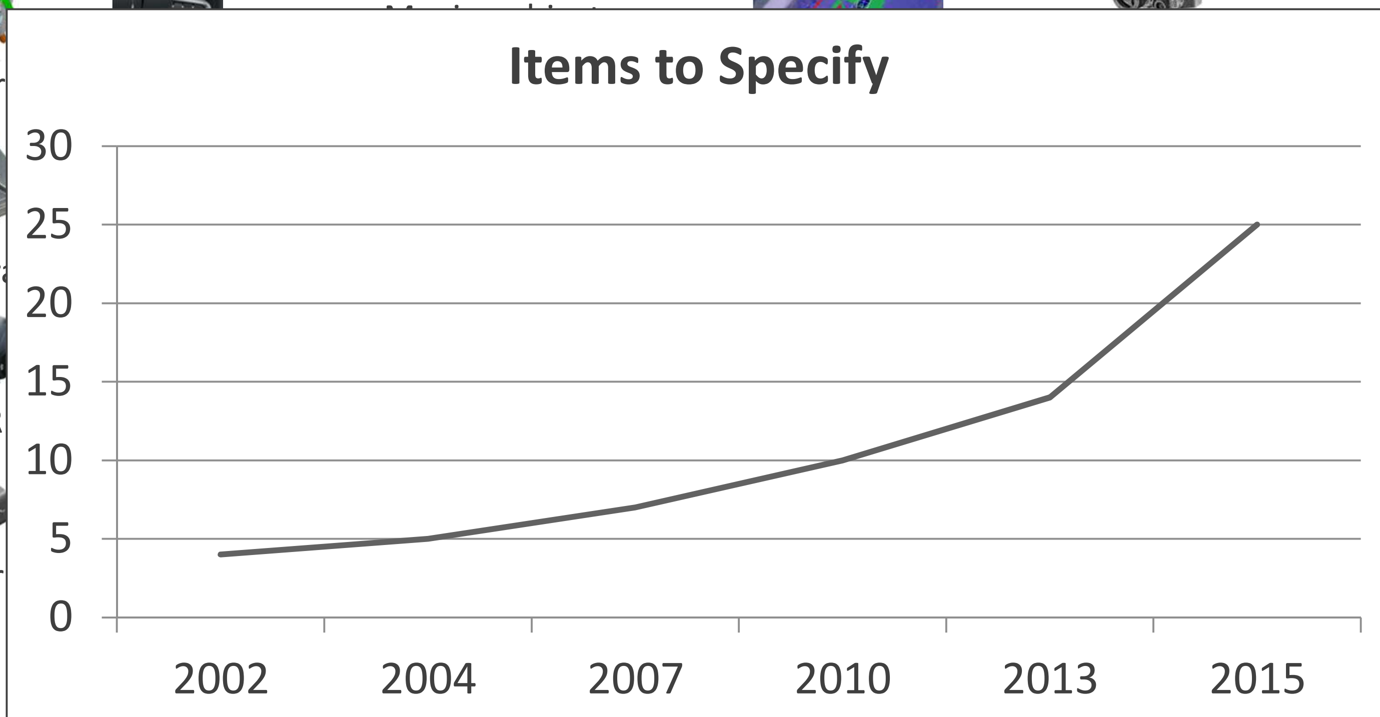

Sonar

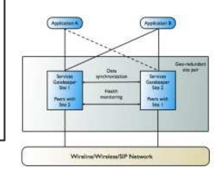



Head Unit


Side Tasks


Functional safety




Redundancies

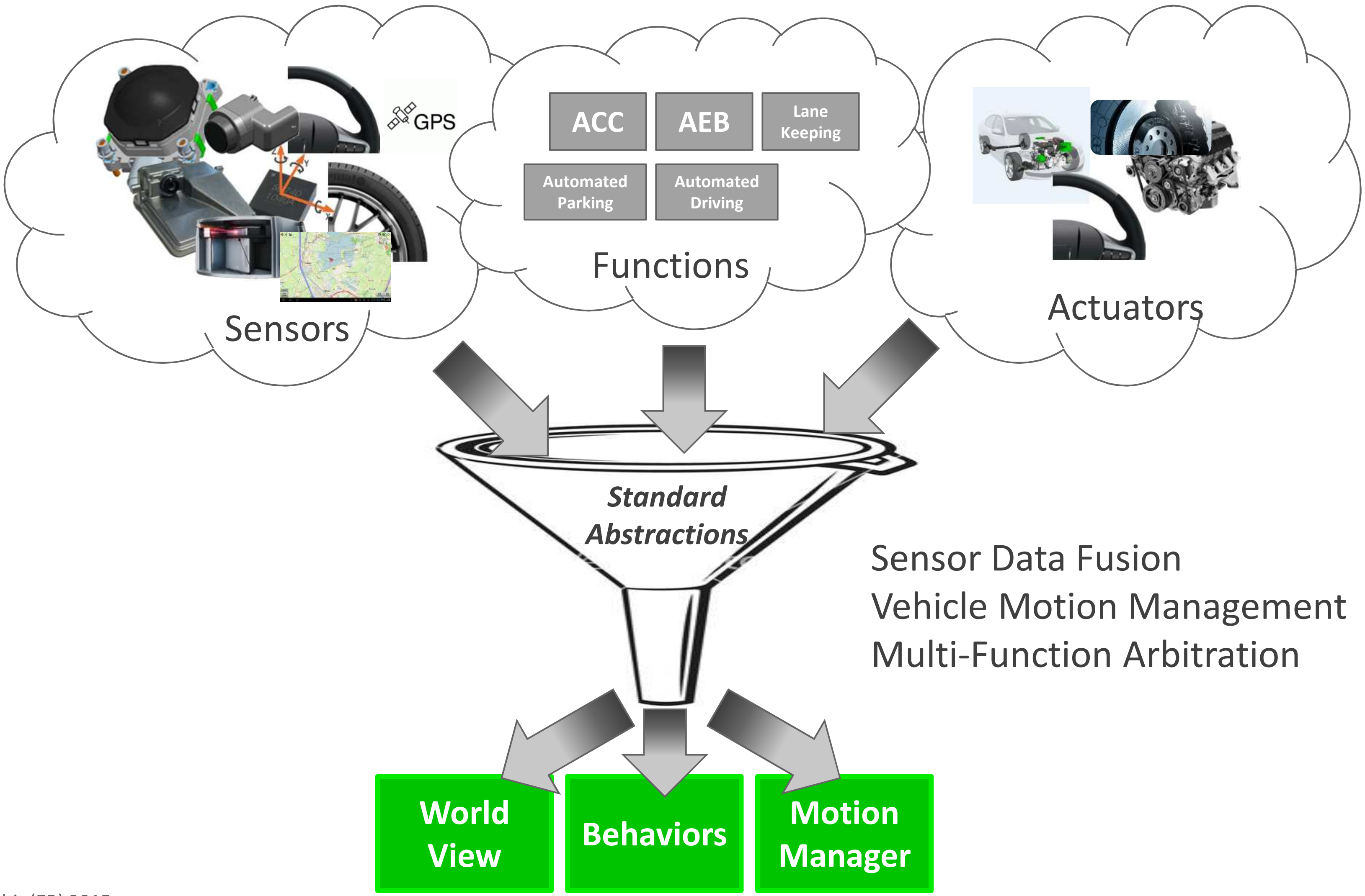

Maps

Vehicle ego motion


Power and Data Grids

Items to specify: 25.

Strategies Against The Complexity Explosion



Sensor Data Fusion
Vehicle Motion Management
Multi-Function Arbitration

EB Assist Robos

Construction Kit for Automated Driving

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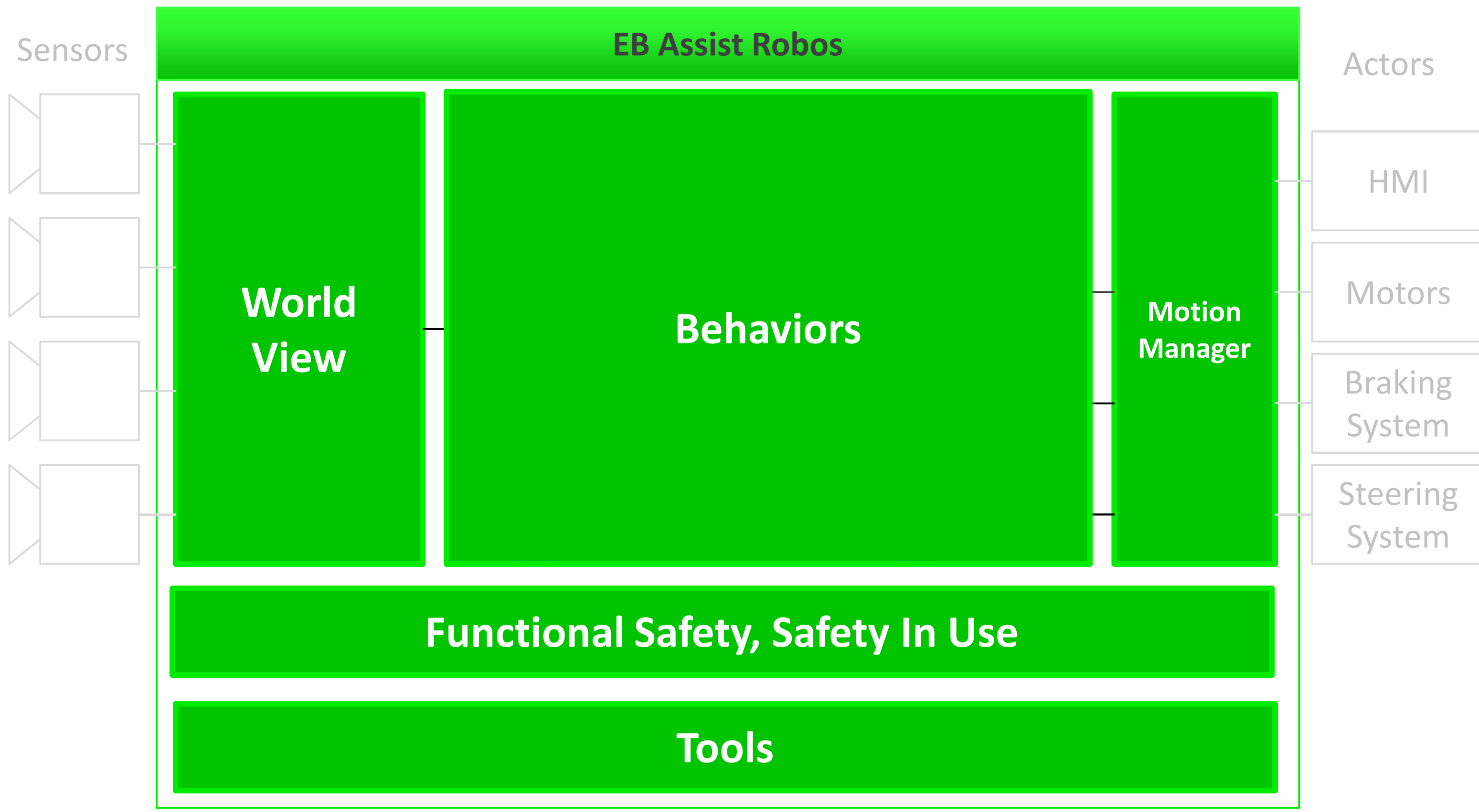
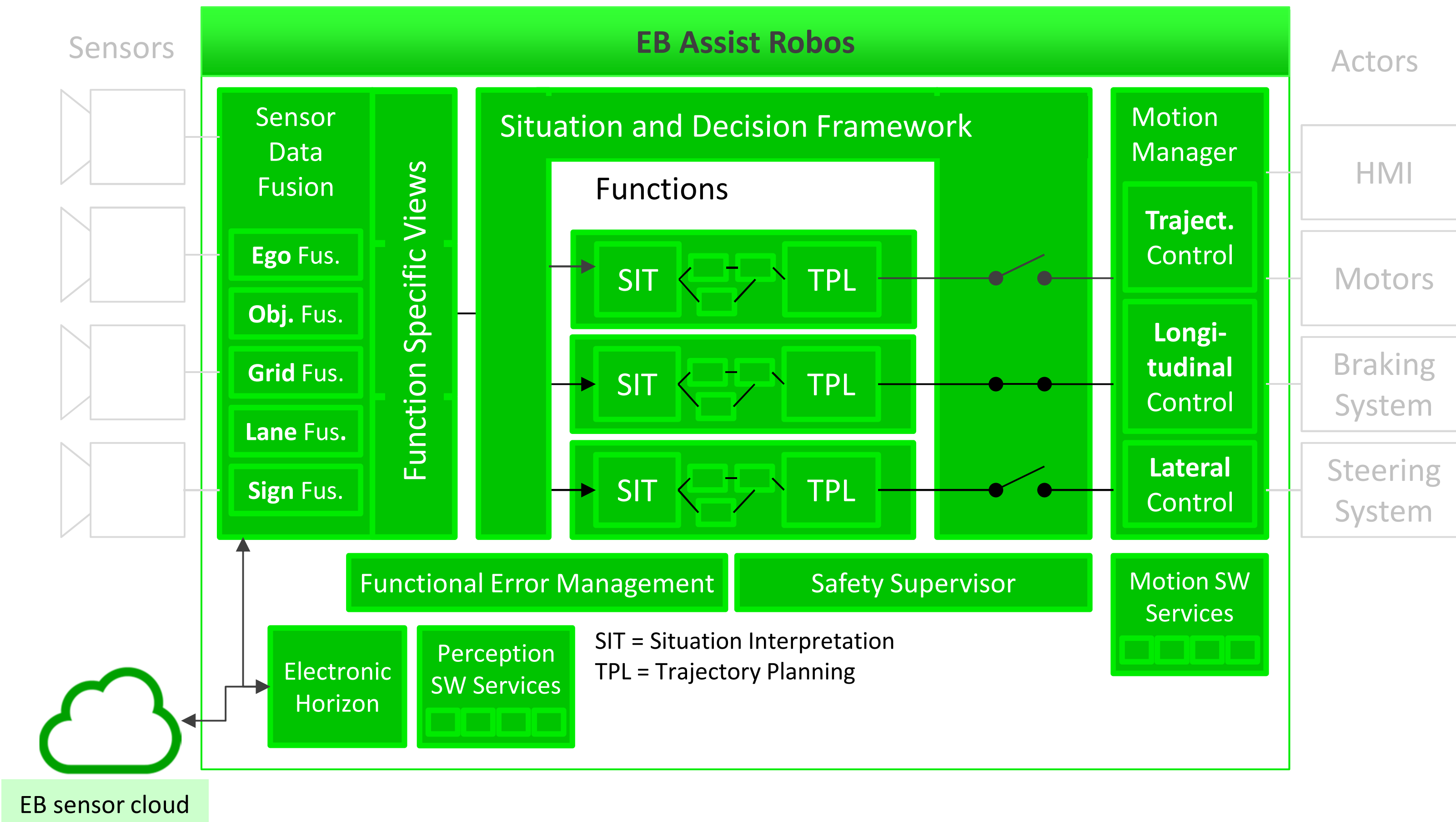
A Standard Architecture For Driver Assistance



A Standard Architecture For Driver Assistance



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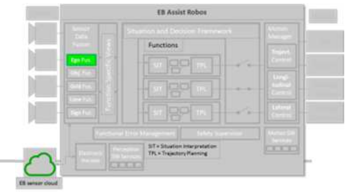
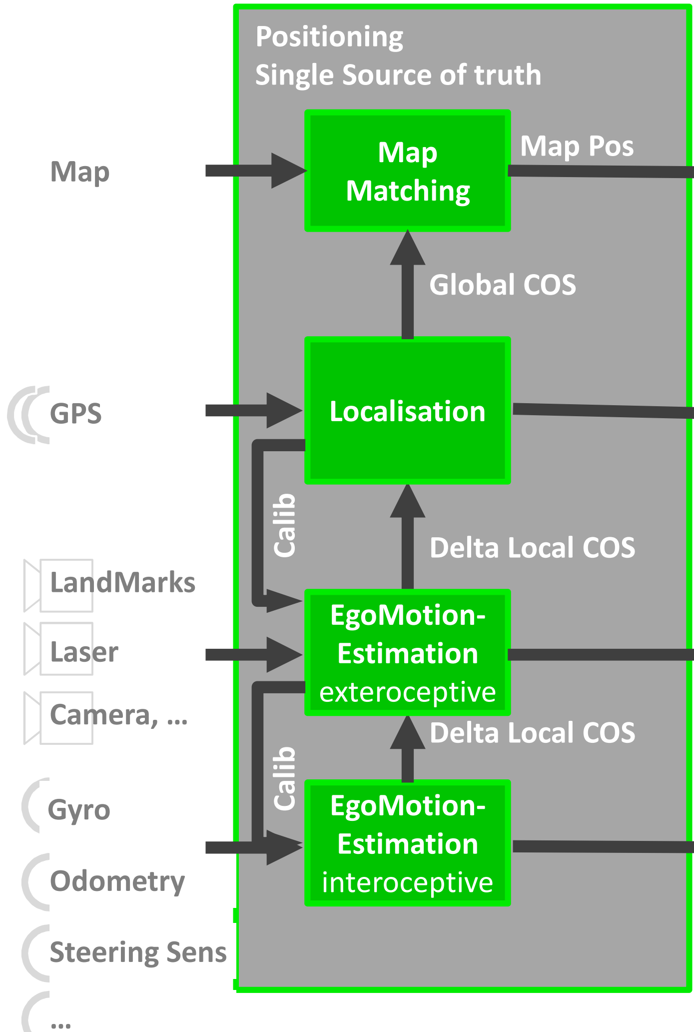
Component Example: Ego Fusion





$$(d, \dot{d}, \ddot{d}, \alpha, \dot{\alpha})$$

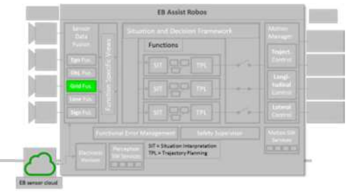
+ position matched to semantic map information

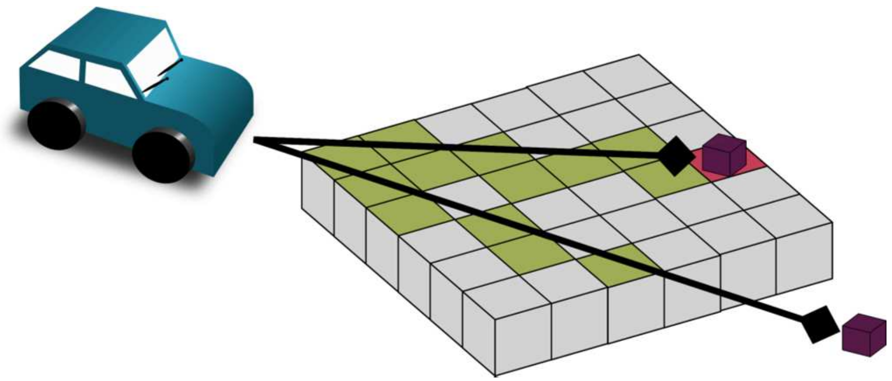
+ error accumulation over time capped to GPS accuracy
- low functional safety

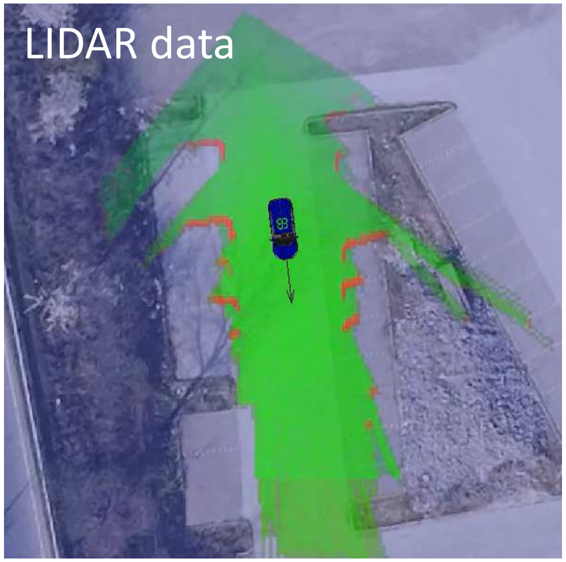
+ high functional safety
+ high frequency
- error accumulation over time still uncapped

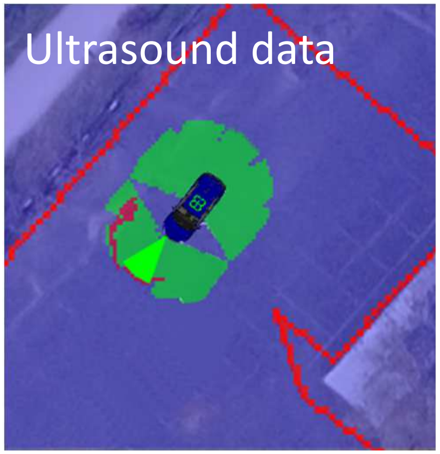
+ very high functional safety
+ very high frequency
- high error accumulation over time

Component Example: Grid Fusion

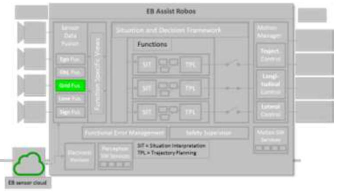






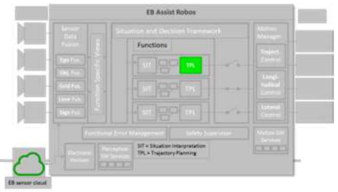


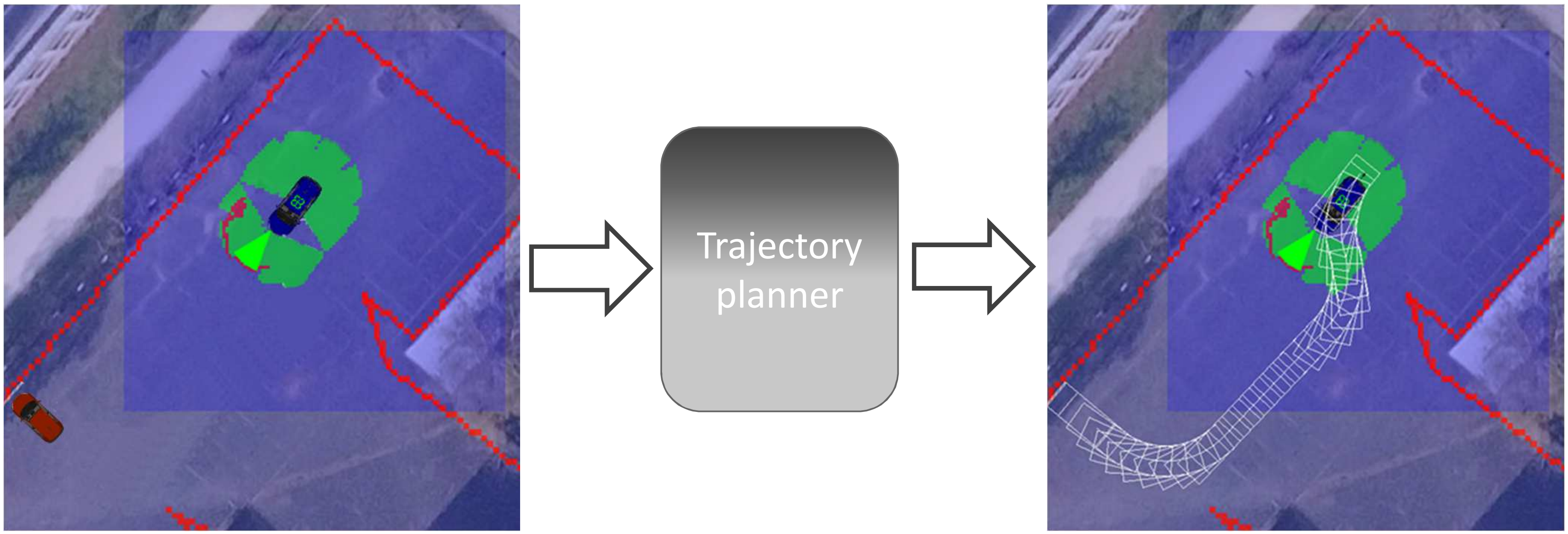
- Independent of object shapes
- Models free space and occupied space
- Ideal for path planning
- Can be used as redundancy component together with object fusion to increase functional safety level



Component Example: Grid Fusion

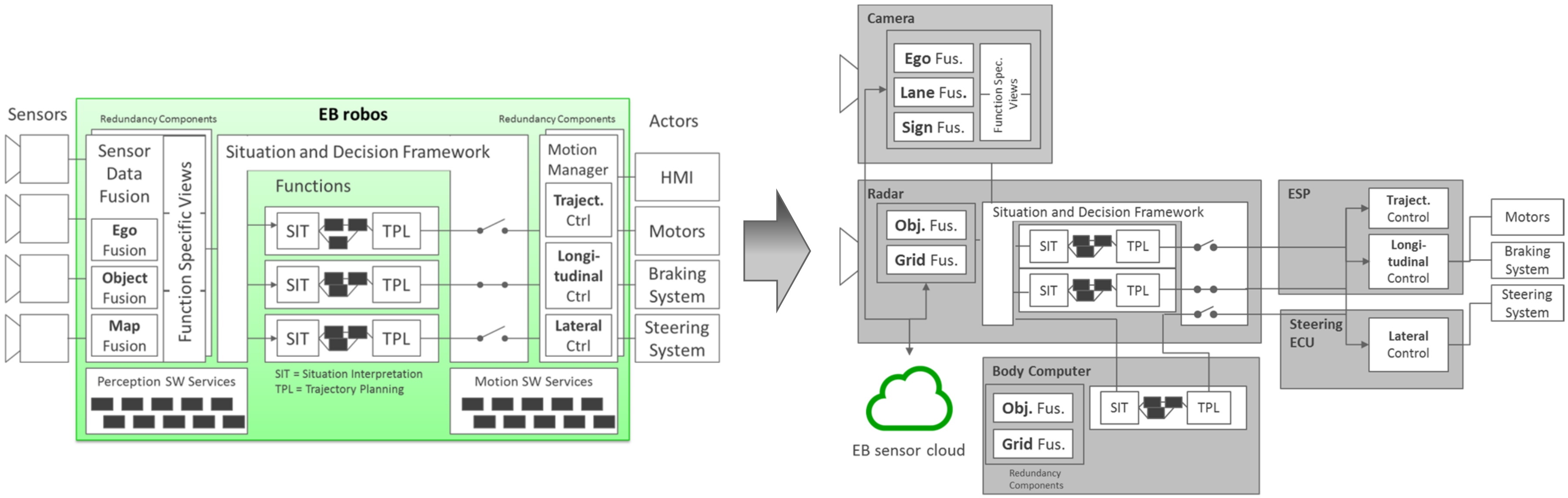
Component Example: Trajectory Planner





- Find the optimal, collision-free trajectory between car pose and target pose
- Rapid re-planning to deal with dynamic obstacles
- If configured, handle direction changes and manoeuvering

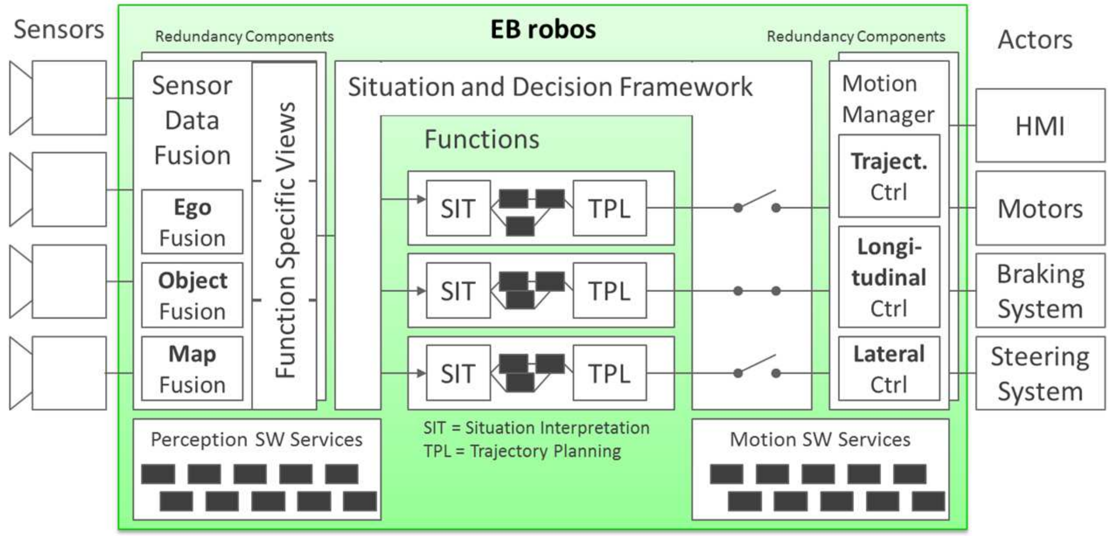
EB Assist robos can be mapped to your system.

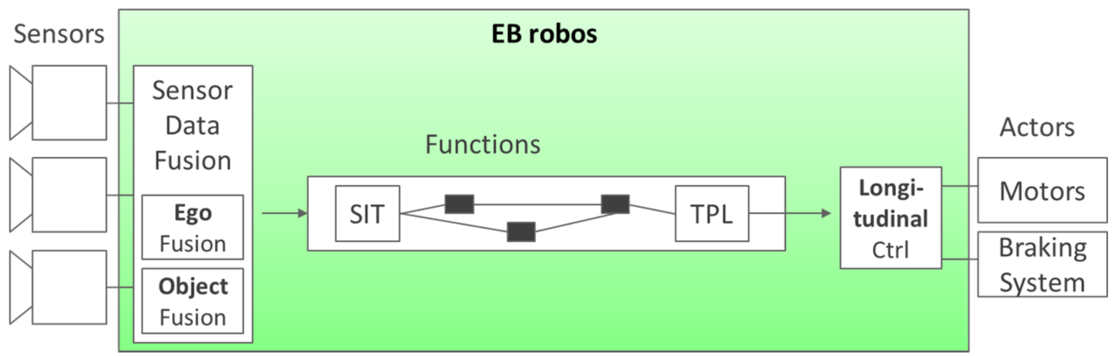


- Although integration into a central ECU is easier, it is not strictly necessary.
- **EB Assist robos** can run on a distributed system of ECUs.
  All components have scalable interfaces mapped to CAN, FlexRay, Automotive Ethernet or high-speed on-board buses.
- EB Consulting and Engineering services will help you choose the right solution for your existing systems architecture and work on migration strategies.

EB Assist robos scales with your Application.

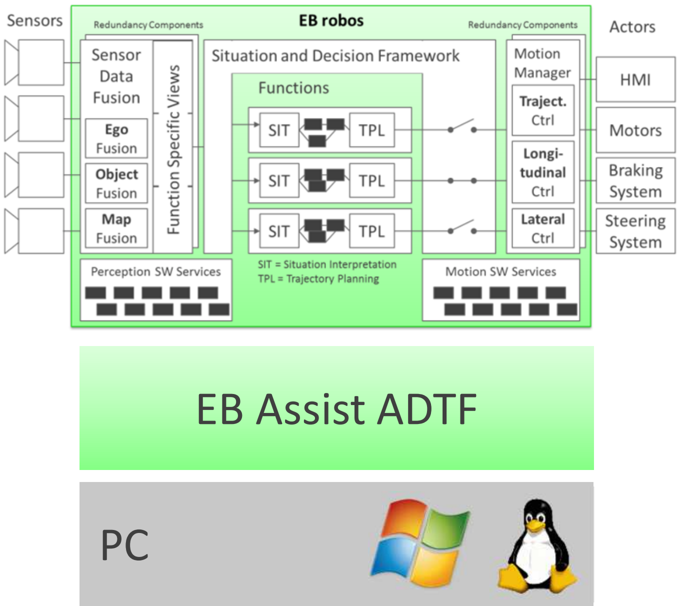
- **EB Assist robos** is built on the concept of modularity.
- Components can be added or removed depending on your need.
- Component re-use minimizes development, application and testing effort.
- Mechanisms for OTA Upgrade are currently in development.



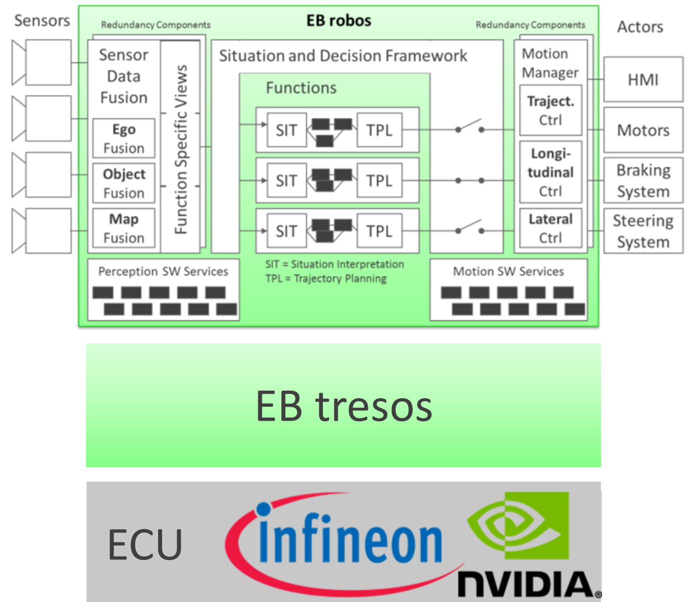


EB Assist robos is ready for Embedded.

runs on ADTF



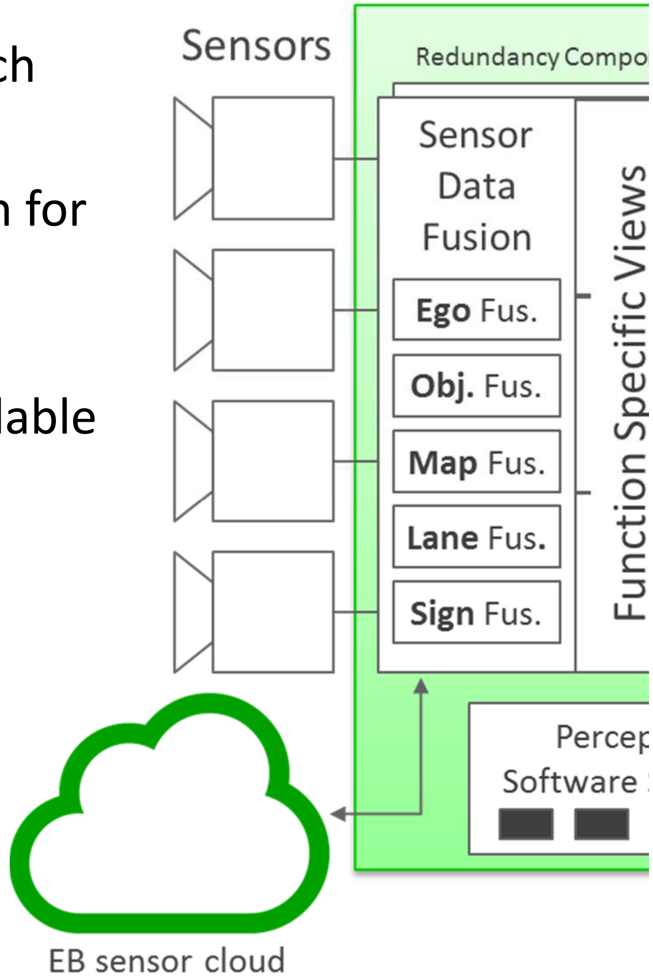
runs on AutoSAR



- **EB Assist robos** is 100% ready for embedded and safety-relevant applications.
- New components can be rapid-prototyped on PC and run in an environment of AutoSAR-tested partner components.

EB Assist robos talks to the cloud.

- **EB Assist robos** is ready to connect to a rich cloud service: **EB sensor cloud**.
- The cloud provides up-to-date information for traffic, road hazards, signs, or other data (it's extendable!)
- The cloud runs on a highly redundant, scalable backend cluster.
- Adherence to Functional Safety principles is certified, of course.
- Likewise, data protection and privacy are guaranteed.



EB Platform for Autonomous Driving

EB p@d

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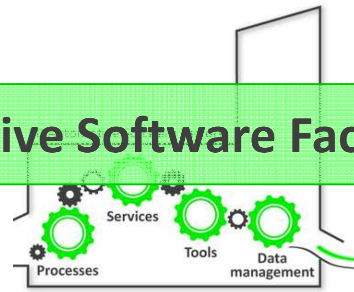
Bringing R&D software to production

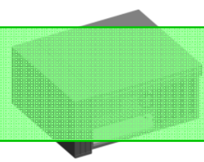
Research & Development – in the lab

EB Automotive Software Factory

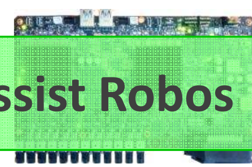


Series Production – on the road

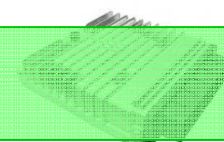
Rapid prototyping
C, C++, Model Based



Rapid embedding
C, C++



Automotive Grade
Software

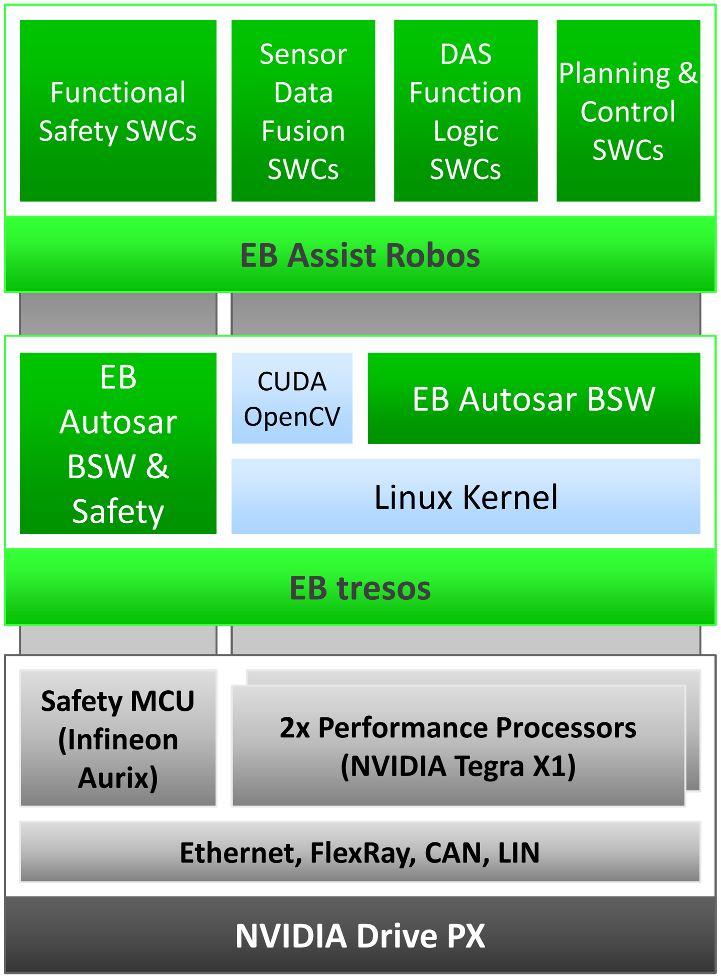


EB Assist Robos

PC **EB Assist ADTF**

ECU infineon NVIDIA **EB tresos** Target ECU

Platform for autonomous driving - PAD



Platform for autonomous driving combines powerful computing with safety-critical software to enable the advanced driver assistance systems necessary for self-driving vehicles.

- **EB Assist Robos**
  - Application-Layer Architecture and software components for automated driving development
  - Rich abstraction for ADAS tasks like fusion, planning, control, multi-function coordination, and functional safety
- **EB tresos**
  - Full Autosar basic software and safety products on safety µC
  - RTE on Linux on high-performance µC
  - OS-to-OS communication via Ethernet + SPI (planned)
- **Hardware** (NVIDIA Drive PX)
  - 2 NVIDIA Tegra X1 (RT Linux)
  - 1 Infineon Aurix (EB ACG 7.3)
- **Scope**
  - Generic platform for ADAS Applications
  - Hybrid approach for performance and mixed criticality
  - Linux & Autosar

Conclusion and Summary

- The complexity to build ADAS systems, from an integrator‘s perspective, rises exponentially into unmanageable dimensions
- Standard abstraction components are a way out of this dilemma
- EB develops a standard software architecture for scalable ADAS functions, **EB Assist Robos**, that
  - is powerful, scaleable and can be mapped to arbitrary hardware configurations
  - is sold on a component-by-component basis
  - can be integrated with existing hardware/software ADAS systems to extend their functionality
- EB develops a three-tiered hardware/software stack together with NVidia and Infineon that allows smooth migration of software components into the Robos architecture, and others
- EB integrates this new system with our existing services, tools and technologies for specification, development, testing and verification.

Contact us!

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