

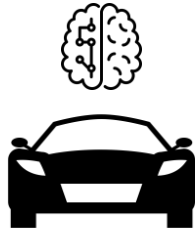
Software Updates Over-the-Air and Diagnostics



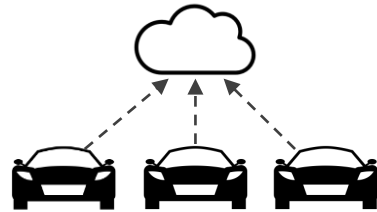
Alexander Much
August 23, 2018



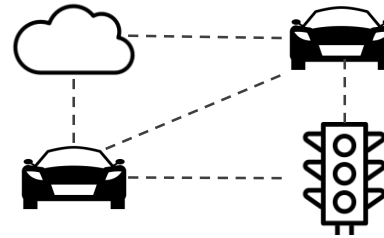
Interesting Times...



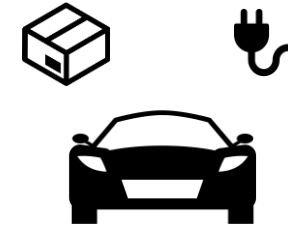
machine learning



crowd sourced data



system of systems



third party access



personalization



shortened
development cycles

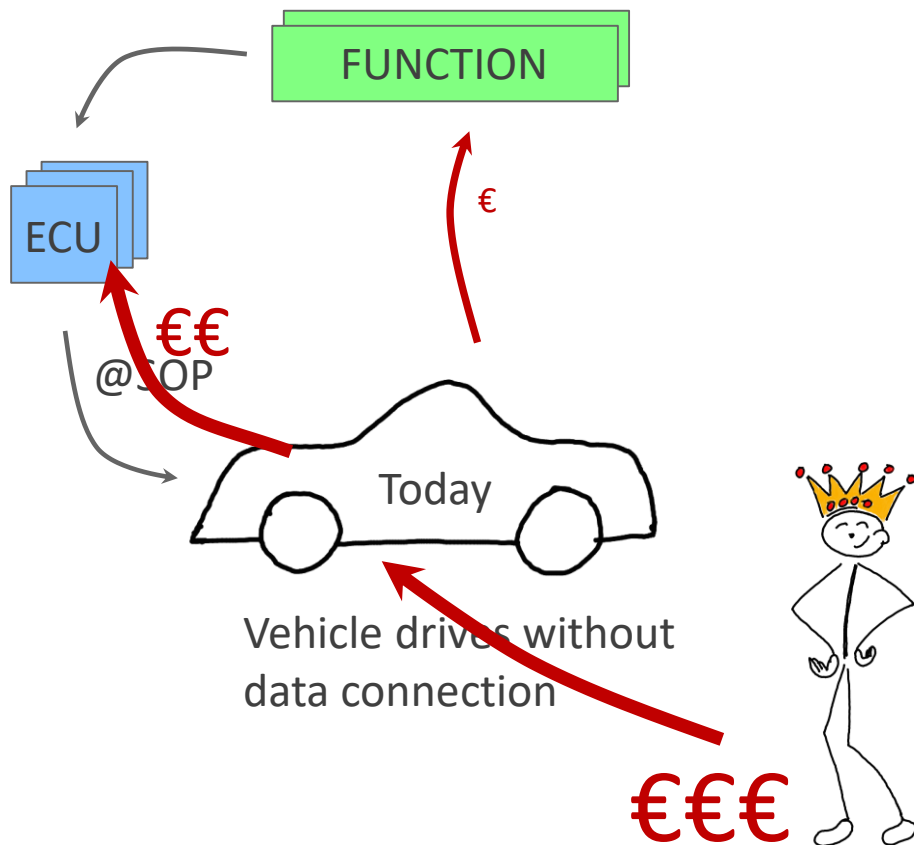


evolution after SOP



new topics
new business models

Status Today



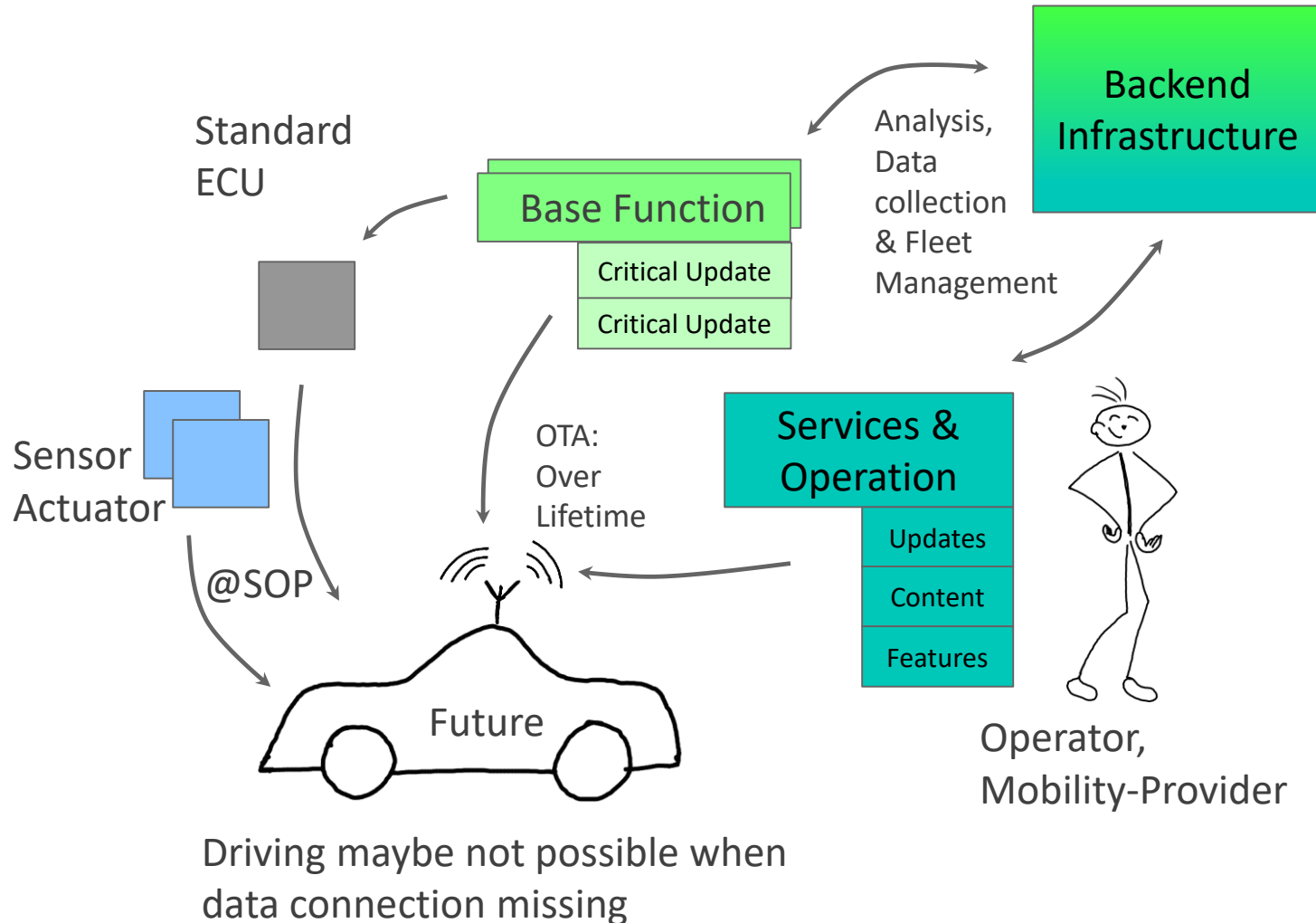
Setup:

- Main delivery of hardware and software respectively functions at SOP
- Updates will be done at garage

Business:

- Cash-Flow is Customer to OEM to Tier1, Tier2, ...
- Software value not fully visible (cost is realized, value is not)

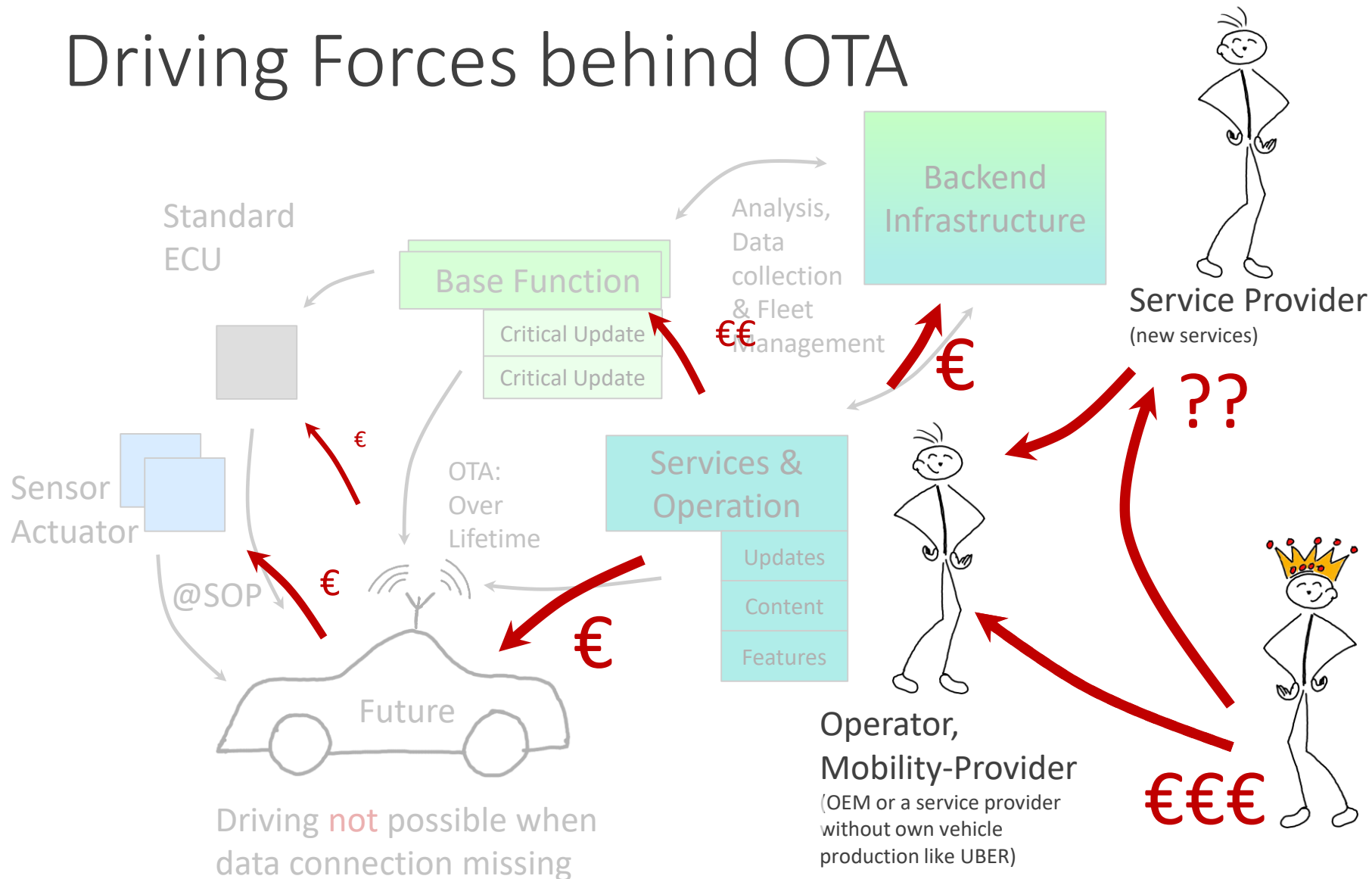
Driving Forces behind OTA



Setup:

- First delivery of hardware, software and functions at SOP
- New players enter the market with a focus on operations

Driving Forces behind OTA



Business:

- Value streams change
- Business cases always need to include both: production and operations
- Heterogeneous business models

Updates through the Ages

Classic software updates



- Physical access to vehicle necessary
- Needs to be done in repair shop

Software updates over-the-air



- Software updates executable anytime and anywhere
- Time- and cost-efficient updating of a fleet on the road

SW Update Process OTA “creates” New Challenges

Software updates over-the-air



- Software updates executable anytime and anywhere
- Time- and cost-efficient updating of a fleet on the road

Challenges for the SW update

- “Unprotected” environment / power consumption calculation necessary / download strategy
- Different embedded runtime environments and architecture
- Virtual diagnostic tester / embedded diagnostic client
- Security
- SW quality / Failover Strategy

SW Update OTA Major Use-Cases



Safety & security updates

- Prevent the intrusion of malicious software code with cybersecurity updates on connected cars
- React on new threats and vulnerabilities
- **Mitigate the impact of software-related recalls**



Functional updates

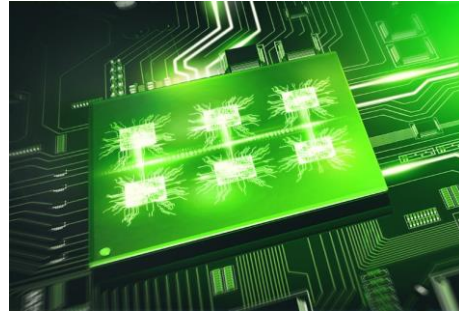
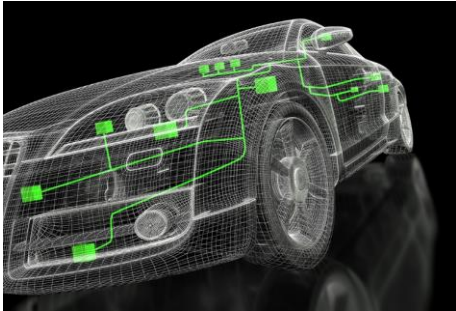
- Improve driver assistance functions on their way towards autonomous driving
- Enable Software-as-a-Service in the automotive area
- **Enable an additional source of revenue after vehicles are sold**



Infrastructure use-cases

- Update the vehicle's ECU's during manufacturing
- Enable **remote diagnostics** on a fleet of cars on the road
- **Predict failures** by conducting data analysis on the collected data

Benefit from our In-Vehicle Know-How



Classic AUTOSAR

- Deep understanding of underlying operation systems and basic software for update process
- Success story:
 - AUTOSAR migration for Renault-Nissan-Mitsubishi Alliance

Adaptive AUTOSAR

- EB is a supplier for SW for high performance controllers on the road in 2019
- Offering includes basic software, operating systems (Linux), Hypervisor, and tooling

Functional safety

- Basic software configuration and development to fulfill project requirements
- Functional safety concepts based on EB's safety products
- ASIL- and SPICE-compliant development processes

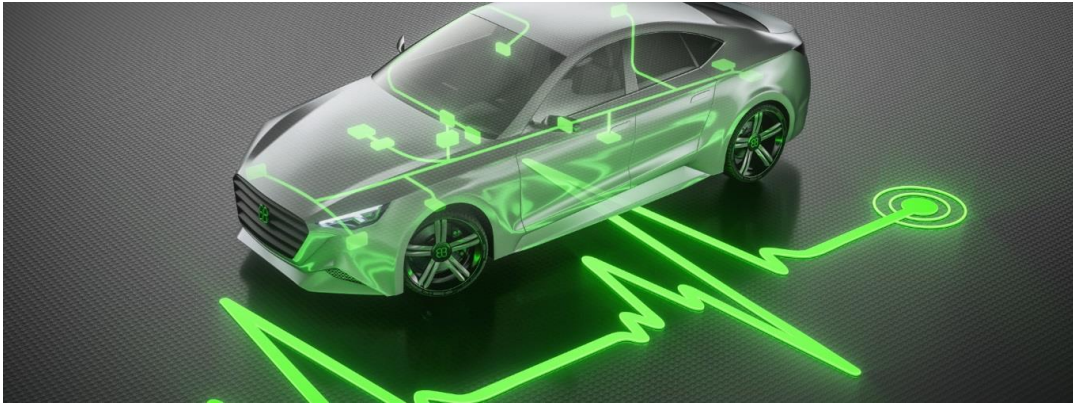
Security

- Secure SW base for ECUs
- On the road in >36 million vehicles
- EB's portfolio is extended by Argus' offerings to enable a one-stop-shop

Software integration

- Can be integrated in any cloud environment
- Success stories:
 - ADAS integration for Daimler
 - Ford Sync integration

EB cadian Product Line at a Glance



EB cadian Analytics

Remote analytics tool to gain valuable insights from the fleet on the road, and as a powerful basis for updates.

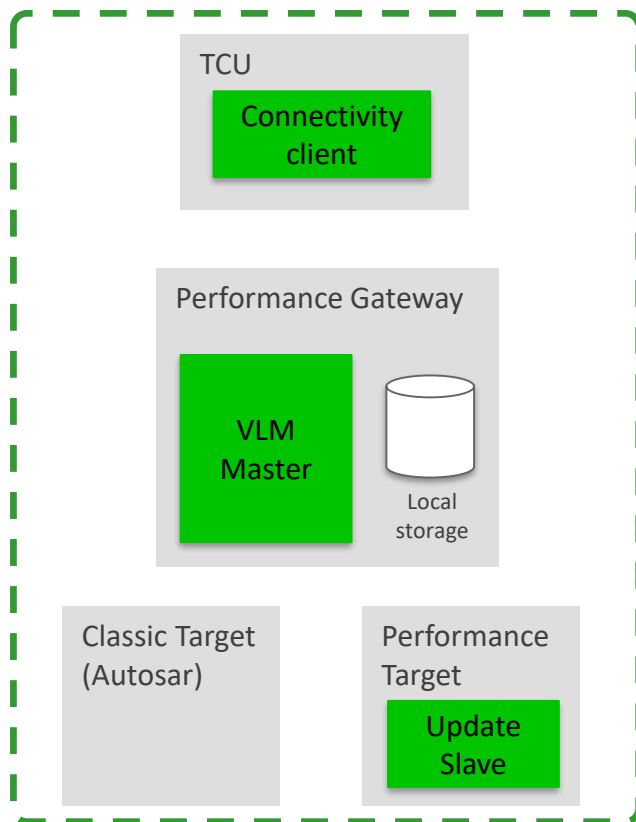


EB cadian Sync

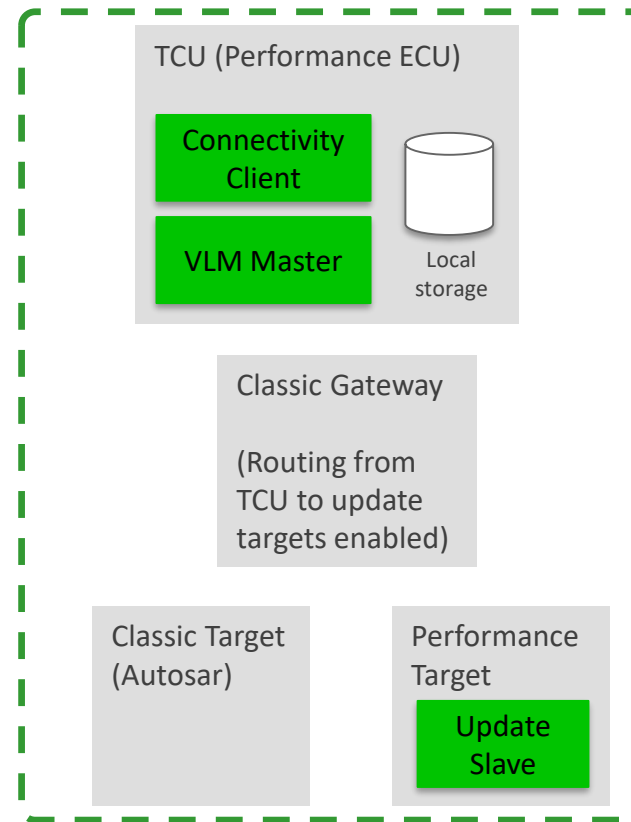
Secure software updates over-the-air.

On-Board OTA Component Allocations

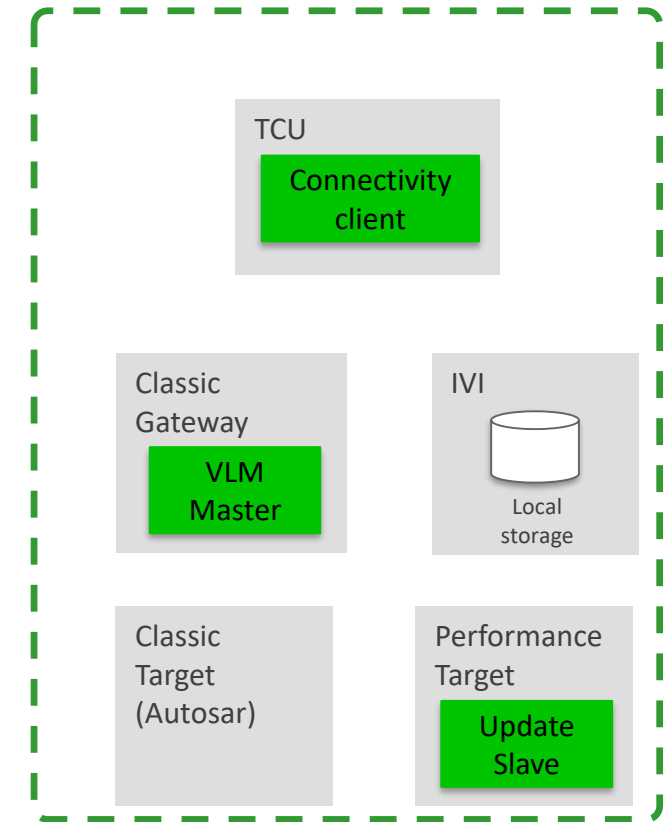
Example 1



Example 2

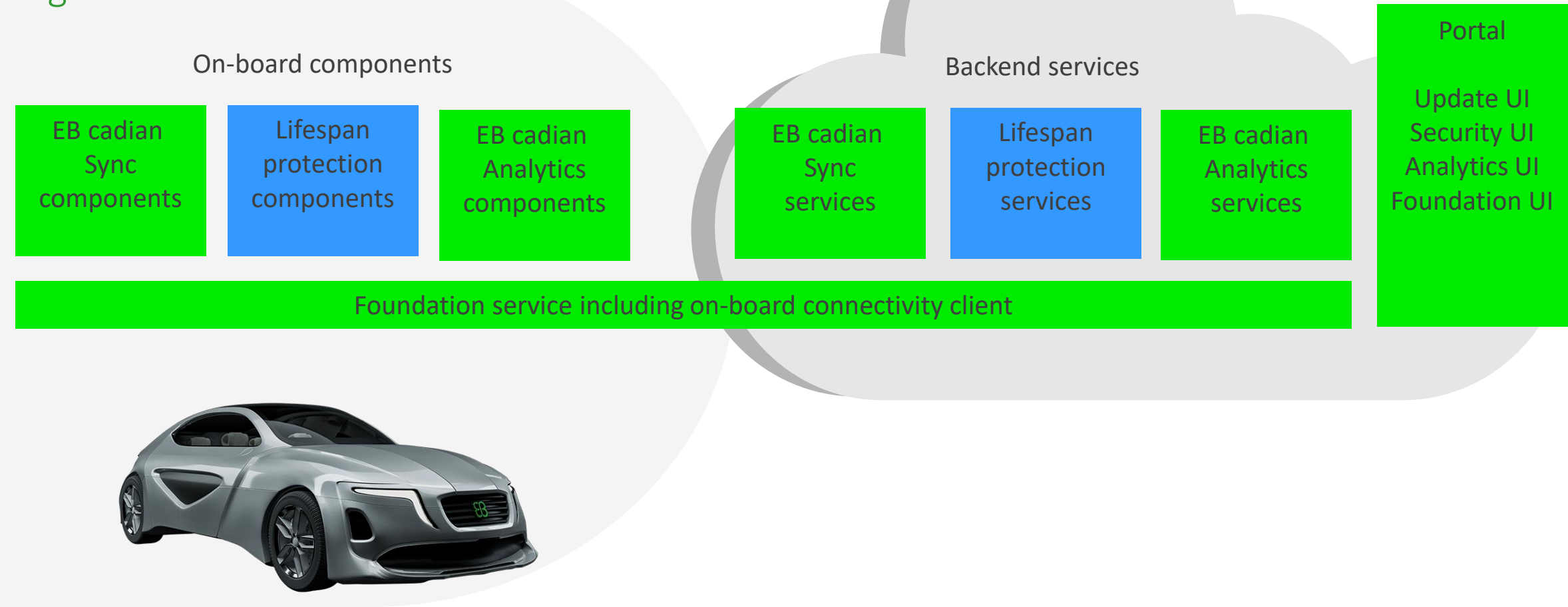


Example 3



Modular Solutions for Maximum Flexibility

High level overview of EB cadian

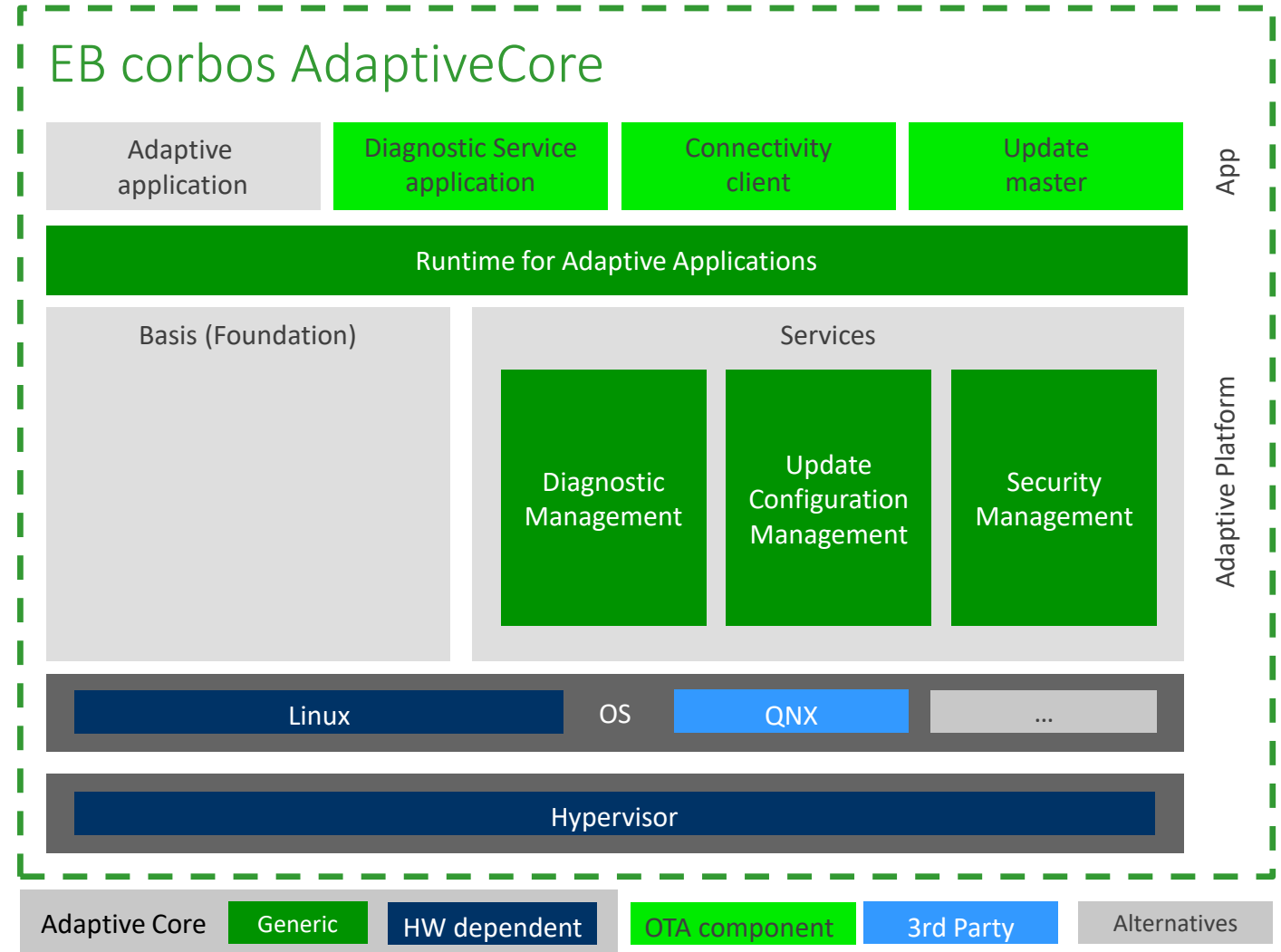


Argus service/component

Software Updates Over-the-Air in AdaptiveCore

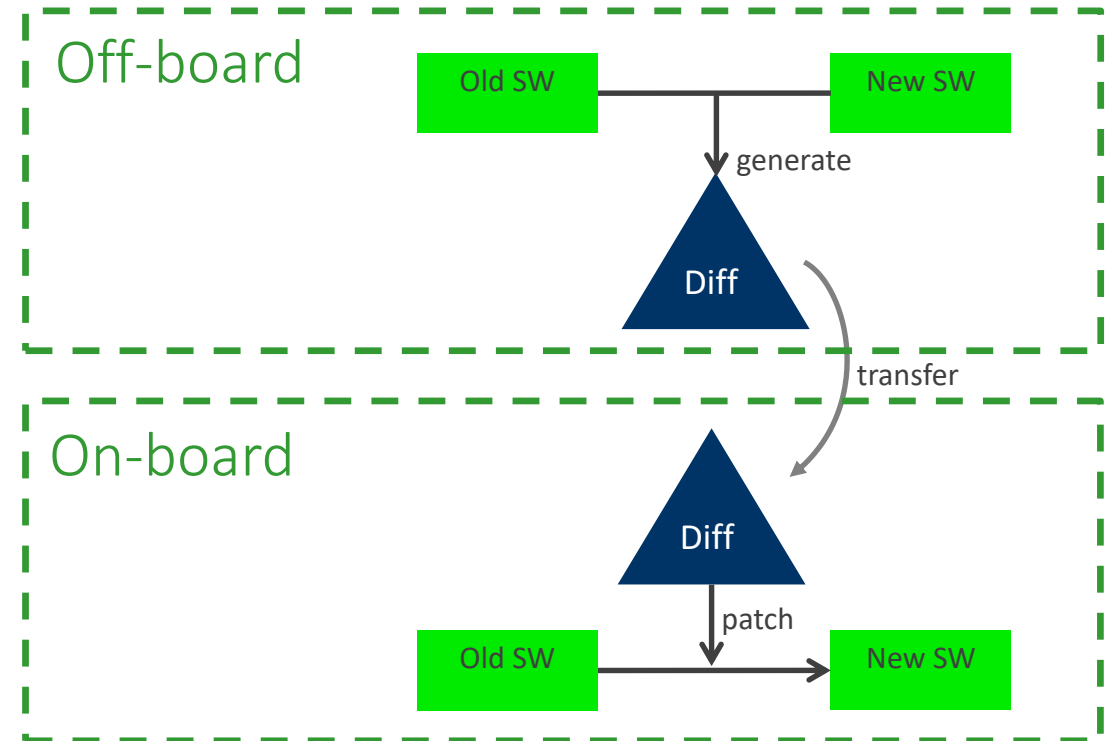
EB corbos

- Update capability the Adaptive AUTOSAR is provided by services in the Adaptive platform
- On application level, the Connectivity client to enable backend communication and the Update master as central update manager are required

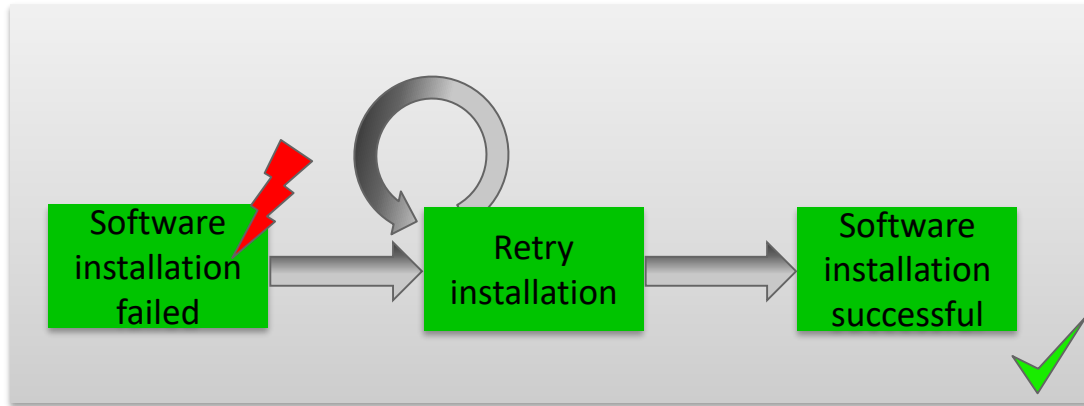


Benefit from Differential Updates

- Save costs by saving bandwidth
- Reduce update time through differential updates
- Creation of a differential file between initial software version and new software version on binary level
- Application of the diff to the target image

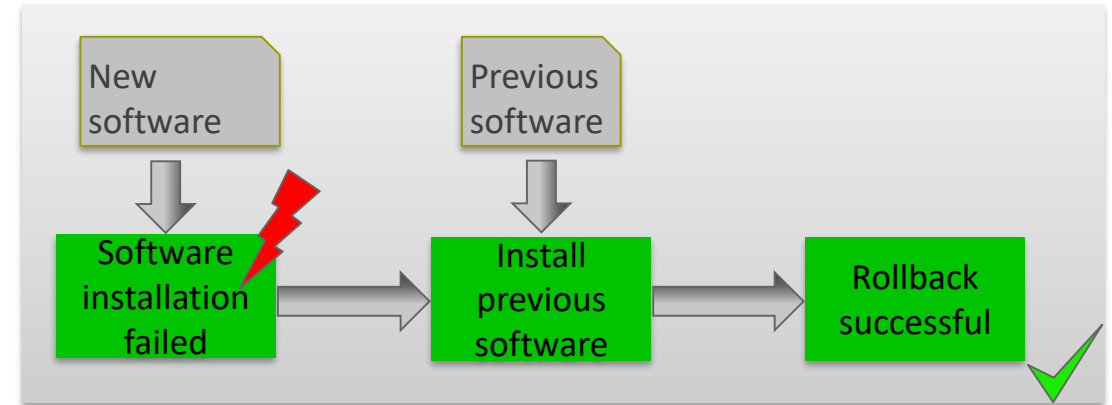


Failover Strategies in Detail



Retry

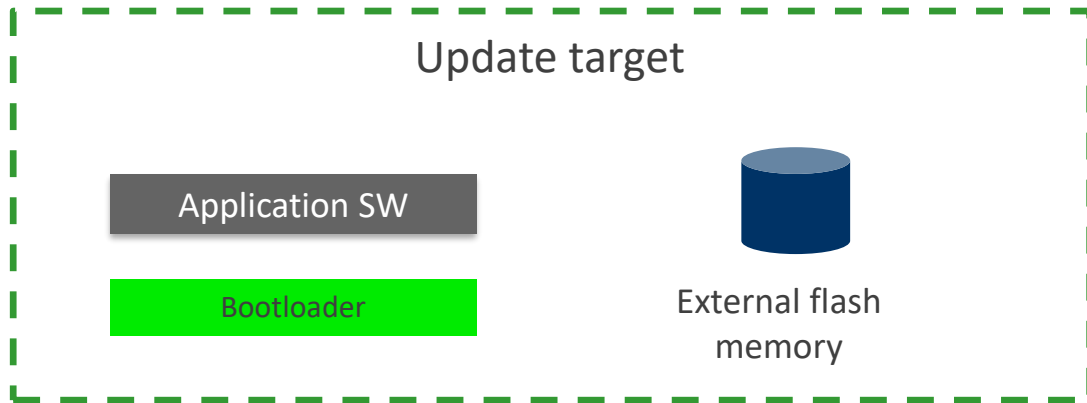
- In case of a failure during or after installation of the new software it is installed again to bring the target ECU back to an operational state
- Retry logic is in the VLM master
- Amount of retries is configurable



Rollback

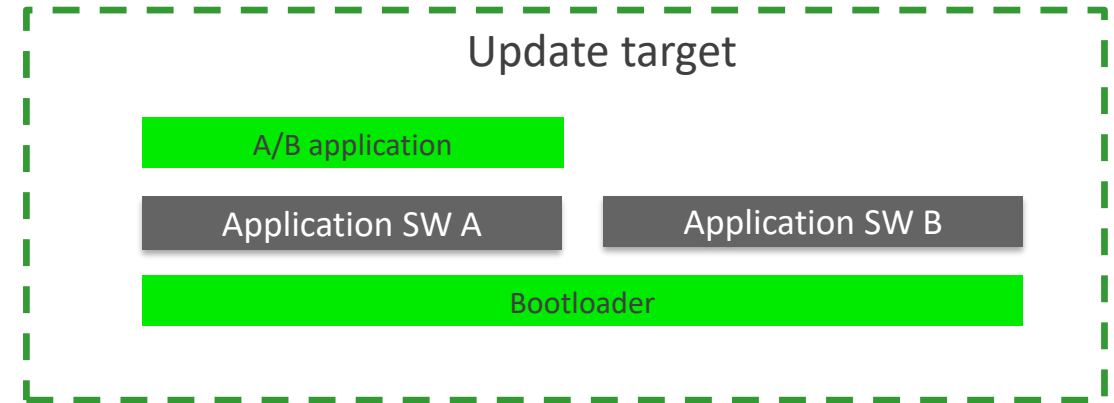
- In case of a failure during or after installation of the new software the latest operational software will be installed again to bring the target ECU back to an operational state
- Rollback logic is in the VLM master or in the target ECU
- Requires additional storage to preserve the “old” software

Failover Strategies in Detail



A/B/A' with external flash

- Download of the new application software (plus the old one – optional) to an external flash memory on the target ECU
- Update of the internal NvM with the previously downloaded software from the external flash memory
- In case of a failure the initial application software may be restored with the 2nd application image initially stored in external flash memory



A/B swap (double-bank)

- Internal NvM is available with at least twice the size of the application software
- New software application is installed to the 2nd flash segment while parked
- When 2nd application was installed successfully, ECU will boot the new software
- Update while driving is possible with an additional SWC for installation of 2nd application while driving

Key Technologies for Connected Cars

EB cadian Sync

The way to manage higher SW complexity and shorter development and update cycle.

Enabler for new business – SWaaS, new features for cars on the road



EB cadian Analytics

Key technology to update SW inside a car and enable new features.

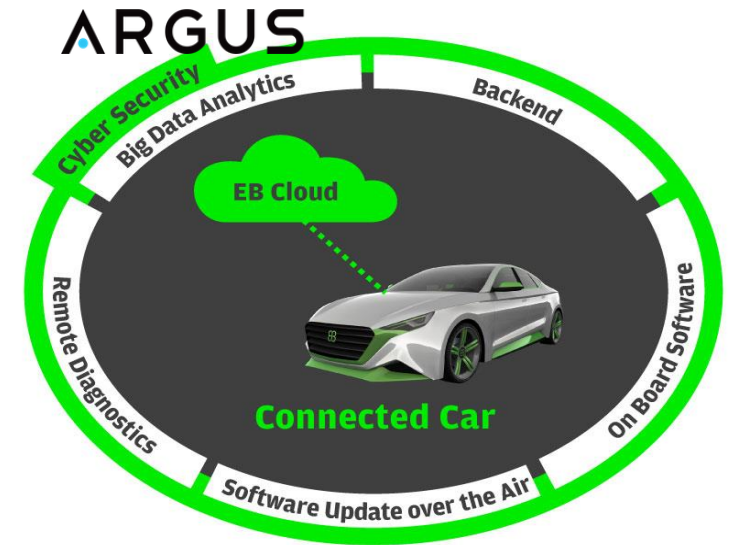
Key technology to collect data for further analysis.

Change from “connected” to “embedded”



Elektrobit offer

End-to-end products for Connected services and Cyber Security using SW update OTA and embedded Diagnostics



Thank you!



alexander.much@elektrobit.com
www.elektrobit.com

