Software updates over the air
Demands and challenges

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Software update over the air with EB cadian Sync

Agenda

1. About Elektrobit
2. Challenges for software updates over the air
3. Demands for software updates over the air
4. EB’s solution
5. Conclusion

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About Elektrobit
Technical competencies
EB’s technical core competencies are development of automotive-grade (software) products and engineering services.

Employees
More than 2200 employees* worldwide. Spans three continents and ten countries.

Consistent growth
Average growth (CAGR) > 10 %

Global presence
Development and business offices in Austria, China, Finland, France, Germany, India, Israel, Japan, Romania and USA.

Continental AG
Wholly owned, independent subsidiary of Continental AG.

100+ million
Over 90 million vehicles on the road and 1 billion embedded devices.
Driving technology further — products & solutions

Automated driving
- Hardware and software products for development, test, visualization, and validation.
- Key software components to bring automated driving functions and systems to serial production.

Vehicle infrastructure
- AUTOSAR standard
- Single- & multi-core OS
- Functional Safety OS
- Embedded Security
- Automotive networks, e.g. Ethernet

Connected car
- Intelligent big data analytics & online diagnostics
- Scalable backend infrastructures
- Cyber security solutions plus modular add-ons by Argus
- Software updates over the air

User experience
- Navigation client for connected use cases
- Electronic horizon provider enabling map-based ADAS functions
- Model-based development of multimodal user interfaces
- Augmented reality solutions

Consulting services
- Consulting services for Functional Safety and Software Architectures
- Lean Software Development
- Established agile processes

Verification and validation
- End-to-end testing of complex embedded software systems
- Test concept development
- Independent verification and validation of software systems

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Challenges for software updates over the air
By 2025 98% cars sold will be connected

Challenges for software updates over the air

Automated driving
New safety laws dictate connectivity
Digital services and new business models
Mobility as a service
End-to-end security
Evolution of E/E architectures

- **Today**
  - Signal-based communication
  - System of ECUs
  - Predictable communication
  - Function orientated topology

- **Tomorrow**
  - Central computing nodes
  - Mix of signal based and service orientated communication
  - Partly centralized functions
  - Software upgradeability

- **Future**
  - IP/Ethernet communication
  - Centralized applications / functions
  - Computing power for AD and AI
  - Anything anywhere (sensors/actors)
  - Architecture follows software / system demands
Future value will be created through software

Value of a car: today vs. tomorrow

Source: Morgan Stanley Research, 2013: Autonomous Cars: Self-Driving the New Auto Industry Paradigm
Amount of variants raises complexity

Dimensions of variants

- Configuration variants
- Brands, regions
- Functions

Effort for software management

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OTA updates require failover strategies

- **Retry**: A/B/A’ with external flash
- **Rollback**: A/B swap (double-bank)
Connected services open the door to new threats

- Brute force
- Packet sniffing
- MITM (Man in the middle attack)
- Jamming
- DOS (Denial of service attack)
Challenges for software updates over the air

Cybersecurity and over-the-air update

- Various legal regulations for Cybersecurity underway in US, UK, China, EU
- ISO/SAE 21434 – Cybersecurity Engineering – will be published end of 2019

Security has more aspects than functional safety

- To be addressed during product R&D
- Over whole product lifetime
- Company infrastructure and IT systems to be included
Demands for software updates over the air
Demands for software updates over the air

Flexibility in deployment

TCU
- Connectivity client

Performance Gateway
- Update master
- Local storage

Classic Target (AUTOSAR)
- Update slave

Classic Gateway
- Update master
- Local storage

TCU (Performance ECU)
- Connectivity client
- Update master
- Local storage

Classic Gateway (Routing enabled)
- Update slave

TCU
- Connectivity client

Classic Gateway
- Update master
- Local storage

IVI
- Update master
- Local storage

Classic Target (AUTOSAR)
- Update slave
Combining technologies for OTA update solutions
Security over the whole software lifecycle

Demands for software updates over the air

- Security can not be added “later“!
  - Security
  - Specification
  - Architecture & Design
  - Implementation
  - Test

- TARA
- Low code complexity
- Load and penetration tests
EB’s solution for software updates over the air
Our connected services

**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.
Vehicle lifecycle management with EB cadian

On-board
- EB cadian Sync
- EB cadian Analytics

Off-board
- EB cadian Sync
- EB cadian Analytics

EB cadian Foundation

Portal
- Update UI
- Analytics UI
- Foundation UI
EB cadian Sync modules

EB cadian Sync backend
- Manages SW/HW dependencies, versions, vehicles and campaigns
- Generation of update packages
- Generation of differential updates
- Data exchange with OEM backend
EB cadian Sync modules

Connectivity client
- Provides central functions for connected services, i.e.
- Download/upload of data
- Authentication
- Logging

TCU
- Connectivity client

Gateway
- Update master

Classic ECU 1
- Differential slave

Performance ECU
- Application update slave

Classic ECU 2
- A/B slave
EB cadian Sync modules

**Update master**
- Central on-board component of EB cadian Sync
- Manages installation of updates
- Interacts with the vehicle network to enable safe and secure updates
- Enables interaction with the end user
EB cadian Sync modules

Application update slave
Efficient installation/update of applications, hypervisor, bootloader on performance ECUs
EB cadian Sync modules

Differential update slave
Bandwidth and time saving installation of updates
EB cadian Sync modules

A/B update slave
Robust installation of updates with optional local rollback
EB cadian Sync

End-to-end design and development

Reduce costs and vehicle downtime by using state-of-the-art delta and A/B update capability

Ready-to-use OTA distribution platform with full software, fleet, vehicle, and update campaign management

Trusted data exchange on all levels from the ECU to the cloud

Platform independent, modular onboard software components

Security products from our preferred partner Argus complement EB cadian Sync perfectly
Conclusion

Software updates over the air ...

... enable new business models

- Provide functional updates for your in-vehicle software
- Improve driver assistance functions on their way towards autonomous driving
- Enable Software-as-a-Service in the automotive area

... mitigate the impact of SW related recalls

- Use remote analytics to identify the need for security related updates
- Prevent the intrusion of malicious software code with cybersecurity updates on connected cars
- React immediately on new threats and vulnerabilities
Conclusion

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
Benefit from our expertise

Managing complexity by handling software variants

- > 15 years of experience in the field of data logistics for ECU software
- Numerous projects for provisioning of ECU software for vehicle production
- Remote vehicle data platform for Continental: vehicle diagnostics independent of vehicle manufacturer, or vehicle type requires deep understanding of in-vehicle ECU software variants
Thank you!

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