Embedded approach to Remote Diagnostics

Enabling ‘On-the-Go’ repairs

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Agenda

- Introduction
- Service & Diagnostics in Transition
- On-Board served Diagnostics
Heritage or Legacy

- **Complex Electronic Architecture**
  - 1 to 6+ CAN busses
  - Individual components serviced via Ethernet, USB-media and Serial means

- **Diverse set of Diagnostic Protocols**
  - KWP variants, J1939 variants, proprietary protocols

- **Manufacturing & Service Tools**
  - Collection of data driven and custom built components
  - Very limited Operating System and Vehicle Communication Interface abstraction
Diagnostic environment has changed

 Repair and Maintenance Information (RMI) & Right 2 Repair (R2R)
  • Non-discriminatory access to Service & Diagnostics information and procedures

 Service and Diagnostics overhaul:
  • Move protection inside the Product
  • Reduce protocol variants
  • Data driven Diagnostic Tools
  • Seamless portability from Manufacturing stations to Service Tool instances to Remote Diagnostic & Telemetry services
How do we tackle this challenge?

IT Infrastructure → Technical Publications

Order, Produce, Record

Manufacturing

Diagnostic Content

UI microservices

DoIP & DoCAN

Service Tool

Diagnostic Gateway

Standard Diagnostic Runtime & Diagnostic API

Technical Publications

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Technical Publications
What does a standardized diagnostic core mean?

**Data Driven:**
- ODX descriptions for all electronic components
  - Starts before the product is designed
  - Maintained through the lifecycle of the product
- OTX sequences for all interactions with electronic components
  - Development and Test
  - Manufacturing operations
  - After sales service operations

**UI separation:**
- Different functions have different UI requirements: decouple UI

**Service tool agnostic:**
- Data and sequences need to be able to be executed in different environments
From “classic” service tool
to onboard diagnostic server

IT Infrastructure

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On Board Diagnostic Server

UI microservices

ECU 1

ECU 2

ECU 3

ECU 4

ECU 5
to remote service

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Telemetry
In practice

- Bandwidth and cellular coverage have limitations

- Certain service procedures require operator oversight or operator intervention

- "Blending" up-to-date service information with machine diagnostics is a key benefit of the new service solution that has to be maintained
The practical variant

IT Infrastructure  Technical Publications  Diagnostic Content  Diagnostic Content

Order, Produce, Record

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Technical Publications

Diagnostic Content

UI microservices

Manufacturing

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Technology proof of concept
Technology conclusion

- **Onboard (telemetry) hardware is capable to:**
  - Execute standardized diagnostic content
  - Serve diagnostic data as micro services for integration in service tool UI
  - ARM A9 dual core, 650 MHz, 512 MB RAM / 2 GB flash

- **Leverage onboard hardware to:**
  - Protect the machine: authentication & encryption
  - Standardize the machine diagnostic interfaces
Final remarks

- **Impact on product development processes**
  - Machine electronic architecture requirements
  - Managing machine variants, options and configurations
  - Connecting all functions in an organization
  - Supplier parts management

- **Standardized content + separation of UI**
  - Enables diagnostic packaging down to individual machines
  - Enables integration of fleet level service instructions with machine state in real time