Unified Diagnostic Services
Remote Use Cases

Jim Samuel
Dearborn Systems Ltd

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Unified Diagnostic Services

- This is the new title for ISO 14229
- Supports the vehicle manufacturers wider requirements
- A diagnostic service is a specific communication function not required to deliver a systems normal function
- Communication is between systems on the vehicle and external test equipment
- The services are described independently of the communication protocols which will deliver them
- The implementations on specific protocols are or will be described in other standards
The Fully Networked Car, A Workshop on ICT in Vehicles
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Enhanced Service Structure

ISO 14229
Enhanced Diagnostic services definition

ISO 15765 – 3
Application Layer services

ISO 15765 – 2
Network Layer services

CAN 2.0

ISO 114230 – 3
Application Layer Services on KWP2000

ISO 15765 – 2
Implementation of unified diagnostic services

ISO 11898-2,-3, SWCAN etc

SAE J2190
Enhanced Diagnostic Test Modes

SAE J1850

ISO 114230 –3

CAN 2.0

ISO 114230 –1

ISO 11898-2,-3, SWCAN etc

SAE J1850

ASAP

Network/Transport

Physical

Data Link

Application
Diagnostic Service Functionality

• We may wish to see data stored within a system - such as Trouble codes - or some form of identifications.
• We may wish to see live data - such as Engine or vehicle speed.
• We may want to transfer large amounts of data - for example reflashing a module.
• We may wish to take direct control of a module's I/O - for example disabling individual cylinders to identify a fault.
• We may wish to run specific routines already in a module - such as some form of self calibration.
• We may wish to apply security locks to certain services, or to allow the normal function of a system to be disturbed to varying degrees.
### Functional Units

The services are organised into functional units. There are several services defined in each unit.

<table>
<thead>
<tr>
<th>Unit Name</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnostic and Communication Management</td>
<td>Controls a diagnostic communication session. Determines which services may be accessed</td>
</tr>
<tr>
<td>Data Transmission</td>
<td>“Live” data transmission</td>
</tr>
<tr>
<td>Stored Data Transmission</td>
<td>Recovery of fault data</td>
</tr>
<tr>
<td>Input / Output Control</td>
<td>The tester controls a module's inputs or outputs</td>
</tr>
<tr>
<td>Remote Activation of Routine</td>
<td>Run and recover results of a system's in built test</td>
</tr>
<tr>
<td>Upload / Download</td>
<td>Transfer of large data packets</td>
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Remote Use Cases

- We are going to look in a little more detail on two uses of the services where the client is remote.
- The first case looks at performing some remote diagnostics to identify which component needs replacing.
- The second case allows an OEM to reprogram a module in a vehicle bought in for service.
- We will look at the overall architecture and which services might be used.
- In each case we require a telematic module connected to the vehicle.
Possible Vehicle Architecture

Main in Car Network (CAN)

LIN subnets

Infotainment

Radio  Phone  GPS  Display
Remote Diagnostics Use Case

Operator notices fault

Vehicle calls service centre
Remote Diagnostics Use Case

Operator notices fault

Service Centre Requests secure access

Vehicle calls service centre
Remote Diagnostics Use Case

Operator notices fault

Service Centre Requests secure access

Vehicle allows access
Remote Diagnostics Use Case

Operator notices fault

Service Centre Requests fault data
Remote Diagnostics Use Case

Operator notices fault

Service Centre Requests fault data

Vehicle provides Fault data
Remote Diagnostics Use Case

Operator told How to repair

Experts determine fix

Data provided to experts
Remote Diagnostics Message Flow

Service centre                  Telematic Gateway                  Vehicle ECU

Establish Connection

Security Access

RequestSeed

RequestSeedPositiveResponse

SendKey

SendKeyPositiveResponse

ReadDTC Information

reportDTCByStatusMask

reportDTCByStatusMaskPositiveResponse

reportDTCByStatusMaskResponse

reportDTCByStatusMaskResponse
Calibration Download Use Case

Calls Service Centre
For updates

Downloads new Calibration
Remote Calibration Download Use Case Message Flow

Service centre

- Request Download
- RequestDownloadPosResponse
- TransferData[Block1]
- TransferDataPosResp[Block1]
- TransferData[BlockN]
- TransferDataPosResp[BlockN]

Telematic Gateway

- Request Download
- RequestDownloadPosResponse
- TransferData[Block1]
- TransferDataPosResp[Block1]
- TransferData[BlockN]
- TransferDataPosResp[BlockN]

Vehicle ECU

- Request Download
- RequestDownloadPosResponse
- TransferData[Block1]
- TransferDataPosResp[Block1]
- TransferData[BlockN]
- TransferDataPosResp[BlockN]
Summary

- Automotive Industry has defined a set of common diagnostic services
- When implemented on vehicles with a telematic capability they provide the opportunity to implement a number of remote functions