Dictionary Server for Remote Vehicle Communication

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Abstract

Driven by a continuous process of innovation, car manufacturers are extending their services portfolio to Mobility Services and Remote Capabilities. Due to IT-improvements in the automotive industry, the complexity of the internal network of vehicle control units is growing. To make an abstraction of this complexity, several standards have been published. One of them is the Diagnostic Server (D-Server), which is responsible for providing the necessary information to interact electronically with a vehicle’s control units. However, manufacturers or IT-service providers implement these services in an architecture that is not suitable anymore to fulfill customers expectations nowadays, in terms of remote capabilities on one side, and in an IoT environment on another side. In this context, we propose a Dictionary Server, designed in another architecture which provides more flexibility than the D-Server mentioned above. This architecture allows OEMs to propose mobility services, offers a better protection of their know-how while opening a way for a smooth implementation of vehicle communication systems with memory- and computing capacity-limited devices.

Introduction

Remote vehicle diagnostic, remote package delivery, cooperative parking are one of the focus of car manufacturers today. There are also vehicle data, measurements, input/output parameters, ECU configuration and memory programming as discussed in [9]. Furthermore, the remote firmware upgrade as discussed in [9]. There is also the remote predictive maintenance as discussed in [9]. Moreover, the remote firmware upgrade, which could even be commercialized as a feature-on-demand service. However, the Dictionary Server strongly depends on the network. Overall, the data model of the ODX Dictionary and the ODX Dictionary Service must be undertaken with scrutiny.

ISO 22901-1 & ISO 22900-3

The ISO 22901-1 specifies the data exchange format in and describes diagnostic capabilities of physical ECUs needed throughout the life cycle of a vehicle from development, testing, production to after-sales and service. Diagnostic information is made up of Diagnostic Trouble Codes (DTCs), diagnostic requests and responses, communication parameters, identification data, input/output parameters, ECU configuration and memory programming data amongst others [3]. It ensures that diagnostic data from any vehicle manufacturer is independent of the hardware and software supplied by any equipment manufacturer.

The D-Server provides an uniform access to ECUs. It is designed to provide a standardized and abstracted access for applications to ECU’s communication parameters and measurement data via an universal object-oriented API. This interface completely separates applications from hardware, bus-, protocol- or vendor-specific properties of subsequent components of the tool chain [7]. Consequently, based on this norm, the external device only needs to communicate with a D-Server [5]. It is required however to be configured with ECU-specific information. Apart from describing communication parameters with ECUs, ODX-files also encapsulate the translation process of messages from physical layers to clear text. An example is shown in the Figure 1 [8].

Discussion and Outlook

The Dictionary Server opens new possibilities to support remote services. As an example, during a vehicles recall campaign, remote Software Updates could be performed. Remote and real-time emission controls and measurements are also another important aspect. There is also the remote predictive maintenance as discussed in [9].

The Dictionary Server shifts the D-Server’s complexity and encapsulates its structure on a remote server (Figure 2). It improves the physical architecture of the Figure 1 by:
- harmonizing communication protocols (e.g. a web service gateway);
- enabling a lightweight data exchange format between third-parties;
- moving the queries’ complexity of the ODX database to a remote server.

Dictionary Server

The Dictionary Server structure on a remote server (Figure 2). It improves the physical architecture of the Figure 1 by:
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Figure 2: Dictionary Server architecture.

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References


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