ETAS VCI

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A modular platform for vehicle communication

Figure 1: ETAS VCI (Vehicle Communication Interface) module for vehicle diagnostics.

Due to the growing number of intelligent automotive systems and electronic components, efficient vehicle maintenance is becoming increasingly complicated. To make error detection and troubleshooting of these complex electronic systems more efficient in the future, new tools and methods will need to be integrated into diagnostic procedures. The modular Vehicle Communication Interface (VCI) will provide the foundation for the development and application of advanced diagnostic concepts.

Working in concert with a computer, VCI modules replace many of the functions that were covered by scan tools up to now. ETAS has developed a platform which will serve as a powerful diagnostic interface between a host computer (PC, laptop, tablet PC, PDA, etc.) and the vehicle ECU network (Figure 1).

A VCI platform-based vehicle diagnostic system consists of a host computer, the VCI hardware and firmware, and the application software handling diagnostics and service. Connected to the vehicle's diagnostic data link connector, the VCI module handles the data transfer between the host computer and the onboard ECU network. Equipped with a microprocessor, the module acts as the gateway between the vehicle's ECUs and the host computer, with which it can communicate by means of a cable or wireless connection. For the data exchange with the ECUs, a plethora of physical communication links and protocols – of the types used in the current and future generations of vehicles – are and will be available (Figure 2, left).

MVCI software architecture

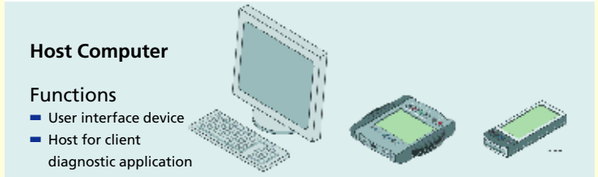
The ETAS VCI supports the software architecture stipulated in the new MVCI standard as per ISO/CD 22900 "Road Vehicles – Modular Vehicle Communication Interface (MVCI)". Beyond this, the ECU reprogramming functions described in SAE J2534 „Recommended Practice for Pass-Thru Vehicle Programming" are available in the form of client applications. It is the aim of both the MVCI architecture and the related SAE J2534 standard to abstract the detail mechanisms of the lower levels of vehicle communication protocols in order to facilitate the exchange of software and VCI hardware between a variety of diagnostic applications. The MVCI architecture specifies the Open Diagnostic Data Exchange (ODX) format for both exchange and shared utilization of vehicle and ECU data.

The MVCI protocol handling software module comprises the physical interface to the vehicle's ECU network and provides the protocol processing functions for ECU communications. Implemented on the diagnostic interface, this module communicates with the MVCI server through the Diagnostic Protocol Data Unit Interface (D-PDU) API.

In systems lacking an MVCI server, the application can communicate directly with the VCI module through the D-PDU or the SAE J2534 interface (J2534 API). The functions provided by the J2534 API form a subset of the D-PDU API.

Interfaces

The VCI module supports J2534 as well as D-PDU client applications for ECU reprogramming and vehicle diagnostics. In addition, the VCI module is capable of integrating an MVCI D-Server, along with the associated file system containing ODX runtime data, with its entire functional complement. The module also contains a web server interface for the purpose of enabling thin clients to control and configure the VCI module by means of browser access through the VCI API. A separate SMB interface enables access to the VCI file system from the host computer. To support advanced client applications, the VCI module integrates, as a direct Java interface, the Java Native Interface (JNI) as described by the Open Service Gateway Initiative (OSGi).



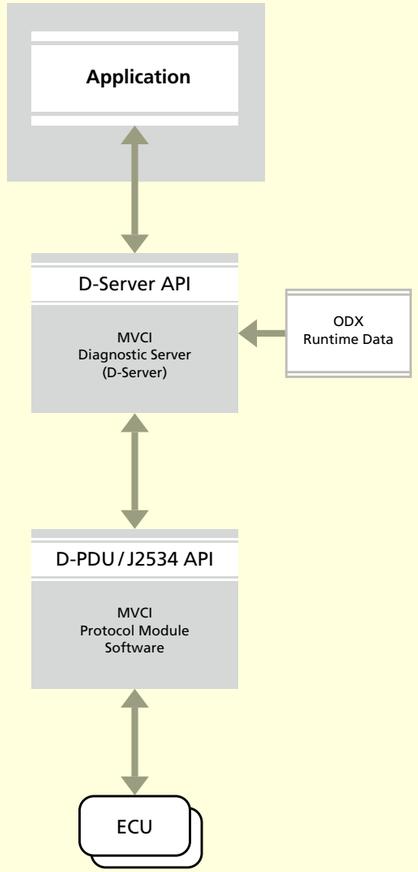


Figure 2, left: ETAS VCI system overview.

Figure 2, right: Standard-based MVCI software architecture.

The VCI firmware handles communication on up to six simultaneous connections with the vehicle, which may be using a variety of protocols (Figure 2). To ensure reliable communication and prevent system downtime, the protocol stacks feature built-in error handling and restoration mechanisms.

Applications

If a VCI module is connected to a computer serving as both user interface and host for diagnostic applications, the resulting combination can provide vastly greater functionality than a conventional scan tool, e.g.:

- OBD scan tool for legacy, current, and future vehicles
- Distributed diagnostics
- Engineering tool for diagnostic development
- ECU reprogramming (J2534)
- Execution of diagnostics and test procedures
- Autonomous flight recorder (without host computer)
- Measuring device
- Point-to-point connection (USB, Ethernet) or link to workshop's local network (LAN)
- Wired or wireless connection (WLAN) with host computer

ETAS provides a flexible and scalable VCI platform for the implementation of innovative concepts for vehicle diagnostics. While the platform facilitates the migration of vehicle diagnostics toward an MVCI compatible system, it is also capable of replicating existing methods and procedures for vehicles in the field.