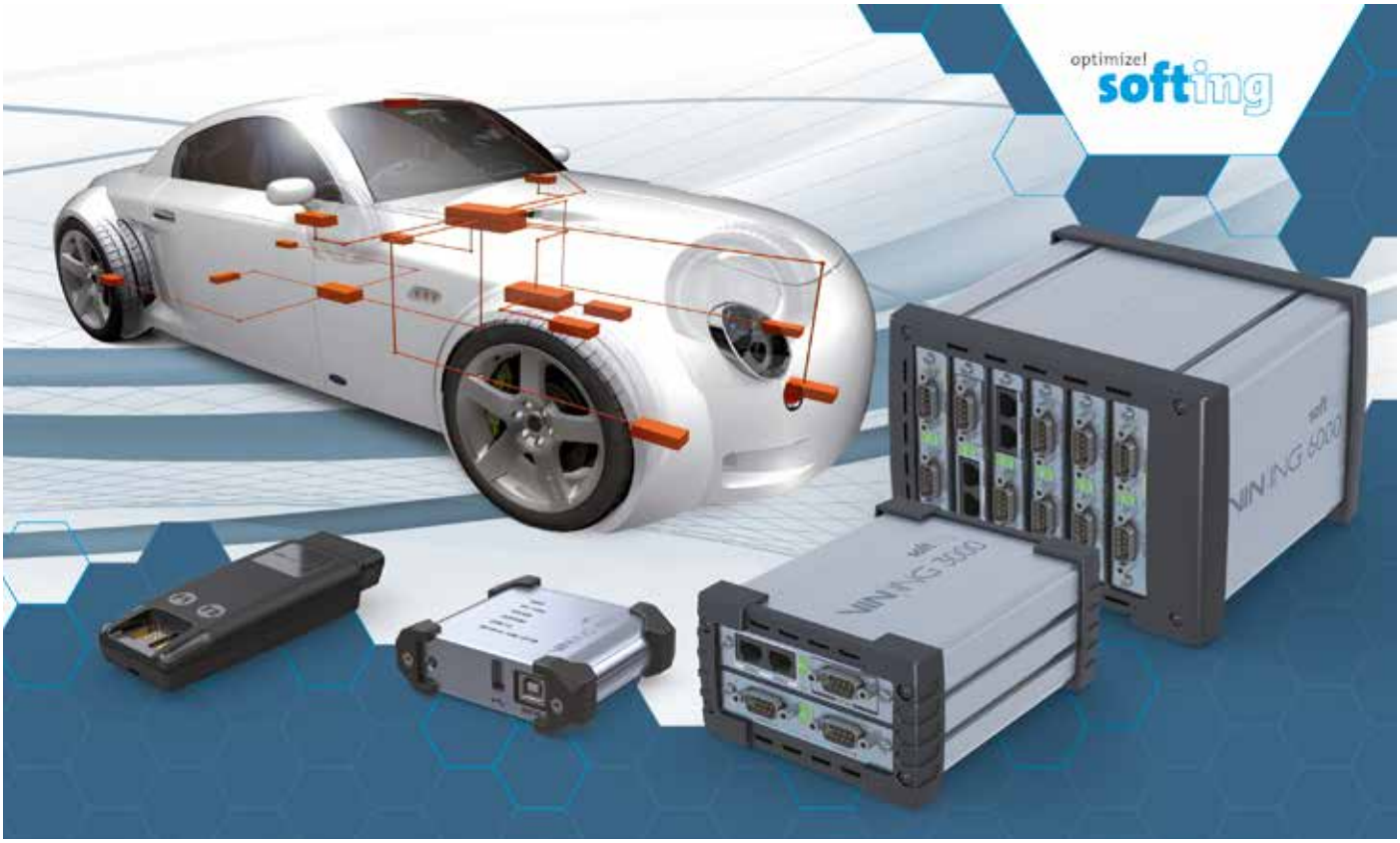

VCIs for the Entire Vehicle Lifecycle

VCIs (Vehicle Communication Interfaces) in a number of variations are used throughout the entire vehicle lifecycle so a test system can communicate with the vehicle. The newly developed VCIs of the VIN|ING product family from Softing take the specific requirements of engineering, manufacturing and after-sales service into account. Highly integrated and powerful hardware and software components make it possible to integrate the entire diagnostic system on the VCI. This means the VCIs are perfectly equipped for the various scenarios of remotely accessing a vehicle.

The use cases along the process chain deliver a number of very different requirements for VCIs. In engineering, onboard communication over the various bus systems CAN, LIN, FlexRay and BroadR-Reach is required, alongside diagnostic and calibration functions. Interfaces for reading in data formats such as AUTOSAR and FIBEX to describe bus communication have to be provided. In test scenarios, such as on-road tests, or at test benches, VCIs are used with functions for data logging, bus analysis and the simulation of ECUs. To ensure these various demands are met, the optimal solution is for the VCIs to have a modular hardware and software concept.

The requirements made of a VCI in manufacturing are performance, performance and more performance. This is true both of the effectively parallel communication with lots of ECUs and of the flash programming of ECUs. Fast availability in a WLAN network with good roaming characteristics continues to be essential. State-of-the-art encryption and authentication methods as well as taking the individual demands of the IT infrastructure into demand are obligatory.

In after-sales service the vehicle interfaces are essentially limited to the signals applied at the OBD jack for ISO 1941, CAN and Ethernet. Alongside the widely used UDSonCAN, UDSonIP is also increasingly being used as a diagnostic protocol for fast vehicle access over Ethernet. Various legacy protocols still have to be supported for servicing older vehicles. The VCI also has to be equipped for powerful and secure remote access. This is the basis for current and future diagnostic concepts as well as for software updates without the vehicle having to be taken to the repair shop (SOTA).

VIN|ING 1000: The Compact Base Device

VIN|ING 1000 (Figure 1) was designed as a compact, low-cost VCI for after-market applications. With one to two CAN interfaces as well as K- and L-line, the VCI can be flexibly adapted with different diagnostic connectors using cables. Thanks to the sturdy aluminum housing with protective caps as well as a lockable USB cable, the VCI is equipped for the tough conditions in the repair shop environment. Communication with the workstation takes place over USB or optionally over Bluetooth. Data pre-processing and protocol handling in the interface ensure fast response times and reliable real-time behavior regardless of the system environment.

Figure 1: Compact VCI for Simple Service Diagnostics (© Softing)

VCI for Manufacturing and After-Sales Service

VIN|ING 2000 was developed in response to new demands in the vehicle industry. It is the successor to the tried and tested HSC diagnostic interface and features extensive modifications. With a compact design and WLAN, Ethernet and USB as interfaces to the host system as well as CAN, K-line and Ethernet to the vehicle, the VCI is particularly well suited for future-proof manufacturing and after-sales service applications. Highly integrated, powerful components and a modular software architecture are the prerequisite for running an MVCI diagnostic server on the VCI and processing stored ODX data (Figure 2). This enables vehicles to be accessed remotely from one tester system in a whole range of mobile applications. With OTX sequences being run on the VCI, entire diagnostic tasks can be processed independently and without a connection to a host system. This makes it possible to realize applications, such as independent programming solutions, actuator diagnostics and other control tasks, simply and at an acceptable price.

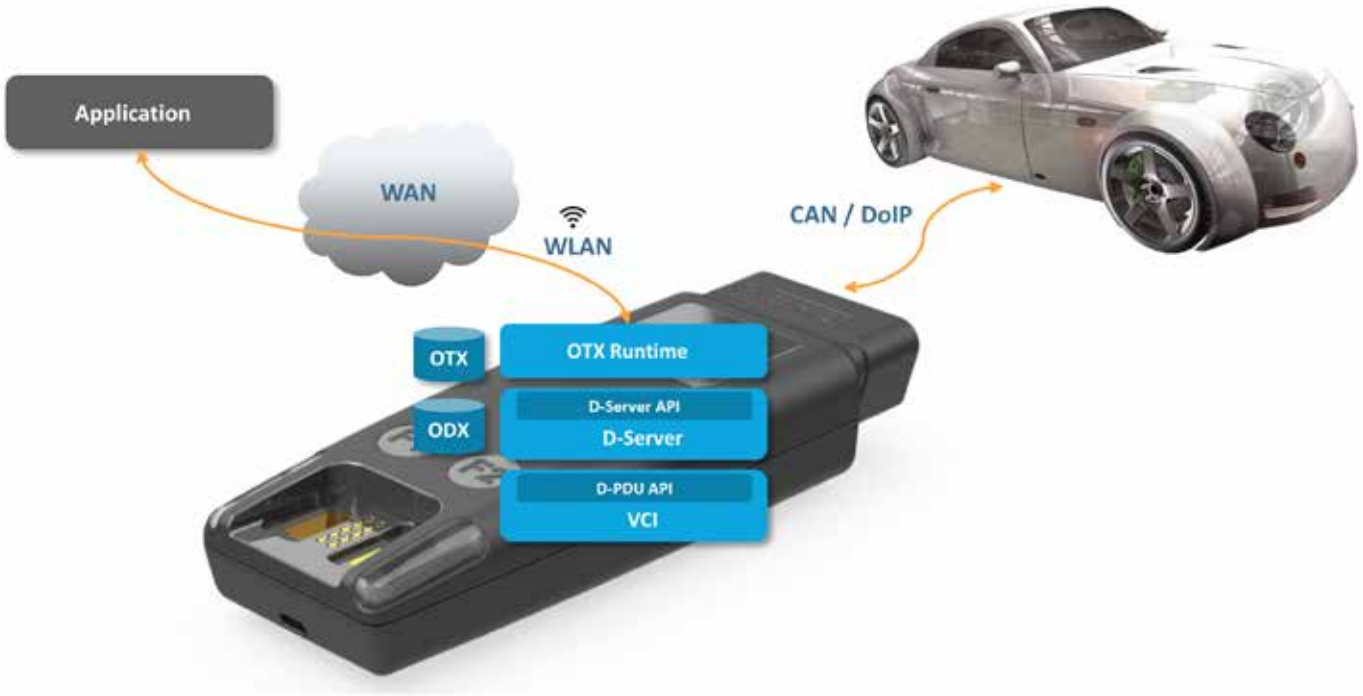

Figure 2: VCI with an Integrated Diagnostic Server (© Softing)

Figure 3: Modular VCI System for Engineering and Testing (© Softing)

Modular Communication Platform VIN|ING 3000

Currently we are developing the modular communication platform VIN|ING 3000 to be able to cover the different use cases for developing and testing vehicles (Figure 3). The main board is equipped with a powerful SoC (System on Chip) and a large programmable FPGA module. Using this hardware a fitting IP core can be loaded to support CAN FD, FlexRay and other vehicle interfaces. With up to six different slide-in modules, the perfect VCI can be put together very flexibly to suit the individual use case. All standard vehicle interfaces, such as Classical CAN, CAN FD, K-line, LIN, SENT, FlexRay and BroadR-Reach, are supported. By choosing the appropriate slide-in modules, up to 24 separate vehicle interfaces in virtually any combination are available. The following slide-in modules are envisaged:

- Module 1: CAN + UART:
  2 x CAN FD and 2 x UART (K-line/LIN/SENT)
- Module 2: CAN:
  4 x CAN FD
- Module 3: FlexRay + CAN:
  2 x FlexRay (channel A + B) and 2 x CAN FD
- Module 4: Automotive Ethernet:
  2 x Ethernet 10/100/1000 Base-T and 2 x BroadR-Reach
- Module 5: OBD:
  2 x CAN / CAN FD, 2 x K-line, 1 x Ethernet 100Base-T

All modules are equipped with at least two freely usable I/O signals. VIN|ING 3000 is designed for two slide-in modules; six can be installed in VIN|ING 6000.

Paired with the new VCI Communication Framework (VCF) from Softing, VIN|ING 3000 / 6000 are perfectly suited for the crucial use cases during the development of ECUs. The VCF modules for measurement tasks, data logging, bus analysis and residual bus simulation can be run parallel to diagnostic communication with a standardized runtime system. Depending on the communication function, the usual configuration methods are available. A2L files compliant with the ASAM standard MCD2-MC are usually used for measuring via XCP. The LDF or FIBEX format is used for bus analysis on the LIN bus; for FlexRay or Ethernet, AUTOSAR is also used. The well-known DBC format (CANdb) can also be used on the CAN bus. Behavior can be controlled for multiple functions using the block sequencer with the possibility to react to results. The only requirement is that an appropriate script be developed in „C“ and loaded in VCF. Thanks to the platform-independent implementation of VCF, the software can be used on Windows systems, on Linux, iOS and Android.

Summary

The different requirements in terms of the communication of a test system with the electronic control units of a vehicle can be derived from the use cases shown. The VCIs of the VINI|NG family are a new generation of very powerful communication interfaces which cover the specific requirements of engineering, manufacturing and after-sales service. The devices have a modular hardware and software architecture as well as standardized data and call interfaces. This means that by adding extra units, the functionality can be extended without the applications having to undergo major adaptation.

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