

Universal Vehicle Diagnostics in spite of OEM-Specific ODX Data

In the past, the support of OEM-specific data was usually hard-coded in the software in each individual diagnostic tool - particularly in the case of "higher" diagnostic functions. A new technology makes it possible for users to configure any adaptations required for the various authoring guidelines themselves and then re-use these for all tools.

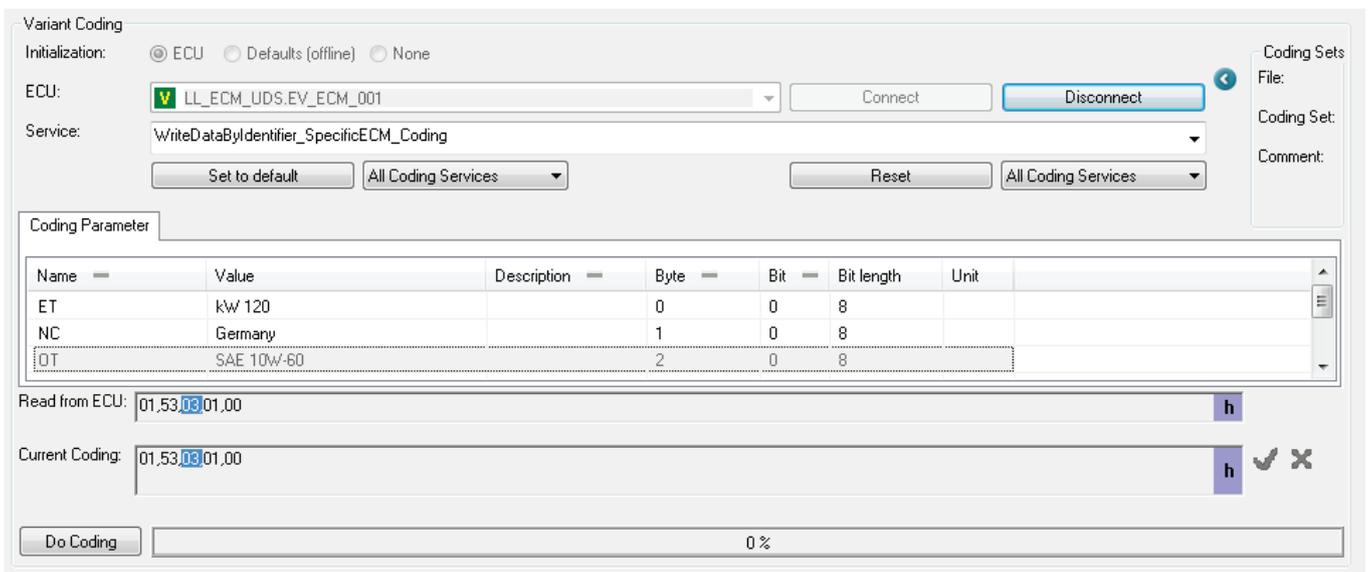
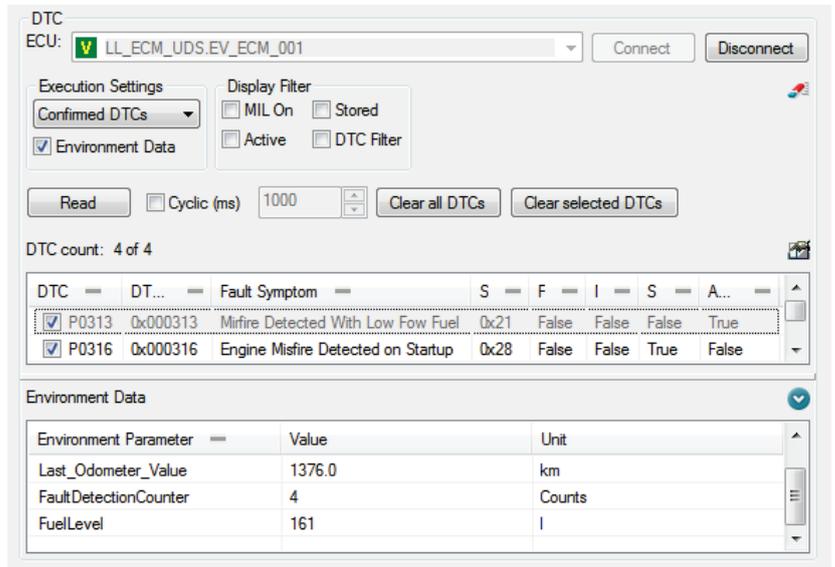
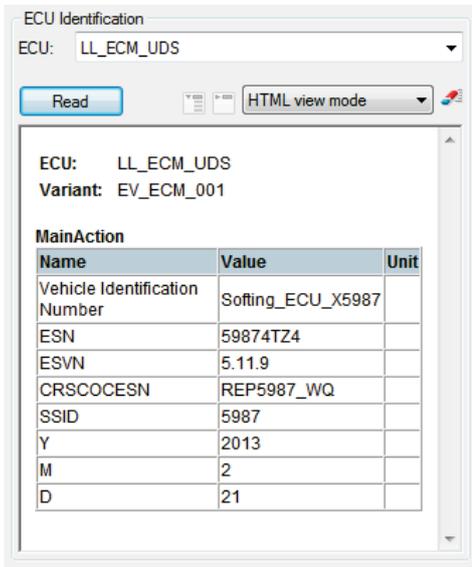
Today ECUs are installed in virtually all modern cars, trucks, buses, motorcycles and mobile working machinery. An external tester can be connected using the diagnostic interface which is now legally prescribed for virtually all of these vehicle classes. The tester exchanges information with the ECUs over communication protocols such as UDS or KWP2000. Data-driven diagnostic systems are usually used for this purpose. The current state of the art is a diagnostic

runtime system compliant with ISO 22900 that uses ODX as data format for diagnostic data. This is a formal description language for specifying vehicle and/or ECU diagnostics and exchanging diagnostic data. It is standardized in ISO 22901-1.

OEM-specific authoring guidelines

The ODX standard is very complex (the specification comprises around 450

pages) and allows considerable leeway. This means a diagnostic service and the interpretation of the relevant data can be written in different ways. And yet such alternative forms of authoring can still behave identically in the runtime system. Major vehicle manufacturers in particular have their own diagnostic philosophies, use specific diagnostic functions in a special way and prefer certain description methods. The full ODX scope is usually not required.



ECU Identification, Reading/Deleting Error Memory and Variant Coding in the Engineering Tester DTS Monaco

Rather it is more about ensuring the usability in the entire tool and process chain. For this reason, different vehicle manufacturers have created their own, limiting authoring guidelines with which suppliers have to comply - and this is mandatory. They are also referred to as specific dialects which all comply with the ODX specification.

Hard-coded

Powerful diagnostic tools also provide users with functional views giving users without detailed knowledge of individual ECU descriptions simple diagnostic access. Examples of this include identifying installed ECUs, reading and deleting the error memory and the coding of variants. Such "higher" diagnostic functions are, however, only partially regulated in the ODX standard or at the pro-

gramming interface of the diagnostic runtime system. To ensure these higher and process chain, the relevant authoring guidelines must make specifications on certain attributes of services or parameters. To date, such attributes have usually been hard-coded in the tools used, making cross-OEM use impossible or at least seriously limited. In the best case scenario, there were OEM-specific add-ons or plug-ins which then had to be maintained continuously in addition to the actual software.

Universal mapping

Softing's new method of solving this problem is to make the mapping between the attributes and the higher diagnostic functions comprehensively configurable. The scope of configuration

possibilities ranges from convenient "comfort" functions (e.g. the use of special semantics for service IDs) to special "workarounds" for individual ECU variants which do not correspond to the relevant authoring guidelines. First of all a specific validity context is specified for each mapping. This can either be global or limited to a bus protocol, be a function group or an ECU. Within the relevant context, the actual mapping takes place in two steps: first of all over specific service attributes, e.g. their unique description, and then over specific attributes of the parameters of the services found, e.g. a semantics attribute. The OEM-specific configuration is stored in an XML file. This means that changes can be made not only by the tool manufacturer, but also by experienced users themselves.

The screenshot displays the 'Tool Quick Test' interface. At the top, there are checkboxes for 'Error memory', 'Supported DTC', 'Coding strings', 'Environment data', 'Test not completed', and 'Additional Services'. A progress bar indicates 100% completion. Below this, the 'ECUs (3)' section shows a table with columns for ECU, Link, ECU-Vari..., and Status. The 'Errors (BV_ECM)' section shows a table with columns for DTC, DTC (hex), Fault Symptom, and Status Byte... The 'ECU Identification (BV_ECM)' section shows a table with columns for Identification Parameter and Value. The 'Environment Data (DTC P0313)' section shows a table with columns for Environment Para..., Value, Unit, and RangeInfo.

Quick Test (Overall Vehicle Status) in the Engineering Tester DTS Monaco

Application examples

This mapping technology was implemented successfully for the first time in the Engineering Tester DTS Monaco which enables full testing of diagnostic communication, data and sequences in Engineering, Testing and Test Preparation. It can be flexibly adapted to suit all kinds of tasks and user groups, and supports all named higher diagnostic functions.

- The function ECU Identification makes it possible to read out all kinds of identification information of individual ECUs or an entire vehicle. If ECUs whose data is based on authoring guidelines from different OEMs are installed in vehicles, these deliver different identification data in different formats, e.g. a parts number instead of a serial number. The mapping ensures that the output on screen and in reports remains consistent.
- ECU error memories, incl. environmental conditions, can be read out or deleted using the DTC function: There are also extensive filter possibilities to choose from. If there is a mix of, for example, UDS and KWP ECUs installed in the vehicle, a uniform data view is established in spite of the highly protocol-specific function scope and behavior.

- The function Variant Coding enables ECUs to be adapted to a specific vehicle in terms of engine type and equipment. The current ODX standard stipulates the category ECU-CONFIG (ODX-E) for this. Many OEMs, however, prefer the traditional use of linked read and write services in which the coding parameters have the same names and types in Request and Response. If both methods are used in different ECUs of a vehicle, a standard user view of coding is created.
- With the function Tool Quick Test the overall vehicle status can be determined very fast in terms of ECU identification, error memory entries and current coding, whereby the above-named functions are used in combination. In addition to the consistent output on screen and in reports, individual ECUs within a vehicle which provide extended identification information, such as VIN or current kilometer reading, in a special service can also be identified.

Now that this mapping technology has proved itself in practical use in the Engineering Tester DTS Monaco, the plan is to gradually integrate it in further diagnostic tools from Softing's product families Diagnostic Tool Set, OTX and TDX. For their users this means, on the one hand, the simple adaptation to OEM-

specific authoring guidelines and, on the other, that mapping tools can be reused in all scenarios once they have been configured.

Universal mapping makes it possible to implement all kinds of diagnostic tools in the entire process chain of an OEM without relevant hard-coded OEM-specific software adaptations. Tier-1 suppliers can use the same tool chain for different OEMs. In both cases, a uniform view of the higher diagnostic functions is established and consistent output on screen and in reports is ensured.

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