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THE NEW GENERATION OF THE DIAGNOSTIC ENGINEERING TESTER ALREADY COVERS FUTURE USE CASE SCENARIOS

THE SWISS ARMY KNIFE OF DIAGNOSTIC ENGINEERING

(Source: Softing Automotive)

Diagnostic devices are becoming an increasingly important tool for vehicle engineering, but also for manufacturing and troubleshooting. The comprehensive requirements of modern motor vehicles over the entire life cycle also have to be covered. It is therefore not surprising that there is a trend toward using tools with comprehensive functionality, which, at the same time, are easy to use and simple to adapt to different applications.

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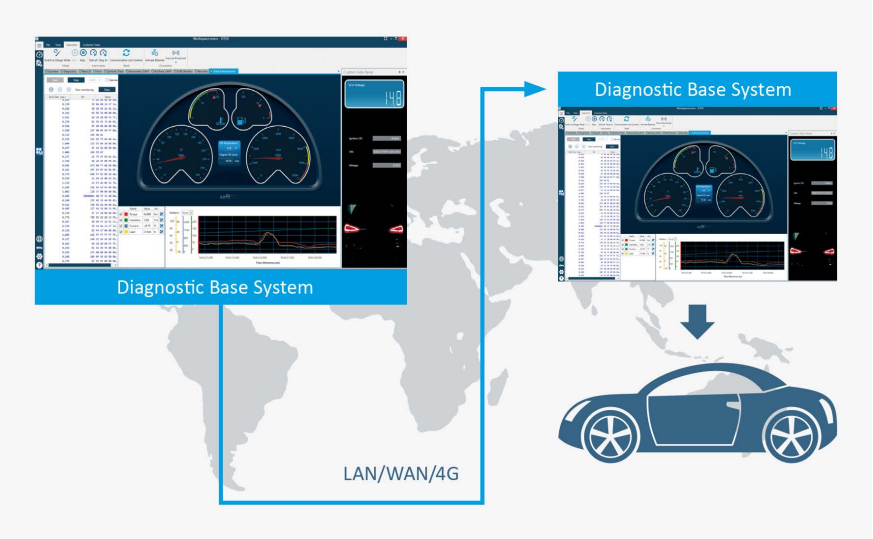

Figure 1. Besides on-site use, Softing DTS.monaco also supports remote access to vehicles and control elements. (Source: Softing Automotive)

It's a long time since a vehicle operated exclusively on a mechanical basis. Electronic control units (ECUs) play a central role, working together with mechanical systems as mechatronic components. From their beginnings in electronic engine control, they are now used in all conceivable electronic areas for control and regulation tasks. Today, more than ten ECUs are usually installed throughout the vehicle, a number which increases to more than 100 ECUs in the premium segment. It is very rare for an automotive manufacturer to develop the control units themselves; as a rule, they come from a large number of different automotive suppliers. The use of standardized communication protocols for data exchange with the vehicle, but also with other ECUs, is thus correspondingly important. This is how, for example, the various control units can be integrated into subsystems.

INCREASINGLY IMPORTANT: DIAGNOSTICS IN ECUS

The functionality of ECUs is not limited to the actual control and regulation tasks. Diagnostic functions are playing an increasingly large and important role. They are used for the continuous monitoring of the ECU itself as well as the connected sensors. The diagnostic results are then stored in the error memory. In current ECUs, diagnostics of ten exceeds the 70% mark. The tasks performed with it cover, for example, testing the communication with other bus participants, analyzing the exchanged data and testing the internal ECU status.

Another important task - for the corresponding ECUs - is to monitor the correct functioning of all emissions-relevant elements. The diagnosis is accessed by an external tester connected to the vehicle's standardized OBD interface. Functions for reading and resetting the error memory or updating the ECU program in the flash memory are available for this purpose. Furthermore, current measurement values can be displayed, ECUs parameterized and variants defined. The execution of special ECU functions and the testing of the diagnostics provided in the ECU are also important.

Given this wide range of necessary diagnostic functionality in an ECU, it is not surprising that a number of manufacturers offer a variety of different engineering and development tools. However, these often cover only partial functionality and are tailored to specific target groups with a certain level of knowledge and different operating requirements. Use is correspondingly difficult for users who have to deal with different operating concepts and data exchange formats. For example, while those responsible for complete or subsystems are usually diagnostic experts who need access to the entire functionality and therefore expect and accept a complex user interface, technical staff, for example, only need partial functionality for testing and checking vehicle functions. Here, for example, the simple executability of test sequences or the support of a quick vehicle change are of greater importance.

ON THE ROAD TO THE DIAGNOSTICS OF THE FUTURE

While the current status quo already means a high degree of complexity for the use of ECUs and the development of diagnostic functions, new trends are already looming on the horizon that represent the next level of challenges for vehicle engineering. E-mobility and autonomous driving with the assistance systems required there further increase the complexity of the control components used. The expansion of the range of vehicles offered and shortened innovation cycles are to be compensated with a global development team, but this is only possible with functioning and secure data exchange worldwide. Especially in early development phases, the integration of hardware that is only available in small quantities becomes a bottleneck, making it necessary to manage global access to the test objects. Finally, the maintenance of ECUs over the entire product life cycle is becoming increasingly important.

In addition to the functionality already supported, the diagnostic options must be extended accordingly. This makes it possible to validate vehicles, ensure the correct installation of components in manufacturing and carry out targeted repairs in the repair shop. Diagnostic functionality is also available while driving, e.g. for error analysis within software components and for checking the correct interaction of several ECUs when performing a driving function. The particular advantages of the diagnostic

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of the future are particularly evident when it comes to exploiting the networking of vehicles with their environment. One example is remote troubleshooting by updating ECU software via the radio interface. A win-win situation for customers, manufacturers and repair shops: for customers because they are spared a trip to the repair shop, for manufacturers because they can avoid reputation-damaging recall actions, and for repair shops because the lifting platform and test equipment are kept free for important and more lucrative tasks.

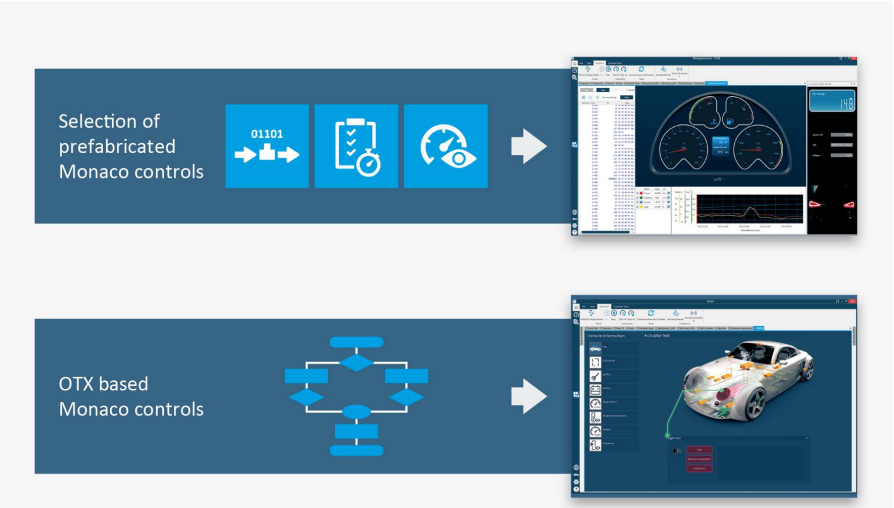

Figure 2. Various design options for creating UIs in Softing DTS.monaco (Source: Softing Automotive)

ALL-IN-ONE TOOL FOR DIAGNOSTIC DEVELOPMENT

In response to these comprehensive diagnostic requirements, automobile manufacturers and suppliers are looking for a complete solution which,
> unites the partial functionalities of the individual tools in a single system,
> can be used by all user groups, and
> covers the entire range of use cases, from ECU testing to vehicle release.
One such complete solution is the diagnostic engineering tester Softing DTS.monaco, recently presented in its ninth generation. In view of future diagnostic requirements, this version has been completely redesigned as 64-bit software with a multilingual user interface, adapted to the latest E/E architectures and uses state-of-the-art security mechanisms. A major innovation is the integration of the Diagnostics over IP (DoIP) communication protocol in compliance with the ISO 13400-2 standard so that these messages can be both recorded and displayed. Remote diagnosis via the development network is now also supported. In the new generation, the diagnostic tool offers an improved program structure, intuitive navigation that can also be operated by touch, new predefined graphical instruments for measuring and actuator diagnostics, as well as the possibility to record measurement data in .CSV text files. Licensing is now possible using an activation key or via server licensing. The support of the latest version of the OTX standard ISO 13209 represents a significant innovative advance over the previous version. At the same time, the reusability of entire projects and individual user interfaces from earlier versions is ensured.

USERS BENEFIT FROM EXTENSIVE EXPERIENCE

Softing DTS.monaco is the flagship of the Diagnostic Tool Set, an expert tool for professional vehicle diagnostics that has grown over the decades. It is based on Softing's Diagnostic Base System and uses Softing's many years of cross-manufacturer experience in the field of diagnostics over the entire vehicle life cycle. The modular architecture allows an individual adaptation of the available functionality to the respective requirements and working steps of the testing process.

INDIVIDUALLY AND INTERACTIVELY DESIGNABLE USER INTERFACES

A major advantage of Softing DTS.monaco is the free design of the user interface. This consists of predefined but flexibly configurable control elements. These can be arranged individually to provide a logical and efficient way of working. For this purpose, you will find what are referred to as layouts in the workspace for sorting the diagnosis topics. The specially developed diagnostic control elements can be placed within these freely configurable interfaces. For common use cases, such as error memory operations, ECU and vehicle programming or variant coding, the appropriate control elements are already included in the scope of delivery and can be used intuitively by the user without detailed previous knowledge. Experts are responsible for defining the communication functionality belonging to the individual diagnostic services. In addition, OTX sequences can also be created using the Softing OTX.studio tool and then integrated and started directly in Softing DTS.monaco. These can be used as macros, but also enable the implementation of predefined diagnostic releases. As OTX makes it possible to create user interface elements, user interactions and customized representations can also be realized.

THE RIGHT CONTROL ELEMENT FOR EVERY DIAGNOSTIC TASK

The control elements implemented in Softing DTS.monaco cover a large number of diagnostic tasks. The control elements at communication level support the representation and analysis of diagnostic communication at both bus and application level. Data and communication can be checked from the byte level to the representation of physical values. The single or cyclic execution of lists of diagnostic services is supported as is the execution of complex OTX diagnostic and test sequences. For control tasks, control elements are available that illustrate tests by means of images, text or the linking of files, automatically establish and terminate

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communication to ECUs, monitor and influence the communication status of ECUs or enable/disable switches for executing a range of services, e.g. changing the status of ECUs. For measurement tasks, ECU variables can be displayed and modified using various graphic control elements or recorded, stored and modified using the recorder control element. Finally, a number of control elements are available to support the reading and clearing of the error memory of an ECU, the reading of ECU information, the programming of memory areas in ECUs, the execution of on-board diagnostics, the execution of services, jobs and sequences via buttons, the rapid determination of the vehicle status and the programming of individual ECUs by experts.

WIDE RANGE OF APPLICATIONS

Softing DTS.monaco is already used in numerous engineering departments all over the world to take care of diagnostic tasks. The range of ODX and expert use cases extends through ECU release to the commissioning of HiL systems and test benches. The tool is also regularly used for updating and validating vehicles during on-road tests. A few typical use cases are:

Testing and troubleshooting the communication between the diagnostic tester and the ECU: Problems in data exchange between the diagnostic tester and the ECU pose a particular challenge for diagnostic experts, as they affect the further vehicle life cycle and can lead to delays or failure of vehicle programming, for example. A test environment is required interprets the communication with the external diagnostic system and records the messages of the ECU. Furthermore, in the latest E/E architectures, protection against unwanted external attacks must be ensured, which greatly increases the complexity of such an analysis. Furthermore, the integrated functionality for DoIP monitoring is particularly helpful here.

Checking the ECU specification and the functional diagnostic specification: Throughout the life cycle of a vehicle or an ECU, various diagnostic services

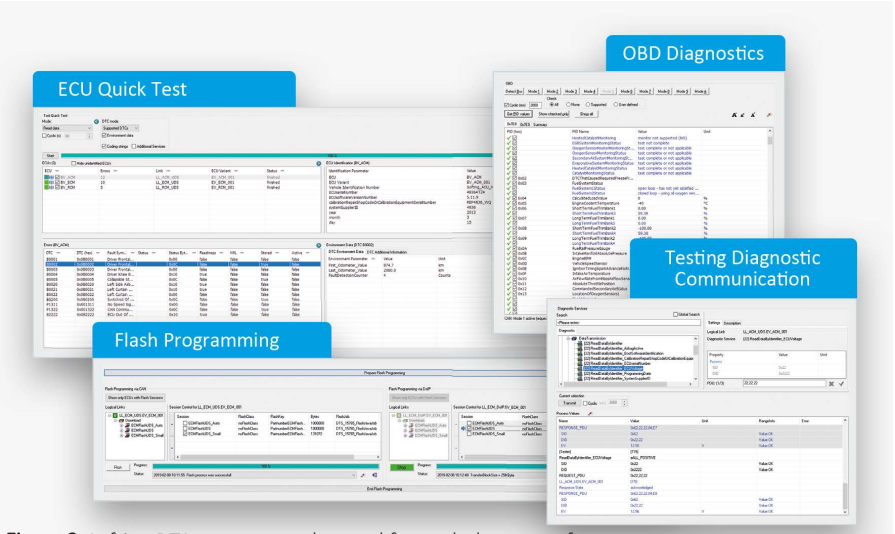

Figure 3. Softing DTS.monaco can be used for a whole range of use cases. (Source: Softing Automotive)

and functionsmust be supported that are specified by the manufacturer or the legislator. A first part of this partly approval-relevant review can be executed with Softing DTS.monaco. For example, the services and responses stored in the diagnostic database can be tested for correct implementation. In addition, the tool supports the reliable testing of the various modes and functional command groups of the on-board diagnostics against the specification directly from the user interface and without expert knowledge.

Identification and error checking including documentation: The identification of a test object and the reading of the error memory is an activity which recurs over the entire product life cycle. For each test, the version status and any existing error memory entries must be recorded and documented. Softing DTS.monaco offers intuitive operation and the reliable storage of the identification and error reports, with a direct connection to central IT systems if required.

Display of measurements and interaction with actuators: The visually meaningful representation of measurement parameters and their thresholds is necessary particularly at the test bench and in vehicle validation. Interaction with actuators also has to be displayed. Softing DTS.monaco offers extensive visualization and recording options for this purpose. Correspondingservices and parameters can be configured for this data server and reused.

Update of vehicles and ECUs, flash programming: ECU and vehicle updating is an important application area for Softing DTS.monaco, both in the engineering process and in automated flash programming during production and troubleshooting. The requirements range from compatibility with variousmethods and file formats to simple and reliable operation.

BENEFITS FOR THE USER

Softing DTS.monaco combines the functionality of several diagnostic devices, each with limited functionality, in a single tool. This reduces costs and at the same time reduces training time, as users only work with one tool. Further advantages are the intuitive operation and the preconfigured templates, which quickly lead to results. In addition, Softing DTS.monaco allows the early detection and correction of communication problems and functional errors, which from a user's perspective is reflected in the high quality of the diagnostic solution, the flexible adaptability to different tasks and the comprehensive and complete documentation of communication data and test results.

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