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Parallel Remote Access for Maximum Engineering Efficiency

Engineering projects are increasingly being handled by teams whose members are spread across the globe or are having to work at home due to the pandemic. Remote access to test objects enables the efficient networking of global and domestic work capacities. Furthermore, the very time-consuming tasks devices under test and vehicles are subjected to during testing and trials are often repeated. So, on the one hand, engineers must be able to access vehicles and devices under test which are distributed all over the world. On the other hand, it is important that repetitive tasks run efficiently and thus as simultaneously as possible. The use of an innovative, remote-capable diagnostic tester that covers the high demands of the increasingly complex engineering landscape and the associated diagnostic functions is thus essential.

Claudio Amato

Hardware as a Rarity in the Global Engineering Landscape

In order to meet the high demands and increasing complexity in engineering, engineering sites for ECUs and vehicles, test setups and test benches as well as test fleets are now distributed globally. And that means that a project can effectively be worked on 24 hours a day: A project is taken over in Europe from an Asian engineer and then passed on to the US. Control functions are developed in the Far East, tested in India and the prototype is built in Germany. But in most cases, the hardware – whether ECUs, test benches or test vehicles – is rare, particularly in early engineering and test phases. To avoid expensive travel and enable seamless interaction between all globally distributed engineers, remote access to the device under test, DUT, is now a must. Various factors – also in combination – play a major role for remote access and mustaken into consideration: infrastructure, bandwidth and latencies, network, IT security, vehicle status, the tools used as well as vehicle security.

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Remote Diagnostics in Engineering

As soon as an ECU is no longer developed independently of its environment, several people tend to be involved. Diagnostics takes on several roles: Naturally, it is first developed and released, but is then also used to verify the functions. Furthermore, it plays another crucial role: It provides the basis for updating the ECU software. This usually takes place using diagnostic communication protocols. The same is true of variant coding as well as different diagnostic functions, such as for example the reading out of measurement values and error memory operations.

All these tasks can be run by the engineer directly on the device under test with the environment required in each test case. If necessary, the engineer can then access the device under test remotely over the network. Clever test sequences can optimize the time spent on the device under test, for example by evaluating and documenting test data offline while another colleague is already testing again.

Scalability Thanks to Parallel Access

The tasks to be carried out in engineering are repeated for each device under test or vehicle, something which is ultimately time-consuming. Let's take a look at the example of reading out and documenting the construction and version status of a test fleet on one individual test day: A vehicle interface is plugged into the test vehicle, the tester application is connected, and automatic or interactive tests are performed – a procedure that has to be carried out per vehicle and readout time, for example before and after an on-road test. The same is true of test benches and test setups with similar tasks. If new software has to be installed on an ECU, you do not want to have to successively update all the test benches individually, but ideally at the same time, so that all the devices under test have the same status.

Challenges of Parallel Remote Access

In summary, the challenge is, on the one hand, to ensure that engineers have easy access to the globally distributed vehicles and devices under test. The high demands of remote diagnostics in terms of infrastructure, bandwidth, latencies and IT security must be taken into account. On the other hand, it is important that repetitive tasks can be run highly efficiently. The solution for maximum engineering and development efficiency in diagnostics is an innovative diagnostic tester that makes it possible to process all the necessary tasks and enables the combination of parallel and remote access.

There are various methods used to carry out the remote access described, whether LAN/WLAN at one location or a WAN (Wide Area Network) outside the company domain, for example over 4G/5G (e.g. for a test vehicle). It is necessary to use a modern, network-compatible vehicle communication interface, VCI. Basically, as soon as it is registered in the company network, it can be addressed locally. Extending existing VCIs with diagnostic functions essentially works in a similar way. They enable the exchange of data and are usually installed in test benches and almost always in test vehicles. As the connection quality can vary considerably, particularly during on-road tests, data is usually exchanged asynchronously. A diagnostic solution thus has to be adapted to this behavior.

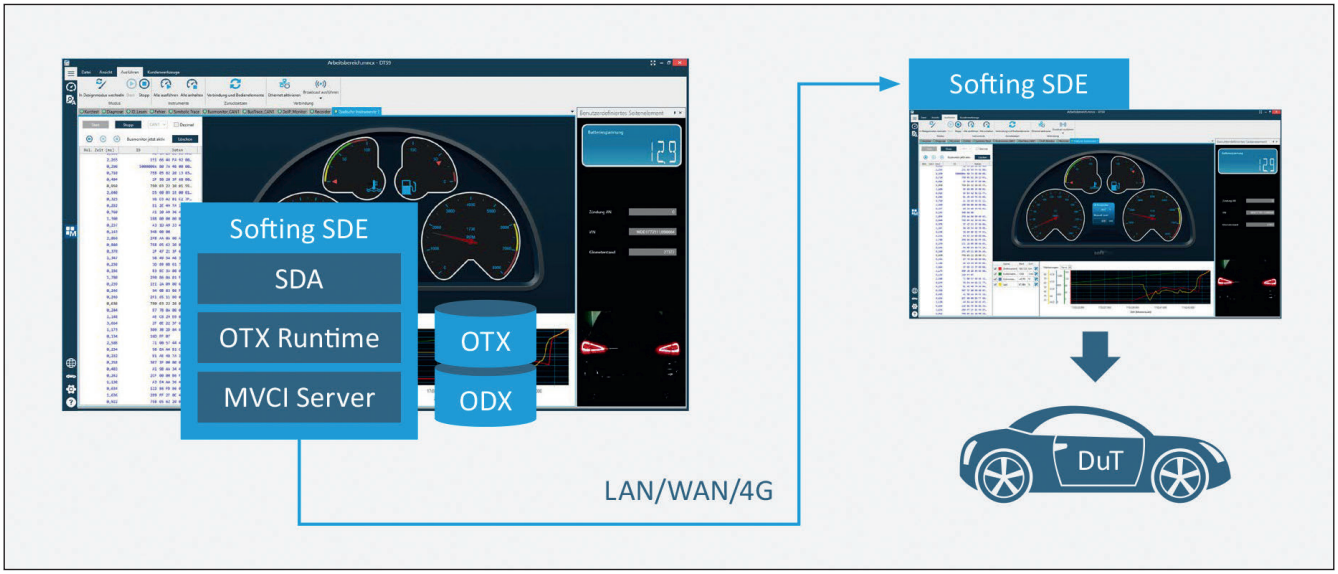

Fig. 1: Softing DTS.monaco Remote Use © Softing

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With a modern development tester, the VCI is accessed via a communication API and remote access is opened. The actual diagnostic sequences are carried out autonomously in the VCI, considerably reducing the dependence on the transmission link. In the tester application, only the diagnostic tasks are triggered and results displayed, and the connection to the backend is enabled.

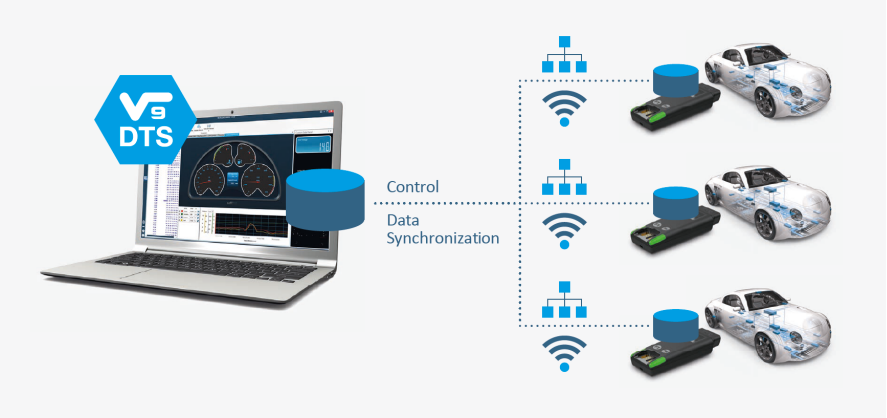

Fig. 2: Parallel Remote Test Execution © Softing

Softing DTS.monaco, the All-in-One Tool

Today's global engineering and development landscapes demand development testers which support diagnostics both locally and in remote scenarios. Softing DTS.monaco is an example of this kind of development tester. This tester is already being used in numerous development centers all over the world for comprehensive diagnostic tasks.

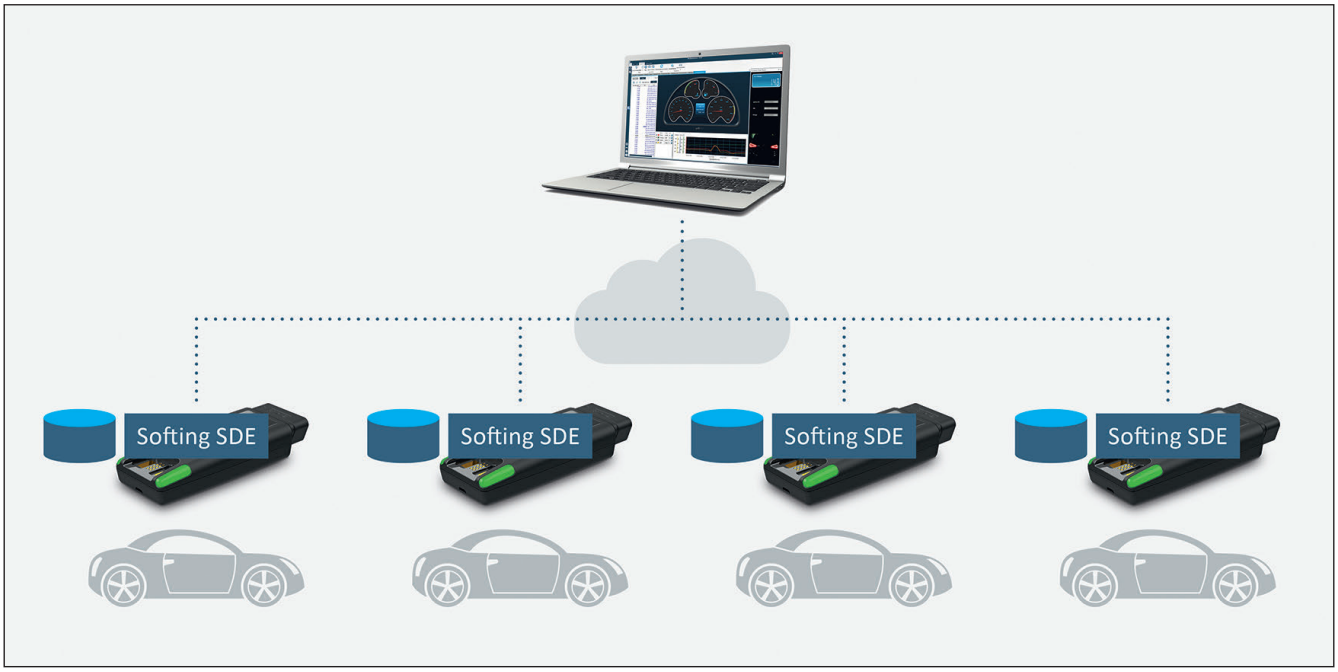

Fig. 3: Softing DTS in Parallel Operation

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These range from ODX and expert use cases 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.

In conjunction with a WLAN-enabled VCI, such as the VIN|ING 2000 from Softing, the tester can be used universally for all diagnostic and communication application cases. The representation is exactly tailored to suit the particular task in each case. Examples include:

- ECU identification
- Error memory operations
- Flash programming
- Reading out measurement values
- Variant coding
- Actuator test

These functions are implemented internally using a functional API which extends the runtime environment for the standards OTX and ODX. This interface can also be called up remotely so that a second instance of the tester can be connected remotely. This then makes the global cooperation models described above possible: The engineer develops new software, for example, and makes this available centrally. A tester provides the software at the appropriate time and starts testing. If problems occur, engineers can intervene from a distance, run their own tests and fix any bugs directly via a remote software update. Then the actual tests can be continued.

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Eight Times the Time Saving

Whether in on-road tests, manufacturing preparation or test bench maintenance, several programming and testing tasks often take place in parallel. In combination with the diagnostic interface VIN|ING 2000 from Softing – in the configuration as a smart VCI with an integrated diagnostic runtime system – it is possible to access the test object remotely. On the one hand, this can take place sequentially – cost-effectively and proven for use in the vehicle and on the production line. On the other, scaling over the network is now simple with the new Softing DTS "Multitest" interface. Up to eight connections can be addressed at the same time, regardless of whether the devices under test are available at the same location or remotely. And different test objects and vehicles types can be processed simultaneously at different locations.

The prerequisite for this is that the diagnostic data appropriate for the respective test object is loaded onto the VCI. The next step involves the display elements of the graphic interface having to be linked with the relevant VCI. Using the multitest interface, it is then possible to start and stop all test sequences in the VCIs separately or together, and document test results in parallel. Other use cases, such as ECU and vehicle updates, are prepared.

Equipped for the Future

Softing DTS is an expert tool for professional ECU and vehicle diagnostics that has grown over decades. The modular architecture allows the available functionality to be adapted individually to the respective requirements and working steps of the testing process. Based on cross-manufacturer experience, the tool now additionally implements the advantages of remote and parallel access. In conjunction with a WLAN-enabled VCI, such as the VIN|ING 2000, Softing DTS.monaco enables maximum engineering efficiency in vehicle diagnostics.

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