One Tool Does It All

ControlDesk Next Generation: The new universal experiment tool for efficient ECU development

Rapid control prototyping, hardware-in-the-loop simulation, bus system access, ECU calibration and diagnostics – once completely separate, now converging more and more. Requirements are changing, and development tools have to change with them. ControlDesk Next Generation is dSPACE's answer to this challenge.

No More Strict Dividing Lines

Numerous specialized tools have evolved to meet the needs of different phases of developing and testing ECU software – rapid control prototyping (RCP), hardware-in-the-loop (HIL), calibration and diagnostics, and so on. Each tool is tailored to its own application context, and each requires expert knowledge for productive work. But that is no longer completely in tune with the realities of ECU development. The dividing lines between different areas are disappearing, as these examples of real-world situations show:

- For a component test, several internal ECU variables, bus signals and variables from the HIL simulation model have to be measured on a HIL simulator, under automatic control and time-synchronously. The test also requires access to the ECU's fault memory and the simulator's electrical failure simulation (figure 1).
- An RCP system is being put into operation, and CAN bus monitoring has to be performed to evaluate correct communication with the real ECUs involved. Internal ECU variables also need to be measured time-synchronously for plausibility checks.
- To test an ESP ECU, measurement data (e.g., from wheel speed sensors) has to be replayed by a HIL system precisely and in real time.

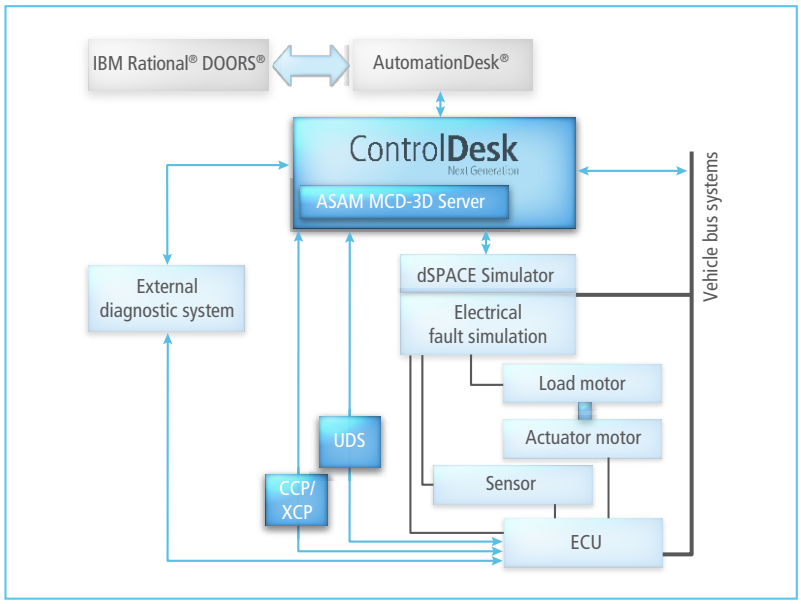


Figure 1: Example scenario for using ControlDesk® Next Generation.

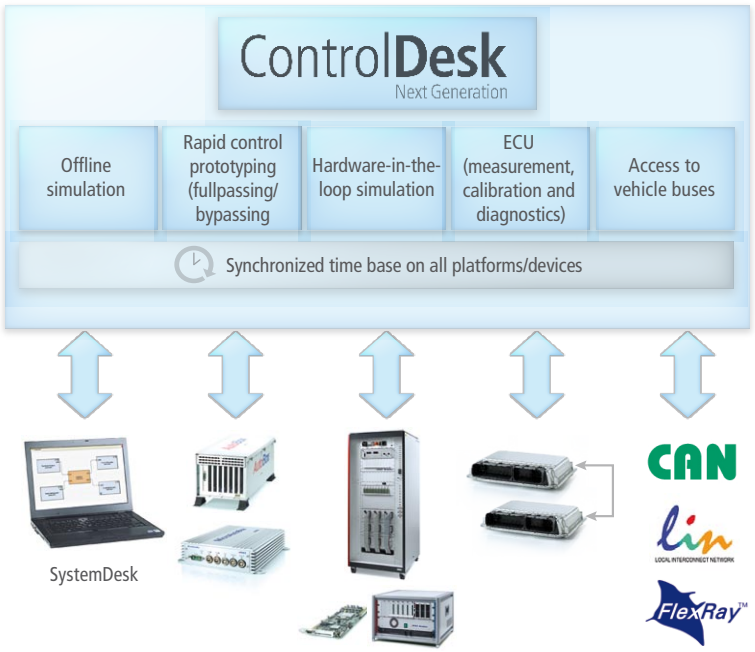


Figure 2: ControlDesk Next Generation, the new universal, scalable experiment tool for ECU development.

The objective: to reproduce a test drive in the laboratory as many times as required.
As these cases show, developers increasingly have to work with different data sources, without necessarily having a specialized knowledge of the overall system or of all its subdomains.

Status Quo: Heterogeneous Tool Chains

Today's users work with several development tools at once – usually from different providers. The tools have to be adapted to one another and integrated into the development process to fit the overall scenario. Users themselves have to ensure that all the tools function satisfactorily when combined in a complex scenario. If there is a problem, any one of the tools could be the source. Tool couplings add to the difficulty. Validating and maintaining the tool chain involves intensive work, especially if an error occurs, and wastes time that could be spent working productively.

> ControlDesk Next Generation is a complete package, containing everything developers need for efficient work.

A Seamless Process

Seamlessness is another major goal. Ideally, tasks such as setting up user interfaces, or generating and managing measurement data and parameter sets, should be performed only once. Getting rid of unnecessary data management is the only way to make transitions easy, such as from an RCP system to the real ECU.

ControlDesk Next Generation: dSPACE's Central Experiment Tool

ControlDesk Next Generation is dSPACE's new tool for use throughout the entire ECU development and testing process, optimally covering all application scenarios (figure 2). It unites the functionalities of ControlDesk and CalDesk®, two of dSPACE's well-established tools (available since 1999 and 2003 respectively). ControlDesk is primarily used for HIL, RCP (fullpassing) and offline simulation; CalDesk for ECU calibration and diagnostics, in-vehicle scenarios and RCP (bypassing). Now the strengths of the two tools have been combined in their successor, ControlDesk Next Generation. The result: fewer tools, less time spent working on user interfaces and administration, and no more data exchange between different tools. The long-awaited seamless process has arrived.

Synchronous access to all data sources, including ECUs and bus interfaces, is another major benefit. On top of that, ControlDesk Next Generation has numerous enhanced details and entirely new features. Now that ECU access and diagnostics are integrated, and bus systems can be accessed flexibly, third-party tools are no longer needed. ControlDesk Next Generation's modules ensure scalability, and it can be configured optimally for specific application cases. Whenever users require additional functionality, such as ECU access, they can simply buy it at a later date (figure 3). ■

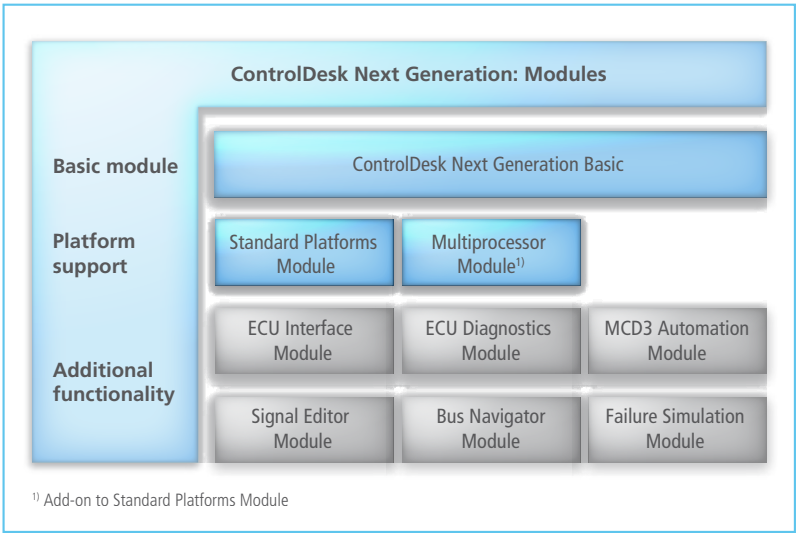


Figure 3: ControlDesk Next Generation's modular design.

Migration

Thanks to its new installation concept, ControlDesk Next Generation can easily be installed in parallel to existing dSPACE releases, instead of being placed in the dSPACE folder structure. This makes it easier to evaluate the new tool and to migrate ControlDesk 3.x and CalDesk experiments.
Customers with valid Software Maintenance Service contracts for ControlDesk 3.x and CalDesk will automatically receive the new ControlDesk Next Generation with dSPACE Release 7.0.

Interview

with Holger Krisp, Product Manager for ControlDesk Next Generation

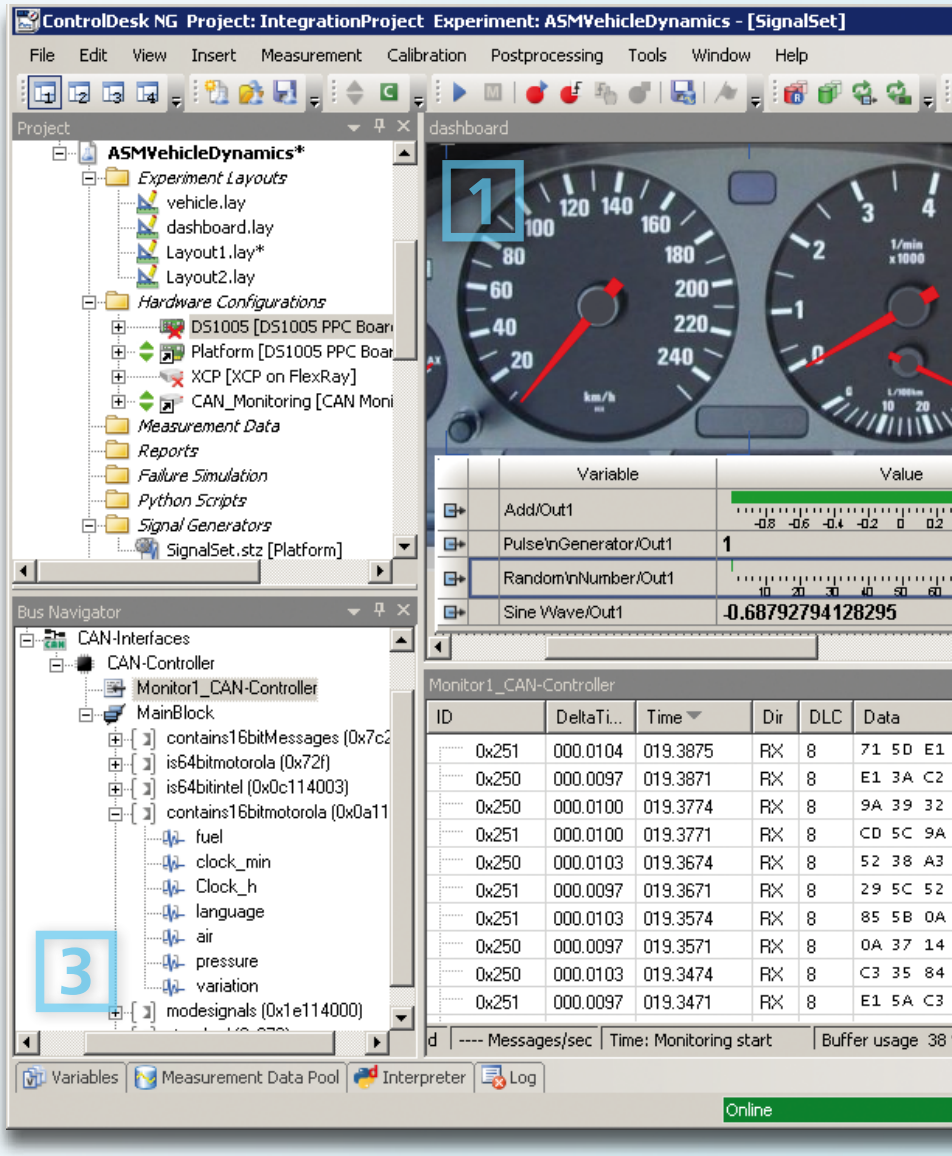
Mr. Krisp, why did dSPACE decide to develop ControlDesk Next Generation?
We are in close touch with many of our users, so we have first-hand knowledge of how they use our products. For some time now, we've been seeing that classic work practices are changing – and the trend is gaining momentum. So we created ControlDesk Next Generation to bring together different application scenarios, with the aim of making daily work easier and also of creating new application potential. ControlDesk and CalDesk were powerful, well-established tools, each in its own domain. Their successor ControlDesk Next Generation harnesses synergies and extensions, so it is in an even stronger position.

Why should customers choose ControlDesk Next Generation?
Because it's the current all-rounder, precisely geared to the needs of the market. As a strong partner, dSPACE makes sure that the new tool focuses on efficient development work, eliminating the stress of problems like malfunctioning tool couplings. If something ever doesn't function as desired, we see it as our duty to analyze the problem and work with the customer to find the right solution.

Do you already have market feedback?
Discussions with our customers on ideas for combining ControlDesk and CalDesk have been going on for a long time now. Their response to our vision is unanimously positive. As one customer statement put it: "At long last ControlDesk and CalDesk have been united. Just what we were waiting for." The waiting will finally be over, when ControlDesk Next Generation launches in dSPACE Release 7.0.

Thank you for talking to us, Mr. Krisp.

The Functionalities of ControlDesk Next Generation



So Many Interfaces
ControlDesk Next Generation provides access to all dSPACE RCP and HIL platforms (such as the multicore DS1006 Processor Board and the new MicroAutoBox II). For ECU access, it supports ASAM MCD-1 MC (CCP and XCP, more specifically XCP on CAN/Ethernet/FlexRay) and different types of on-chip debug interfaces. To integrate ECU diagnostics, CAN- and K-line-based access via ASAM MCD-2 D (ODX) is available, with diagnostic protocols such as KWP2000, UDS, TP2.0 and GM LAN.
External measurement equipment can also be connected (for example, for measuring temperatures). Vehicle buses (CAN, LIN and FlexRay) can be accessed directly via PC interface boards and dSPACE bus interfaces (such as the DS4302).

All Data Sources Measured Synchronously
ControlDesk Next Generation ensures the precise synchronization of measurement data from different sources (RCP and HIL platforms, ECUs, bus interfaces and external measurement devices). This opens up entirely new possibilities, especially for HIL users. For example, the temporal relationship between the HIL simulator's setting an overvoltage and the change this provokes in one of the ECU's internal variables can be measured directly in the tool. The collected measurement data can be placed in the Measurement Data Manager and exported for further evaluations in standard formats such as MAT or ASAM MDF.

Instrumentation
ControlDesk Next Generation has numerous innovations for creating layouts easily and flexibly. Several simulation, ECU and bus variables can be quickly dragged all at once to a multi-row instrument (the Variable Array) for display. The Instrument Selector has been completely reworked for easier handling. Instruments are generated automatically when variables are dragged from the variable description, so there is no need to create an instrument beforehand. And there are a whole lot of little improvements that when added together really speed up the user's work.

Plotting and Postprocessing
Ongoing measurements can be observed and compared with previous recordings in Plotter instruments, with a time cursor for going straight to any desired point in time within the data. Several Plotters can be scrolled in synchrony. The Plotter can be switched to a triggered display like an oscilloscope, making it easier to perform tasks such as analyzing high-frequency signals (for example, to evaluate a system's step response).

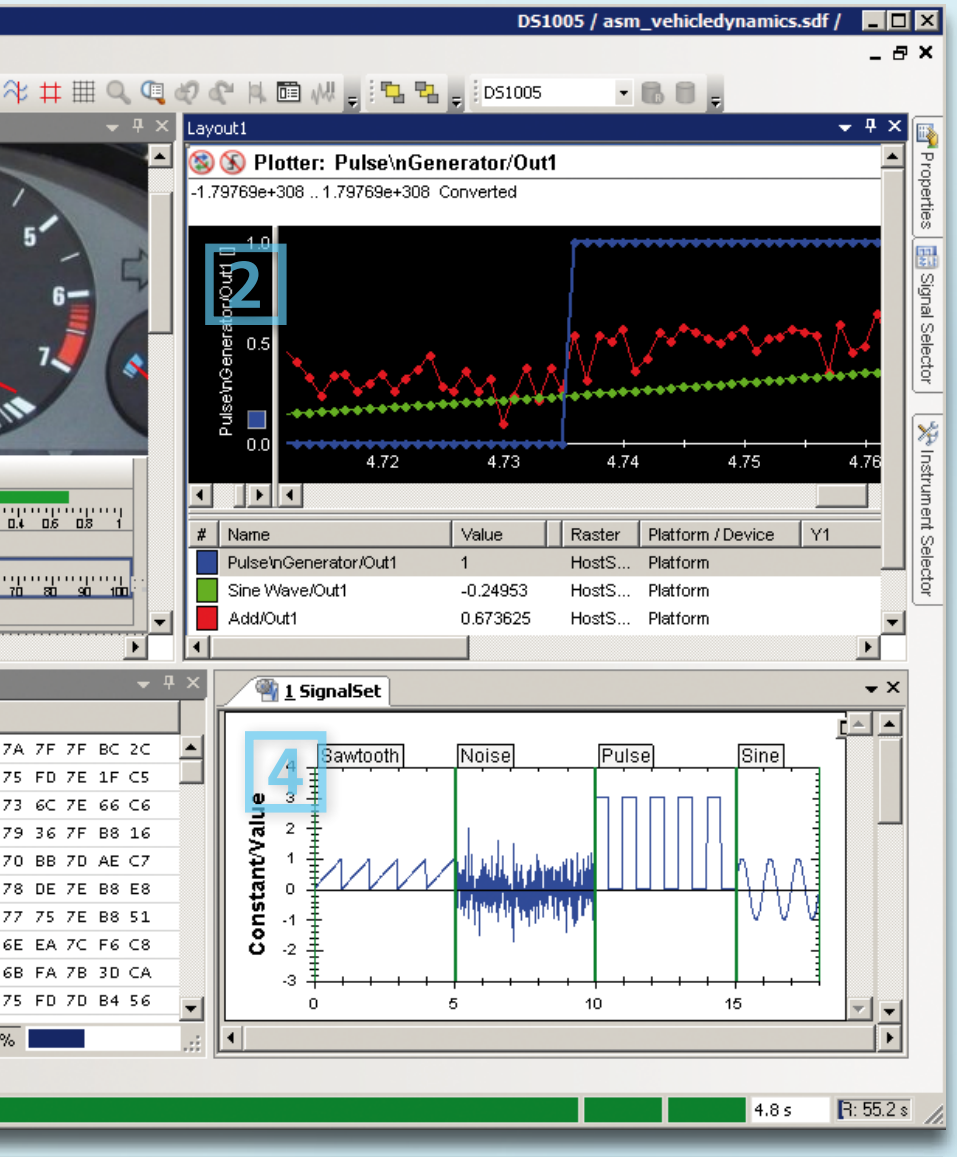


Figure 4:
User interface of the new ControlDesk Next Generation.

Legend:

1. Instrumenting
2. Plotting und Postprocessing
3. Bus Navigator
4. Signal Editor

Bus Navigator

For access to bus systems such as CAN, LIN and FlexRay, the bus interfaces to the connected HIL and RCP platforms, and PC interface boards, can be integrated. The Bus Navigator gives a clear picture of the current communication matrix, which is defined according to DBC, LDF and ASAM MCD-2 NET (FIBEX). Layouts for transmitting and receiving bus messages can be generated at the push of a button, and automatically contain all the defined signals. Signals can be connected to display and parameterization instruments from within the Bus Navigator. A bus monitor is available to display and record CAN and LIN traffic with the message contents (for example, for during system setup). Recorded CAN traffic can also be replayed in real time.

Signal Editor

In the new Signal Editor, time-synchronous stimulus signals such as sine, ramp or noise can be defined graphically. Changes in signal form can be coupled to conditions (such as "Generate a sine signal as long as the vehicle speed is lower than 50 km/h."). Recorded signals from the Measurement Data Manager can be easily dragged across for stimulation. The Signal Editor saves the signal behaviors in accordance with the ASAM AE HIL API 1.0 standard.

Automation

With its comprehensive automation options, ControlDesk Next Generation can be given application-specific extensions, and it also integrates optimally into existing development and test processes. Tool events can be received from external tools and processed (for example, to control a test sequence in AutomationDesk). The automation interface is implemented as a COM object model, so that external applications (implemented in C#, C++, Visual Basic, etc.) can be integrated, and automation scripts can be written in various programming languages (such as Python, C# and Visual Basic). An automation module that complies with the ASAM MCD-3 standard is also available.