Embedded Success

dSPACE

AutomationDesk – Key Features for successful ECU Testing

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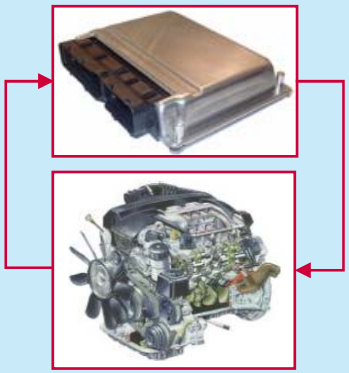
Content

- Introduction to ECU Testing & Hardware-in-the-Loop Simulation
- Application Examples & Benefits of Test Automation
- Key Features to maximize Benefit

Introduction to Hardware-in-the-Loop Simulation

ECU (Electronic Control Unit) controls plant

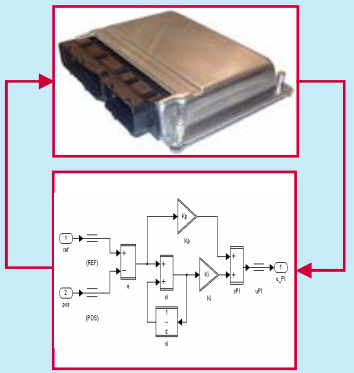


Plant (e.g. Engine)

How to test ECU without plant?

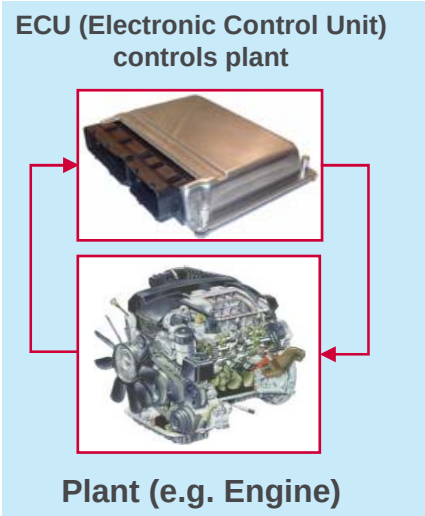
- e.g. to test ECU before finishing development of plant prototype
- e.g. to protect plant against damage in case of ECU failures
- e.g. to avoid abrasion and consumption of resources (fuel)

ECU (Electronic Control Unit) controls plant



Plant Model

Introduction to Hardware-in-the-Loop Simulation



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- e.g. to test ECU before finishing development of plant prototype
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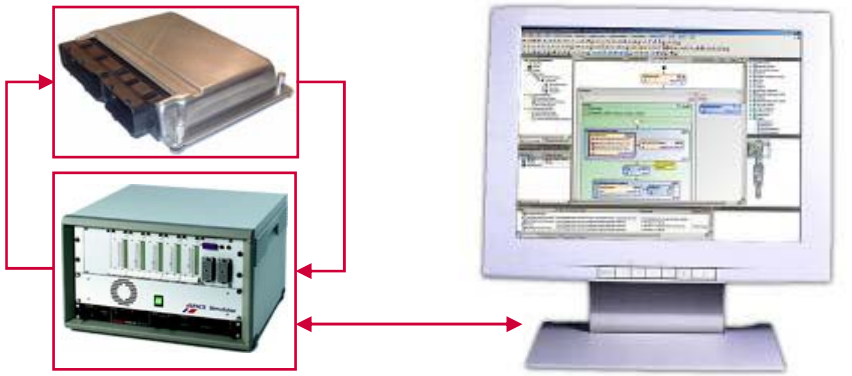
Hardware-in-the-Loop (HIL) Simulation!

(Simulation of plant model in real-time)

Testautomation with AutomationDesk

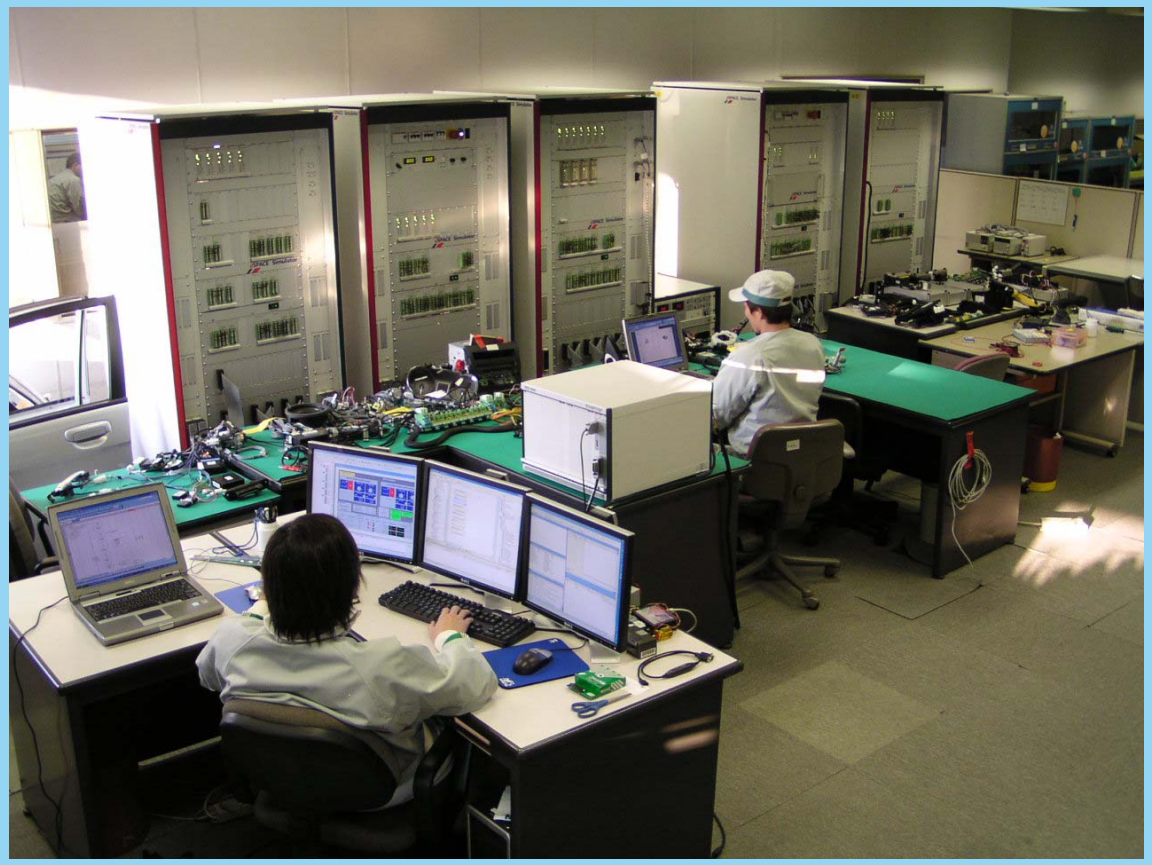
- Describing test maneuvers to test ECU
- Test maneuvers accessing HIL Simulator
- Driving test maneuvers automatically
- Automatic evaluation and reporting of test results



Host PC with AutomationDesk

Mitsubishi Motors Corporation

First Virtual Vehicle in Japan!

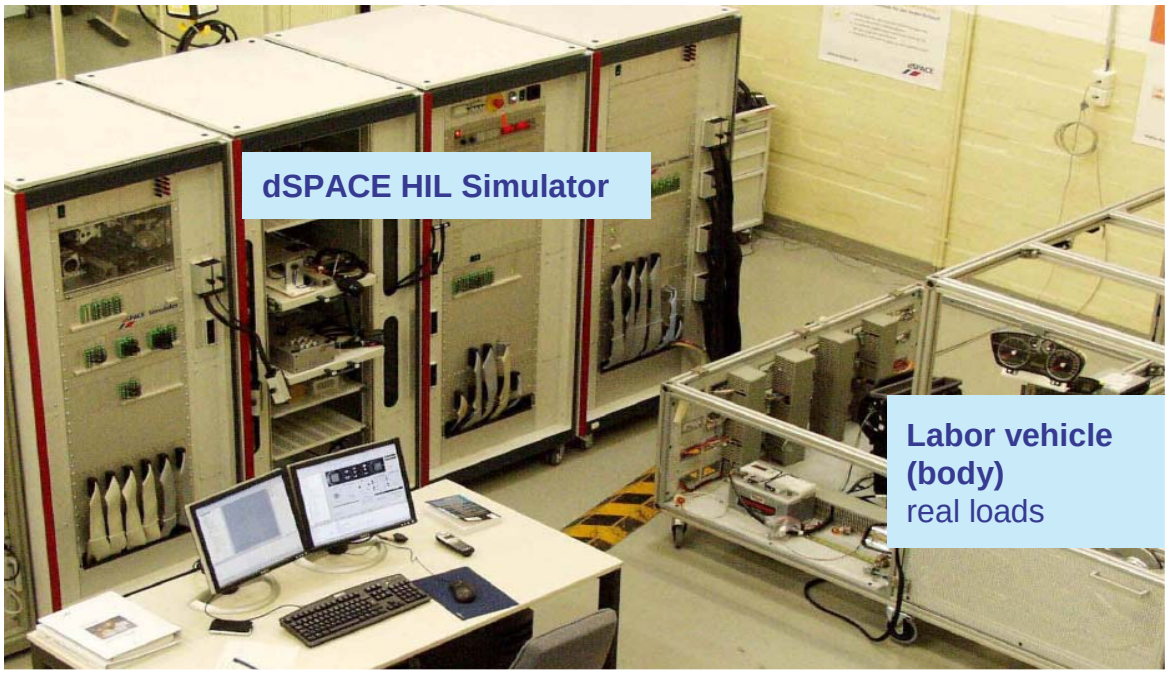


Integration HIL

- 5 Full-Size-Racks
- > 20 ECUs
- Body electronics & Power train
- Short start-up period
- More information: dSPACE News 3 / 2007

"AutomationDesk is easy to use on base of Libraries."

Ford Cologne

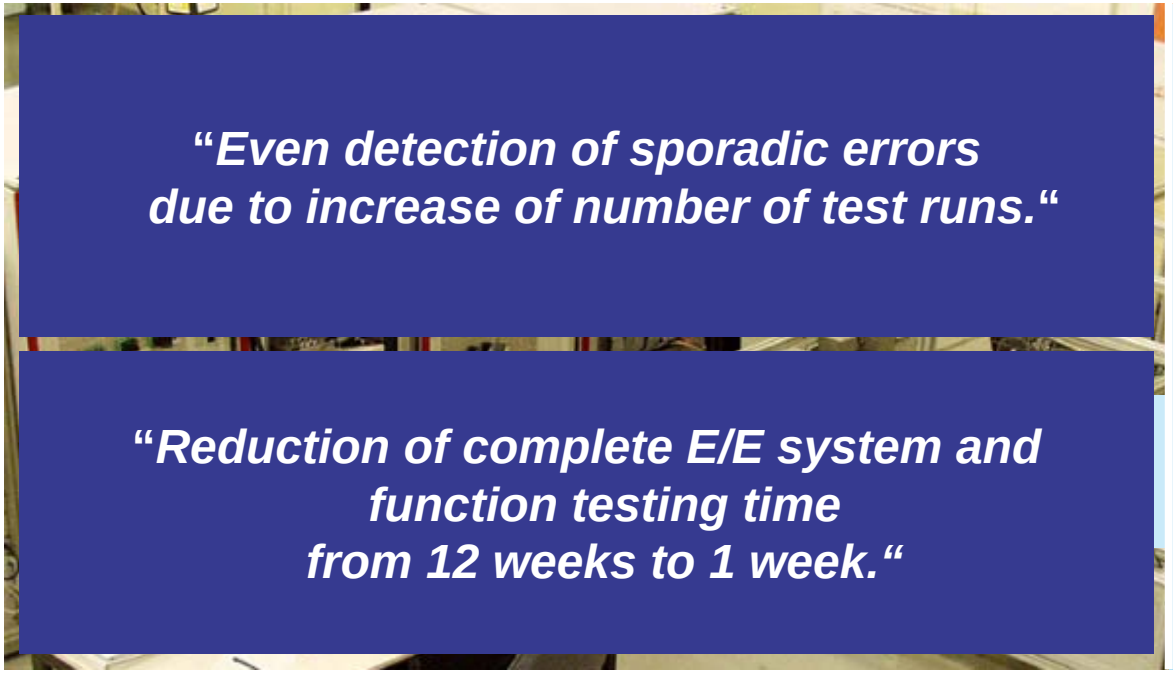


HIL for Body Electronics, Power Train & Vehicle Dynamics

- > 50 ECUs
- > 10 000 test cases
- about 1800 CAN signals

Function	Number of test steps	Test duration (manually) [h]	Test duration (HIL) [h]	Improvement (factor)	Availability of test results
Door closure	937	80	10	8	1,5 days vs. 2 weeks
Window lifter	2612	100	66	1,5	2,5 days vs. 2,5 weeks
Exterior light	1300	80	5	16	1 day vs. 2 weeks
ESP	350	96	9	10,6	1,5 days vs. 2 weeks

Ford Cologne



"Even detection of sporadic errors due to increase of number of test runs."

"Reduction of complete E/E system and function testing time from 12 weeks to 1 week."

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ZF LS (Steering Systems)

Automated testing of steering systems

- ECU diagnostics with dSPACE CalDesk
- Coupling of AutomationDesk and Telelogic DOORS (requirements management system)

"Coupling AutomationDesk and DOORS via dSPACE's Connect&Sync Module has greatly simplified ECU testing at ZF LS."

"Visibility of constantly up-to-date test result at management level leads to high 'error remedying morale' of developers."

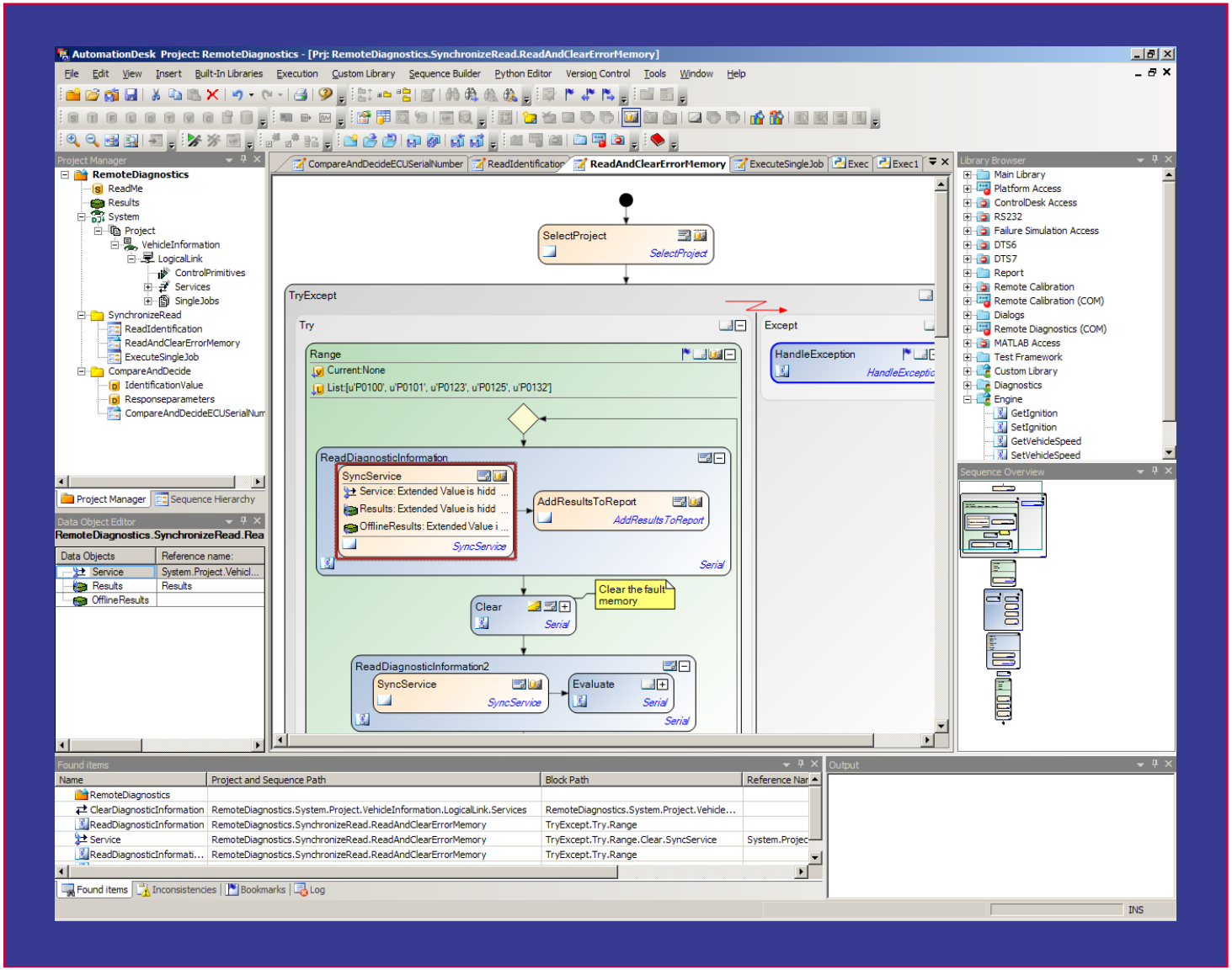
Telelogic Technology Partner Agreement between dSPACE and Telelogic

How to achieve these benefits?

…by efficient development & execution of Tests!

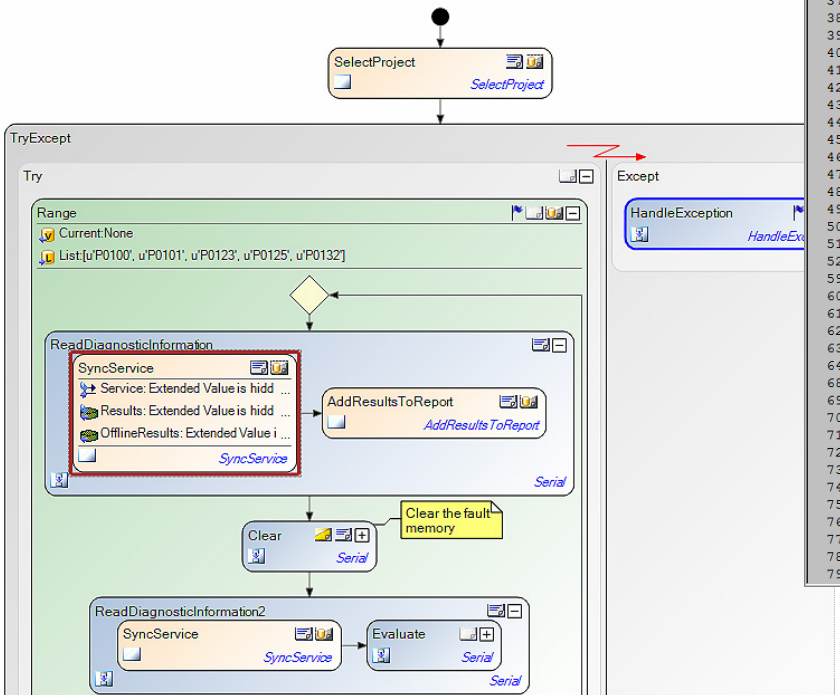
➔ Key Features for successful ECU Testing

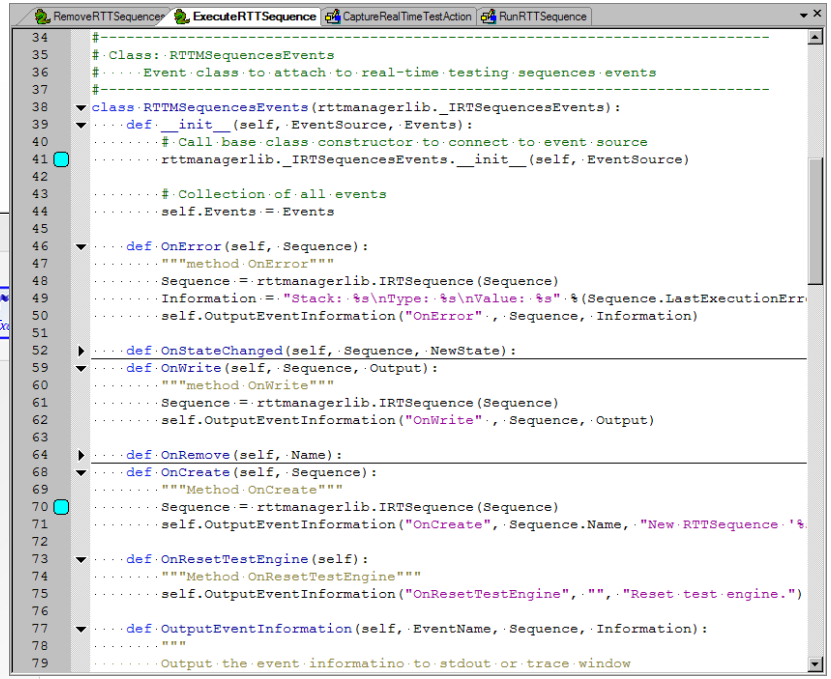
Test Automation Software AutomationDesk



Graphical Test Development with AutomationDesk

- Graphical blocks for implementation of control flow, error handling, variant handling, …
- Prevention of syntax errors (supervision by graphical editor)
- Python scripting for algorithms, e.g. complex algorithms, API calls, …
- Combination & Integration of graphics & scripts.
  Experience: 40-60% graphically, 40-60% scripting





Tool Interfaces in AutomationDesk

HIL-Simulator

- dSPACE real-time platforms, ControlDesk, electrical fault simulation units, 3rd party HILs

Diagnostic tool support

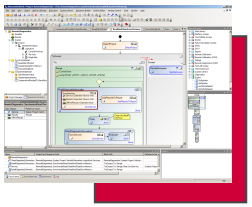
- CalDesk, DTS6, DTS7, EDIABAS, VAG-Tester, DiagRA, CAESAR[1)], samtec[1)]

Measurement and Calibration tool support

- CalDesk, INCA, CANape, CANoe[2)], CANalyzer[2)]

Calculation and Evaluation

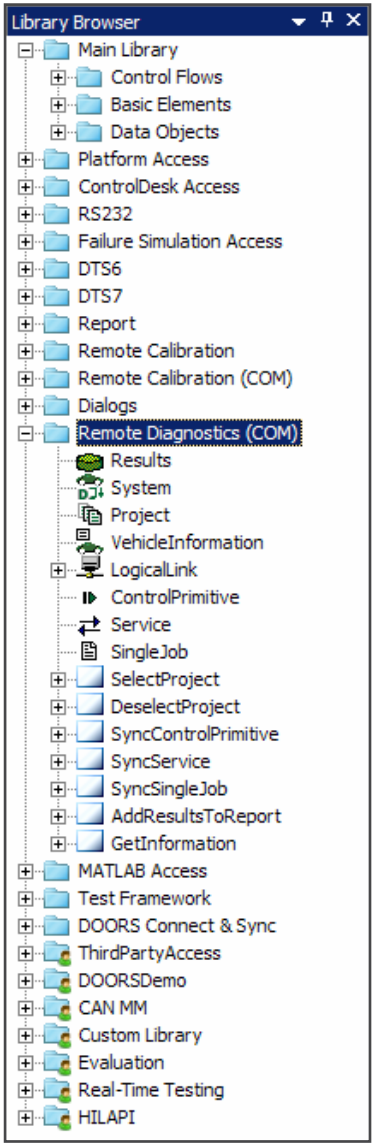
- MATLAB



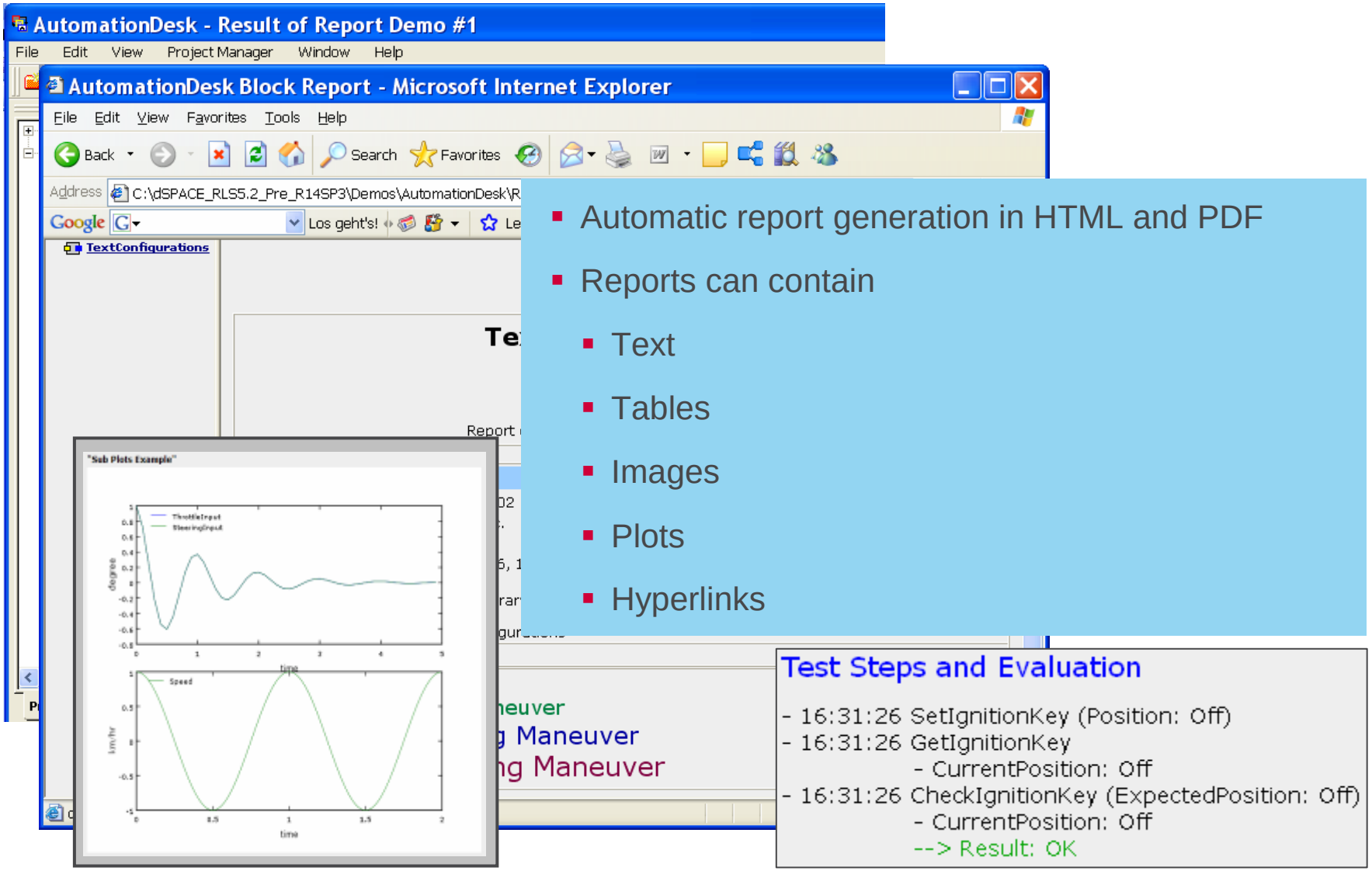
Customer specific Extension

- 3rd party hardware or software

1) on demand 2) in customer projects



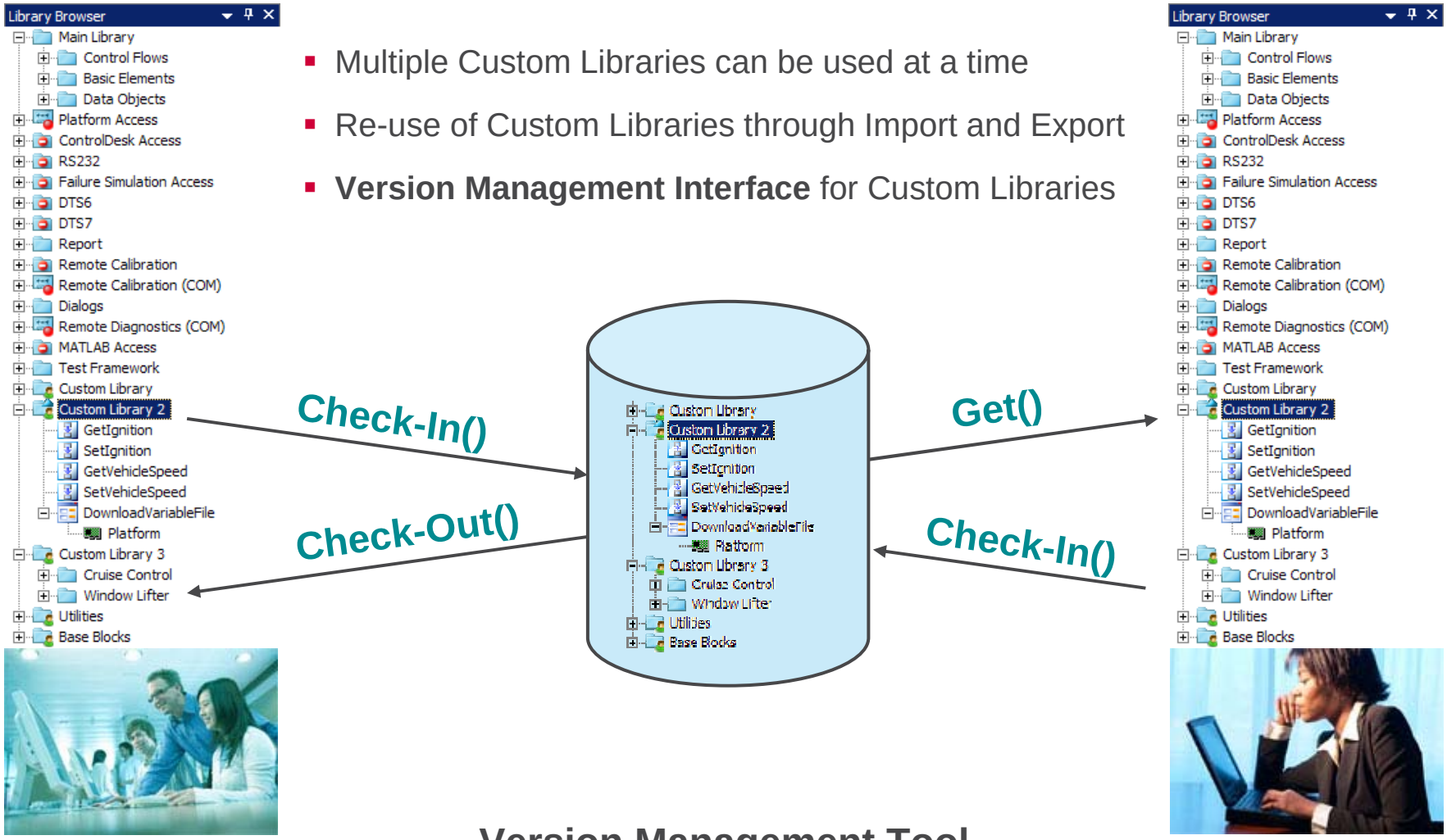
Results & Reports



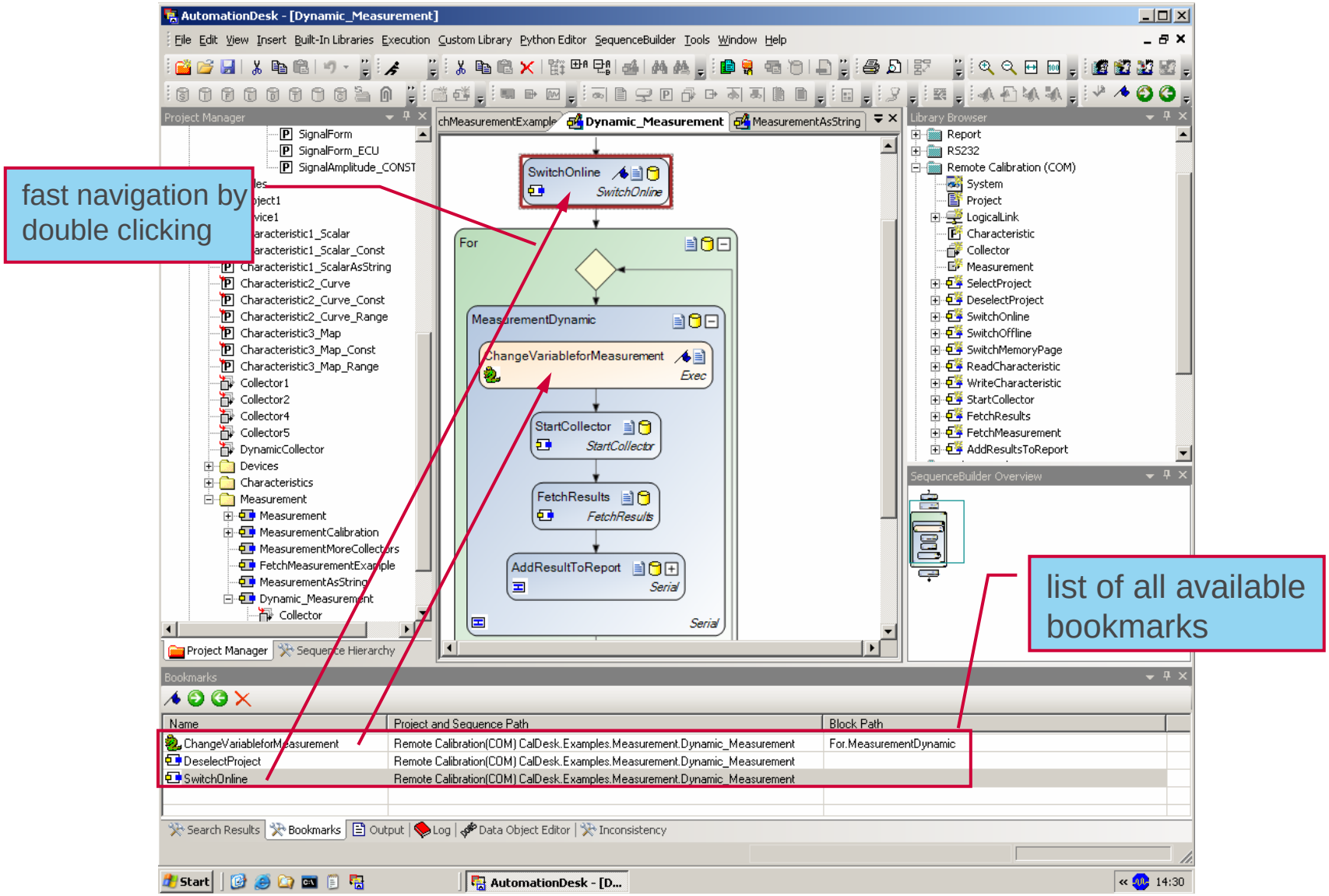
- Automatic report generation in HTML and PDF
- Reports can contain
  - Text
  - Tables
  - Images
  - Plots
  - Hyperlinks

Multi User Support

- Multiple Custom Libraries can be used at a time
- Re-use of Custom Libraries through Import and Export
- **Version Management Interface** for Custom Libraries

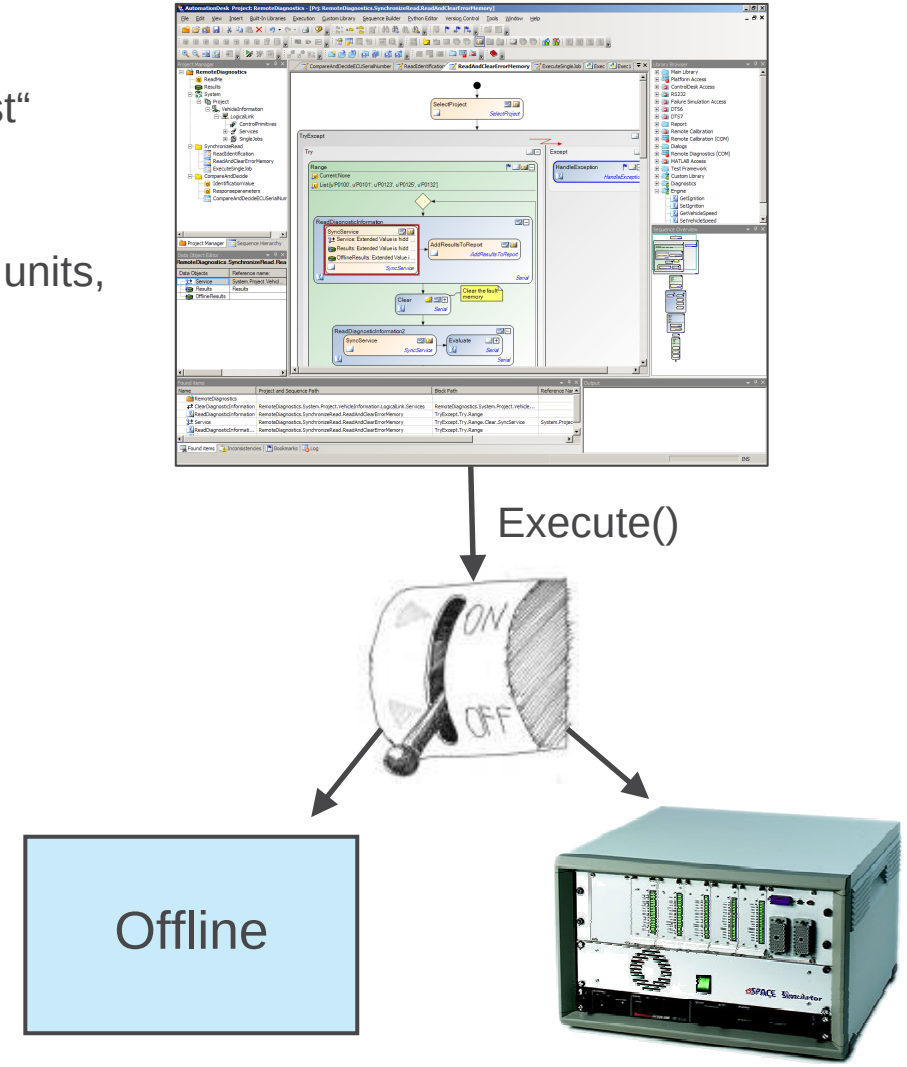


Bookmarks


fast navigation by double clicking
list of all available bookmarks
AutomationDesk - [Dynamic_Measurement]
Project Manager
Library Browser
SequenceBuilder Overview
Bookmarks
Name
Project and Sequence Path
Block Path
ChangeVariableforMeasurement
DeselectProject
SwitchOnline
Remote Calibration(COM) CalDesk.Examples.Measurement.Dynamic_Measurement
For.MeasurementDynamic

Offline Test Execution

- Execution of test sequences to “test the test“
- Execution possible without “real HIL“
- Access to real-time model, failure insertion units, MATLAB, remote calibration, and ECU diagnostics are “redirected“
- Instead, blocks return a “dummy“ value
  - → Test development „offline“ at the developer‘s desk
  - → HIL-Simulator can be used full-time for automated testing



AutomationDesk – Key Features for successful ECU Testing

- Process integration capabilities,
  Openness, Flexibility
- HIL Test-Automation-Tool
  with most installations worldwide
- Worldwide customer and user base
- Worldwide sales, professional training
- Competent services and support in
  Test-Automation, HIL simulation,
  and diagnostics from one source – dSPACE
- Continuous enhancements and new versions

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Test Automation 2.0