



Silver 3.4

Virtual ECU platform for rapid software development on Windows PC

Silver is a tool used by automotive engineers to move control development tasks from real cars, test rigs and HILs to Windows PC. Silver provides an environment to quickly port control software (C Code or hex file) from real ECUs to Windows and to run the resulting virtual ECU in closed-loop with a simulated vehicle on PC.

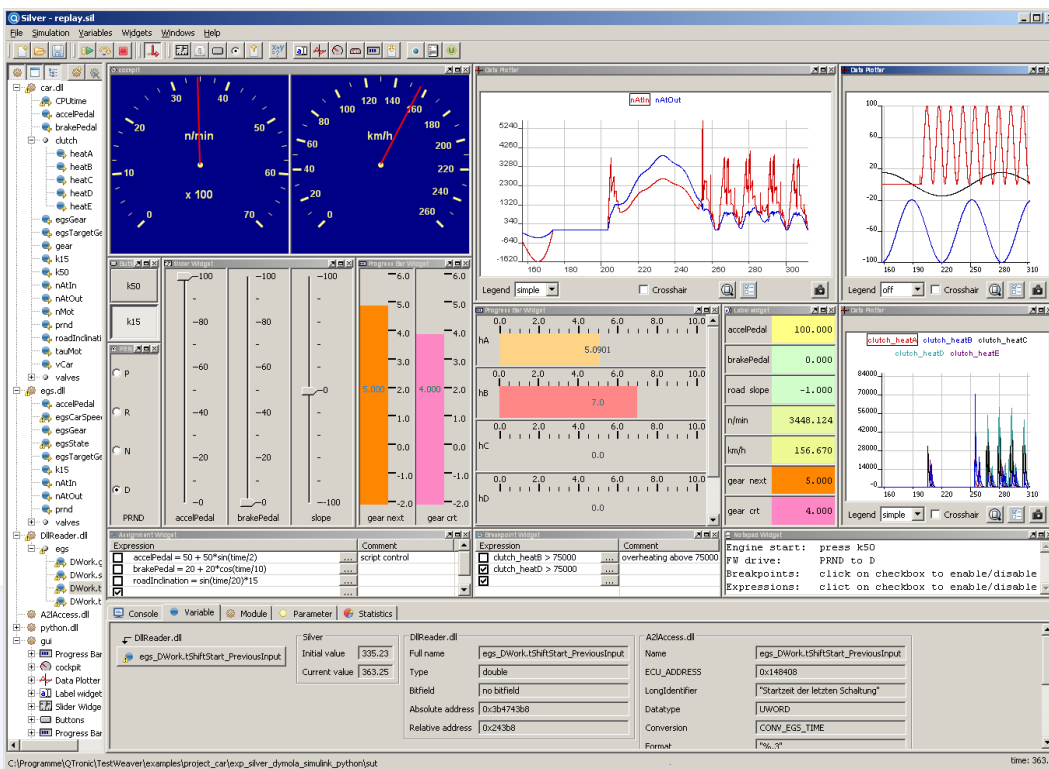
Control software and simulation models can be imported from C/C++, MATLAB/Simulink, TargetLink, ASCET, Dymola, SimulationX, MapleSim, SIMPACK, AMESim, axisuite, GT-POWER, Python. Silver provides built-in support for automotive standards such as AUTOSAR, ASAP2/A2L, CAN, DBC, MDF, FMI, XCP, PAR, DCM, and ISO 26262 compliant development.

Benefits

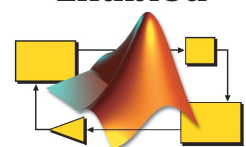
- extremely fast development cycles
- parallelize the development process
- executing other's contributions without their tools
- sharing results without sharing IP
- excellent debugging and test support

Features

- fast co-simulation of vehicle model and virtual ECUs
- configurable signal plotters, gauges, sliders, switches, and animation panels
- excellent debugging support: breakpoints with symbolic conditions on signals, connection to source-code debuggers for step-by-step module execution, comparison of simulations and measurements, code coverage with CTC++
- simulations driven by: graphical interface, measurement files MDF/DAT/CSV, or scripts
- reading and writing of measurements, for instance in MDF/DAT or CSV format
- Python scripting, PID controllers, filters, FFT
- test automation: TestWeaver, ECU-Test, TPT, Python
- optimization of Silver setups with NumPy and SciPy
- range monitoring for all ECU signals
- monitoring of stack and run-time requirements
- fault simulation, worst-case analysis with TestWeaver
- online calibration on PC with INCA, CANape via XCP
- interface to all ECU signals with ASAP2/A2L files
- interface to CAN configured with DBC files
- execution of HEX files for TriCore and PowerPC



SIMULINK
Enabled



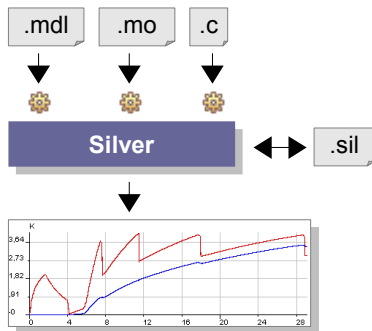
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How to virtually integrate modules with Silver



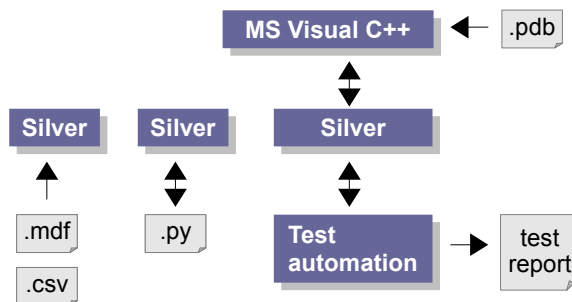
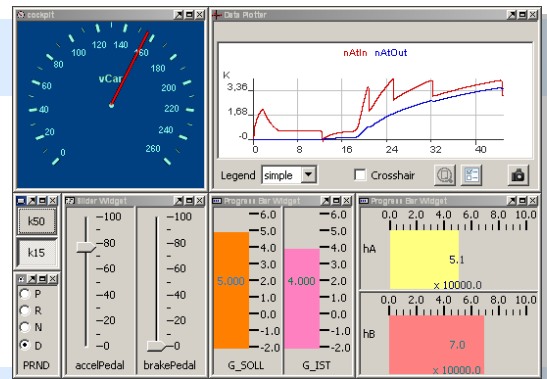
- 1 Build models using Simulink, Dymola, SimulationX, AMESim, Python, C/C++
- 2 Convert the models into Silver modules (gear icon) using the QTronic export tools. For each ECU, configure Silver Basic SW adapter using dbc and a2l files.
- 3 Load all modules into Silver. Silver connects module outputs to module inputs automatically based on name matching. Potential problems and diagnosis information is given for undefined inputs, unused outputs, and module errors.
- 4 Add GUI elements to control simulation or display results. Store the configuration in .sil file for later re-use. Run the simulation to co-execute all the modules. Control and inspect results on-line using the GUI. For off-line analysis, measurement files can be read and written in various formats.

Silver application scenarios

Interactive test

Configure the user interface for your application and drive the system interactively. Silver provides plotters, push buttons, sliders and many more to build up a GUI using drag and drop.

Use this virtual integration to make sure that all modules of your application work together as expected when put into closed-loop with the plant model.



Test automation and debugging

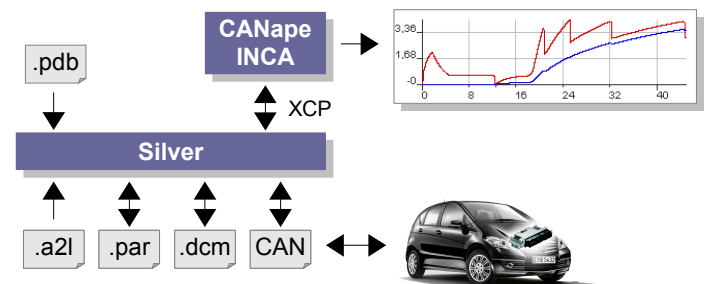
To automate testing of your application, drive simulation by Python scripts, or by mdf, dat or csv files. You can also use Silver as execution platform for test automation, for example using TestWeaver or TPT. You can also attach tools (such as CTC++) to measure the code coverage achieved by the tests.

To debug problems found during test, you can attach a C debugger to the Silver process, step through your code or set breakpoints on signal level and even on code level. Runtime exceptions, such as divisions by zero or access violations, can be easily traced back to the module and the line in source code that provoked it.

Measurement and calibration

Attach an a2l or pdb file to a module to measure and plot all variables for which the address in the compiled module is known. This way you can access all static variables of a running module, not only its top-level inputs and outputs.

Silver can emulate your ECU: Attach tools such as Vector CANape or ETAS INCA to Silver to measure and calibrate the running application, using the same configuration files that you use for the real ECU hardware. Silver can write ("flash") application parameters given in various formats (par, dcm, hex) into your application. Parameters can be changed on-line and saved to files.



Rapid prototyping

A laptop running Silver can be connected via CAN to a hardware-in-the-loop simulation or to a real car. Silver then by-passes the real ECU, which shortens development cycles.

Our services

- Silver setup for development projects
- Consulting for test and validation of systems
- Development of simulation models