

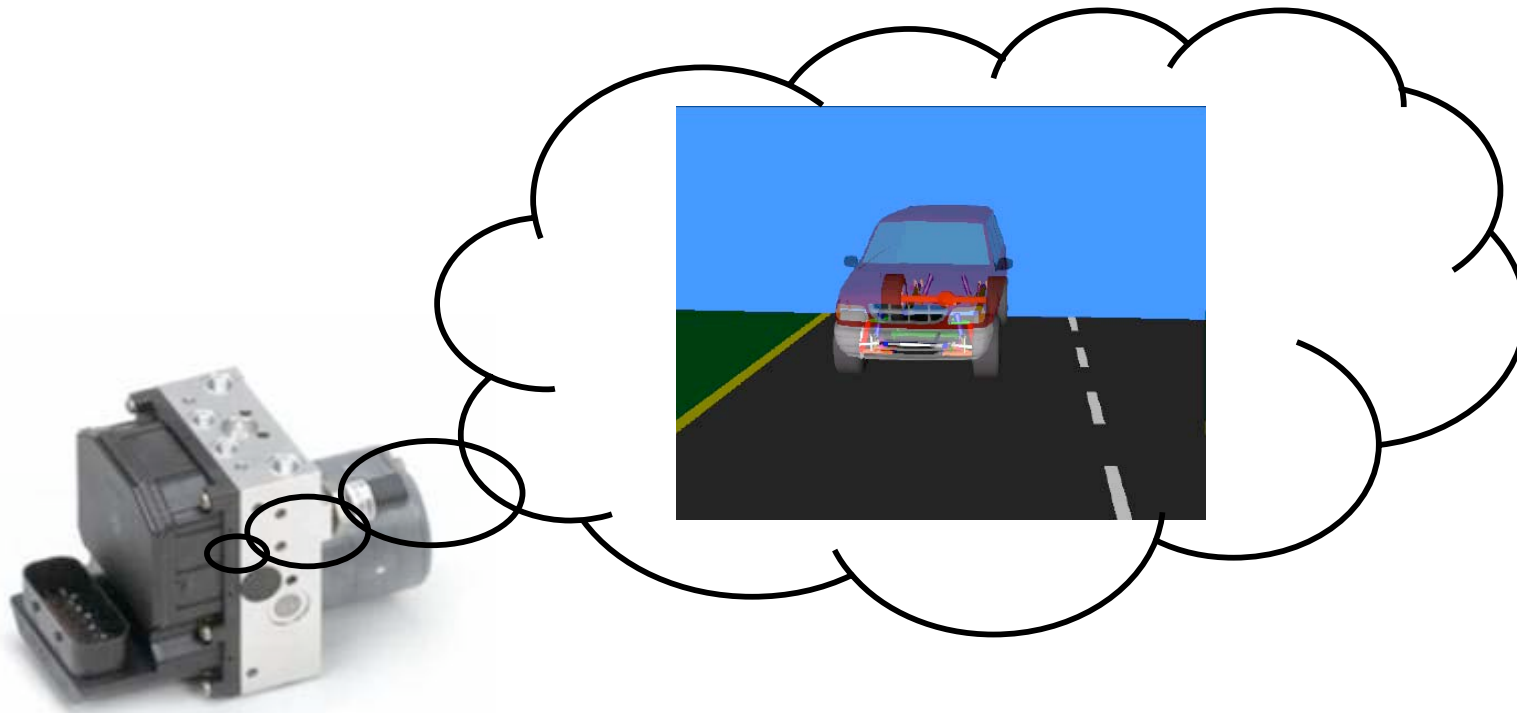
2008 Vehicle Dynamics Expo USA
CS-LABCAR: V&V of ABS and Stability Control ECU Software



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Product Marketing Manager, ETAS

HIL Systems for Chassis and Vehicle Dynamics Applications

- Currently deployed systems are based on
 - Closed system architectures and proprietary hardware
 - PC architectures, using third party PCI hardware for IO signals



CS-LABCAR

- Combine the advantages of PC architectures with
- Special purpose signal hardware for ABS and VDC sensors and actuators
- In a mechanical package that includes all wiring, cooling, etc
- Including all software needed to run real-time experiments
- **Result: A turn-key HIL test system for chassis and vehicle dynamics applications**



Openness

a.k.a. Invest Wisely



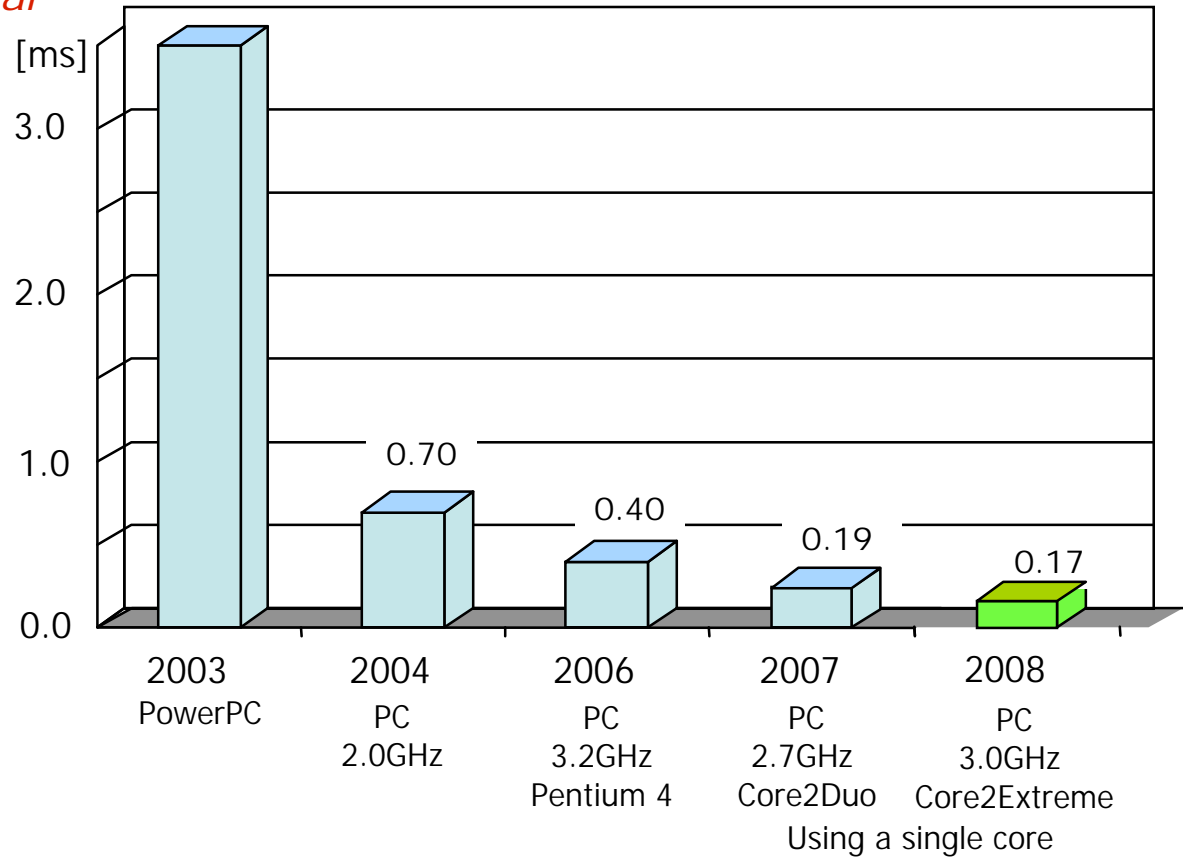
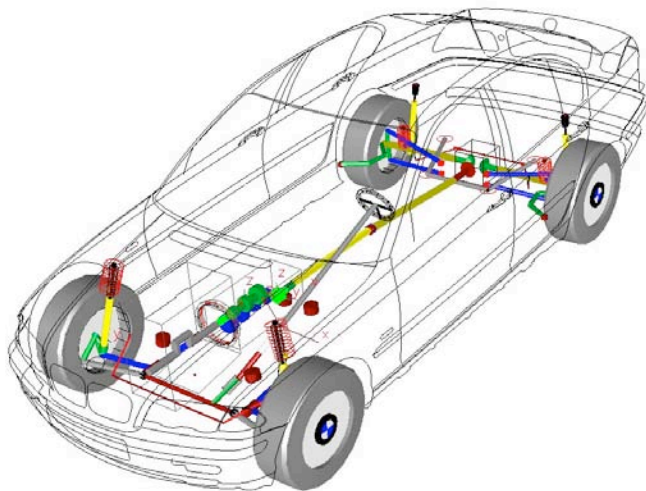
- PC-based architectures provide the openness needed for advanced HIL test systems
 - Benefit from improvements made by the PC industry in terms of
 - Performance
 - Cost
 - Reliability
 - Benefit from
 - Third party hardware
 - Open source and commercial software
 - Third party software and modeling tools
 - Compliance with standards such as Ethernet, PCI, .COM,...



Open PC-Based Architectures

Performance v. Calendar Year

Calculation time of vehicle dynamics model in milliseconds



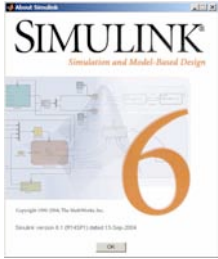
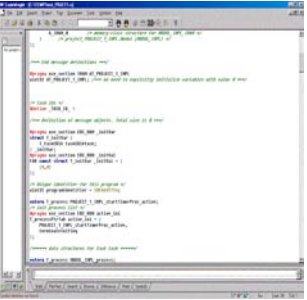
Other Noteworthy Features of CS-LABCAR

- Programmable power supply
- Internal and external load emulation
- Integrated breakout box
- CAN, FlexRay, ...
- Connection box for ABS/VDC unit
- Enough room to combine a chassis controller with an engine controller
- Reflective memory links
 - High bandwidth, low latency interface between PCs



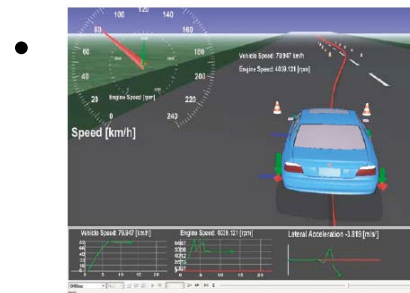
Modeling Tools for CS-LABCAR

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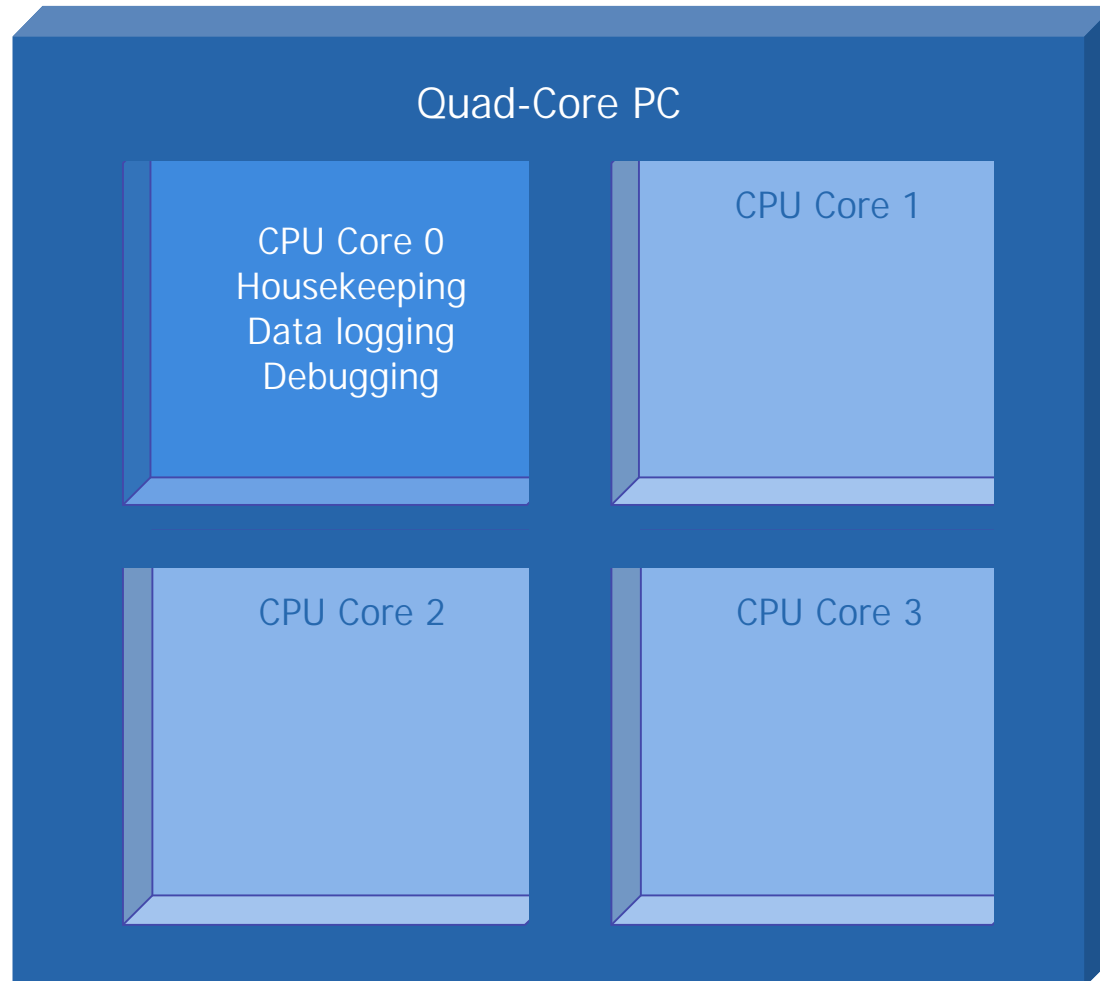
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Existing C code

-  



Multi-Core PCs and Models



Vehicle Dynamics Model

CarSim[®]
Mechanical Simulation

Powertrain Model

GT-POWER

Hardware Control

CAN Emulation

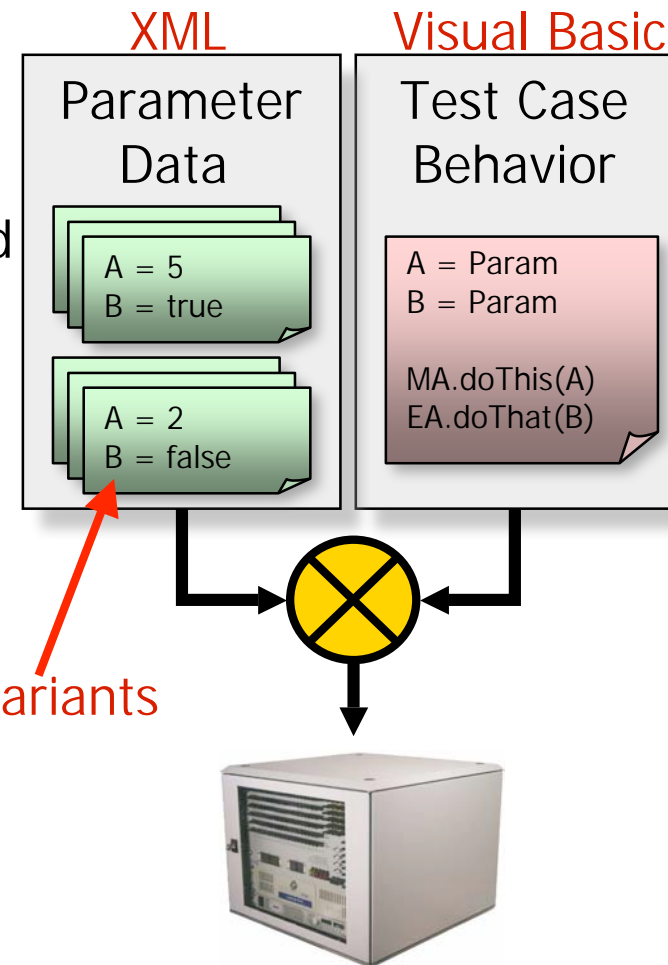
User C Code

Test Automation

Parameterization is Essential for Re-use of Test Cases

- CS-LABCAR has an open .COM API that lets you choose the language for test automation
 - C#, VB, Python, m,...
- Integration with other tools lets you write tests in a bench-independent, parameterized form

Parameter Usage	Description
Adaptations of the test bench	Test system configurations, tool options, time-out durations,...
Initializing a test operating point	Environment data, initial conditions of models,...
Test points and test vectors	E.g. road curvature and vehicle speed for ABS tests
Test evaluation criteria	Evaluation methods, Pass/fail criteria, tolerances



Conclusions

- CS-LABCAR combines PC architecture with commercial and open-source software tools
- Result:
 - Guaranteed leading edge performance
 - At very competitive price levels
 - Guaranteed openness for a wide range of software and modeling tools
- Long term protection of your investment

