



„Wenn Du ein Schiff bauen willst, dann trommle nicht Deine Männer zusammen, um Holz zu beschaffen und Arbeit zu verteilen, sondern lehre sie die Sehnsucht nach dem weiten, endlosen Meer.“

Antoine de Saint-Exupéry

# **MICRONOVA**

Software- und Systementwicklung

## **Company Overview**

**Orazio Ragonesi, M.B.A.**

Executive Vice President

Director of Automation & Simulation

# Profile

**MICRONOVA**

**Year of foundation: 1987**

**Employees: ~ 70**

**Location: Vierkirchen  
(Germany)**

**Business Segments: A&S  
T&N**

**Owner  
and President: Josef W. Karl**




# Our Customers in A&S...

**MICRONOVA**



... are satisfied Customers



„Wenn Du ein Schiff bauen willst, dann trommle nicht  
Deine Männer zusammen, um Holz zu beschaffen  
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Antoine de Saint-Exupéry

# **MICRONOVA**

Software- und Systementwicklung

## **HIL-Simulation with NovaSim**

**Orazio Ragonesi, M.B.A.**

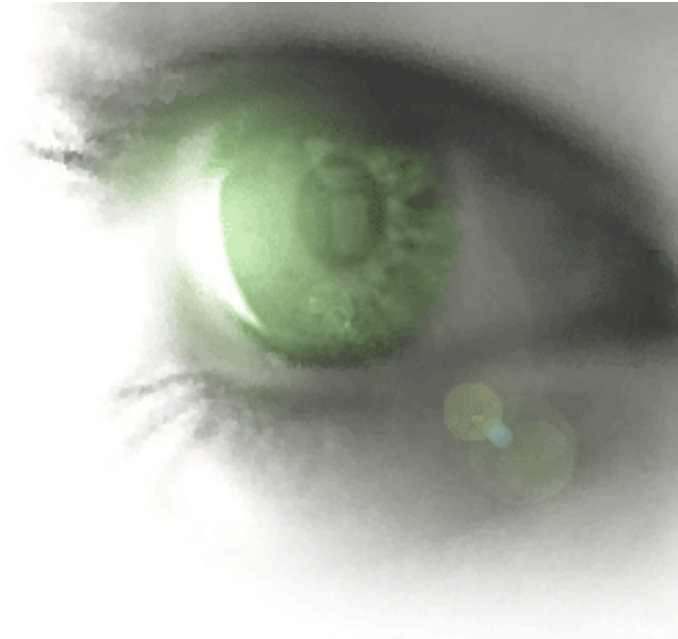
Executive Vice President

Director of Automation & Simulation

# Overview

***MICRONOVA***

- State of testing ECU software
- Solution: HIL-Simulation with NovaSim
- NovaSim Software
- NovaSim Hardware
- Examples
- Summary and result

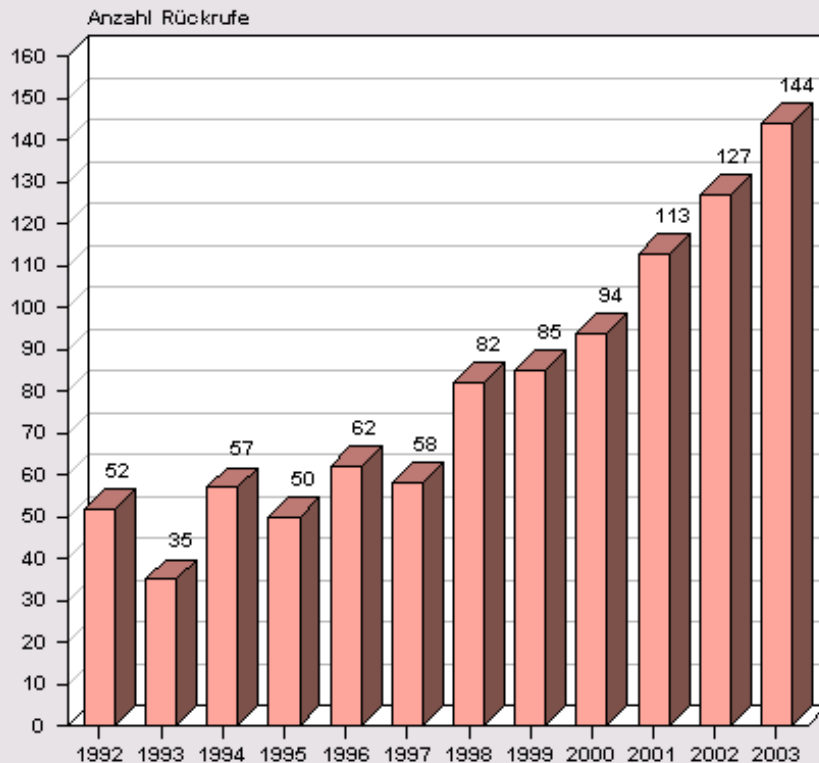




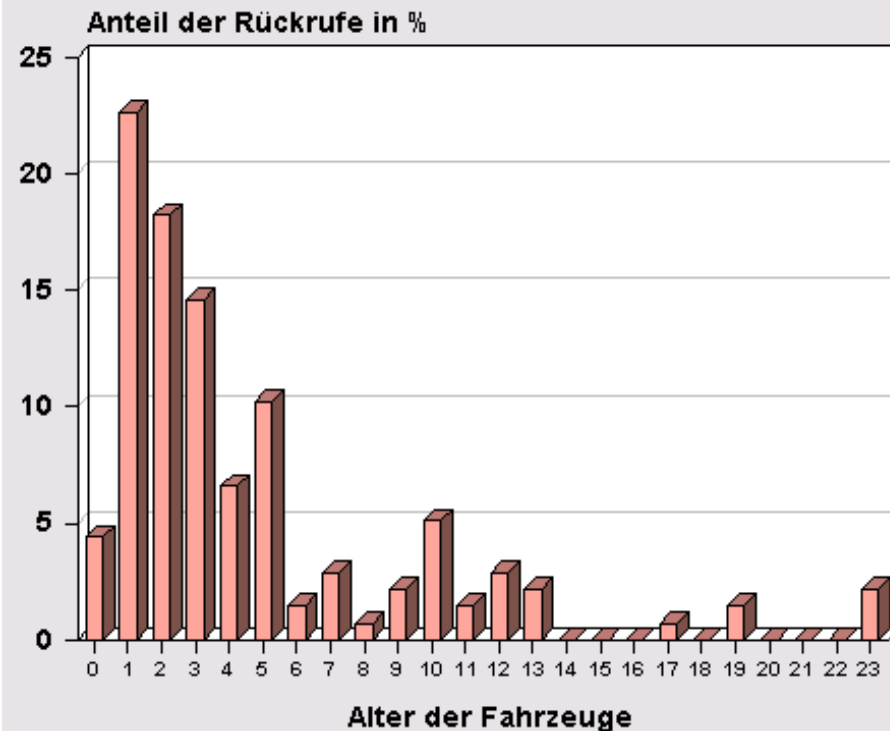
# State of testing ECU software

# Challenge Embedded Development

Entwicklung der Rückrufaktionen von 1992 bis 2003



Alter der Fahrzeuge bei Rückrufaktionen



Studie, dass es mit der Entwicklungsqualität auch deutscher High-Tech-Autos nicht zum Besten stünde. Zeitdruck sowie wachsende Modellvielfalt führten offensichtlich dazu, dass der Reifegrad von

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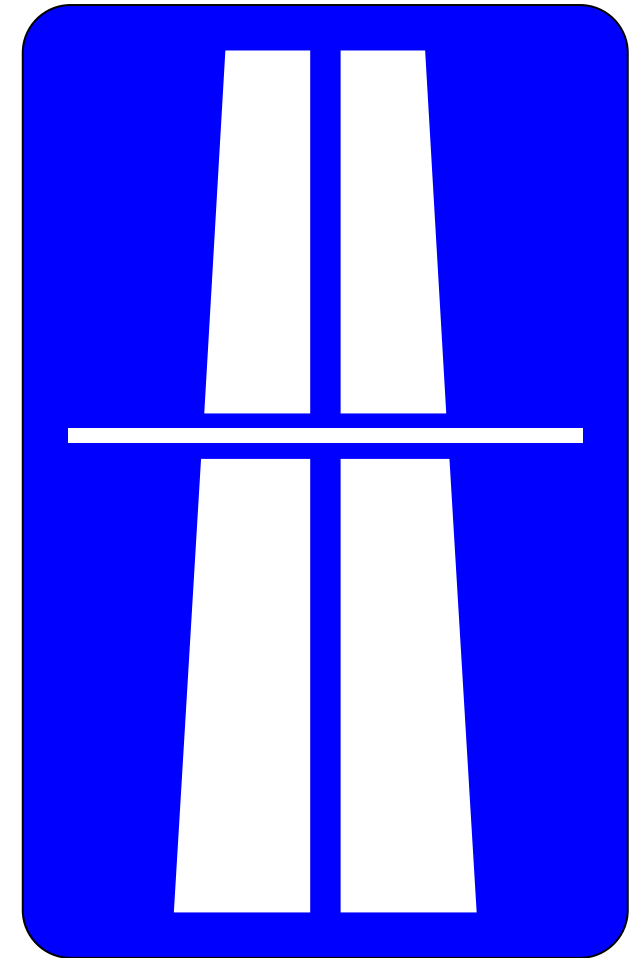
Entwicklungswünsche der Hersteller die Entwicklung in der gesamten Prozesskette der Fahrzeugentwicklung schätzen die Befragten auf durchschnittlich 27 Prozent.

„Auch da können wir von den Japanern lernen – und zwar mehr Disziplin.“

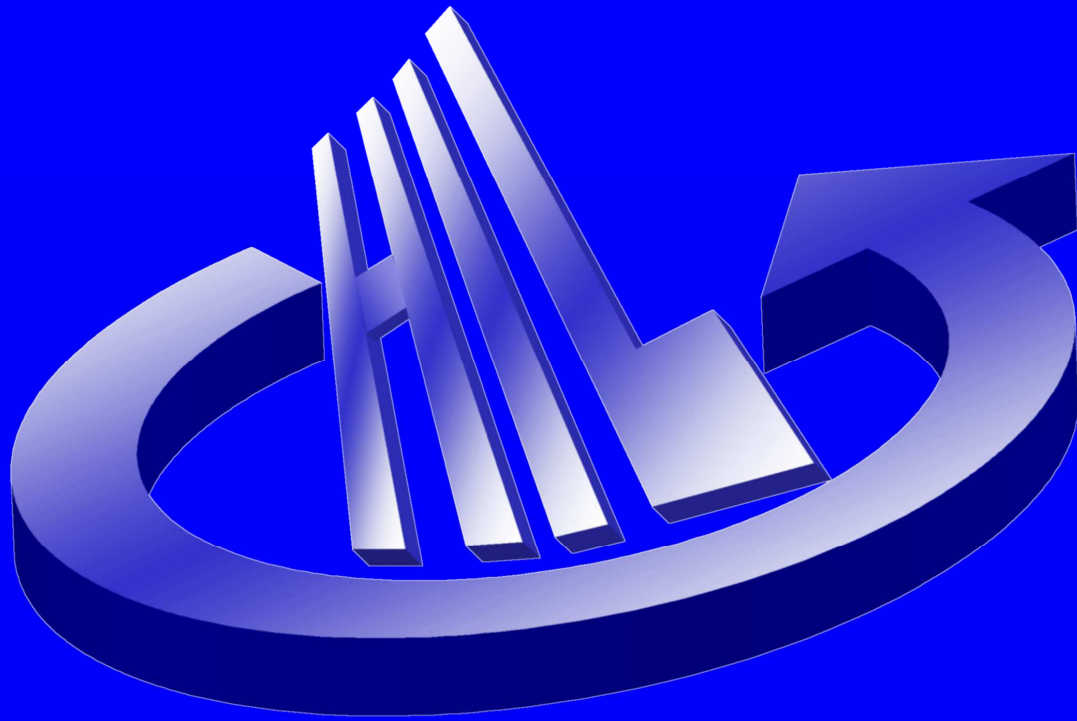
Source: SZ 10.11.2003, <http://www.kba.de/Stabsstelle/Technik/rueckrufe.htm>

# State of testing ECU software

- ❑ Increasingly complex functions in ECUs
- ❑ Big number of variants
- ❑ Complex networking szenarios
- ❑ Reduced development time
- ❑ Increasing usage in safety critical areas
- Challenge: Quality
- German companies on a good way
- CO<sub>2</sub> Discussion on top







**Solution:**  
**HIL-Simulation with NovaSim**

# What is HiL-Simulation?

**Hardware and software simulating whole environment for ECU**

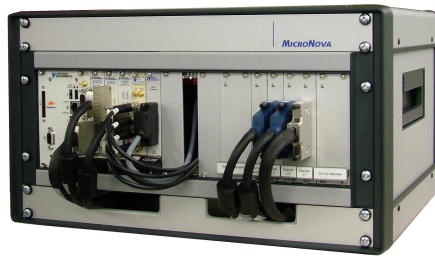


**ECU (UUT)**



# NovaSim Product Line

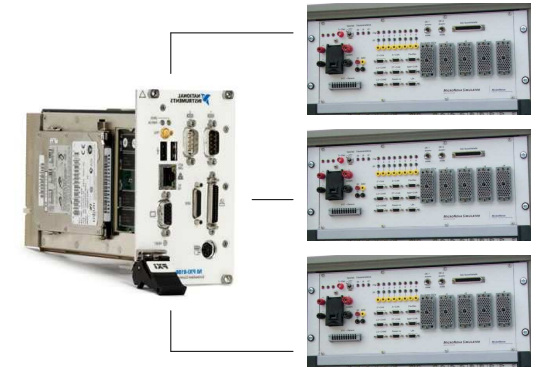
**MICRONOVA**



Basic



Fullsize



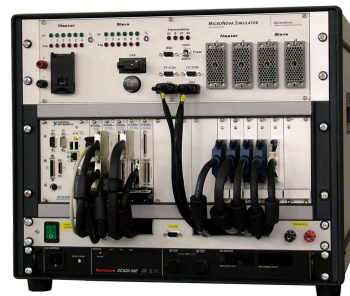
Distributed

## *NovaSim*

Micro



Compact



Cluster



# NovaSim for the automotive industry

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Combi-Instrument

## Comfort / Body

- Intelligent load module
- Door control unit
- Multi pole sensor
- Ventilator / cooler
- ...

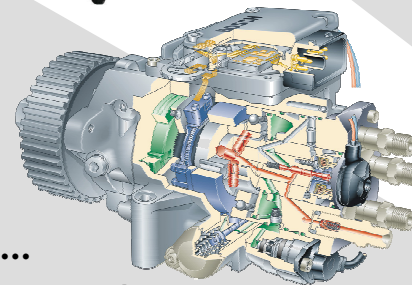


**MOST**

radio

## Infotainment

- CAN-MOST Gateway
- MOST-system
- Navigation
- ...



Engine,  
Transmission, ...

## Powertrain & Driving Dynamics

# HiL-Plattform NovaSim

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# NovaSim Software

# Challenges by non standard signals

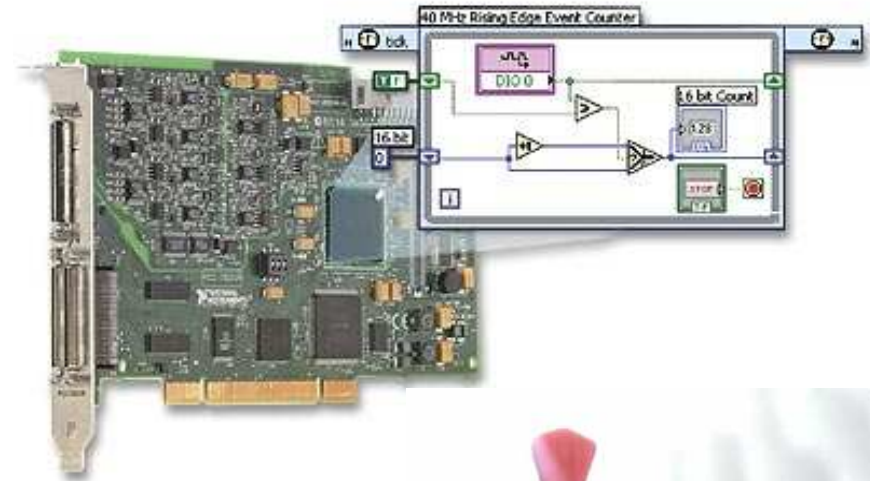
- Creation of signals on realtime computer not possible
- Often synchronisation of several boards necessary
- Easy integration in simulation models necessary
- Partly time resolution down to nanoseconds necessary
- Easy changeability
- Usage of available hardware for different purposes



# Examples for nonstandard signals

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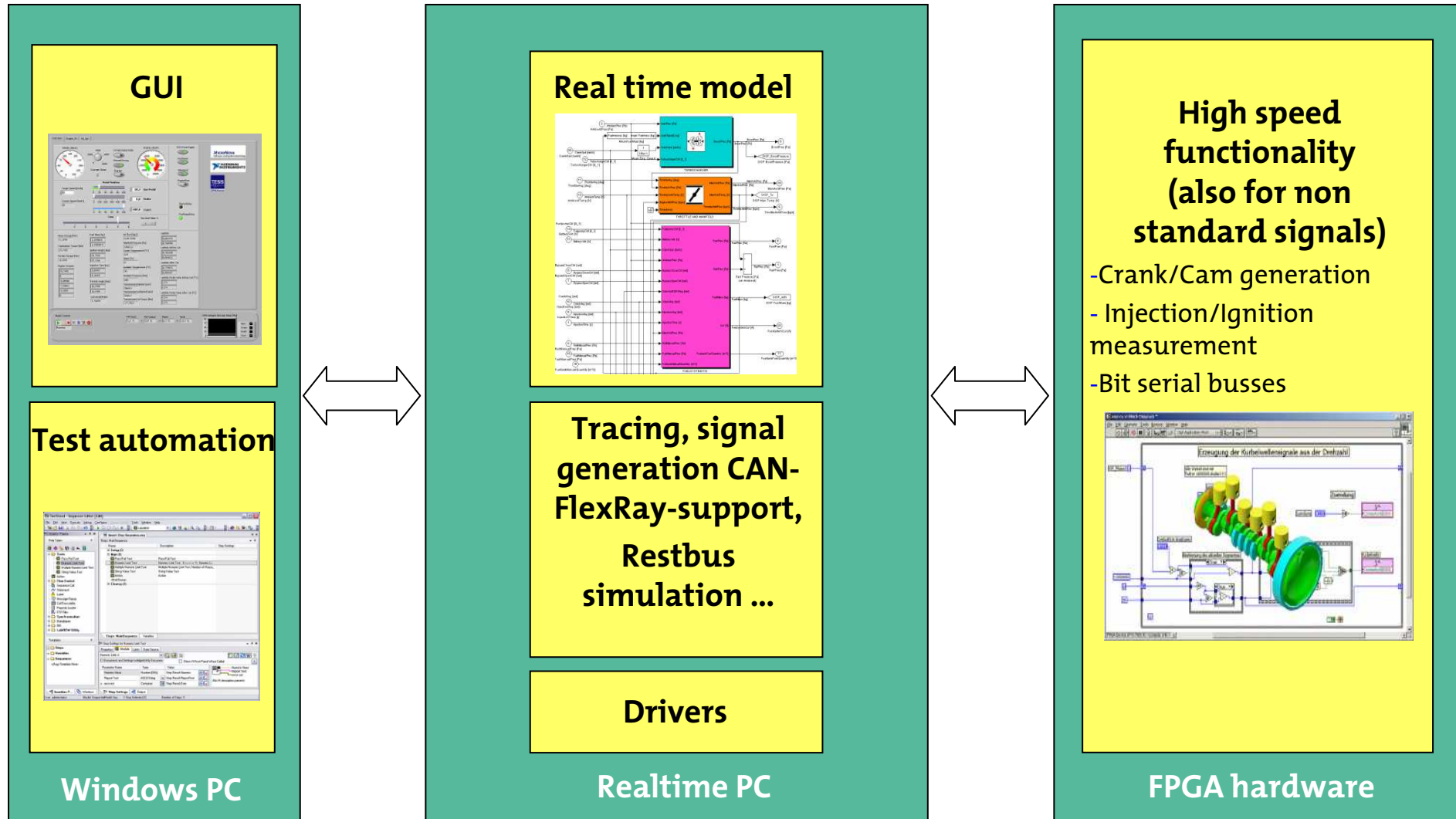
- Crank / Cam signal generation
- Generation of knock signals
- PWM – generation/ -measurement
- User specific serial busses (e.g. SPI, BSD)
- Measurement of injection and ignition signals
- User specific sensor protocols
- High speed signal generation and measurement



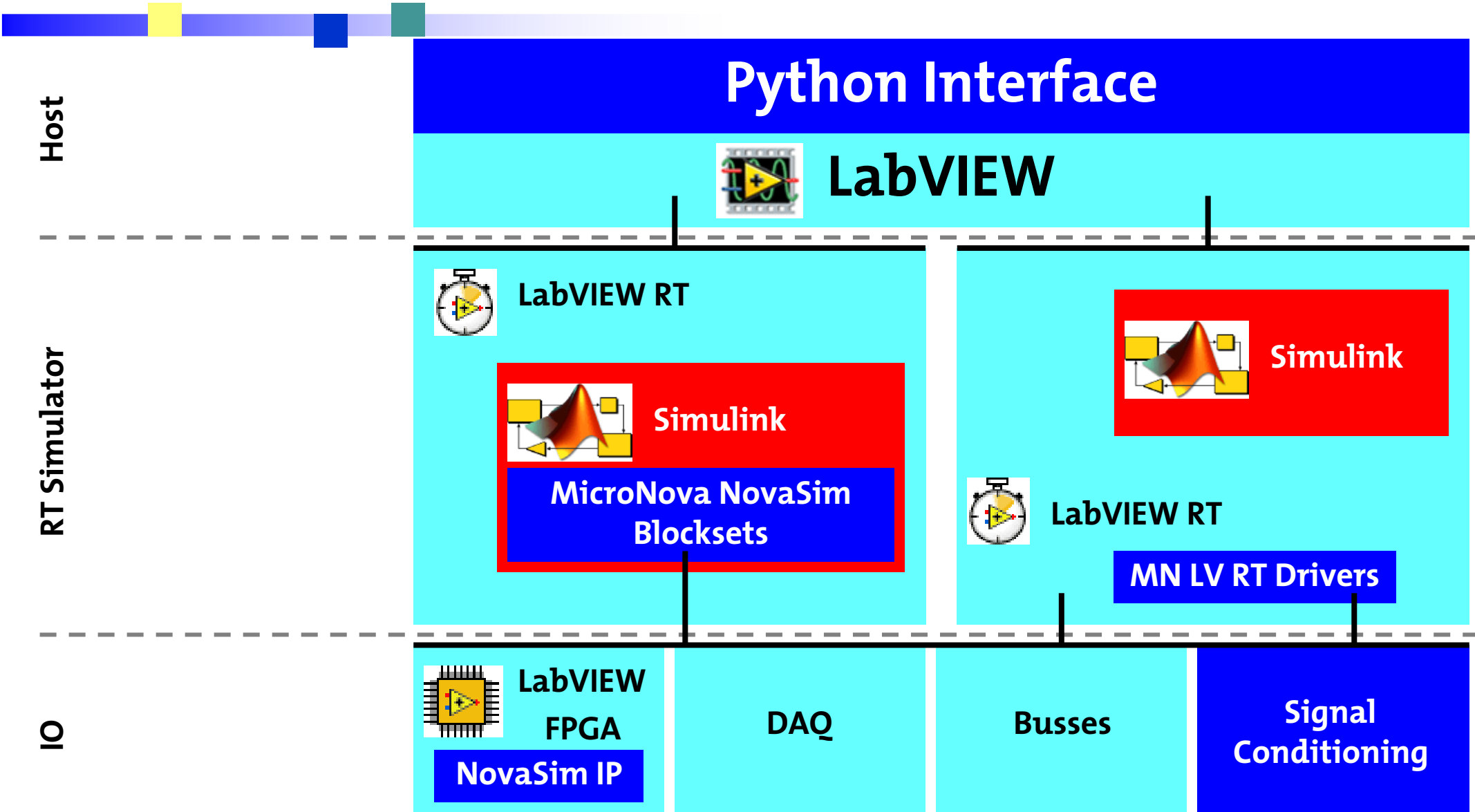


# HiL software components

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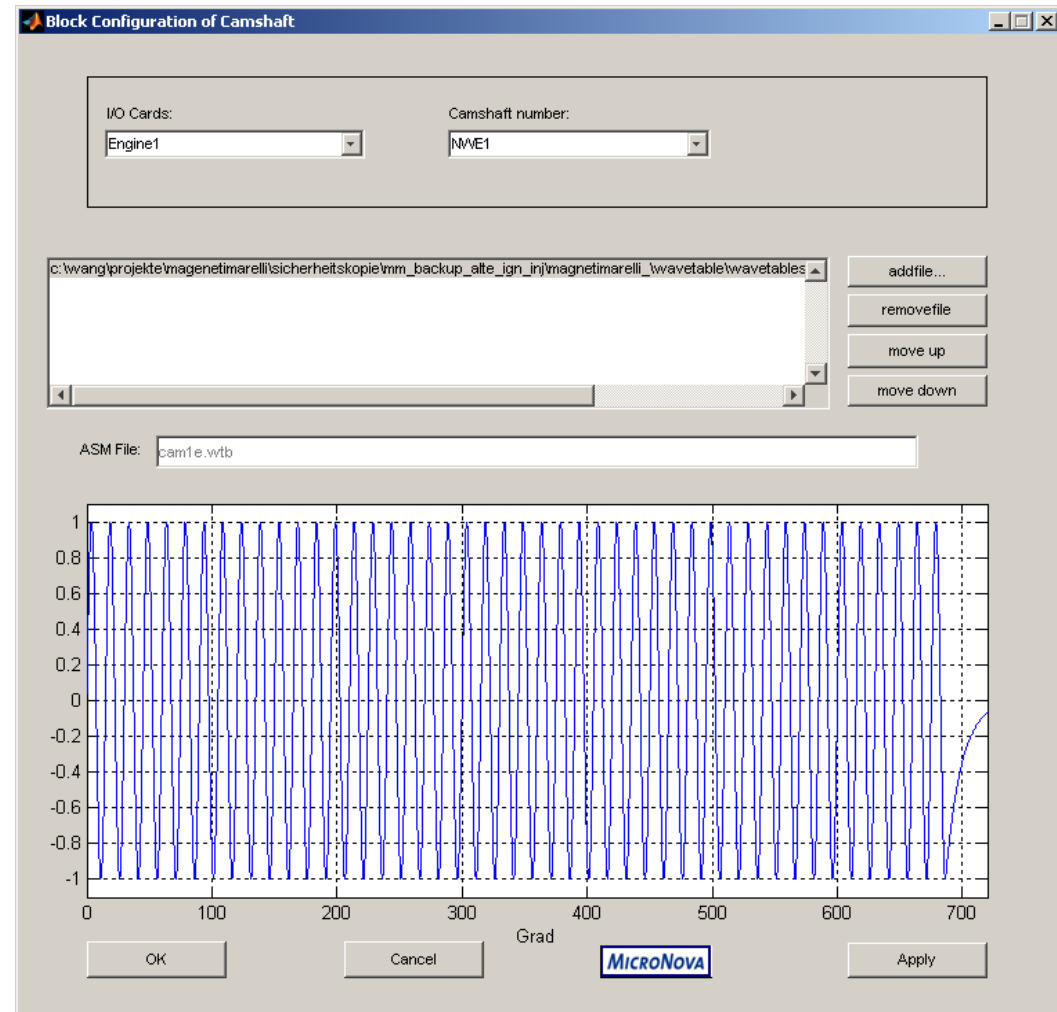
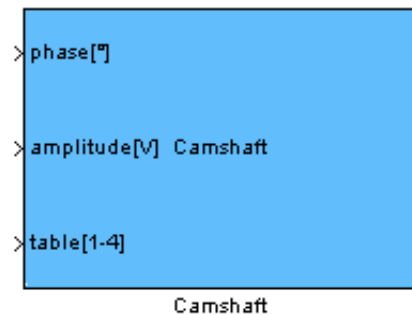
# What makes MicroNova different



# Example: Camshaft signal generation

**MICRONOVA**

- ❑ Table based configuration of camshaft signal (8192 points per revolution)
- ❑ Up to 4 tables for cam signal generation (switchable during runtime)

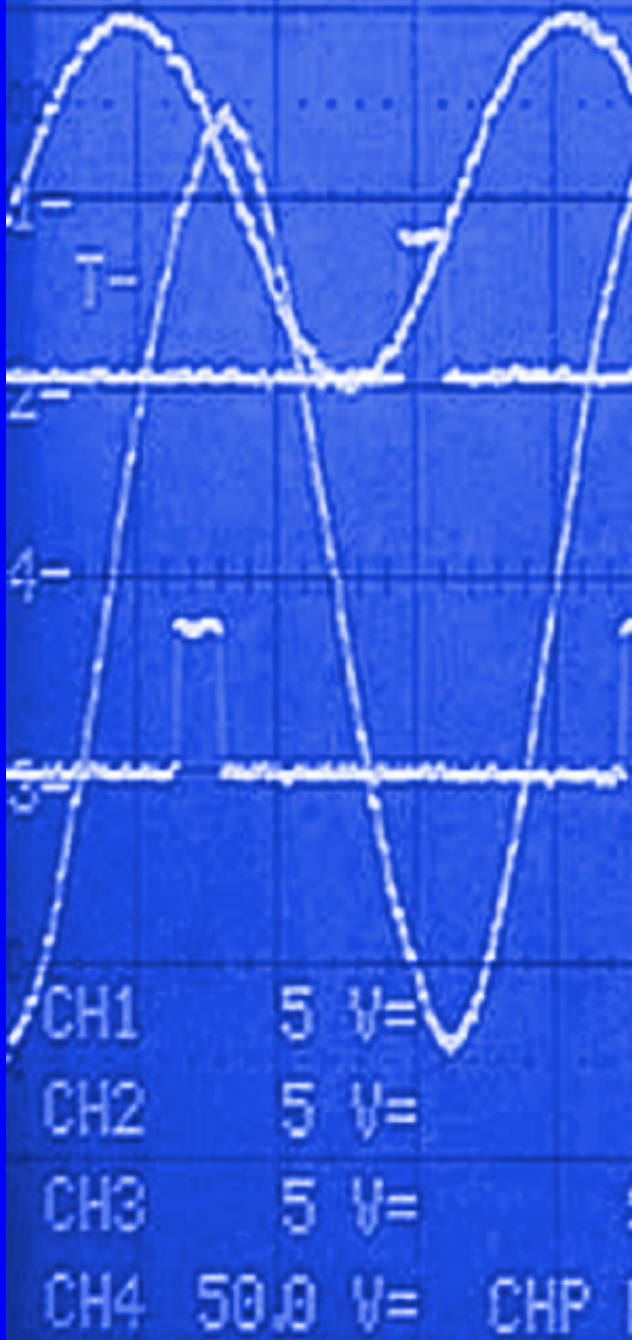


# NovaSim block sets

**MICRONOVA**

- Blocksets for standard digital I/O, PWM I/O, Analog I/O
- E. g. Motor specific blocksets (Crank/Cam Signal generation, generation of knock signals, measurement of ignition, injection)
- CAN blockset with DBC file support
- LIN blockset with LDF file support
- FlexRay support

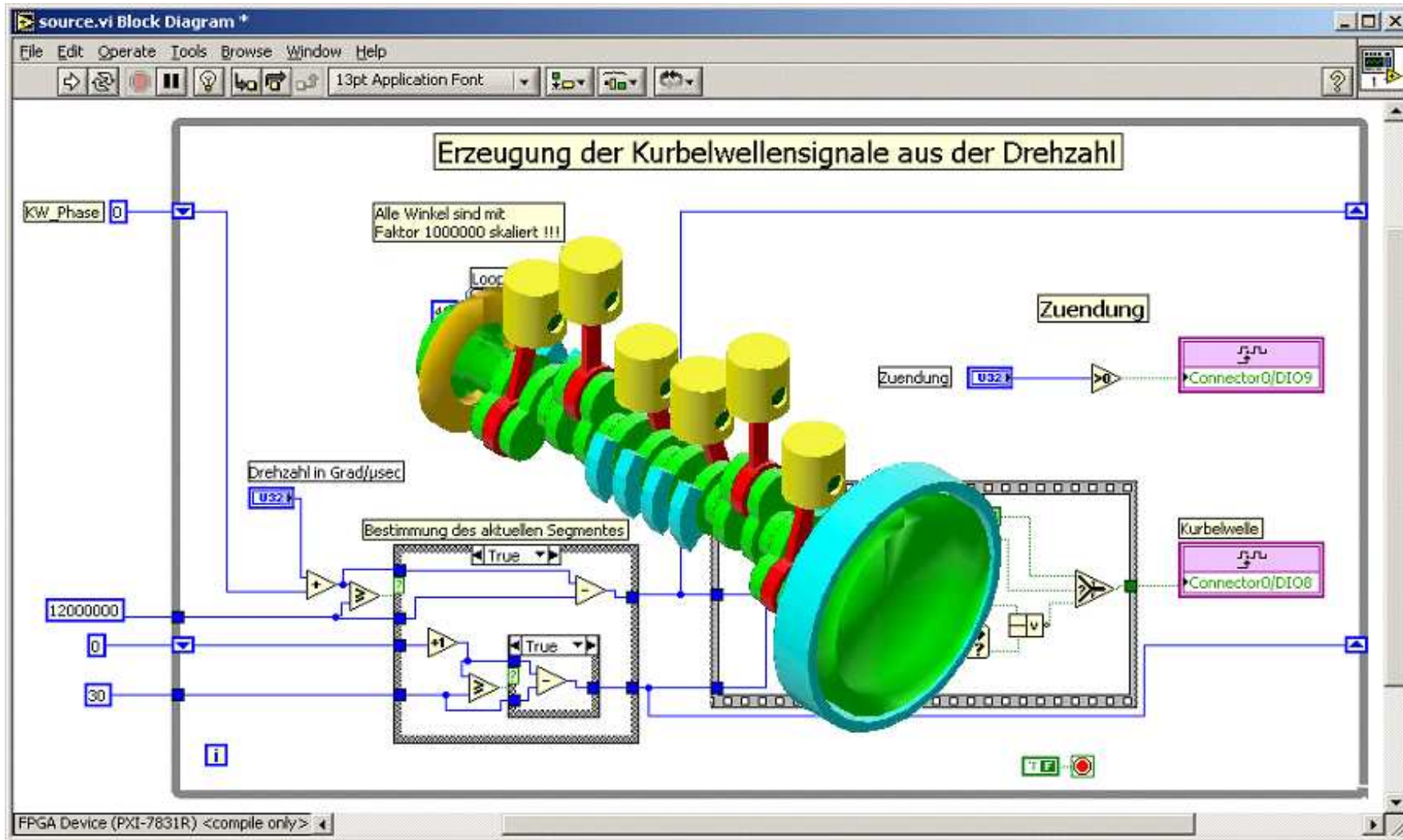
**Same blocksets for NovaSim Micro, Basic, Compact, Fullsize, Cluster and Distributed**



# Motor-HIL-Board based on FPGA technology

# FPGA-Model

*MICRONOVA*

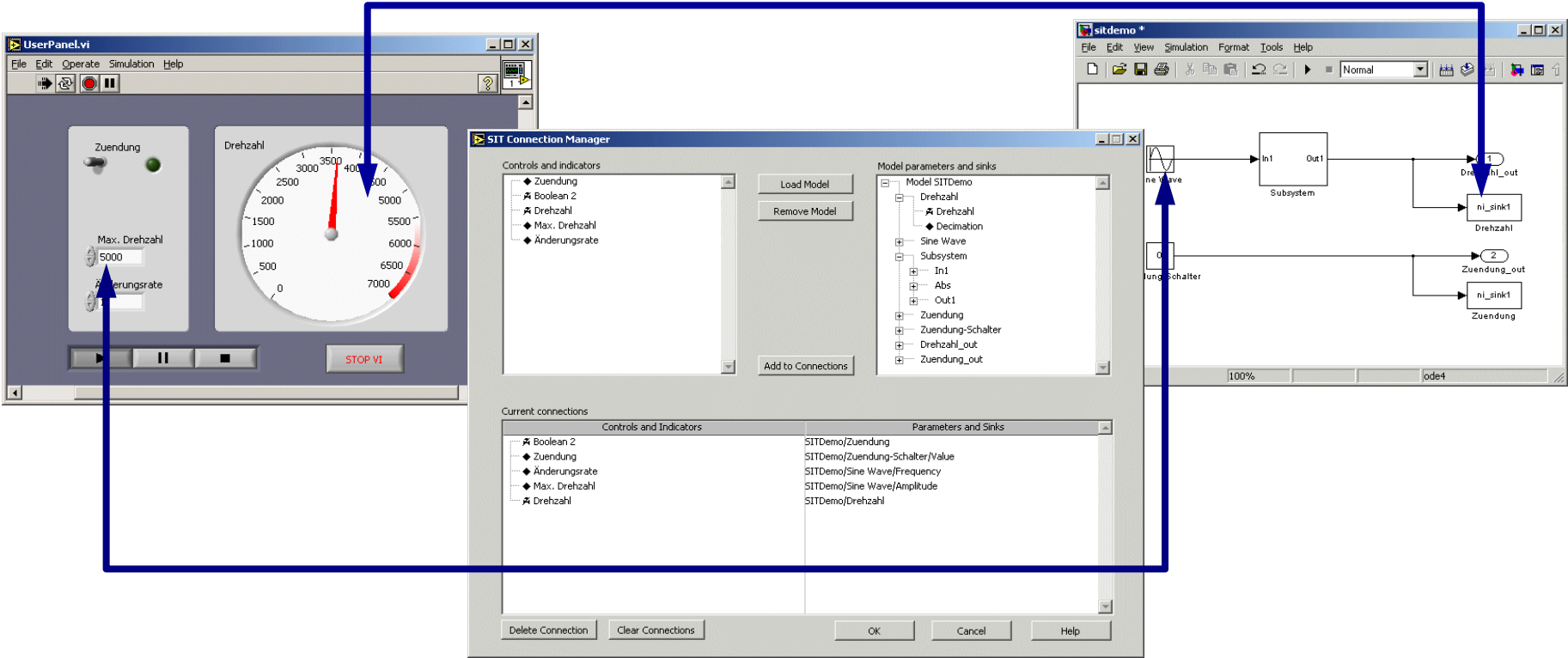




# Integration of Matlab/Simulink

# Creation of GUIs

- ❑ Placement of controls and indicators
- ❑ Opening of SIT Connection Manager
- ❑ Connection of GUI elements with model parameters
- ❑ LabVIEW-Code for GUI elements is created automatically





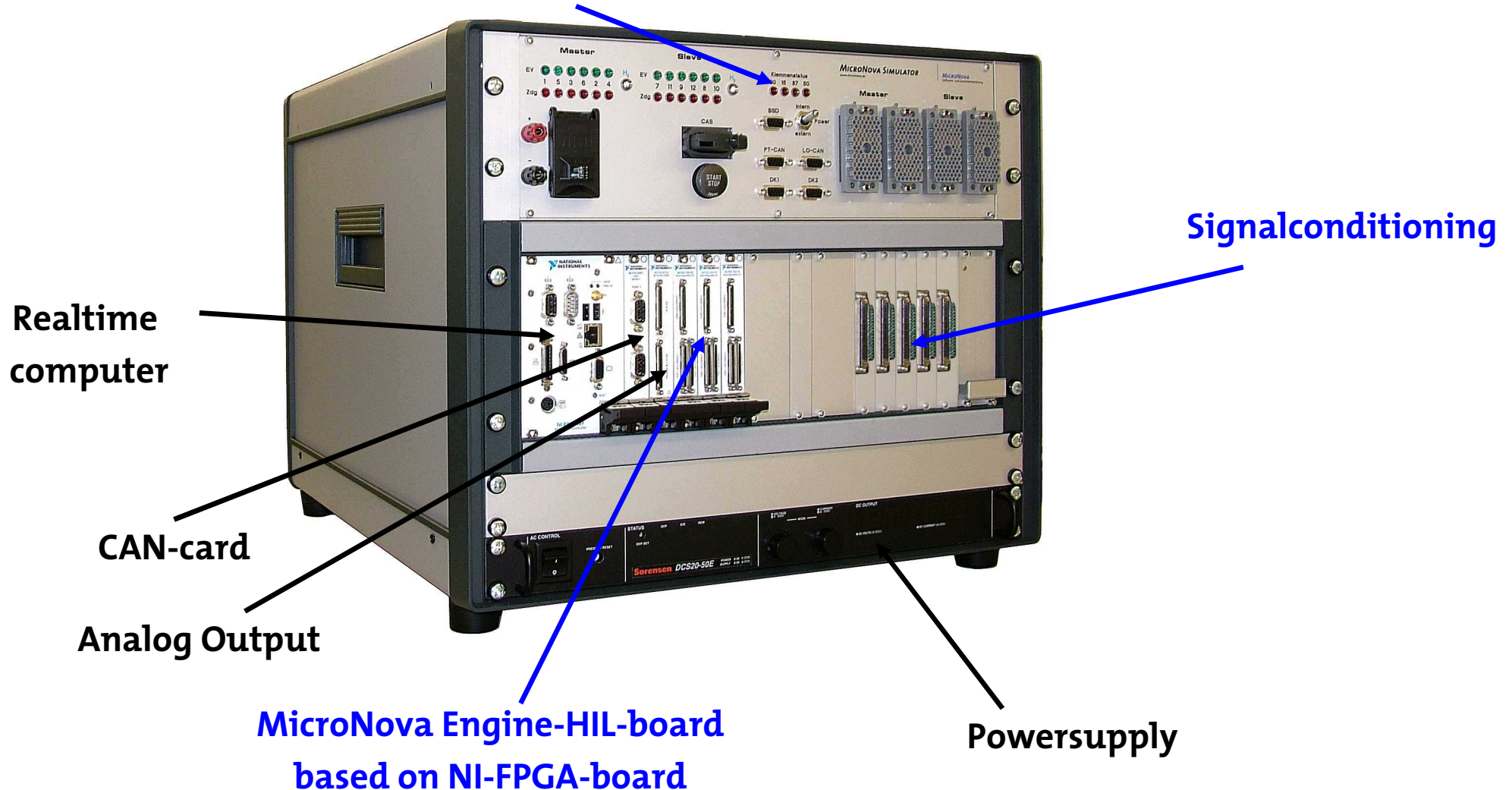


# NovaSim Hardware

# Hardware components

**MICRONOVA**

Display elements and connection panel for ECU



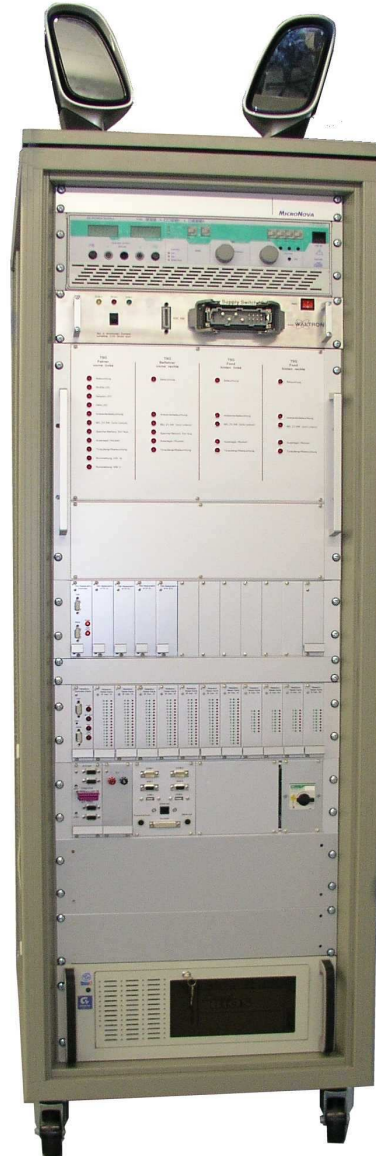


# Examples

# NovaSim RT: Comfort and Powertrain

**MICRONOVA**

**Example Comfort:  
Door ECU HIL  
for AUDI A8 und A6**

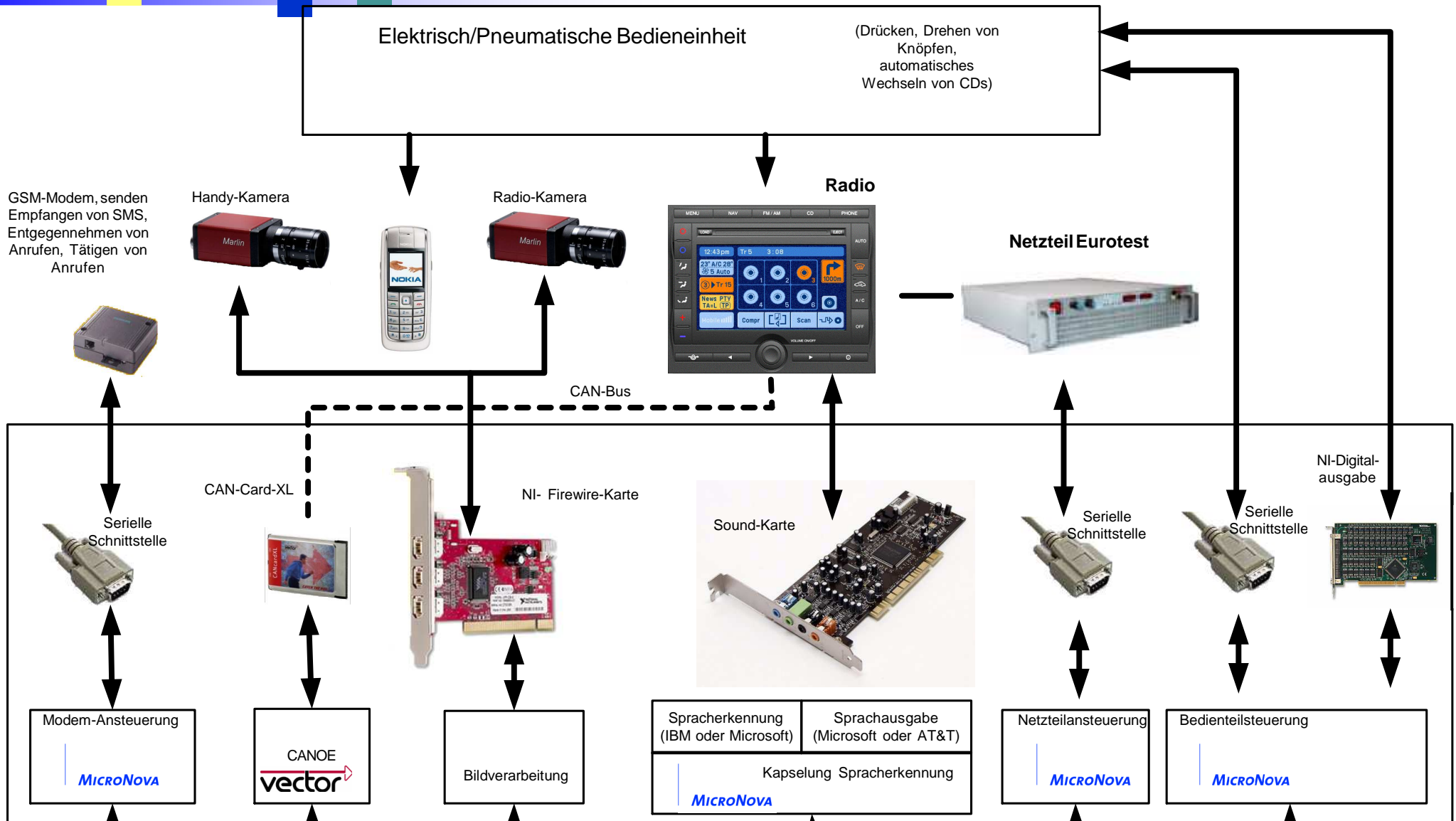


**Example Powertrain:  
8 Cylinder Direct-  
Injection-HIL for  
BMW**



# NovaSim RT: Infotainment

**MICRONOVA**





# Summary and result

# NovaSim Basic Components

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PXI Controller



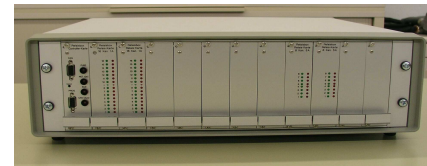
FPGA-Board



Current measurement



Simulated loads



Failure Insertion



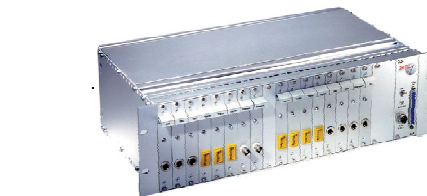
Special Boards



Analog Out

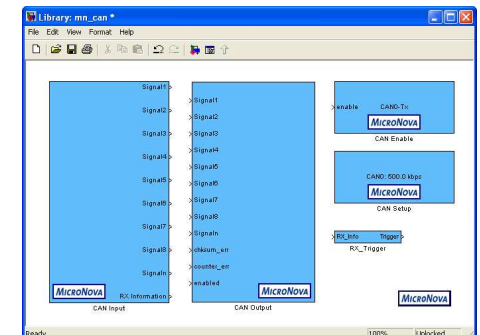


cRIO



Signal conditioning

**LabVIEW 8**



Simulink  
Blocksets

# Advantages of the NovaSim concept

**MICRONOVA**

- Complete Matlab/Simulink support
- Runs big Models with IO computed in 500  $\mu$ s
- Huge number of PXI boards available
- Flexible „Hardware“-adaptation by the usage of FPGA-technology
- Simple graphical programming with LabVIEW
- Scalable from open loop to cluster HIL
- Size and Price





# Summary

**MICRONOVA**

Complete test  
systems with  
Value-Added  
components

Standard  
components

**MICRONOVA**

Software- und Systementwicklung



Local Partner





# ***MICRONOVA***

Software- und Systementwicklung

**Thank You**

