



FACHHOCHSCHULE
TECHNIKUM WIEN

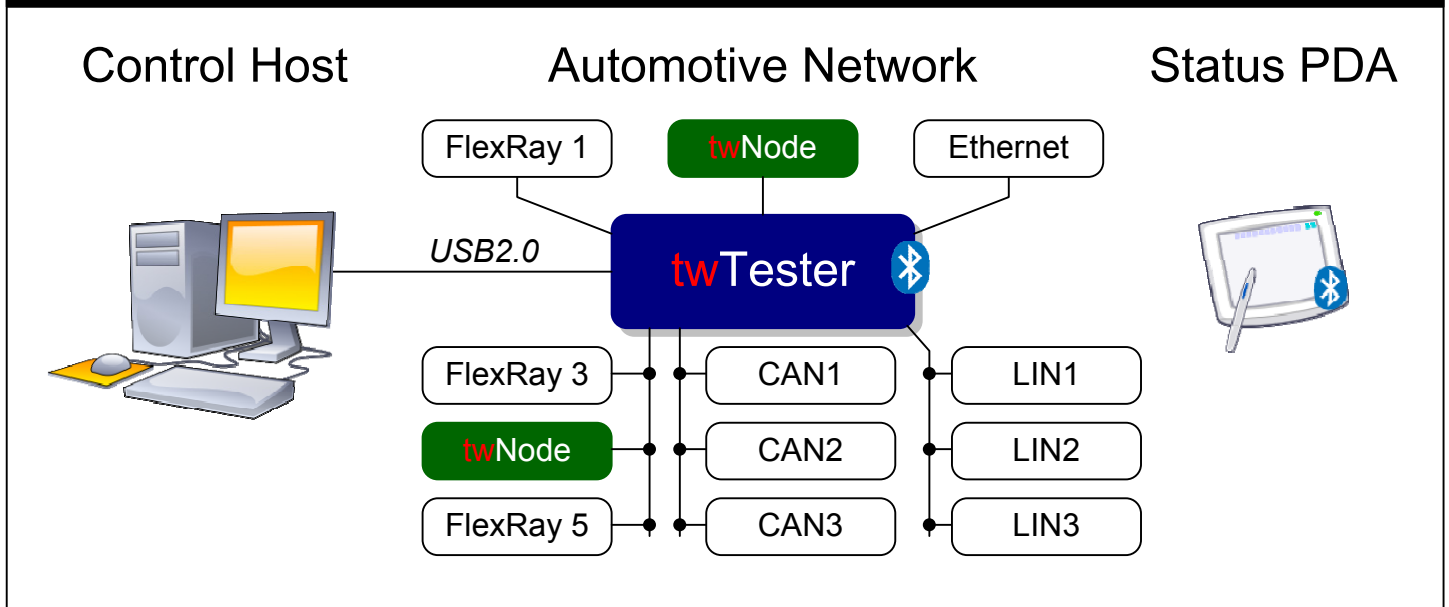
Department of Embedded Systems

twAutomotive

<< PRELIMINARY >>

Parts of **tw**Automotive were developed in the context of the FHplus research project DECS (FFG grant 811414) and the project Automotive Gateways funded by the City of Vienna (MA27 grant 04-09).

System Architecture



twTester Overview

- Supply Voltage Range 5-18V
- 6 Configurable Interfaces for either CAN, LIN or FlexRay
- 2 Dedicated FlexRay Interfaces
 - programmable signal edge delays
 - pulse shaping via passive filters
- 1 Fast-Ethernet Interface
- 1 High-Speed USB 2.0 Interface (CY7C68013A) for Control, Data Exchange
- 1 RS232 Interface
- 1 Bluetooth 2.0 EDR Interface (WT11) for Status Exchange
- 2 Differential Analog Inputs
- Various Zefant XS3 FPGA Boards from Simple-Solutions

twNode Overview

- AVNET/Memec Xilinx Virtex-4 LX and FX Plattform
 - Gigabit Ethernet, Numeric LCD, Push Buttons & LEDs, 32M x 16 DDR Memory, 2M x 16 Flash Memory
- Custom P160 I/O Extension Module
 - Spartan 3 FPGA (XC3S1600)
 - CAN Controller (SJA1000) and Physical Layer Interface
 - FlexRay Controller (MB88121B) and Physical Layer Interface

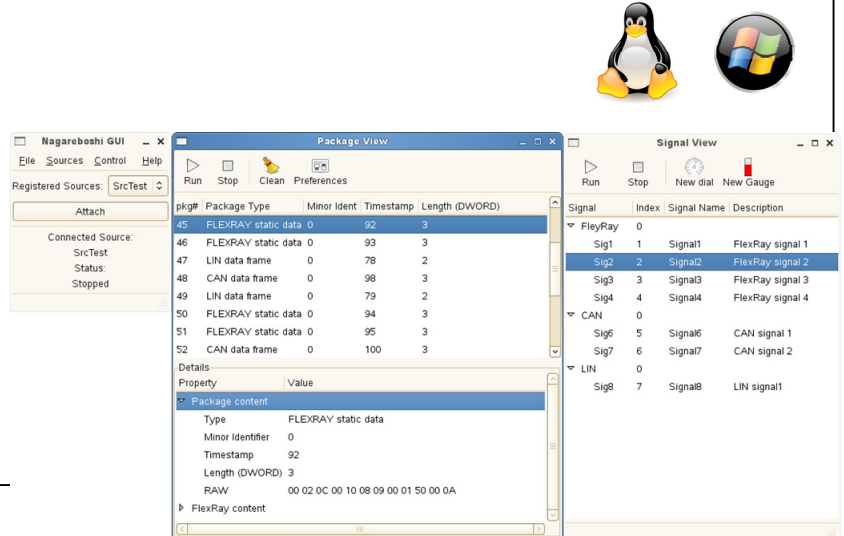
Library

Driver API

- GLib library
- libusb
- libnet

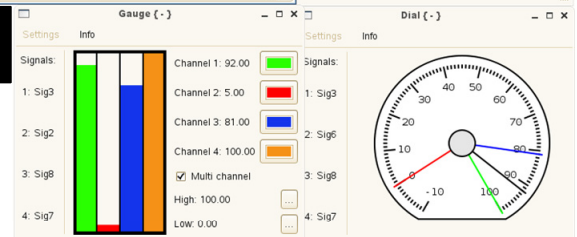
User API

- Command Line Interface
- Start / Stop Facilities
- Filter & Trigger Functionality



Graphical User Interface

GTK+ Application



Display

Signal View

- Multi Dials
- Multi Bars
- Scope

Frame View

- Update Mode
- History List Mode

Control

Start / Stop

Filter

- CAN, LIN, FlexRay
- Frame Types
- Validity, etc.

Action

- Monitoring
- Replay, etc.

Configuration

Sources / Sinks

- File
 - USB / Ethernet / ...
- #### Schedule Importer

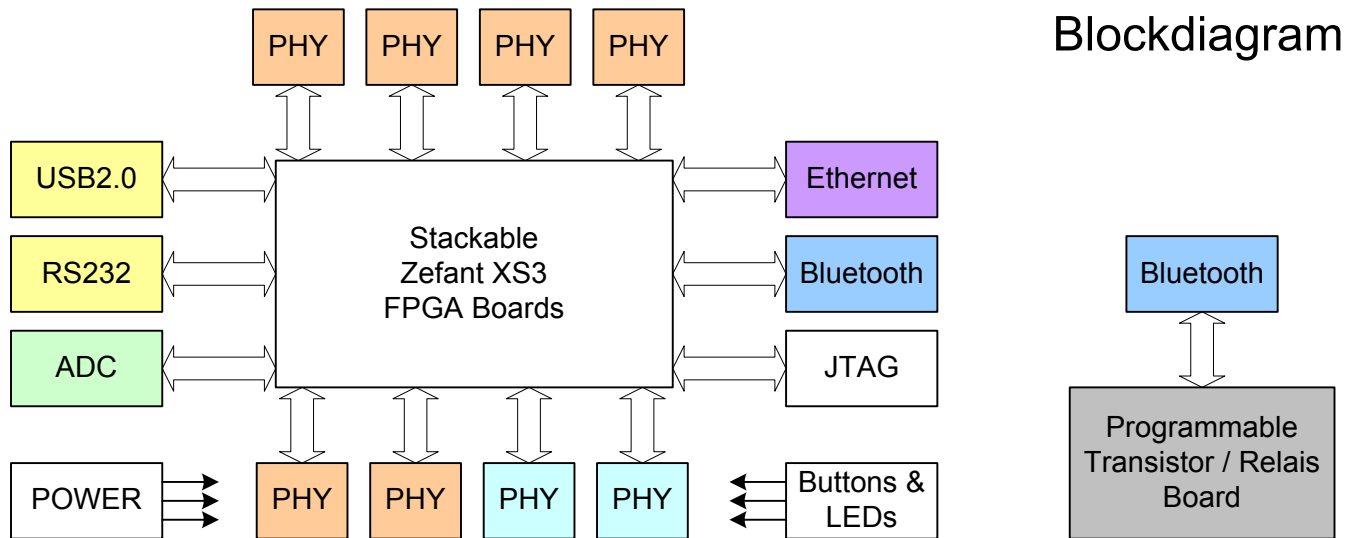
FPGA Unit Config

- Power-on Sequence
- Interface Control
- etc.

Status

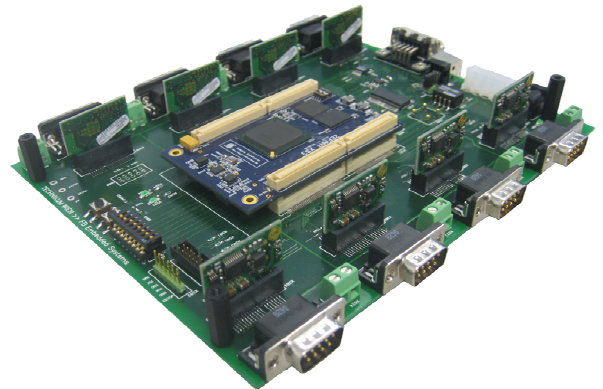
- Display Status Information & Statistics
- Remote Control of Basic Functionality via Bluetooth 2.0





Functionality

- Active Star-Coupler for FlexRay
- LIN, CAN, FlexRay Gateway
- Busmonitoring of LIN, CAN, FlexRay & Ethernet
- Replay & Fault Injection of FlexRay Bus Traffic
 - Symmetric & Asymmetric Faults
 - etc.



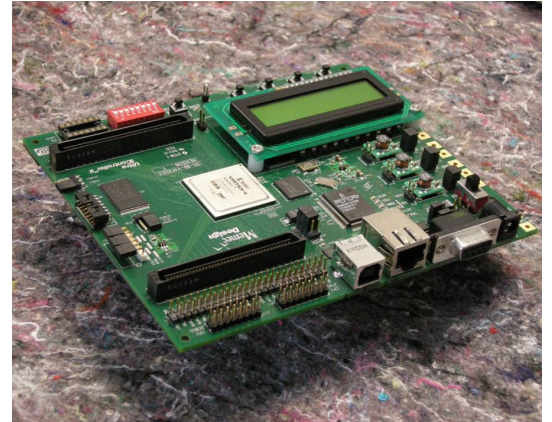
Features

- 1 USB 2.0 High-Speed Interface for Control and Data Transfers (measured net data rate >320Mb/s)
- 1 RS232 Standard Serial Interface (optional for control and data transfers) with Handshake
- 2 Differential ADC Inputs (AD7266) for autonomous surveillance of board supply voltages
- 6 Interchangeable Physical Layer (PHY) Interfaces:
 - TZM FlexTiny FlexRay, CAN and LIN (optional: Custom FlexRay, CAN and LIN Boards)
- 2 Dedicated Physical Layer Interfaces for FlexRay (TJA1080):
 - DS1021 Delay Line Chips for programmable TXD delays of both the rising and falling edges
 - Interfaces for passive filter circuits for dedicated pulse shaping of the FlexRay bus lines
- 1 Bluetooth 2.0 EDR Module (Bluegiga WT11) for Remote Control & Status Display, and Interfacing of a Transistor / Relais Board to control the power-on sequence of the distributed ECUs
- 1 Fast-Ethernet Physical Layer Device (DP83848) with standard MII Interface

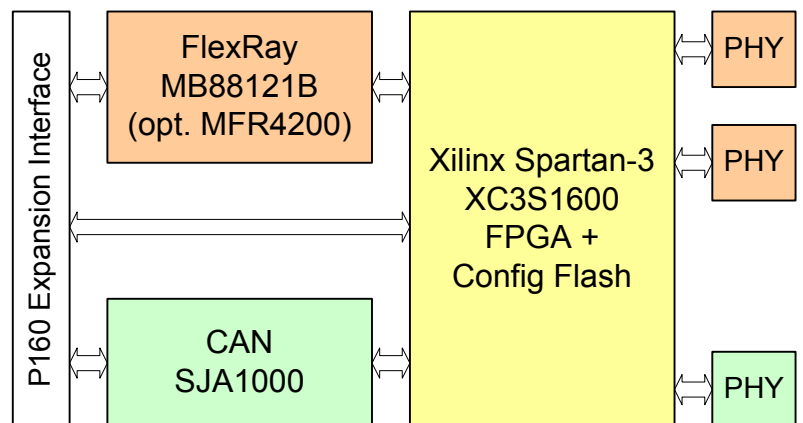
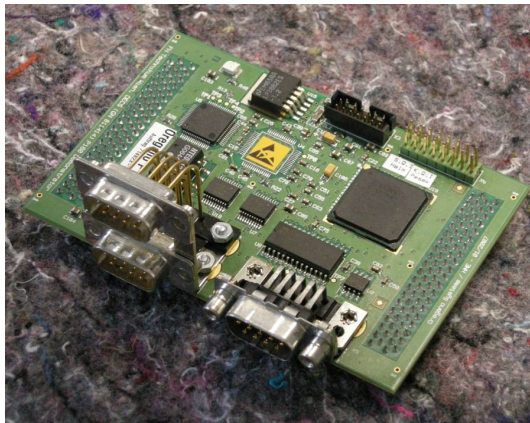
Baseboard

AVNET / MEMEC Virtex-4 LX or FX Development Board

- XC4VLX25 Xilinx Virtex-4 FPGA or
- XC4VFX12 Xilinx Virtex-4 FPGA (with PowerPC 405)
- 32/64 MB DDR SDRAM, 4MB Flash
- 10/100/1000 Ethernet PHY
- RS232 / USB-UART Bridge
- System ACE / JTAG / P160 Expansion Interface
- LEDs, Buttons, Switches, Numeric LCD



P160 Module Blockdiagram



P160 Module

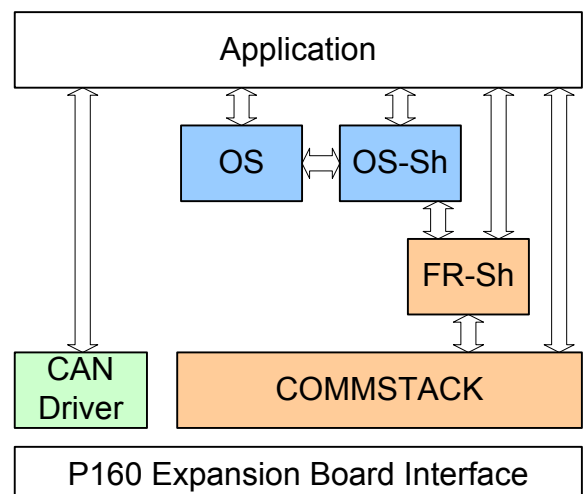
Development Platform

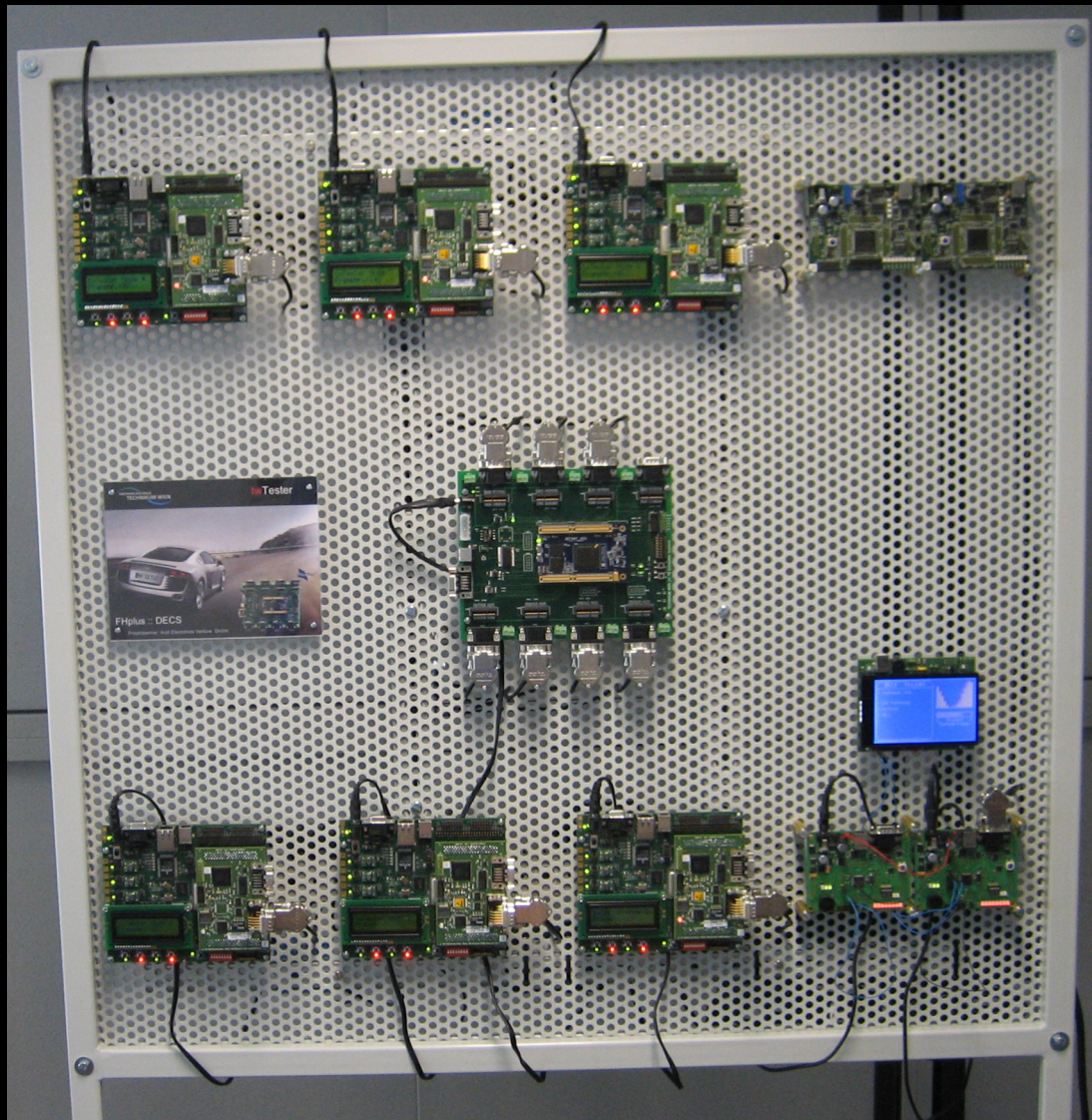
- FlexRay node
- CAN node
- FlexRay / CAN Gateway

Software Components

- OS = OSEKTime like Operating System with a static Dispatching table
- OS-Sh = OS-Synchandler reads the FlexRay Cycle Time and serves this timebase to the OS
- FR-Sh = FlexRay-Synchandler provides routines for communication via FlexRay
- COMMSTACK = port of the FlexRay driver from Elektrobit to the twNode hardware
- CAN Driver = generic CAN driver for the SJA1000

Software Architecture





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