

# **Centre of Excellence for Fieldbus Systems**

**Thilo Sauter  
Mikhail Gordeev**

Institute of Computer Technology  
Vienna University of Technology

# Competence Centre

founded in 1994

- co-operation with the Institute of Electrical Measurement

multivendor systems

- P-NET, Profibus, Interbus, CANOpen, IEEE1394 (FireWire), LonWorks, EIB

currently 8 researchers

- financed by government, EU projects, industrial partners
- user organizations

# Objectives

## create awareness of fieldbus systems

- initial goal, now less important
- what is a fieldbus, what can I use it for?

## provide information for industrial users

- independence of vendors
- first contact supported by public funding

## support for industrial users

- consulting
- project support
- testing (interoperability)

# Training

## academic education

- lectures
- project-oriented laboratory courses (both compulsory and voluntary)
- diploma theses
- some 300 students up to now

## training courses for industry

- theoretical introduction
- hands-on training
- general as well as fieldbus-specific courses
- 150 participants so far

# Project TRAFICC

“Transferring European Fieldbus Technology to Countries of Central Europe”

- funded by the EU (INCO-COPERNICUS)

## Technology providers

- Austria (TU Vienna), Germany (TU Munich), Switzerland (HTA Bern)

## Technology users

- Czech Republic (TU Prague), Hungary (TU Budapest), Poland (TU Wroclaw)

# Goals of TRAFICC

## establishment of new competence centres

- to promote fieldbus systems
- to support the industry

## individual phases of the project

- knowledge acquisition (“train the trainers”)
- establishment of infrastructure
- construction of multi-vendor installations
- technology transfer to the local industry

goals have been achieved so far

# Research project: WebFAN

## Interconnection of field area networks and the Internet

- remote monitoring, maintenance...

## SNMP as underlying communication protocol

- standardized management protocol
- variety of tools available
- easy implementation
- Management Information Base as structured representation of managed objects
- security aspects accounted for in SNMPv3

# WebFAN

## Interconnection via SNMP gateway (agent)

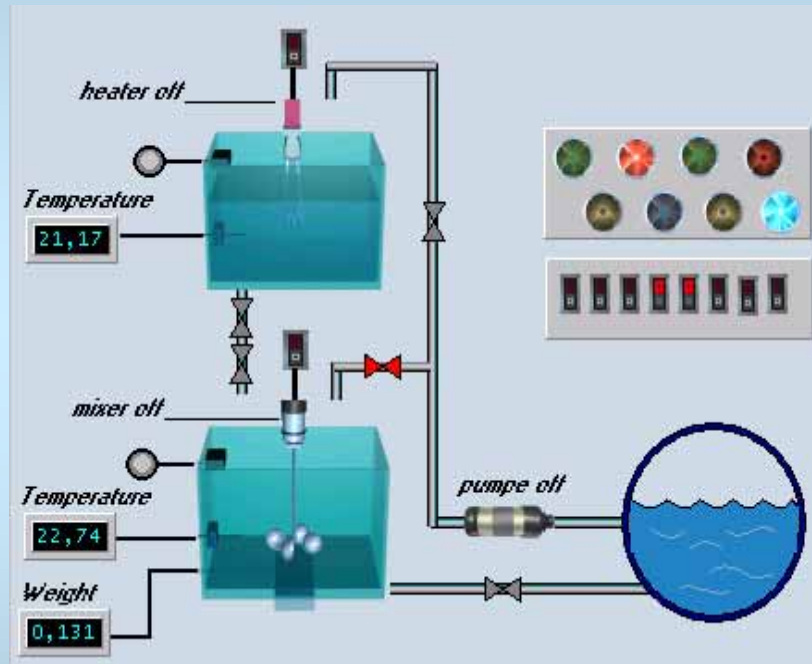
- modular approach
- SNMP side is fixed
- fieldbus side is variable

gateways for different fieldbus systems are being developed

- Profibus, LonWorks, FireWire
- P-NET has been completed recently



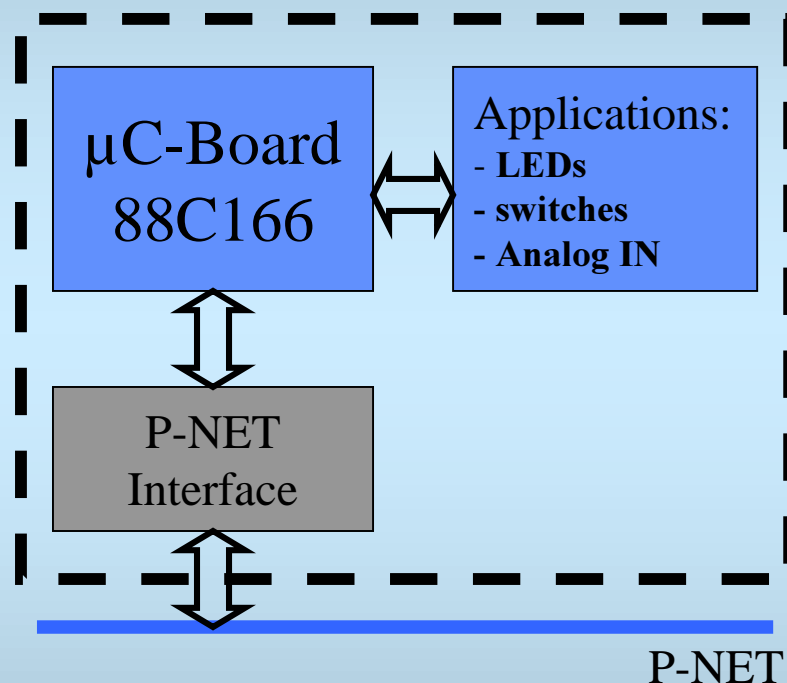
# P-NET Demonstrator System



- Was built up in 1995
- Consists of
  - PD 4000 master controller
  - PD 5010 master controller
  - PD 5020 VGA Video controller
  - PD 3120 Digital I/O module
  - PD 3221 UPI module
  - PD 3230 Weight transmitter
  - Personal computer

# P-NET Slave implementation for Siemens 88C166 microcontroller

- 16bit microcontroller
- 32kByte FLASH
- 256kbyte RAM
- up to 40MHz (39,3216MHz)
- flexible Softwarelist
- full accessible with VIGO and other P-NET-Masters
- programmable in C



*Author: Markus Haag*

# P-NET Slave implementation for Siemens 88C166 microcontroller

- wake-up function (address bit detection)
- efficient protocol
  - 9kB protocol implementation
  - mainly interrupt driven
- up to 26 I/O pins
- 10-bit A/D converter multiplexed with 10 analog-in-channels

*Author: Markus Haag*

# P-NET tutorial

- P-NET essentials
- P-NET protocol
- Multi-tasking programming in Process-Pascal
- Calculator Assembler
- VIGO
- Simple P-NET application example
- Exercises

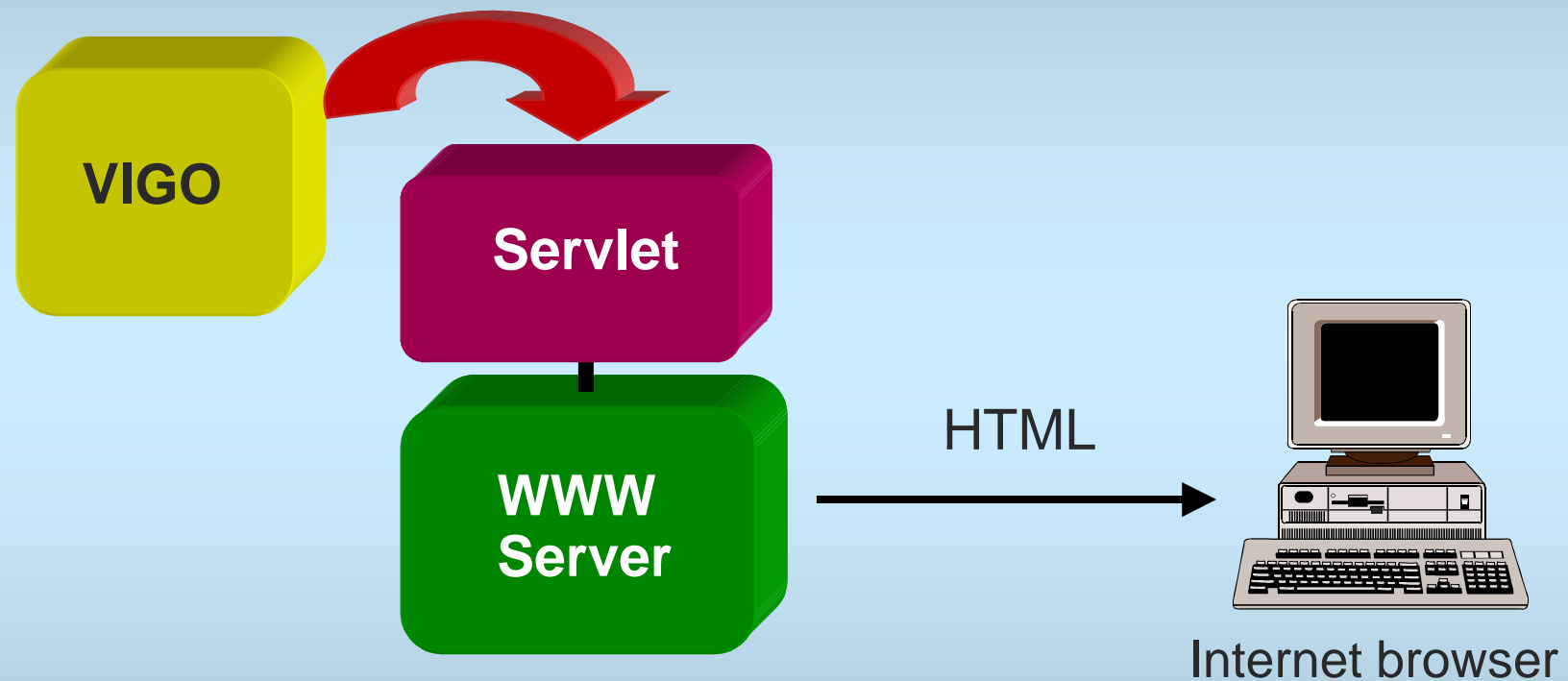
# Internet connection to P-NET

- Java based architecture
- Servlet based approach
- SNMP based approach
- Security aspects are considered

# Servlet

- is a Java application running on a WEB server
- is considered to be a replacement for *cgi* scripts
- generates HTML stream
- universal interfaces to a server data recourses
- supported by a big number of WEB servers
- provided in a form of Java APIs

# Servlet based approach



# Data security in P-NET Internet applications

- Internet is insecure
- Data security aspects **must** be considered
- Sufficient data security can be achieved only by combining
  - secure hardware (smart cards)
  - data encryption and digital signatures
  - secure Internet protocols (S-HTTP, SSL, SNMPv3)
  - secure software (Java 2.0)



# Cooperation with TU Perm (Russia)

P-NET demonstrator system was built in 1997

Documentation is translated into Russian

Current activities:

- education (student laboratory work)
- P-NET Internet applications
- research in the area of the P-NET protocol analysis
- high level simulation tools for P-NET