Vet-Trend - Transnational Meeting
The Potsdam Distributed Control Lab

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Prof. Dr. Andreas Polze
Operating Systems and Middleware Group
Who We Are

Hasso Plattner Institute @ U. of Potsdam
- Privately funded institute
- Bachelor and Master in IT Systems Engineering
- ~50 people for ~400 students

Operating Systems and Middleware group
- Prof. Dr. Andreas Polze + 6 Ph.D.’s + 2 Post-Docs
- “Extending the reach of middleware”
- System predictability in wide-area distributed computing
- Dependable control systems with small devices
Teaching

Architecture of COTS operating systems
- Windows 2000, Mac OS X, BSD Unix, Solaris

Architecture of component-based, distributed systems
- Development of distributed applications with middleware platforms
- CORBA, J2EE, COM+, .NET, Web-Services

Operating systems for embedded and mobile devices
- Windows CE, .NET Compact Framework
- Real-time operating systems (LynxOS, VxWorks, QNX)

Paradigms, design patterns and implementation strategies
- Predictable behaviour for component-based, distributed and embedded systems
- Performance, fault tolerance and timeliness
Research

Extension of middleware for predictable systems
- Paradigms, design patterns, implementation strategies
- Timeliness, security, fault tolerance

Distributed systems
- Predictable behaviour in heterogeneous distributed systems
- Legacy integration and vertical monitoring in SOA frameworks
- Standardization and service orientation in grid environments

Embedded systems
- Analytical redundancy and online replacement
- Experiment-based e-Learning Environment
- Dynamic (re-)configuration of component systems
- Aspect-oriented programming in C# and .NET
The Distributed Control Lab

Web Frontend

Windows CE Client

Visual Studio AddIn

Foucault's Pendulum

Industrial Control

“Higher Striker” Realtime and Windows CE

Vet-Trend Transnational Meeting Brasov
The Higher Striker Experiment

Learning Objective:
- Usage of embedded operating systems
- Timing analysis of control algorithms
- Low-level I/O programming
- Closed-loop control software

Experiment Data:
- Parallel Port I/O
- 38 kHz Sampling Frequency
- 256 Byte dual-ported FIFO buffer
- 633 MHZ Intel CPU
- Windows Ce.Net & RT-Linux
- C and C# (Real-Time.Net)
Experience in Remote Laboratories

- Fall 2006 guest lecture at Blekinge Tekniska Högskola, Sweden
  - Real-time programming lab with „Higher Striker“ in Potsdam
- Labs in embedded systems programming course
  - Programming of real-time control algorithms
  - Evaluation of embedded operating systems
- Coorparations with local undergraduate schools
  - Lego Mindstorm Robot‘s / C-Tutorials
- Discourse - research testbed between 3 Berlin Universities and HPI
  - Access to Distributed Control Lab experiments
- Industrial Control Scenarios in Bachelor Projects
  - Programmable Logic Control
  - Fischertechnik Assembly Line
  - Home Automation
Potential LRC Integration

Course on Embedded Systems Programming
- Task Models, Performance Measurements
- Real-time Scheduling (RMS, EDF)
- Programming Languages (Ada, Real-Time Java)
- Real-time Communications
- Embedded Operating Systems (Windows Ce.NET, RT-Linux)

Web-based Lab Tutorials for DCL Experiments:
- Higher Striker Experiment
- Foucault’s Pendulum
- Lego Mindstorm Robots (Lego NXT under construction)
- Industrial Control & Automation (under construction)

Remote Access to Experiments/Simulators in Potsdam