



Hasso
Plattner
Institut

IT Systems Engineering | Universität Potsdam



Vet-Trend - Transnational Meeting The Potsdam Distributed Control Lab

Dipl.-Inf. Andreas Rasche

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



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

Extension of middleware for predictable systems

- | Paradigms, design patterns, implementation strategies
- | Timeliness, security, fault tolerance

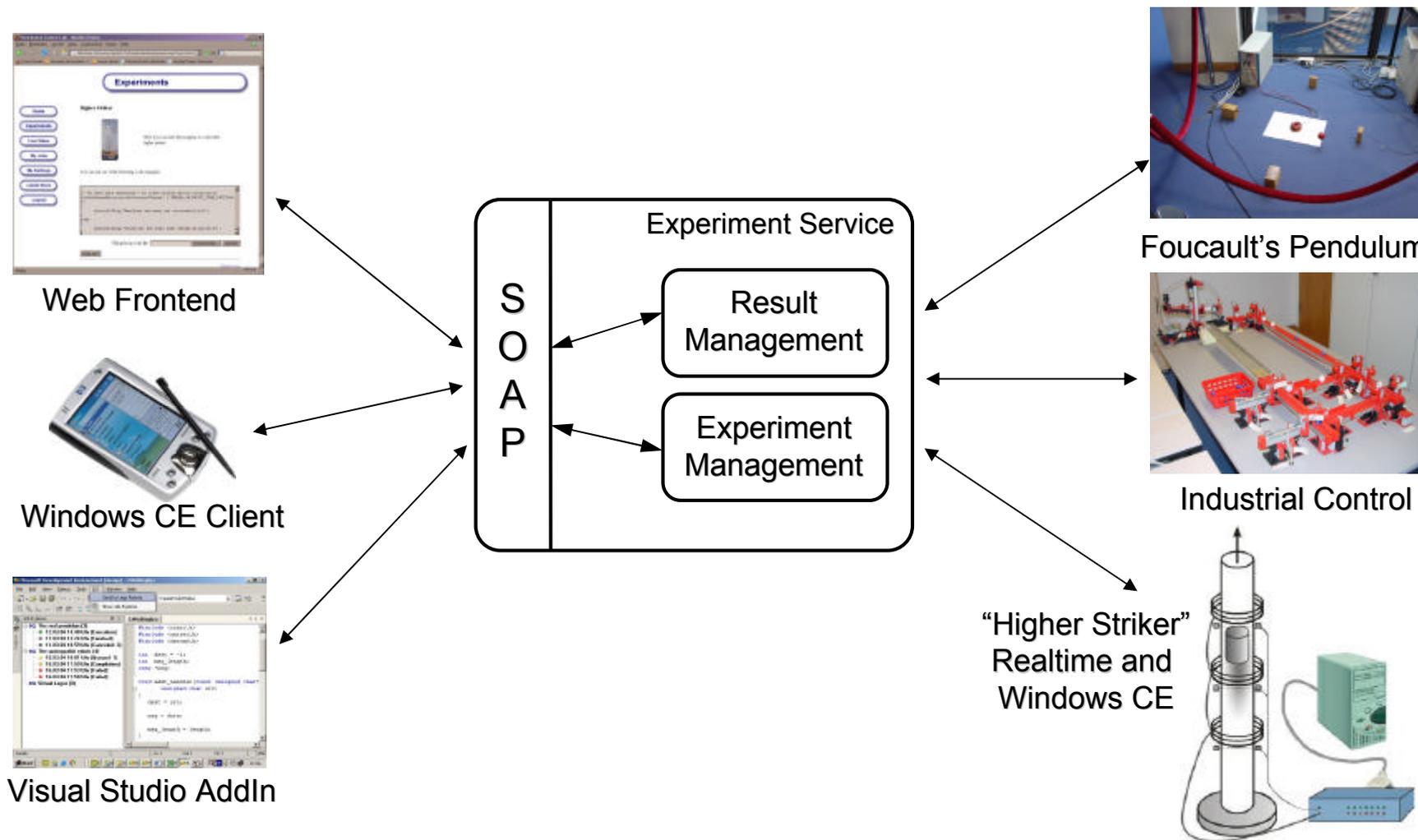
Distributed systems

- | 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



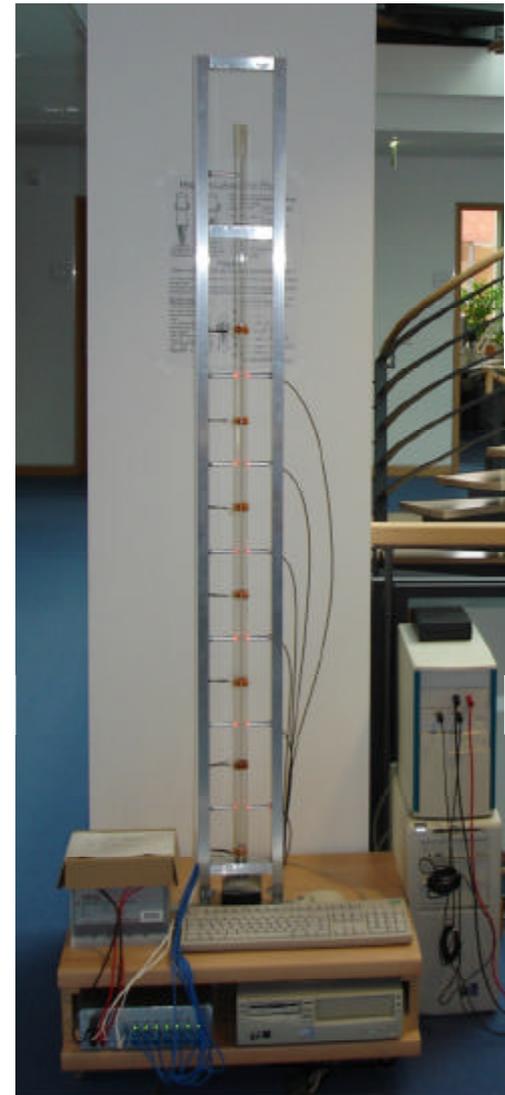
The Higher Striker Experiment

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

Cooperations with local undergraduate schools

- ┆ Lego Mindstorm Robot's / C-Tutorials

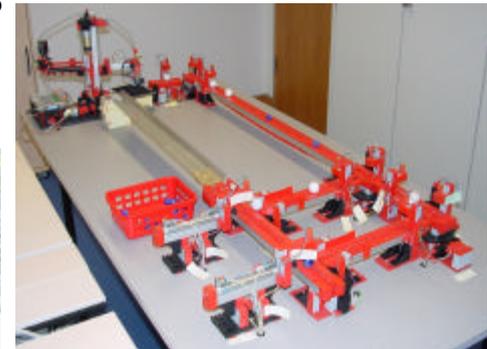
Discourse - research testbed between 3 Berlin Universities and HPI

- ┆ Access to Distributed Control Lab experiments

Industrial Control Scenarios in Bachelor Projects

- ┆ Programmable Logic Control
- ┆ Fischertechnik Assembly Line
- ┆ Home Automation

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.



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