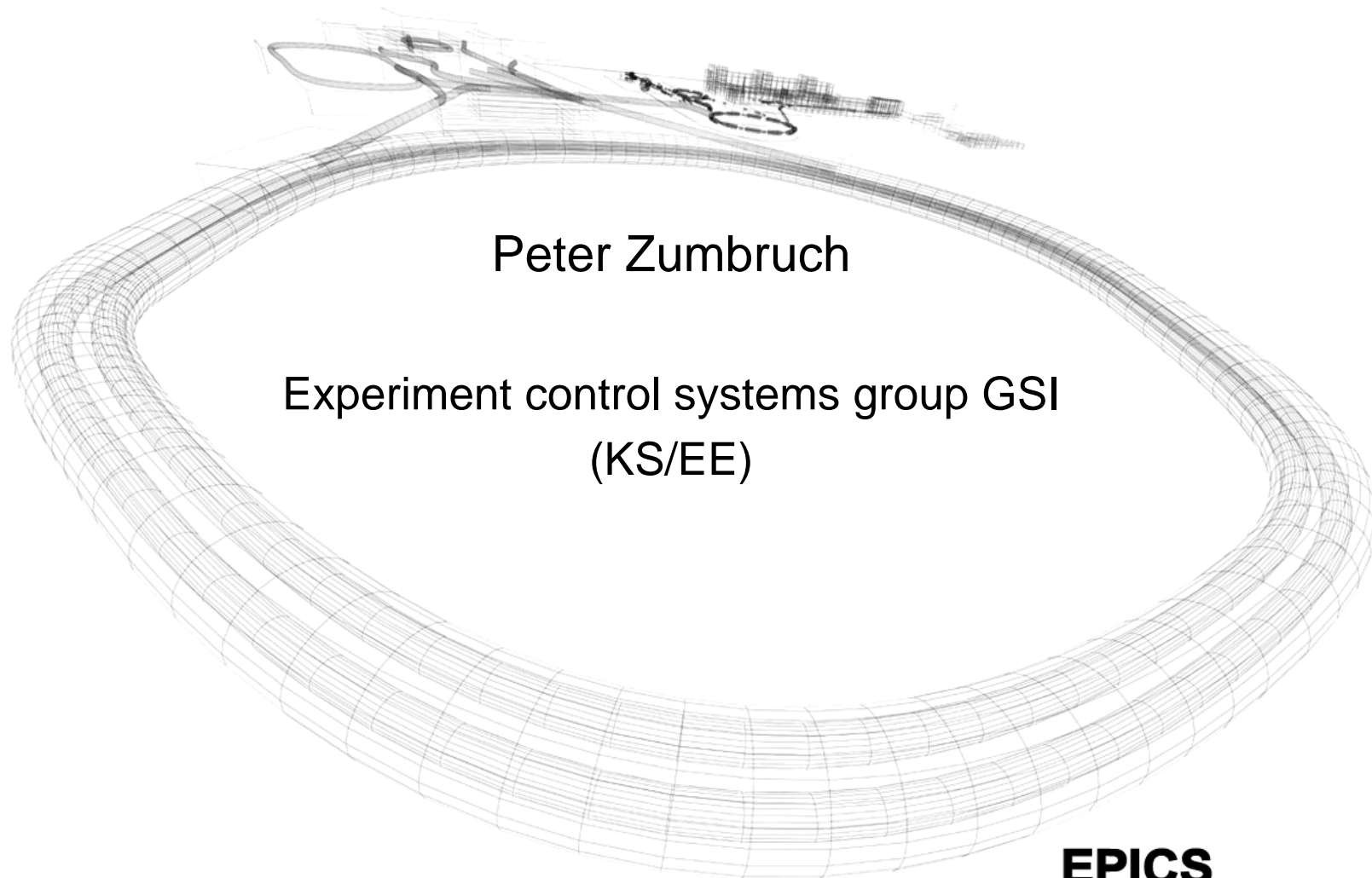


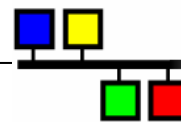
Outlook on EPICS on embedded systems



Peter Zumbruch

Experiment control systems group GSI
(KS/EE)

EPICS



GSI

Overview

- Introduction
 - What is EPICS?
- Platform
 - ETRAX
 - DIM
 - EPICS
 - EPICS – DIM Interface
 - Outlook Xilinx' Virtex4
 - ML403 Evaluation Board
 - CBM Nxyter
- Summary

What is EPICS?

... **short answer:**

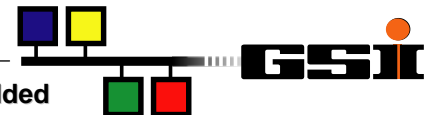
EPICS: Experimental Physics and Industrial Control System

... **a bit more elaborate:**

EPICS is a set of Open Source software tools, libraries and applications developed collaboratively and used worldwide to create distributed soft real-time control systems for scientific instruments such as particle accelerators, telescopes and other large scientific experiments. (From the [EPICS Home Page](http://www.aps.anl.gov/epics/): <http://www.aps.anl.gov/epics/>)

... **striking** - is three things at once:

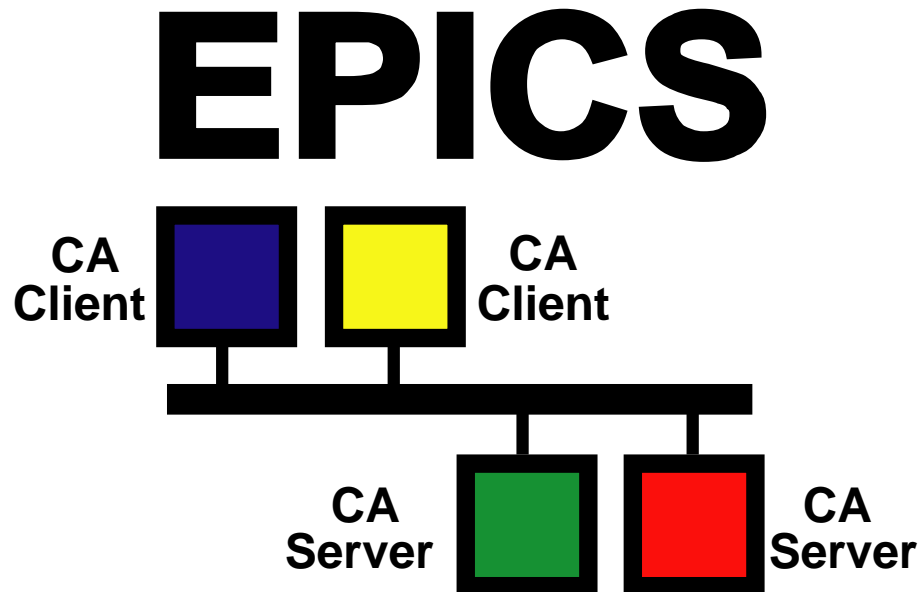
- An **architecture** for building scalable control systems
 - A client/server model with an efficient communication protocol (Channel Access) for passing data
 - A distributed real-time database of machine values
- A **Software Toolkit** of code and documentation
 - A collection of software tools collaboratively developed which can be integrated to provide a comprehensive and scalable control system
- A **collaboration** of major scientific laboratories and industry (> 100)
 - A world wide collaboration that shares designs, software tools, and expertise for implementing large-scale control systems



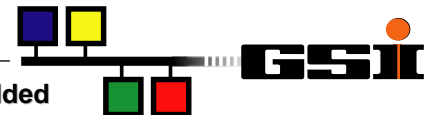
What is EPICS?

(Getting Started with EPICS: Introductory Session I)

Network-based “client/server” model (hence the EPICS logo)

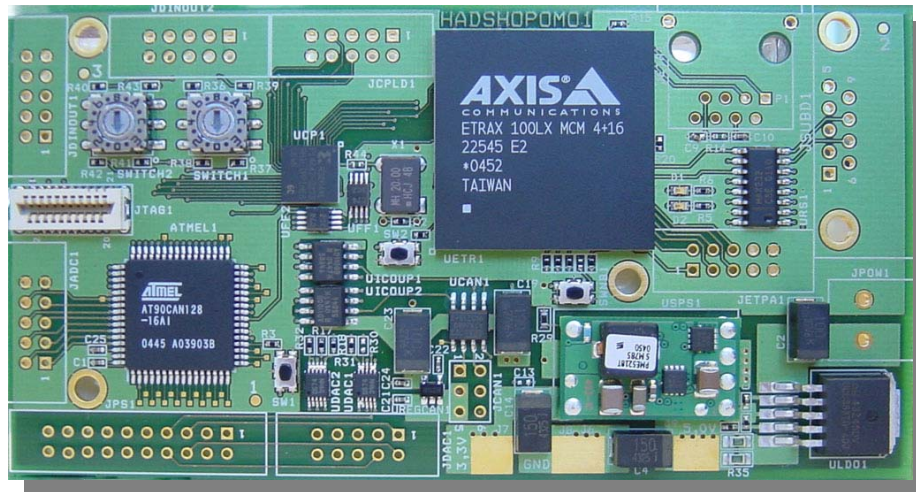


For EPICS, *client* and *server* speak of their Channel Access role
i.e. Channel Access Client & Channel Access Server



Platform: ETRAX 100LX by AXIS

- HADControl (HADSHOPOMO (HADES SHOWER POWER MONITOR))

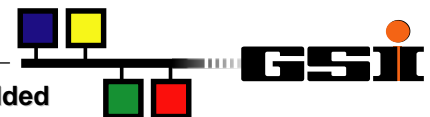


“Multi-purpose control/monitor device developed for HADES (High Acceptance Di-Electron Spectrometer); a pan-European research project. This device is based on the ETRAX 100LX MCM4+16 and runs the "Experimental Physics and Industrial Control System, EPICS".

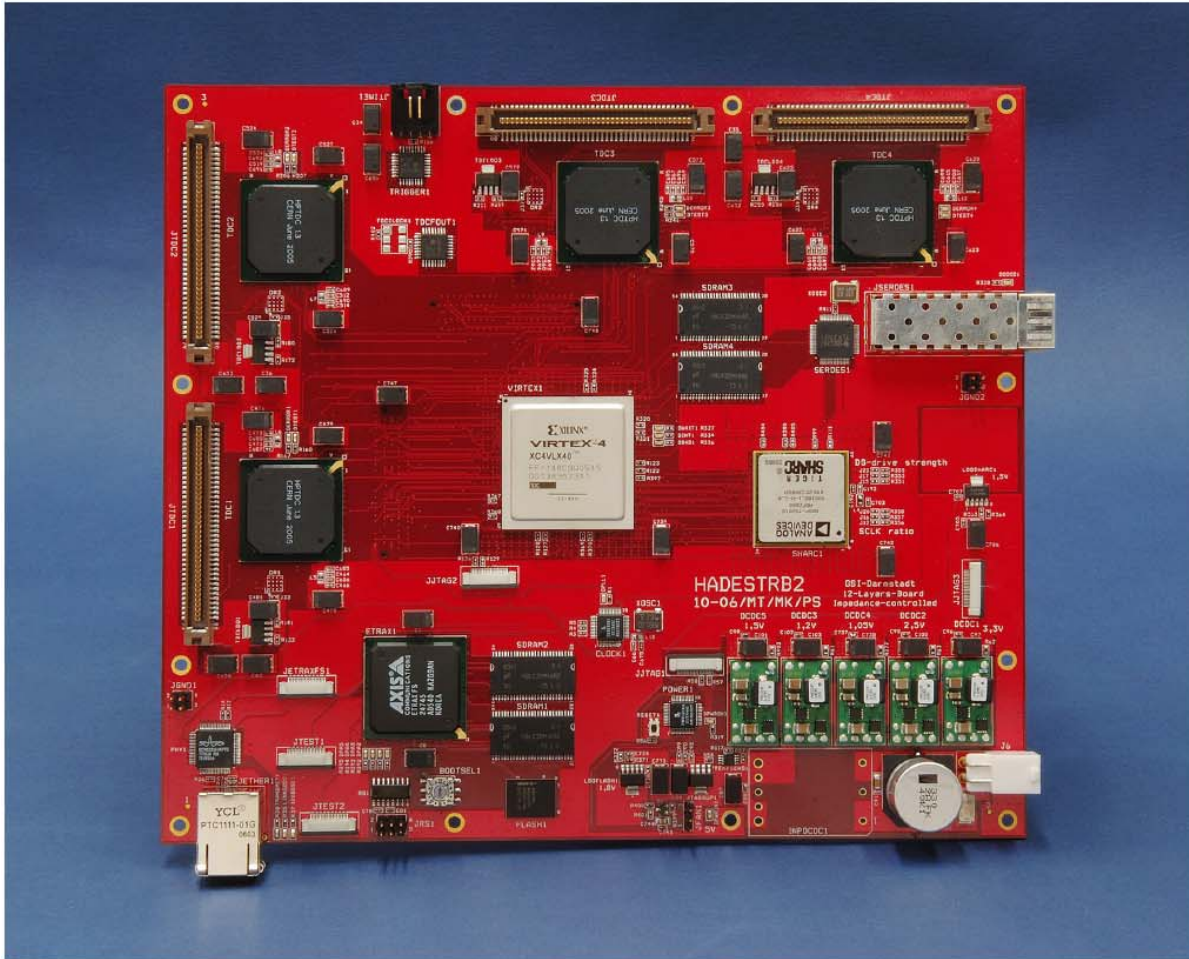
<http://developer.axis.com/showroom>

- First implementation:
 - single wire bus temperature measurement for HADES
 - Monitor system for Driftchamber pressure
- HADES TRB - Trigger Board, DAQ and Slow Control (ETRAX)

Electronics: contact M.Traxler (GSI) – EPICS: PZ



TRBv2



- successor of TRBv1, which is used in the experiment
- larger FPGA
- faster CPU (x3)
- Tiger-Sharc DSP
- 2 GBit/s optical link for trigger and data
- Add-on connector
- TRBv1 functionality given

2007-06-04

Michael Traxler, GSI

What is DIM?

“DIM is a communication system for distributed / mixed environments. It provides a network transparent inter-process communication layer.”

- Protocol
- Distributed Information Management System
- <http://dim.web.cern.ch/dim/>

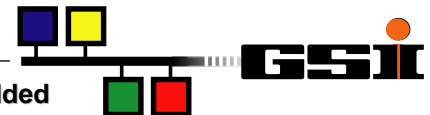
Some Properties:

- Small
- Many platforms
- No inherent access security
- No logic
- Dynamic

- name based publisher/subscriber mechanism for services and commands

Used as network protocol for *CS Controlsystem (GSI)*

Gateway to LabVIEW



Embedded EPICS on ETRAX

- install embedded Linux on ETRAX one chip CPU (axis.com) based front-end systems

- 2 step approach:

1. Install DIM on ETRAX and use EPICS-DIM Interface to communicate via network with external EPICS clients or IOCs

- Suitable for development:

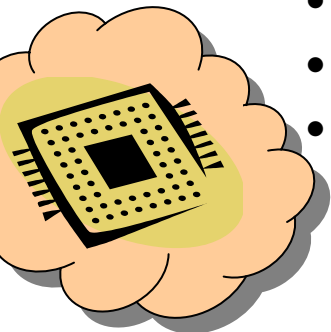
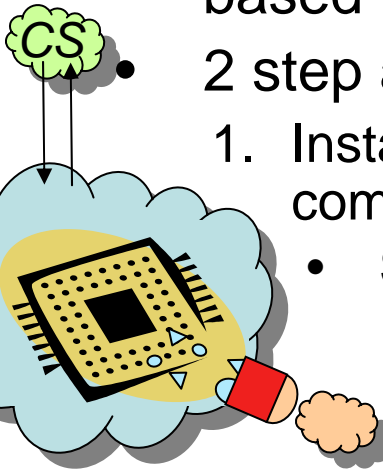
- DIM protocol also accessible via other controls software, i.e. LabVIEW, or CS, etc.
- But locally no (EPICS) logic (database, (fast) sequencing, alarming) provided



2. Install EPICS Embedded on ETRAX

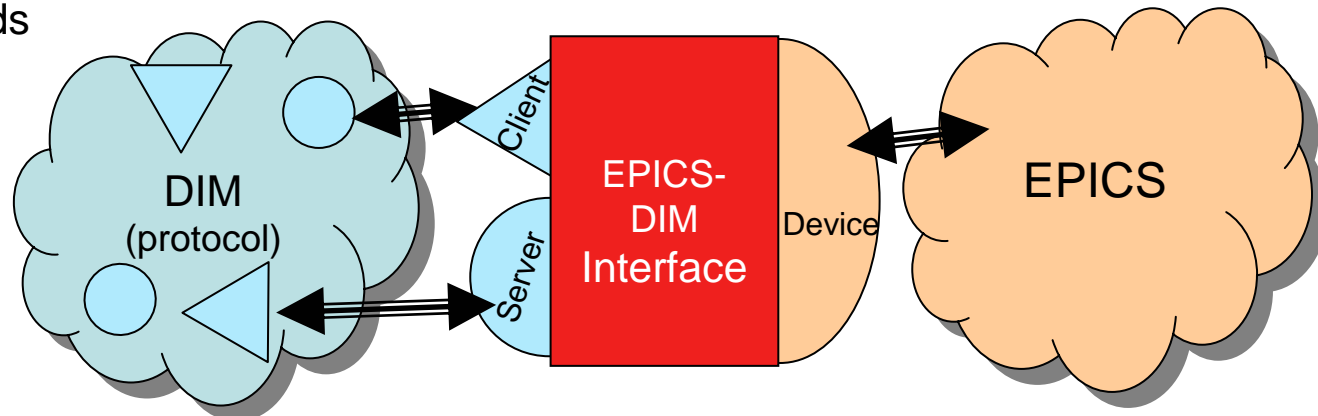
- Provides all features of EPICS
- Local fast EPICS based logic, network independent
- By „turning the direction of the interface“ users may still see a DIM device, mimicked by EPICS using the EPICS – DIM interface

TODO



EPICS DIM Interface

- Running
 - DIM SERVER
 - Providing read/write access to EPICS variables
 - DIM CLIENT
 - Interfacing DIM services and commands for single variables to EPICS process variables
- Successfully used for last 5 weeks HADES beamtime
- On demand
 - String transport mode (DIM provides strings converted by the Interface to single datatypes, easier to handle by EPICS)
 - Array and structs support
 - More EPICS records



Outlook Xilinx Virtex4/5

- Basis
 - KIPs (University of Heidelberg) Environment Platform providing several cores (PPC/MicroBlaze/Leon) with Linux on it.
- Xilinx Evaluation Board ml403
 - Soft IOC
 - Soft IOC with Interprocess communication Run-Control
- Nxyter / SysCore based board
 - DAQ Board (CBM)
 - Soft IOC (incl. IPC)
 - IOC with access to “external” Hardware on-Board
 - Configuration of Setups via EPICS

Summary

<http://wiki.gsi.de/Epics>

- Platform: Axis' ETRAX
 - DIM running
 - EPICS on ETRAX to come
 - Connection to EPICS via '2 step approach'
 - ETRAX-DIM – EPICS-DIM-Interface – EPICS
 - also suitable for other architectures (i.e. XDAQ-DIM – EPICS)
 - EPICS-DIM Interface
- Platform: Outlook Xilinx' Virtex4/5
 - ml403
 - Nxyter / SysCore