Alarm notifications for the PANDA Detector Control System

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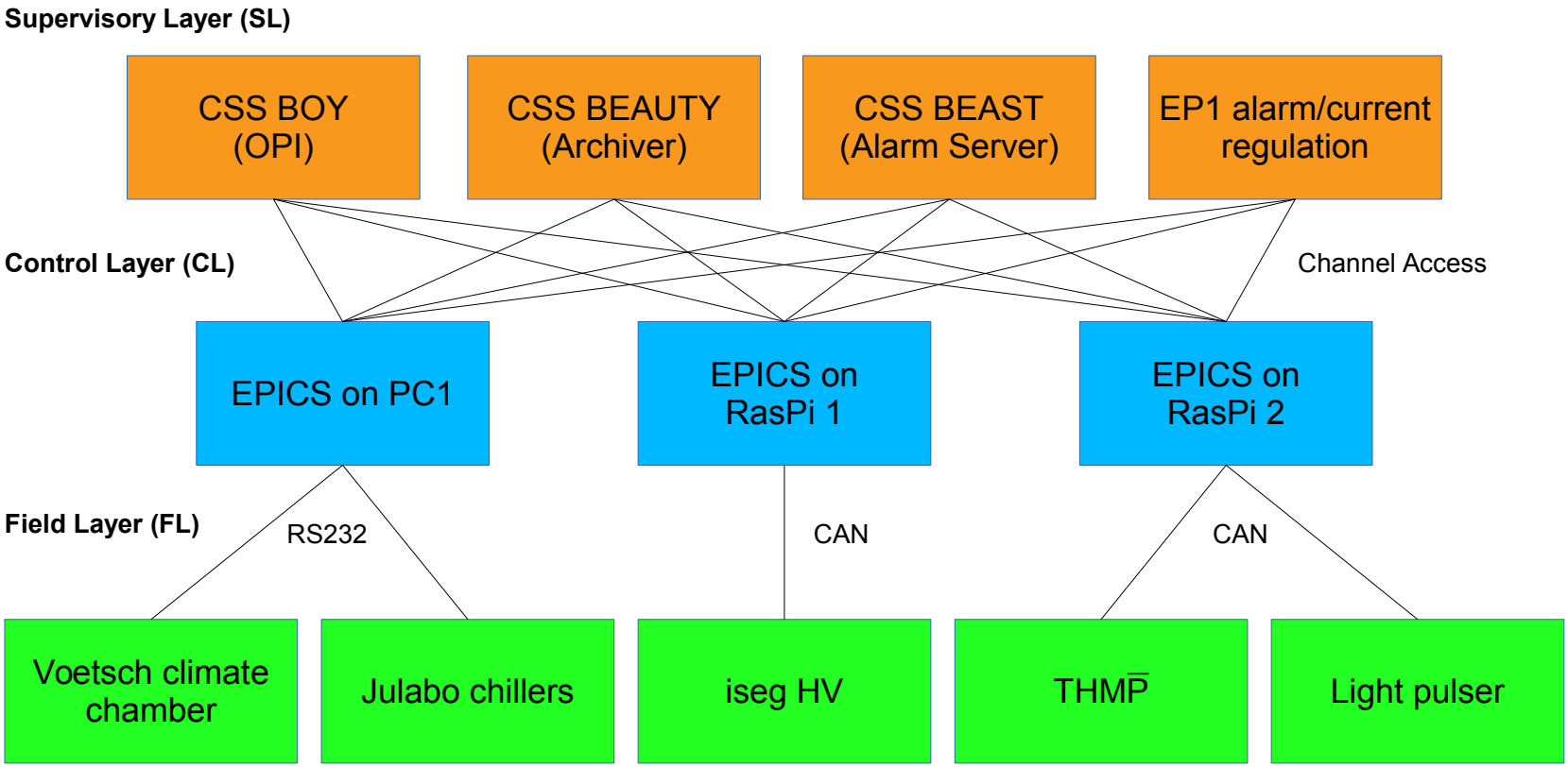
PANDA Detector Control System

- Based on:
  - EPICS (Experimental Physics and Industrial Control System)
  - CSS (Control System Studio)
- Monitors and controls power supplies, chillers, crates, valves and a lot more
- Modular layout

- Add custom applications for specific tasks
- Communication with base system via well-defined interfaces

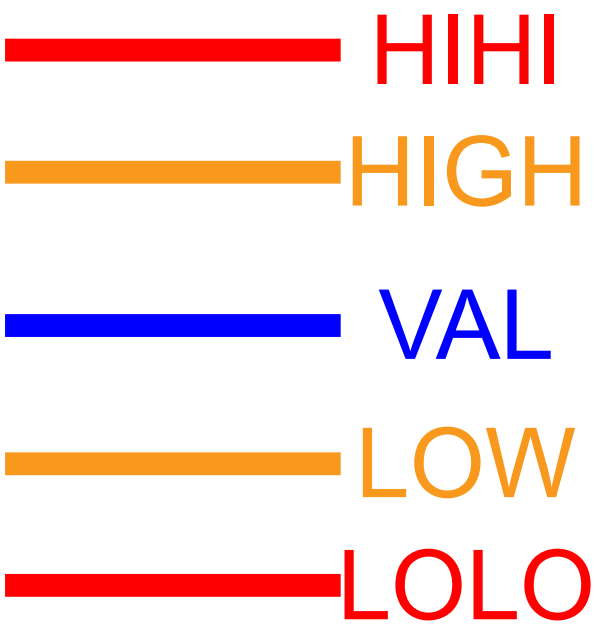
Architectural Overview

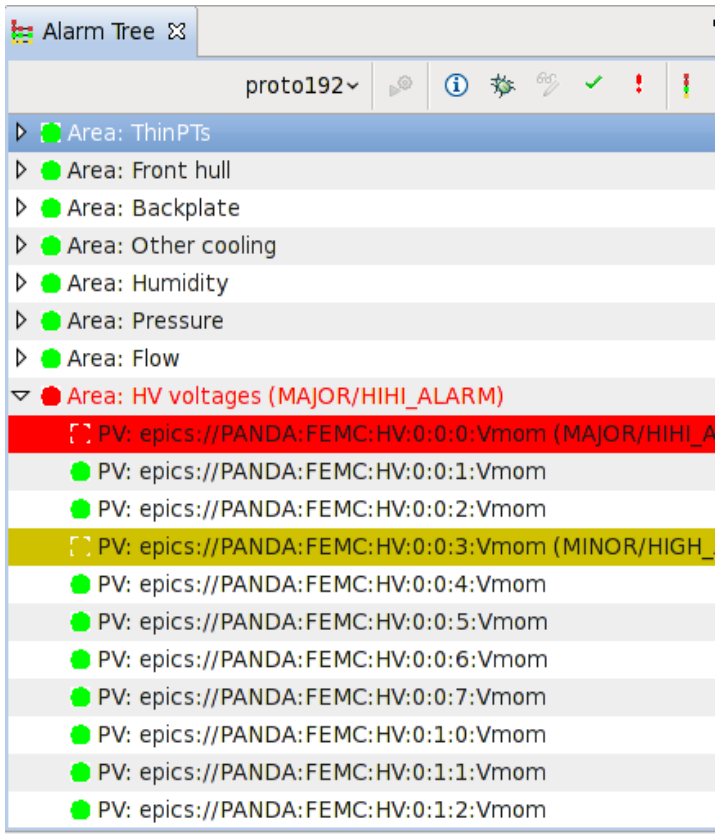
- Divided in layers
- EPICS is central linchpin
- EPICS Channel Access main communication protocol



EPICS Alarm Handling

- Upper and lower boundaries for each numeric value
- Violation changes status of parameter
- No notification or action possible with EPICS alone





BEAST: CSS Alarm Server

- Stand-alone application (not connected to CSS GUI)
- Based on Java and Eclipse Rich Client Platform (RCP)
- Subscribes to all EPICS process variables in its database
- Notifies its clients when alarm status changes
- User interface integrated into CSS GUI
  - Convenient display of detector (alarm) status
  - Acknowledge alarms if problem is taken care of
- Communication to clients via Java Message Service (JMS)
- Message broker for JMS (e.g. Apache ActiveMQ) required
- Native client libraries for many programming languages available (inter alia C, C++, Java, Perl, .net)

$\Longrightarrow$ Write your own clients for specific tasks

Usage Scenario

- Design focus not on future PANDA control room, but
  - Daily work with the prototype
  - Test beam setups
- Problem with daily work: No "shift crew"
- Long running experiments (e.g. cosmic runs)
- Lot of time wasted when devices (e.g. power supplies) fail unnoticed
- Focus on prototype does not rule out re-use of components in final PANDA control room

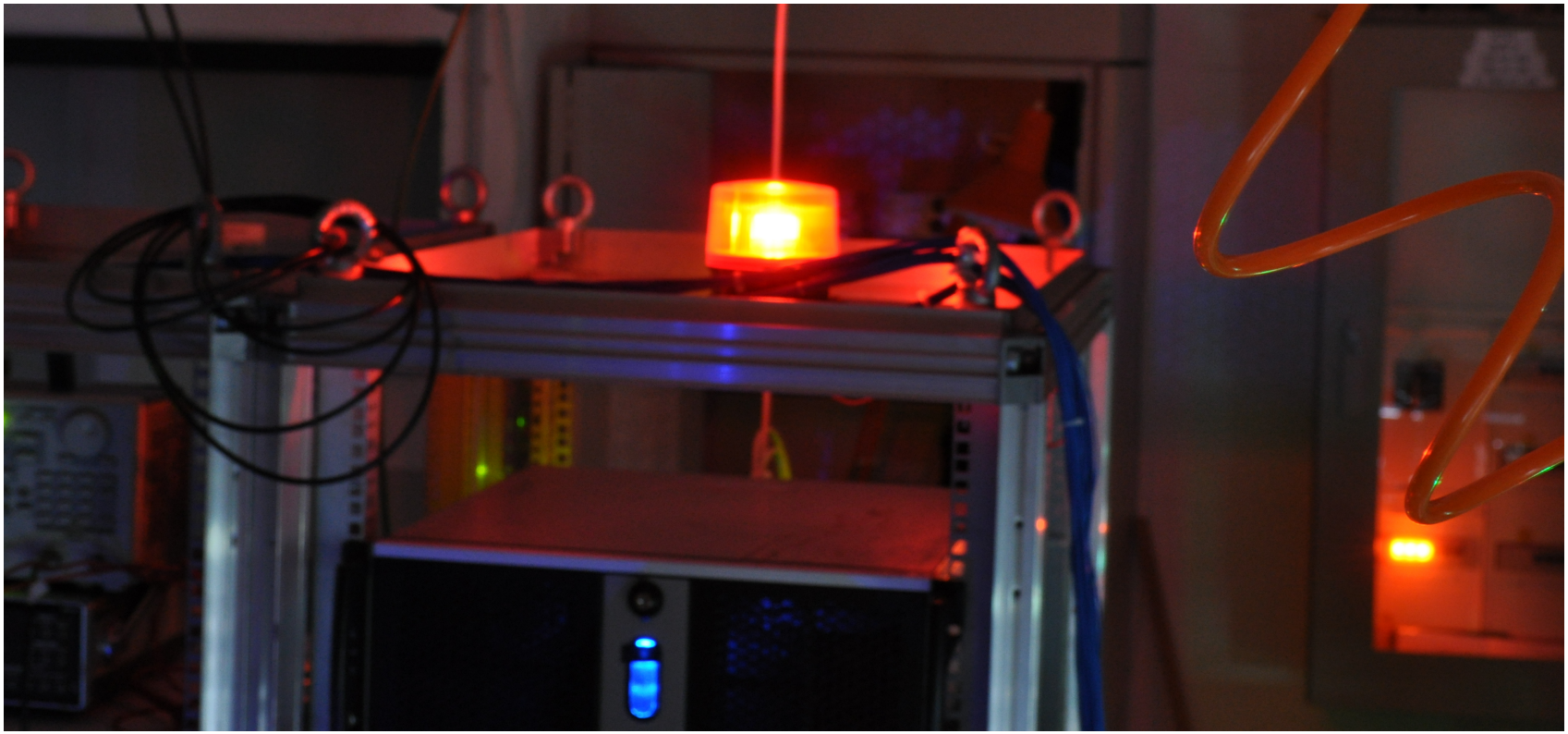
Design Considerations

- Main principle: Draw attention to the problem
- Include the possibility that nobody is at the institute (e.g. nights, weekends)

$\Longrightarrow$ "Three-strikes system"

1. Laboratory notifications
2. Desktop notifications
3. E-mail notifications

Laboratory Notifications

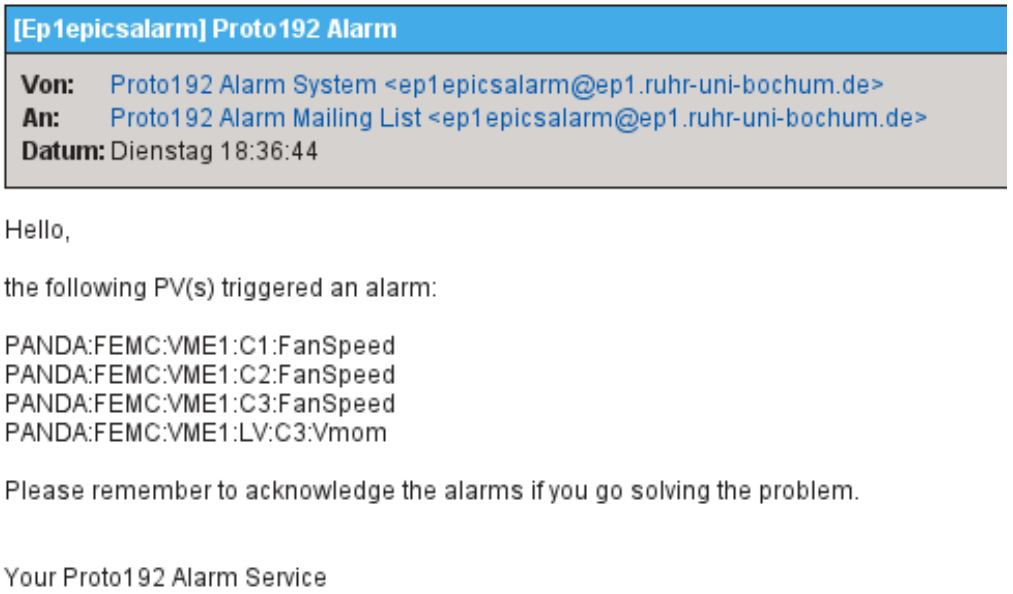


- Red flash light on top of the rack
- Started within seconds after an alarm fired
- Notify staff in the lab (may have caused the alarm)

Desktop Notifications

- Small C++/Qt-based application running on office PCs
- No dependency on Eclipse RCP or CSS
- Communication with alarm server via network (JMS)
- Displays notification when alarm occurs
- Configurable delay, typically several minutes
- Beamtime version: Opto-acoustic alarm by playing a video in a frame-less window (cannot be "clicked away")

E-mail Notifications



[Ep1epicsalarm] Proto192 Alarm

Von: Proto192 Alarm System <ep1epicsalarm@ep1.ruhr-uni-bochum.de>
An: Proto192 Alarm Mailing List <ep1epicsalarm@ep1.ruhr-uni-bochum.de>
Datum: Dienstag 18:36:44

Hello,

the following PV(s) triggered an alarm:

PANDA:FEMC:VME1:C1:FanSpeed
PANDA:FEMC:VME1:C2:FanSpeed
PANDA:FEMC:VME1:C3:FanSpeed
PANDA:FEMC:VME1:LV:C3:Vmom

Please remember to acknowledge the alarms if you go solving the problem.

Your Proto192 Alarm Service

- E-mail to internal mailing list
- Everyone is informed, even if not at the institute
- Delay also configurable, current value at EP1: 10 minutes
- E-mail lists names of all the PVs that currently show a problem
- Acknowledged alarms are ignored
- Internal spam protection: Every alarm reported only once

Summary

- EPICS- and CSS-based alarm notification system for day to day work with PANDA prototypes
- System installed in Bochum since July 2014

$\Longrightarrow$ It works! ☺

- Alarm daemon and desktop applet have modular design
- Dependencies only on C++, Qt and ActiveMQ for C++
- Software available to other PANDA groups
- If you need something like this, write me an e-mail: `tobias@ep1.ruhr-uni-bochum.de`

The End

Thank you for your attention!