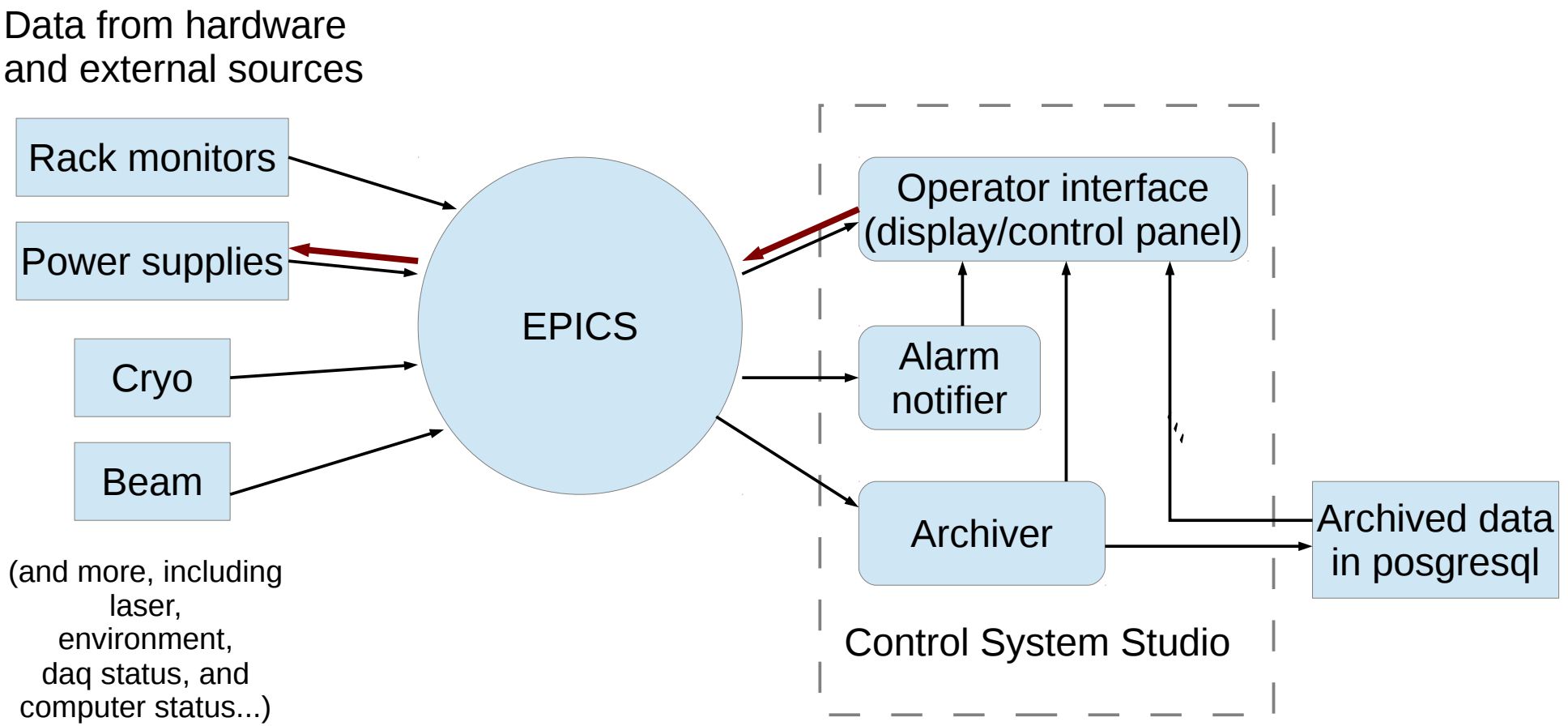
Slow control and monitoring update

"Slowmoncon" working group includes:
Ben Carls, Sowjanya Gollapinni, Dave Huffman, David McKee, Andrzej Szelc, G.H-S., and more

Glenn Horton-Smith

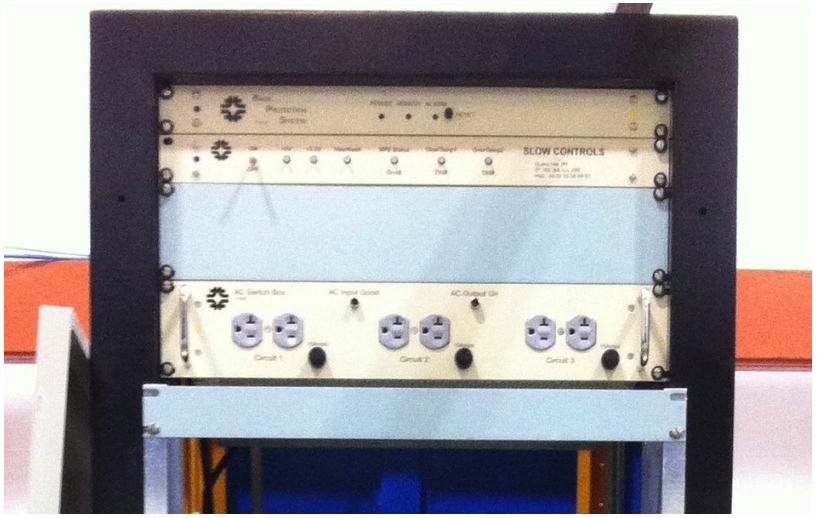
2013/11/21

Overview from 10000 m



Rack monitoring

- Complete chain from hardware through EPICS IOC to display.
- What it monitors:
  Rack protection status
  Rack temperatures
  Rack fan speeds
  (if fans installed)



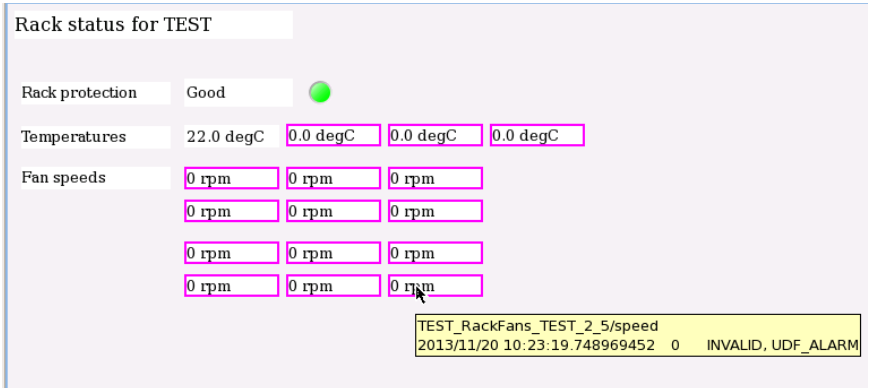
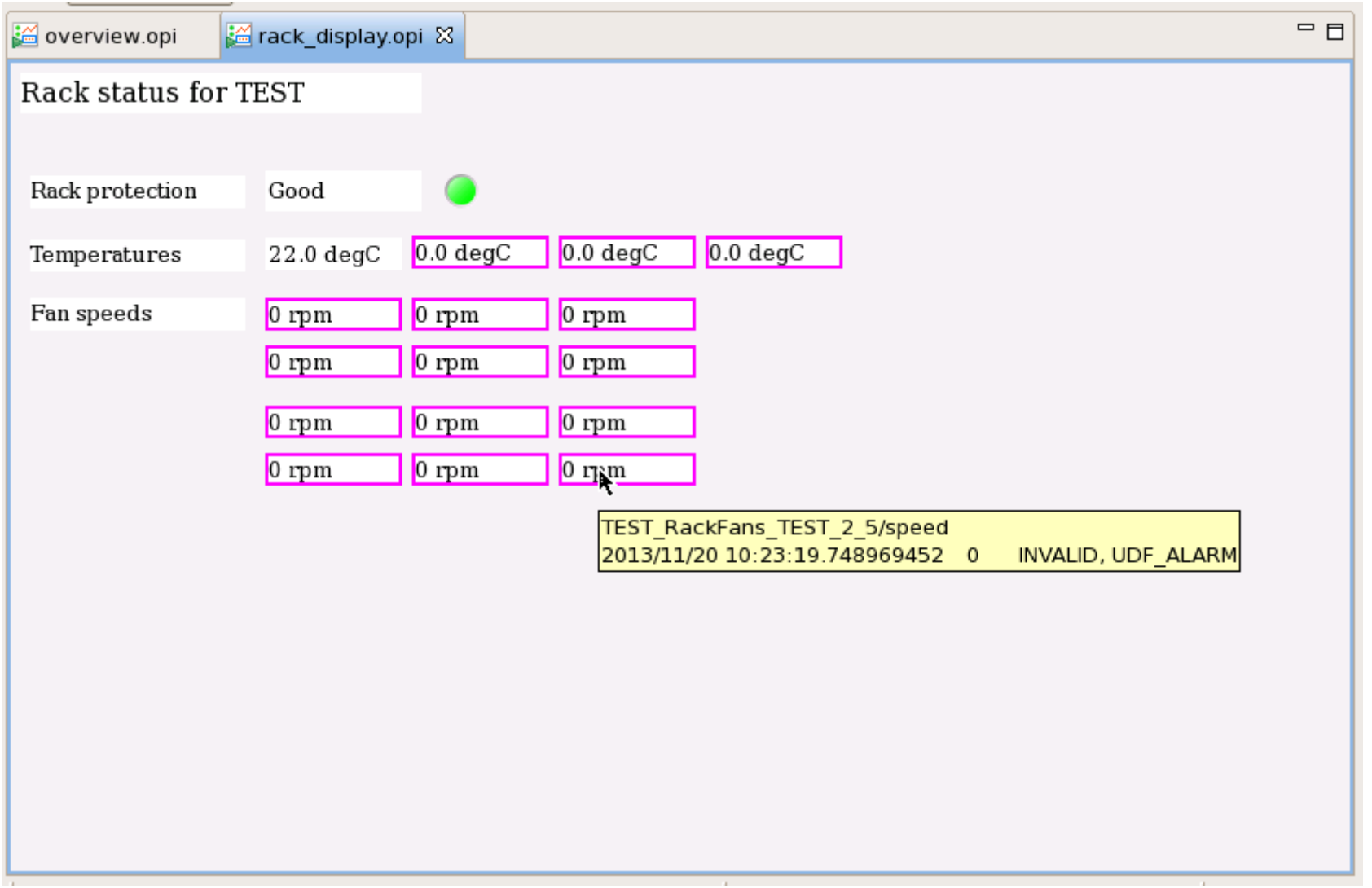


Photo of unit in HV rack at DAB
(image from Sowjanya's TF5 talk)

Rack protection/temperature/fan speed display panel



Power supply monitoring and control

- Sowjanya has talked about this in past meetings.
- Types of power supplies:
  - “On-detector-power” and TPC bias (Wiener MPOD)
  - Crate power (Wiener PL508)
  - Drift HV (Glassman)
  - PMT HV (BiRa)
- Only PMT HV and Drift HV will have controls.
  - PMT HV will be controlled via EPICS.
  - Drift HV will be controlled another way.

Power supply monitoring and control progress

- Sowjanya has shown complete chain of EPICS readout through to CSS displays for Weiner supplies: On-detector, TPC bias, and crate power
- Just saw Drift HV readout display in earlier talk.
- Drift HV control via Python “80% complete”.
- PMT HV displays and controls have existed for a while.

(insert graphics of power supply panels from previous talks here)

Cryo data

- Long list of 135 variables being monitored by cryogenics system.
  - Gas analyzers, temperatures, pressures, flows...
- As said in Brian Rebel's talk today, Ben Carls reads the data from iFix safely so no one else has to.
- Data goes to a text file on uboonedaq-smc.fnal.gov.
- A simple Python program will read this, write values to “soft” epics channels using PyEpics module.

Gas analyzers
(slide from Ben)

- Four gas analyzers to measure concentrations of H2O, O2, and N2
  - O2: two Servomex sensors cover ranges of 0-500 ppm and 0-20 ppm (only goes to 75 ppt)
  - H2O: Tiger Optics Halo+, good to 1 ppb
  - N2: LDetek LD8000, good to 0.1 ppm
- We can measure concentrations off of the cryostat and of delivered argon.
- Gas analyzers do not have the range to cover the purities with which MicroBooNE will operate, purity monitors and the TPC are much more relevant calibrations wise.

Reading the gas analyzers and other cryogenics equipment

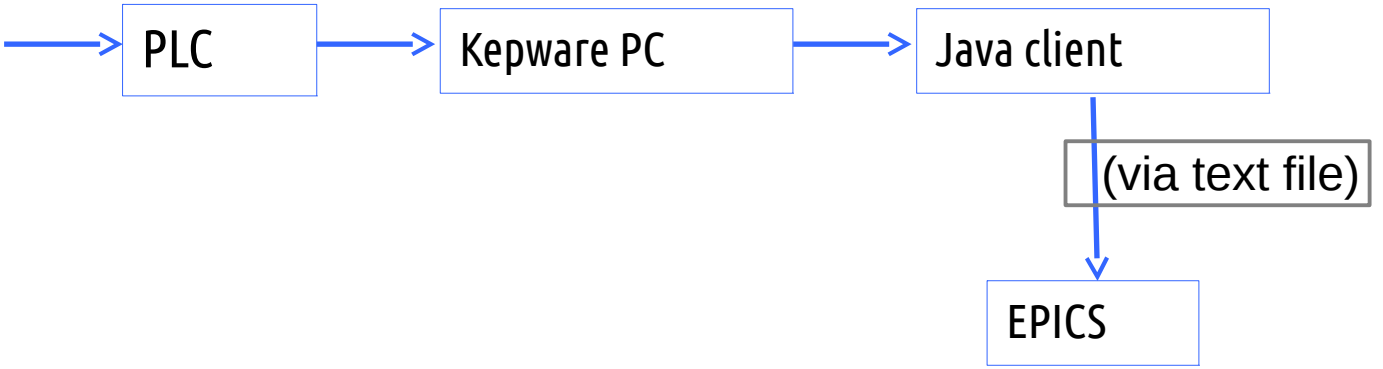
- The gas analyzers and the other cryogenics equipment are read out by a PLC, which relays that to a Kepware OPC server running on Windows
- The Kepware OPC server and iFix run the MicroBooNE cryogenics system
- This makes getting data difficult though, especially if you don't want to mess with Windows

Gas analyzers

Reading the gas analyzers and other cryogenics equipment (2)

- Using knowledge gained from LAPD, we read out the gas analyzers using a Java client running on a linux box
- We still need to work on getting that information to EPICS.
  [We will use similar software as for Weather and IFBeamData import.]

Gas analyzers



Cryo data progress

- Data from all variables currently being written to the text file on uboonedaq-smc.fnal.gov.

```
MM/dd/yyyy hh:mm:ss a  PT102       LT122       TE123       LT124   LT125 …
11/21/2013 07:10:06 AM 0.0         0.0      851.1001       0.0     Error …
11/21/2013 07:15:08 AM 0.0         0.0      851.1001       0.0     Error …
…
```

- The Python program for EPICS is ~90% complete:
  - Read text file? – checked, works.
  - Write values to EPICS from Python? – checked, works.
  - Actually running on uboonedaq-smc.fnal.gov? – soon.
  - Display panels? – not yet. (What values are actually interesting for the experiment?)

IFBeamData

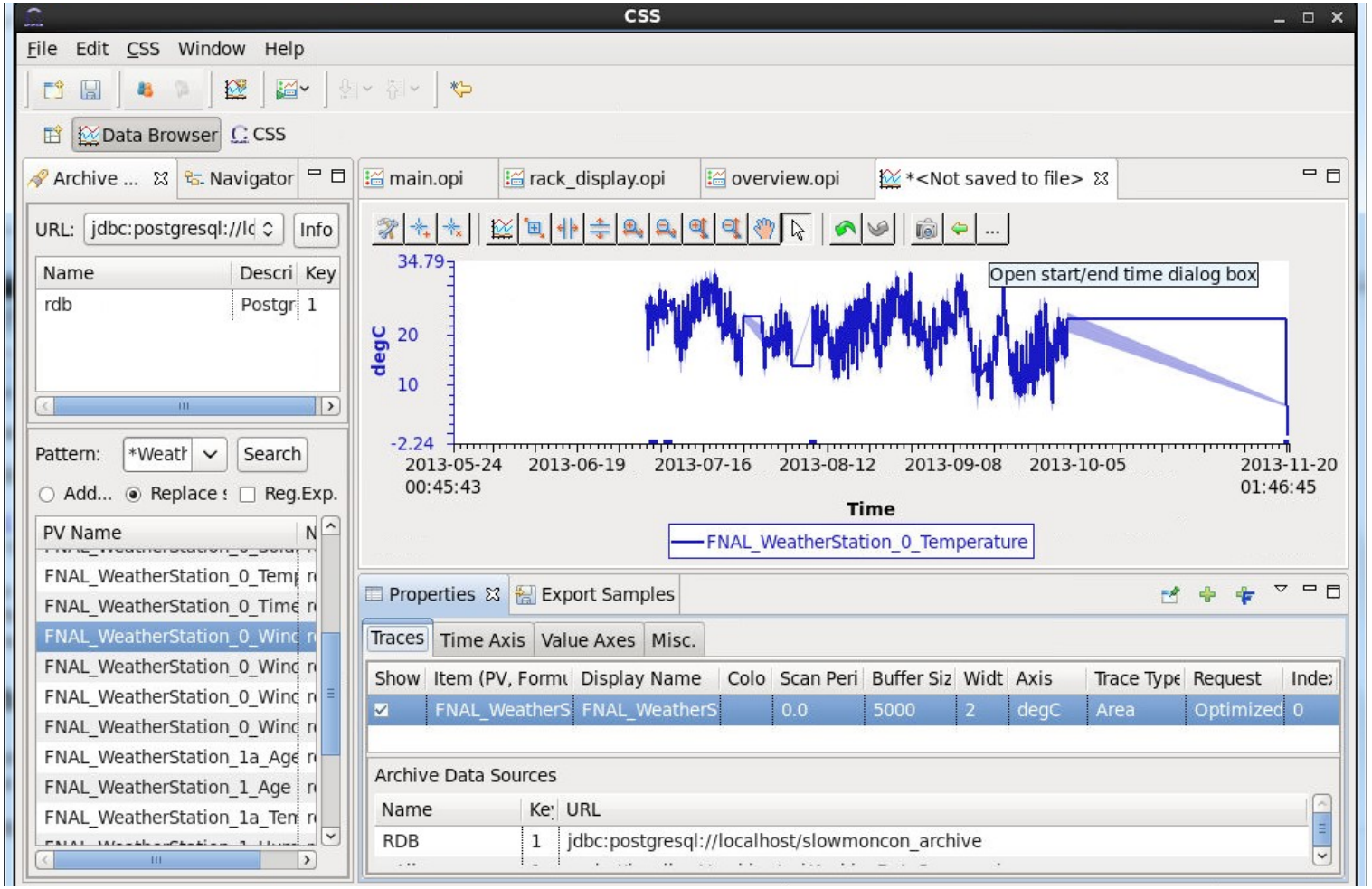
- Data on neutrino beams for all Intensity Frontier experiments provided by server at http://ifb-data.fnal.gov:8089/ifbeam/data/index
- There are several data "bundles" with names like "BoosterNeutrinoBeam", "NuMI_All", "Weather".
- Example data:

```
Name,Time,Clock,Units,Value(s)
m:blow,2013-11-21T11:09:43.752000-06:00,1385053783752,MPH,0.260546875
m:humid,2013-11-21T11:09:43.752000-06:00,1385053783752,%RH,20.3051567078
m:outtmp,2013-11-21T11:09:43.752000-06:00,1385053783752,DegF,47.96069269
m:watsun,2013-11-21T11:09:43.752000-06:00,1385053783752,W/SM,94.83215491
```

IFBeamData used by DAQ and slowmon

- IFBeamData can give latest value read, or can give a history of beam for every pulse for any time range, if you ask it. But there's a latency for big requests.
- Zarko has a system to read the every-pulse history and merge it with the DAQ data periodically.
- Slow monitoring will sample recent values every minute, providing status to us in closer to real time.
- Have been using “Weather” bundle for testing since July.

Control System Studio GUI screen showing archived weather data



Data can also be retrieved directly from the SQL database if desired.
(All the plots of history data in past talks were obtained that way.)

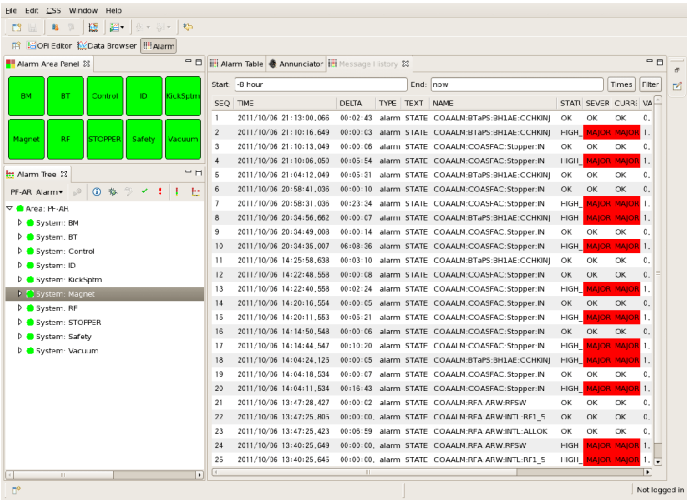
IFBeam data progress

- Data from the Weather bundle being read every minute, written to “soft” channel on uboonedaq-smc.fnal.gov, archived, available to display.
- I have no good reason not to do the same with the BoosterBeamData or NuMI_All bundles. So that's next. (99.9% done, just configuration settings.)
- Alarm settings and displays would be next.

Other data sources

- Indoor environment: Do we need anything except temperature?
- DAQ status: Read from “Ganglia” files using existing tools that write text files. Dave McKee wrote an IOC for this, or we can use the same text-reading tool as for Weather and beam data.
- Computer status: Read from “ipmitool” status (Sowjanya and Eric).
- Laser: Thomas Strauss working on this.

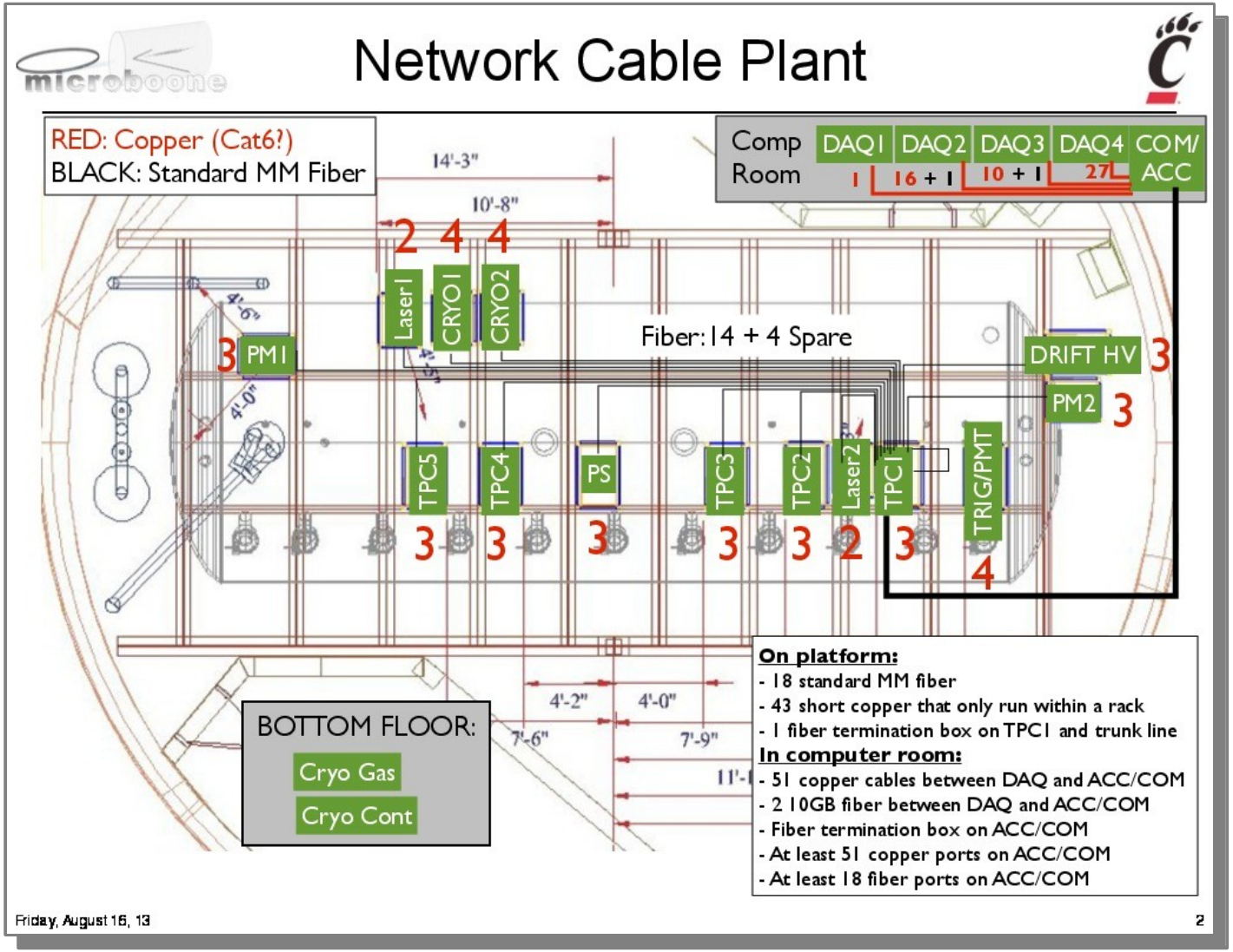
Other software to configured



- **Alarm handler**
  - Another standard Control System Studio component.

    http://epaper.kek.jp/icalepcs2009/papers/tua001.pdf
  - Provides pop-ups, annunciator, logging, messaging when channel goes into “minor” or “major” severity state.
  - Has provision to acknowledge alarms on certain channels, etc.
- **Displays**
  - We have lots of displays. Need to put together in usable, navigable form.

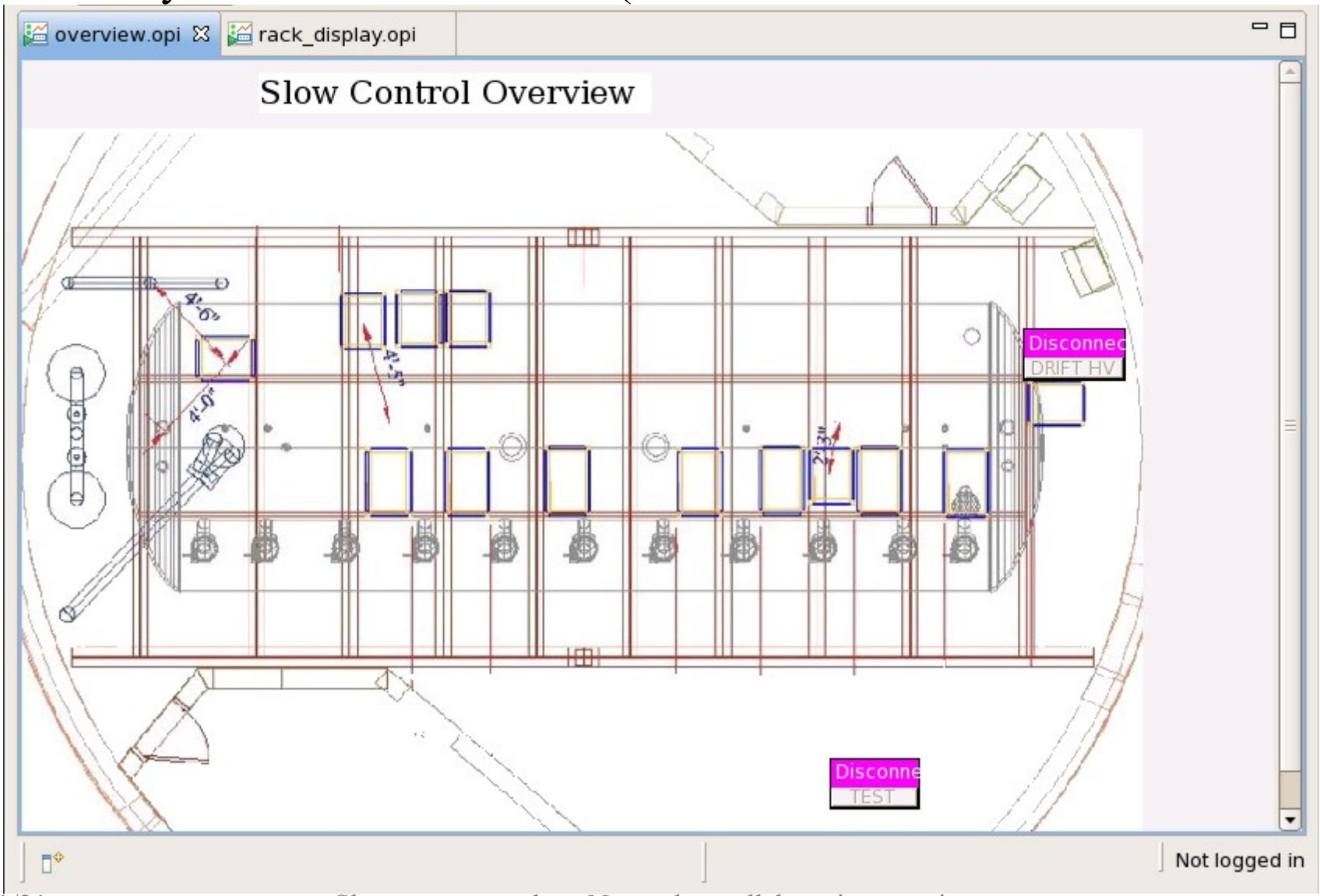
An overview of the rack layout



(slide 2 from Bryce Littlejohn uB-doc-2662-v5)

New overview display

- Eventually a button for each rack. (“Disconnected” means the IOC is off.)



People to thank

Category	Subsystem	Contact person (device)	Contact person (control/monitor)
rack monitor	RackTemps RackFans RackProt	Dave Huffman	Glenn Horton-Smith
power supply	OnDetectorPower	Cheng-Yi Chi (electronics); Linda Bagby	Sowjanya Gollapinni
	CrateRails	Cheng-Yi Chi (DAQ and trigger); Matt Toups (PMT); Bryce Littlejohn, Dave Huffman, Linda Bagby (power supplies)	
	TPCBias	Hucheng Chen (bias); Linda Bagby, Dave Huffman, Bryce Littlejohn (power supplies)	
	TPCDrift	Sarah Lockwitz, Hans Jostlein	
	PMT HV	Matt Toups	
Laser	LASER	Thomas Strauss	Thomas Strauss
Environment	Indoor	Dave Huffman	Glenn Horton-Smith
	Weather	Glenn Horton-Smith	
daq status	DAQStatus	Eric Church	David McKee
cryo	ODH	Ben Carls	Andrzej Szelc
	ArPurity	Ben Carls	
	Cryo	Ben Carls (all), Ben Jones (N2)	Glenn Horton-Smith
computer status	PCStatus	Eric Church	Sowjanya Gollapinni
beam status	Beam	Glenn Horton-Smith	Glenn Horton-Smith

Plus Ron Rechemacher, Gennadiy, and more. Apologies to anyone I forgot.