

MicroBooNE DAQ status

9-May-2013
Eric Church, Yale
for the uB DAQ Team

Outline

□ Procurements

- Stuff Here, Coming, Remains to Order
 - SysAdmin Support

□ SlowMonCon

□ Upcoming DAB Testing (MRT)

□ Beyond the MRT

□ Hardware

- See Bryce's talk for Reception Test/Calibration rack status, Georgia's talk for state of readout at Nevis, Chen's FE Electronics talk. Camillo's Online discussion.

Procurement

- The 15 DAQ servers are here
- The network switches, fibers, optics are en route.
- UPSs, PDUs are PR'd
- All Slow Mon stuff is PR'd
- Fibers soon to be PR'd

DAQ Procurement

x==in hand, y==PR, z==PO (imminent), Green (maybe), crossed-through (eliminated)

Package	Preparer/ comment	Estimated Cost	Requisition	Purchase Order
Already procured				PO in process
Jungo WinDriver License		6500	15-March-2012	x
Glomation 9G20		125	30-March-2012	x
Tektronix AFG3000 pulser		3400	30-March-2012	x
GPS PCI card		3500	30-March-2012	x
DS1624 digital thermometers		800	30-March-2012	x
PMT SEB computer		5400	30-March-2012	x
PAB rackmount keyboard/monitor		900	Sep?-2012	x
Cryo rackmount keyboard/monitor	2x900	1800	Jan-2013	x
DAB rackmount keyboard/monitor		900	Jan-2013	x
8 outlets worth of WTI switchable power units		650	1-June-2012	x
Bitscope	perhaps for purity monitor	1400	10-May-2012	x
DAB mobile computer		3200	1-Feb-2013	x
Slow mon/control EPICs computers		3200	1-Feb-2013	x
Below are for DAB				
HDMI cables for DAB	WBS7,10?	300	7-March-2013	x
network fibers at DAB for Ranger	1 at 170 feet	50	7-March-2013	x
data fibers at DAB	5 at 170 feet	330	7-March-2013	x
Ranger pair at DAB		900	7-March-2013	x
Below are for LArTF				
Logitech Webcams	5x\$60	300	7-June-2013	
data fibers	M at xyz feet, WBS7?	3000	7-June-2013	
USB hubs		500	25-April-2013	

x==in hand, y==PR, z==PO (imminent), Green (maybe), crossed-through (eliminated)

14-18 thermometers DS1624 from Dallas Semiconductors		500	25-April-2013	
APC switchable power 15A		1900	6-May-2013	y
TrippLite UPSs		1800	6-May-2013	y
18 Glomation 9G20 SBCs		1600	3-May-2013	
slowmon chassis parts		1500	3-May-2013	y
10GbE network switch: 12+ port		8000	25-March-2013	z
24-48 port 1 GbE Network switch		5000	25-March-2013	z
Cisco -2960G				
IPMI 24 port Switch		2000	25-March-2013	z
2 Wireless Hubs		1000	25-March-2013	z
14 on-platform rack network switches: D-Link DGS-1210-16?		4000	25-March-2013	z
AB option I		42000	25-March-2013	z
AB-option-II		33000	25-March-2013	Routing upstream (no level3-routing)
AB fibres		4400	25-March-2013	z
GPS PCIe card spare		3300	25-March-2013	
DAQ servers				
One 16 port slide-out monitor/ keyboard		1300	6-May-2013	z
Nine 2U SEB computers		50000	25-March-2013	x
One 3U SEB computer		6800	25-March-2013	x
Event Builder (Assembler) 4U Computer		12000	25-March-2013	x
One Online/ Nearline 4U Monitoring/Recon computer		12000	25-March-2013	x
1U platform server (commissioning/ backup)		1500	25-March-2013	x

x==in hand, y==PR, z==PO (imminent).

one 1U shift station computer		2600	25-March-2013	x
one 1U IPMI computer		900	25-March-2013	x
Four shift station monitors		5000	25-March-2013	

Slow monitoring Basics - Recap

(Sowjanya)

- **Experimental Physics and Industrial Control System (EPICS)** as the main I/O control system for sub-system monitoring and control
 - Based on “**process variables (PV)**”, also called “**channels**”
 - An EPICS I/O Controller has a **database** with one **record** per quantity (PV) monitored or controlled
 - Each record can have multiple **fields** to configure the PV
- **Control System Studio (CSS)** as a toolkit for developing **displays** and **control panels**
 - Also provides **Archiving** and **Alarm handling**
- **EPICS PV naming convention:** (see Doc-Db#2386)
Detector_Subsystem_Rack_Unit_ChannelNum/Variable

Slow monitoring: Sub-system table

Subsystem

Description

OnDetectorPower	Low Voltage Power Supplies (for ASICs, etc)
CrateRails	Rack LVPS - rails
RackTemps	Rack temperatures
RackFans	Rack fans
RackProt	Rack protection system status
TPCBias	Bias HVPS -- TPC wires
TPCDrift	Drift HVPS - TPC
HVC	PMT HV channels
PCStatus	DAQ PC status
DAQStatus	Fast DAQ status – run status, etc. (sampled from Ganglia)
SEBStatus	SEB status – event rates, etc. (sampled from Ganglia)
Environment	Environment and Operations (sampled from facilities)
Cryo system)	Cryogenic sensor data (sampled from cryo IFIX
ODH	ODH status (sampled from cryo or facilities?)
ArPurity	Argon Purity Monitor
LASER	UV Laser system

- There are also **RACK name** and **content** tables (see Doc-Db# 2475 for details)
 - 104 devices as of now (updated 2 weeks ago!)
 - The count above does not include laser subsystems at present.

Templates for records

subst_(recordtype).msi2
Template for EPICS record
for given record type

Tables used to describe database relations

uB-subsystems.csv
List of subsystems
with device, description

uB-racks.csv
List of racks
with human names, etc.

uB-rack-contents.csv
List of units in each rack

uB-device-pvars.csv
List of pvars of device types

(subsystem)_(pvar).csv
List of field values of pvar
for subsystems by rack,unit,ch

Files used by EPICS IOCs

\$(subsys)_\$(rack).db

```
record(Crtyp, Vpvname) {  
  field(Cfnam, Vval)  
  field(Cfnam, Vval)  
  .... one per field  
}  
.... one per pvar in all unit,ch in subsystem, rack
```

⋮
one .db file
for each pair
of subsystem,rack

Can also be used to fill in templates for
display panels, archiver, alarms.

Question: Does MicroBooNE have multiple spreadsheets with “rack content” info now?
It would be nice to have One True Spreadsheet, but we need it in a standardized .csv format.

Subsystems & expert contacts (slide 1 of 2)

Subsystem	Short Description	Contact person (device)	Contact person (control/monitor)
OnDetectorPower	On-detector-electronics power	Cheng-Yi Chi	Sowjanya Gollapinni
CrateRails	Rack LVPS - rails	Cheng-Yi Chi (DAQ), Matt Toups (PMT)	Sowjanya Gollapinni
RackTemps	Rack temperatures	Dave Huffman	Glenn Horton-Smith
RackFans	Rack fans	Dave Huffman	Glenn Horton-Smith
RackProt	Rack protection system status	Dave Huffman	Glenn Horton-Smith
TPCBias	Bias HVPS -- TPC wires	Sarah Lockwitz, Hans Jostlein	Sowjanya Gollapinni
TPCDrift	Drift HVPS - TPC	Sarah Lockwitz, Hans Jostlein	Sowjanya Gollapinni

Subsystems & expert contacts (slide 2 of 2)

Subsystem	Short Description	Contact person (device)	Contact person (control/monitor)
HVC	PMT HV channels	Matt Toups	Sowjanya Gollapinni
PCStatus	DAQ PC status	Eric Church	Sowjanya Gollapinni
DAQStatus	Fast DAQ status	Eric Church	David McKee
SEBStatus	SEB status	Eric Church	Sowjanya Gollapinni
Environment	Environment and Operations	<i>[FESS Metasys contact]</i>	<i>[KSU – or new volunteer?]</i>
ODH	ODH status	Ben Carls	Andrzej Szelc
ArPurity	Argon Purity Monitor	Ben Carls	Andrzej Szelc
Cryo	Cryogenic sensor data	Ben Carls (all), Ben Jones (N2)	Andrzej Szelc
LASER	UV Laser system	Thomas Strauss	Thomas Strauss

Slow monitoring: To-Do list

- Rack device list and mapping – needs to be **verified** by subsystem **experts**
- Finalize PV lists for some sub-systems and get the **experts** to **fill in initial field values** for each PV (*e.g.*, alarm limits, device addresses)
- Re-do displays for some of the subsystems
- Organize all control panels
- Configure archiver and alarm handler under CSS, run
- Get monitoring & controls for Glassman HV (work in progress!)

Everything coming together !!

upcoming MRT

- DAQ Software is ready for this
- Since last meeting we fixed a big assembler bug, such that now we run stably. Fleshed out running and analysis scripts.
- We have working config, states, scripting, readout, analysis such that
 - We loop automatically over ASICs masks, pulser configs on a full flange in ~35min => 160 subrun binary files. Diagnostics is then run immediately. Another 1.5 hrs to break all degeneracies of possible miscabling.
- Bryce will discuss MRT hardware
- We're eager to get into the tent in 2-3 wks!

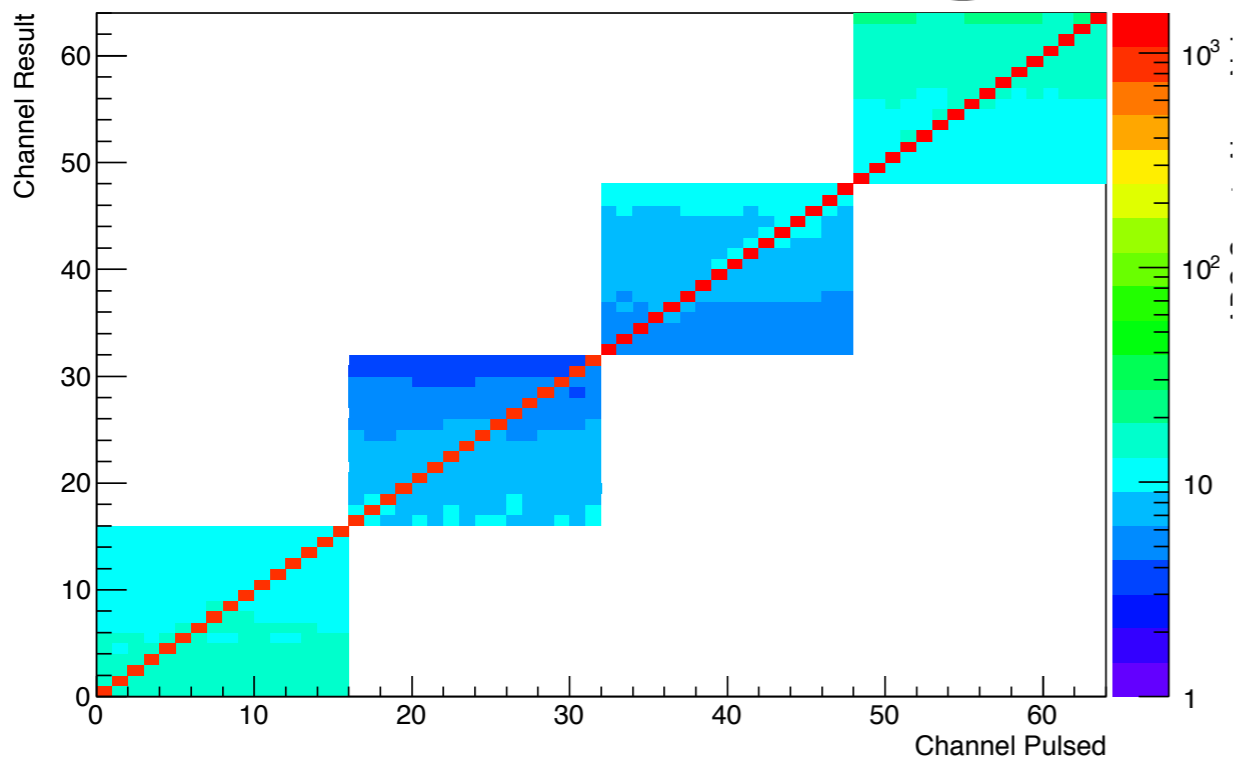
Cycle 2 ASICs !

a diagnostic plot

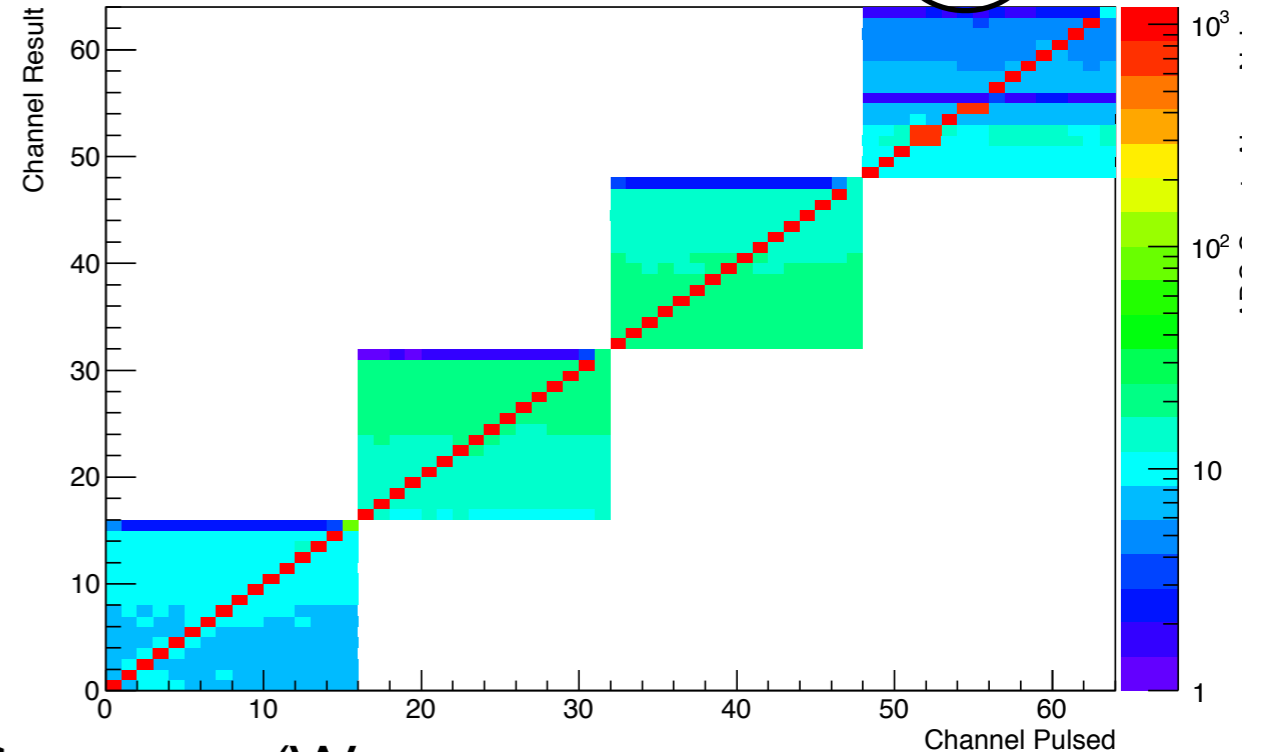
z-axis (color) is: $(\text{max pulse height} - \text{pedestal})/\text{noise}$

Wes

Intra-ASIC Crosstalk Check from Crate 0, FEM 3



Intra-ASIC Crosstalk Check from Crate 0, FEM 5



This shows results with channel i pulsed on all ASICs at once. (We also pulse all channels on one ASIC, and then all on one motherboard, looking for all possible mis-connections.)

Beyond the MRT

- The MRT has been our 0th order goal as a DAQ project. (Wes)
- Now, what's next for uB DAQ?
 - Well, basically, tons.

First things first, post-MRT

- Fix/understand problem of missing Beginning/End of card/event words in compressed mode
- This is our 0th order readout hurdle right now.

- Once solved, run in SN + Trigger mode.
- Can we query status on crates while we run?
 - GPS functionality relies on this!

- Has Nevis's new XMIT code fixed our compressed-mode run end-of-card word problem?!
 - **No. (7-May-2013)**

New Work and moving parts that are remaining that (I think) we should have at least parts of running by end of June/July.

□ ~~DataSpy~~ Nearline Data monitoring

- Start with SEB SN info. Look at actual wire/PMT data in in-browser histograms. Hand off data to online monitor via shared memory. **Nathaniel's RAJA (Root, Argo Javascript, Ajax) Nearline monitor.**

□ Dispatching data from files to N Online LArSoft swizzling processes. Is this something we build from scratch?

□ Application Manager

- should likely port this now from NOvA, as planned

Other things that have been started that I hope can be pretty mature by end of August

- DAQ dB schema and hooks into dB (Andrzej)
- Process to insert beam data into data file (Zarco).
- data swizzling (Jonathan)
 - no beam data yet. Should swizzling await that?
 - decompressing?
 - CalWire? HitFinding? ...
- Run Control GUI (Rashid)
- GPS time into SEB header, then Global header
 - Code is there, machine is ready.
 - VT has made some good progress!

GPS time into the event

Want to grab the GPS time and the DAQ clock Frame number at that instant.

A more careful look

	RUN	DATE	TIME	DeltaT	FRAME	SAMPLE	DIVISIONS	DIFFERENCE
1	TEST_RUN	2013-05-03	21-17-51.2467105	0	3272350	407	2	0
2	TEST_RUN	2013-05-03	21-17-52.0002105	0,7535	3272975	395	7	15999909
3	TEST_RUN	2013-05-03	21-17-53.0002105	1	3273600	384	3	15999908
4	TEST_RUN	2013-05-03	21-17-54.0002105	1	3274225	677	7	16002348
5	TEST_RUN	2013-05-03	21-17-55.0002105	1	3274850	361	3	15997468
6	TEST_RUN	2013-05-03	21-17-56.0002105	1	3275475	349	7	15999908
7	TEST_RUN	2013-05-03	21-17-57.0002105	1	3276100	338	3	15999908
8	TEST_RUN	2013-05-03	21-17-58.0002105	1	3276725	326	7	15999908
9	TEST_RUN	2013-05-03	21-17-59.0001105	0,9999	3277350	315	3	15999908
10	TEST_RUN	2013-05-03	21-18-00.0002105	1,0001	3277975	303	7	15999908
11	TEST_RUN	2013-05-03	21-18-01.0002105	1	3278600	292	3	15999908
12	TEST_RUN	2013-05-03	21-18-02.0002105	1	3279225	585	6	16002347
13	TEST_RUN	2013-05-03	21-18-03.0002105	1	3279850	269	3	15997469
14	TEST_RUN	2013-05-03	21-18-04.0002105	1	3280475	562	5	16002346
15	TEST_RUN	2013-05-03	21-18-05.0002105	1	3281100	246	3	15997470
16	TEST_RUN	2013-05-03	21-18-06.0002105	1	3281725	234	7	15999908
17	TEST_RUN	2013-05-03	21-18-07.0002105	1	3282350	223	3	15999908
18	TEST_RUN	2013-05-03	21-18-08.0002105	1	3282975	211	6	15999907
19	TEST_RUN	2013-05-03	21-18-09.0002105	1	3283600	505	2	16002348
20	TEST_RUN	2013-05-03	21-18-10.0002105	1	3284225	188	6	15997468
21	TEST_RUN	2013-05-03	21-18-11.0002105	1	3284850	177	2	15999908
22	TEST_RUN	2013-05-03	21-18-12.0002105	1	3285475	165	6	15999908
23	TEST_RUN	2013-05-03	21-18-13.0002105	1	3286100	154	2	15999908
24	TEST_RUN	2013-05-03	21-18-14.0002105	1	3286725	142	6	15999908
25	TEST_RUN	2013-05-03	21-18-15.0002105	1	3287350	131	2	15999908
26	TEST_RUN	2013-05-03	21-18-16.0002105	1	3287975	119	6	15999908
27	TEST_RUN	2013-05-03	21-18-17.0002105	1	3288600	108	2	15999908
28	TEST_RUN	2013-05-03	21-18-18.0002105	1	3289225	401	5	16002347
29	TEST_RUN	2013-05-03	21-18-19.0002105	1	3289850	85	1	15997468
30	TEST_RUN	2013-05-03	21-18-20.0002105	1	3290475	73	5	15999908
31	TEST_RUN	2013-05-03	21-18-21.0002105	1	3291100	366	6	16002345

- First trigger picks up the wrong time; this is an artifact of the software.
- Triggers occur once per sec with an accuracy of ~ 100 ns (red circles)
- The jitter of slide 5 is still present from time to time.
- Still an effort should be made to understand last column.

Leonidas

Work that must be done in September when DAB test stand gets a 2nd crate.

- Generate triggers (Ext pulse is fine). *Easy-peasy.*
- Fan it out to generate readout of both crates.
- Get assembler to read and build data from both.
- Run in SN + Trigger mode.

- Then ...
 - Read the Trigger card directly in crate on its fiber/PCIe
 - Get the GPS time into the header: really do it!

Pre- and Post-September: SuperNova data. (Big project, I think)

- ❑ Scripts needed, listening/reacting to (pretend and real) SNEWS email, to tell processes on SEBs to drill down into appropriate frame numbers +/- 1 hr around putative SN. Fake this email at reasonable rate (~1wk). Subscribe to SNEWS!
- ❑ Ensure we're in a low rate trigger mode.
 - if not, stop, reconfig, re-start Run.
- ❑ Pull that data off disks, ship it over sockets to assemblerSN, intelligently, over network.
- ❑ Swizzle, analyse to look for the actual events.
- ❑ Scripts to monitor/reap disks
- ❑ Meta scripts to watch over all this.

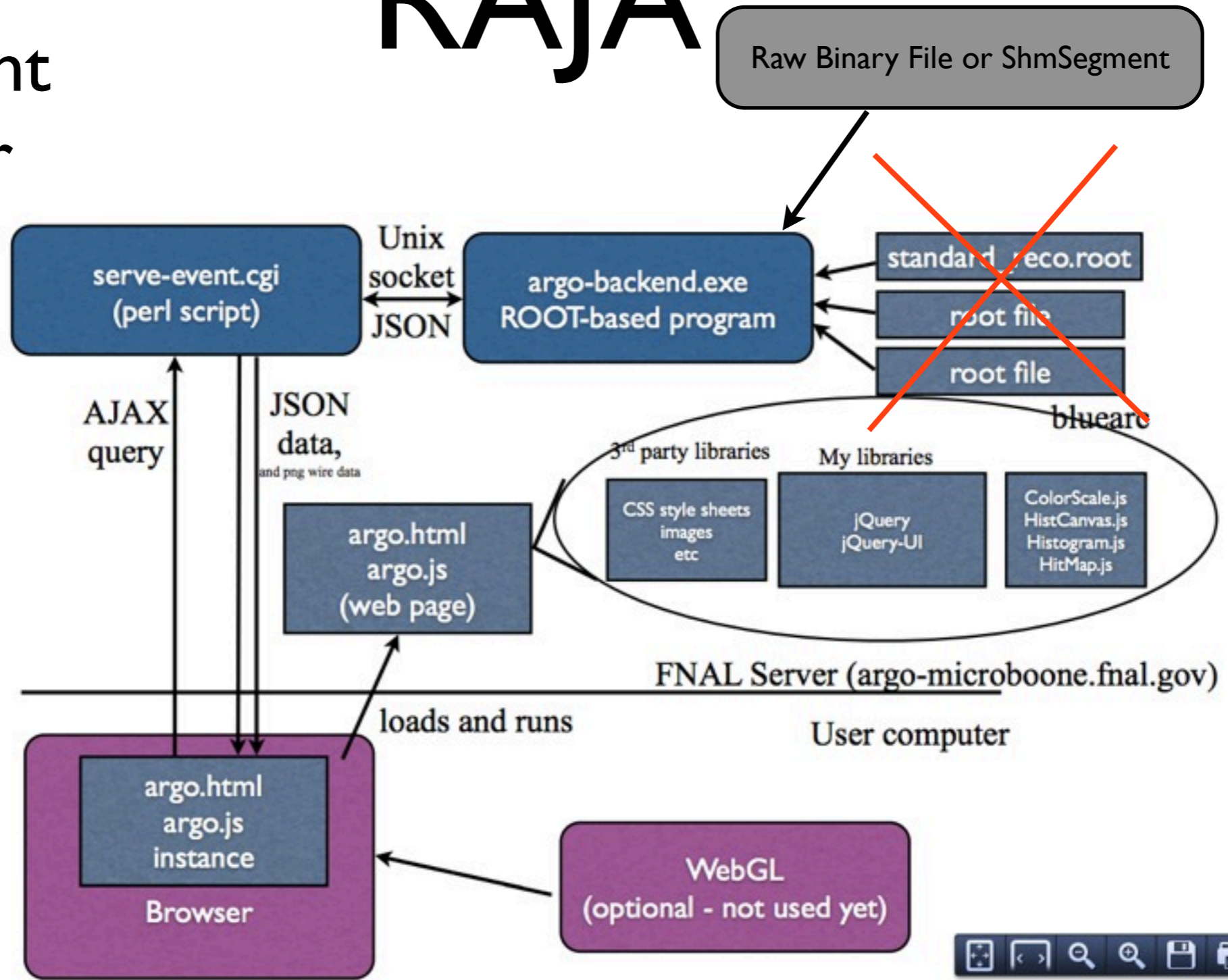
summer hardware task

- Rack and network-up the servers at LArTF in June-July
- Glenn Cooper's CD group has agreed to setup/config/manage our servers on agreeable terms immediately after racking them.

bkup

RAJA

Lightweight
observer



Nathaniel

**Makes an End-Run around
LArSoft**