BNL Cold Elec Testing Computing:

Meet the `hothdaqs`.

Brett Viren

(for the whole team)

Physics Department

BROOKHAVEN
NATIONAL LABORATORY

CE Testing Review

2017 Sep 11

Outline

Networking and Systems

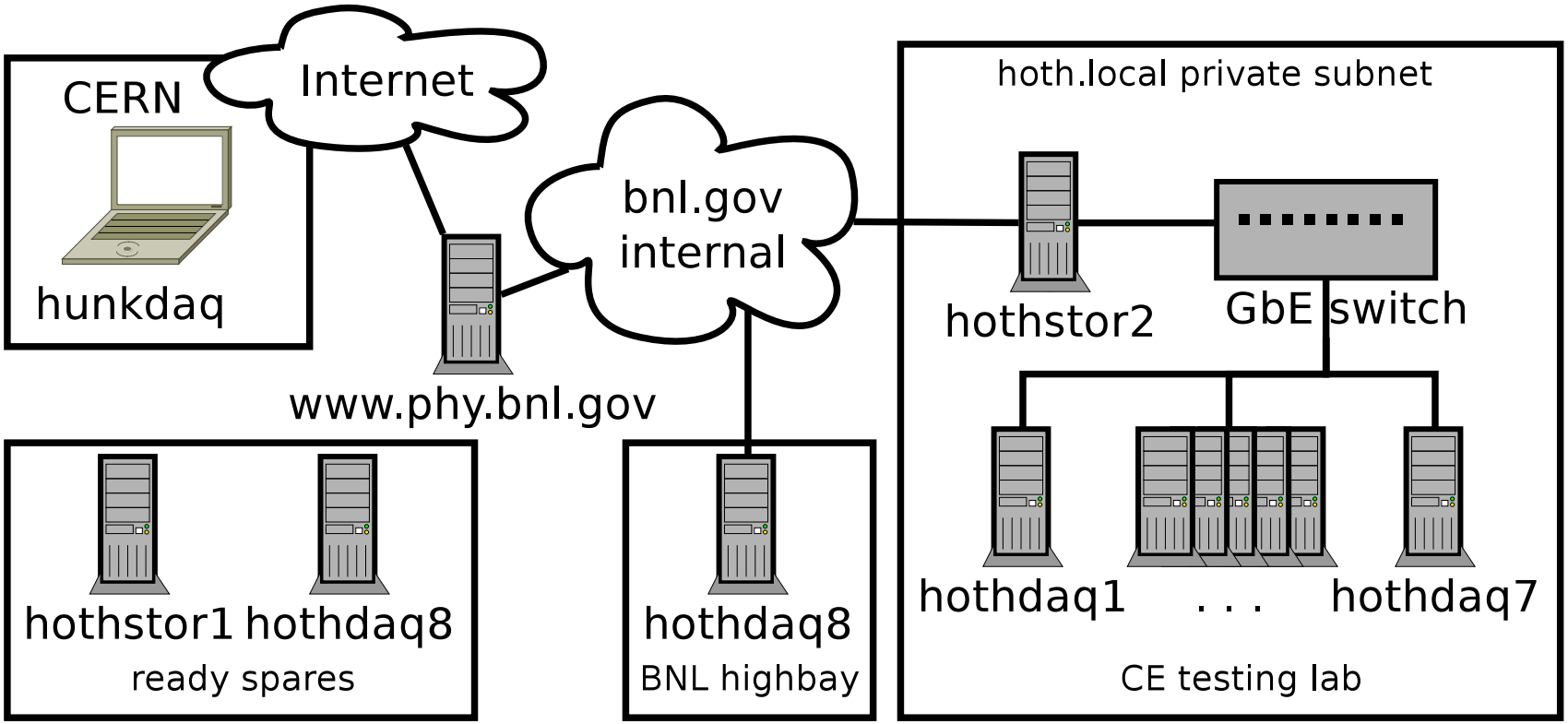
Configuration Management

DAQ Software

Data Transfer

Data Summary Web Pages

Networking and Systems Overview



`www.phy.bnl.gov` provides password protected, reverse HTTP proxy service to `hothstor2` at: `http://www.phy.bnl.gov/coldelec`.

"Hoth" Systems

Primary roles for the "Hoth" systems:

`hothstor` (×2)

- **secondary data storage** (30 TB each)
- **servers** (HTTP, PostgreSQL DB, Sumatra, Ganglia)
- **private network services** (SSH, DHCP/DNS, NAT)

`hothdaq` (×8)

- **primary data storage** (10 TB each)
- **DAQ** s/w dev and operation

`hunkdaq` (×1)

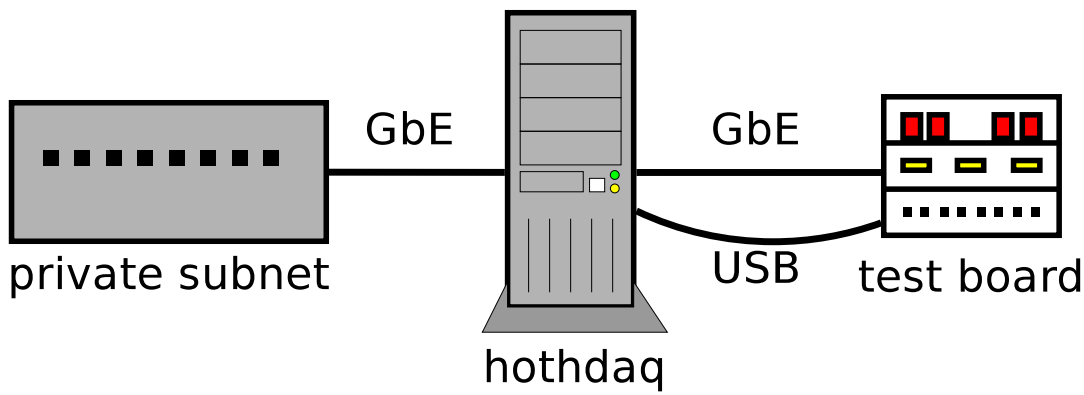
- **laptop DAQ** for APA1 testing @CERN

`hothbay` (×1)

- DAQ for **cold box** tests in BNL high bay.

hothdaqs

- Connects with CE test boards via:
  - secondary GbE NIC, point-to-point network
  - USB devices (eg, firmware flasher)
- Identically configured, but task-specific test stations.
- Enough local disk for their entire expected data set.
  - $11 \times 8\text{TB} = 88\text{TB}$ total, currently acquired 4TB.
- Ganglia monitoring of net, CPU, disk, temps, etc.



Networking and Systems

Configuration Management

DAQ Software

Data Transfer

Data Summary Web Pages

Configuration Management

Comprehensive, semi-automated CM using Anisble

- Developed prior to lab provisioning with ongoing refinement.
- Direct, **manual configuration avoided**.
  - Provision a new `hothstor`/`hothdaq` in minutes.
- Decoupled-systems, **no network disks nor auth**.
- Users, services, quota, keys, database, software, time, USB, network, SSH keys, PSQL certificates, p/w resets, etc....
- Ansible scripts in protected Gogs/Git repo.
- Freedoms for developer/personal accounts, **official accounts strongly managed**:

  `oper` official shift operator
  `arch` data archiving, summary serving
  `inst` build and deploy software releases

Networking and Systems

Configuration Management

DAQ Software

Data Transfer

Data Summary Web Pages

DAQ Software

- Source and docs in DUNE's GitHub org.
  - Brian, Justin, Elizabeth, BV, Arbin, Matt, Mary, Kevin W, Zack W, others.
- Coordinated **release management**.
- Semi-automated **build and deployment** of **tagged releases**.
- Release roll-back possible on per-`hothdaq` basis.
- Devel done on `hothdaq`'s in user account (not `oper`).
- Layered software design:
  - (operator GUI/CLI) $\rightarrow$ (`runpolicy`) $\rightarrow$ (payload DAQ code).
  - Makes consistent data **file name / directory** patterns and **configuration parameter** management.
  - Insinuates **Sumatra** for **data provenance capture**.

Networking and Systems

Configuration Management

DAQ Software

Data Transfer

Data Summary Web Pages

Multiple Data Transfer Methods

Existing:

`hothdaq`→`hothstor` **hourly summary rsync**

- Currently just smaller summaries (JSON/PNG/PDF)
- Will begin to include raw data (`.bin`/`.root`)

ad-hoc copies **select subsamples**

- Brian sent warm p2 FE summary fileset to Tom J. on 7/6.
- Others can be made available via `www.phy.bnl.gov` reverse HTTP proxy to `hothstor`

Still to do:

`hothstor`→FNAL **definitive archive**

- FTS/SAM, FNAL storage for long term safe keeping and use.
- Already in contact with Steve Timm.

`hothstor`→BNLBox **web browsable archive**

- Like CERNBox, based on OwnCloud.
- Operated by BNL RACF/SDCC, new so still testing.

Networking and Systems

Configuration Management

DAQ Software

Data Transfer

Data Summary Web Pages

Sumatra

Provides (almost) invisible capture of **data provenance**.

- **File system** is primary "DB". **Sumatra is add-on bonus**.
- Records: parameters, user, host, times, input/output/log files.
- Central PostgreSQL DB store on `hothstor2`.
  - Local SQLite3 when run on `hunkdaq`
- Supports **result annotations** (tags, comments).
- `smtweb` server for browsing metadata and files
- Available on the internal-BNL network or by SSH tunnel[1].

`http://hothstor2.phy.bnl.gov:8942/`
via ssh tunnel: `http://localhost:8942/`

[1] `ssh -L 8942:hothstor2.phy.bnl.gov:8942 user@gateway`

Result Summary Web Pages

- Collects "summary of summary" of all the tests.
  - Sortable, searchable summary **tables**.
  - Interactive, browser-generated **charts**.
  - **Links** to Sumatra and DAQ PNG/PDF files.
- Categories: ADC, FE, FEMB, Osc, more to come....
- Password protected outside BNL (ask for pw).
- Minimal processing to help spot any problems.
- Automatically incorporates new results once per hour.
- URL: `http://www.phy.bnl.gov/coldelec/summary/`

Tech: cron, rsync, Python, JavaScript, Waf, JQ, Yasha, Jinja2, Highcharts, Bootstrap.

Demo web pages

Demo links

Summaries `http://www.phy.bnl.gov/coldelec/summary`

Sumatra `http://localhost:8942/` (tunnel)

Ganglia `http://www.phy.bnl.gov/coldelec/ganglia/`

Remaining slides show screen captures of demo.

ADC ASIC Test Summary Web Page

ADC ASIC Test Summary for ADC# d0645 sampled on 20170908T101933

Links

- All results for ADC# d0645
- Sumatra entry (requires local Sumatra server or SSH tunnel)

Summary information

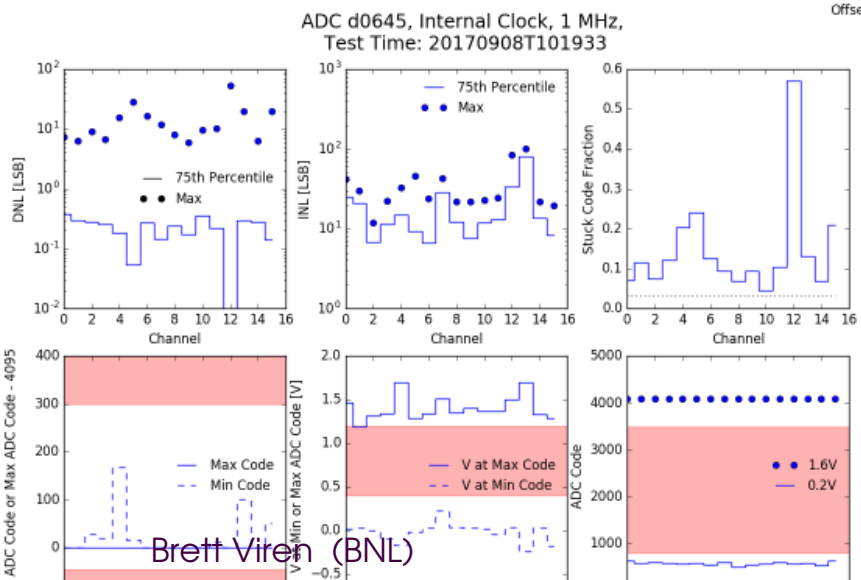
Show 10 entries Search:

Parameter	Value
ADC ASIC sn#	d0645
DAQ Config	adcTest_P1single_hothdaq4_cold
DAQ host	hothdaq5
DAQ version	1.0.40
Passed	False
Test board	11v2
Timestamp	20170908T101933

Showing 1 to 7 of 7 entries Previous 1 Next

Summary Plots

adcTest_20170908T101933_d0645_intClock_1MHz.png



(page link)

Page includes links to

- All other results for the given **ADC ID**.
- All results for the **test board** used.
- **Sumatra entry** for the run.

Inline plots made by DAQ code (additional plots cropped here)

FEMB Test Summary Web Page

Top ADC ASIC FE ASIC FEMB By ADC ID By FE ID By ADC test board

Summary of FEMB Test on box:24 fm:12 am:12 at 20170823T232009

Summary

- ADC ASICSs: [134] [341] [305] [116] [332] [178] [308] [160]
- FE ASICSs: [18] [19] [20] [21] [22] [176] [24] [25]

Summary sheet

Test results

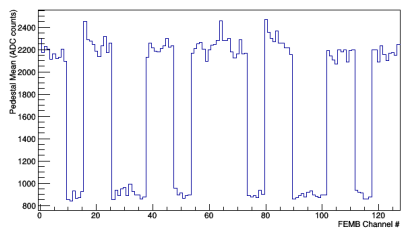
Show 10 entries Search:

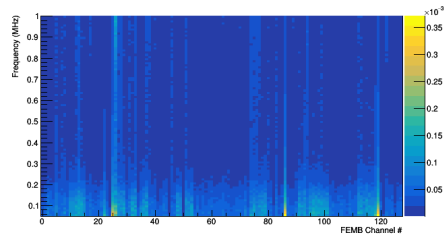
Test Name	gain	shape	base	ASIC failure	Chan failure	figs
extpulse	2	3	0	4	0	PNG
extpulse	2	1	0	4	0	PNG
extpulse	3	0	0	4	0	PNG
extpulse	2	2	0	4	0	PNG
extpulse	3	2	0	4	0	PNG
extpulse	3	3	0	4	0	PNG
extpulse	2	0	0	4	0	PNG
extpulse	3	1	0	4	0	PNG
g2_s2_intpulse_intclock	2	2	0	4	0	PNG
intpulse	3	1	0	4	0	PNG

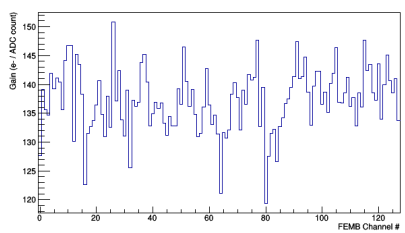
Showing 1 to 10 of 17 entries Previous 1 2 Next

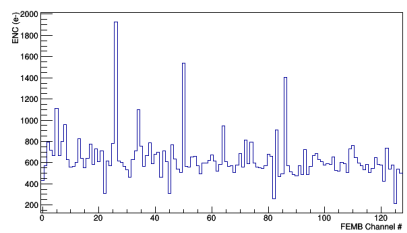
Links to:

- FEMB Summary Sheet PDF by Elizabeth.
- Individual FE/ADC asics
- PNG from DAQ code



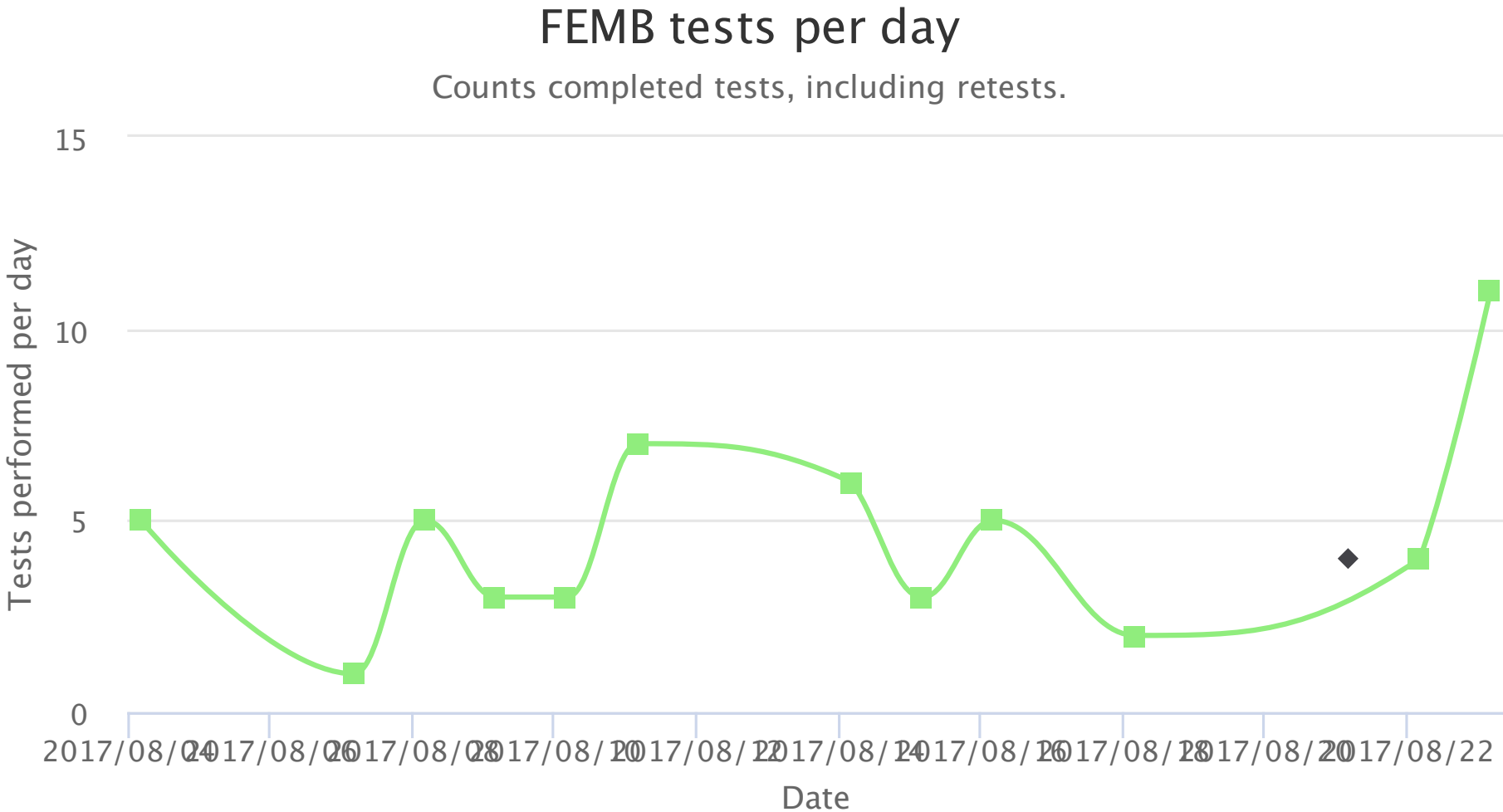






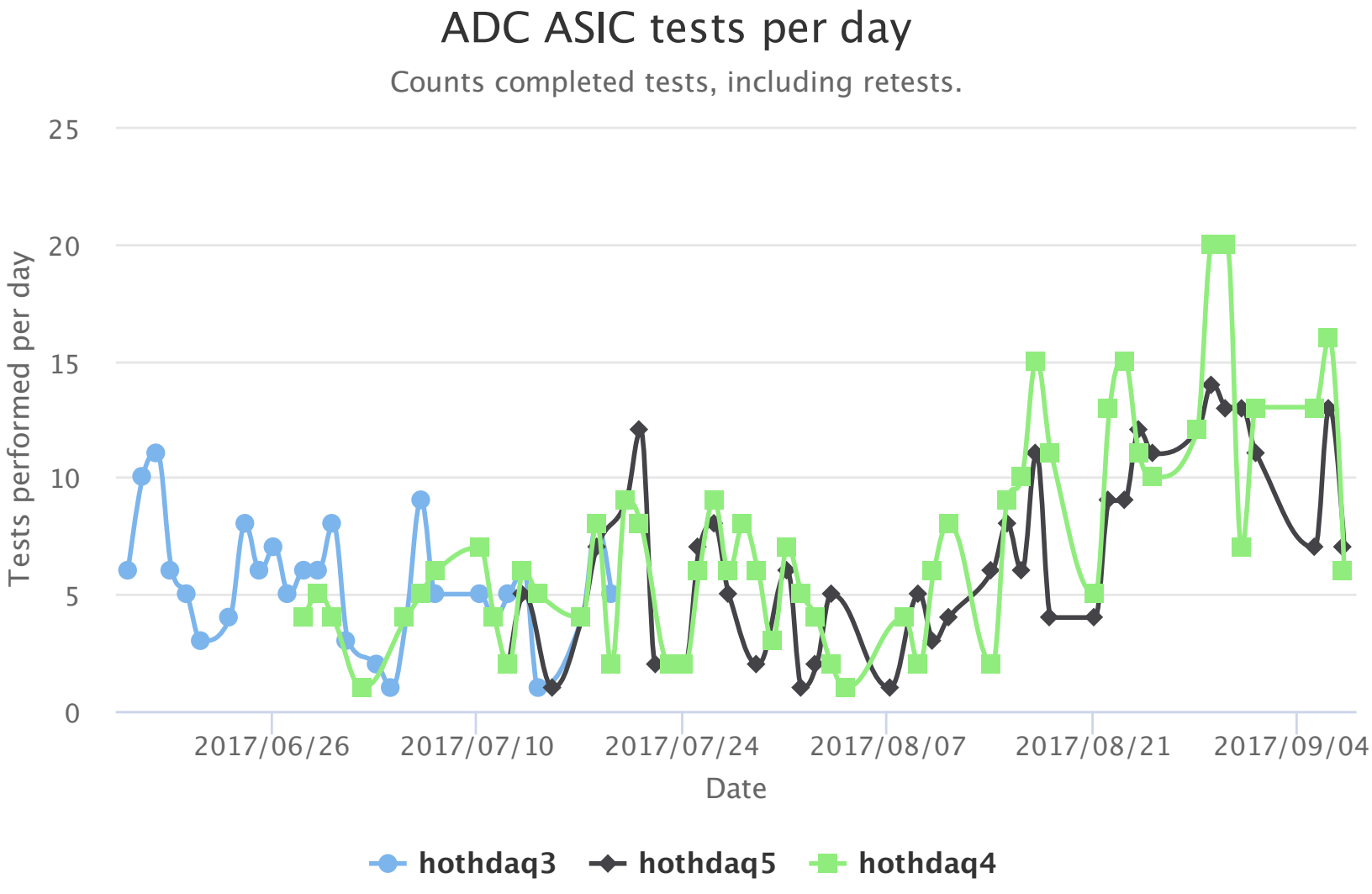
(page link), (img link)

FEMB tests per day



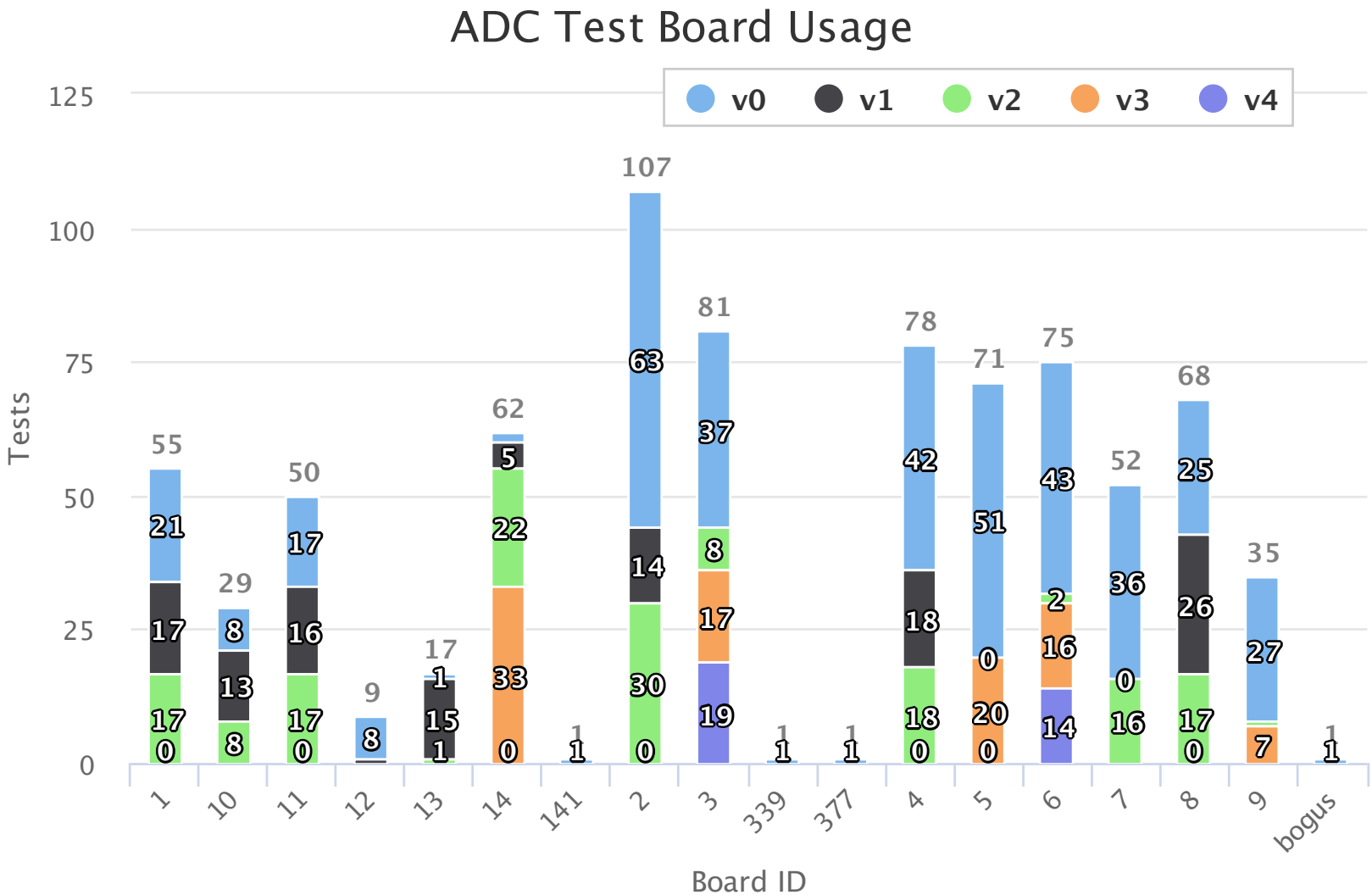
(page link)

Cold ADC tests per day per `hothdaq`



(page link)

Tests per ADC test board version


ADC Test Board Usage
v0
v1
v2
v3
v4
Tests
125
100
75
50
25
0
55
29
50
9
17
62
1
107
81
1
1
78
71
75
52
68
35
1
21
17
17
0
8
13
8
17
16
17
0
8
8
1
15
1
5
22
33
0
1
63
14
30
0
37
8
17
19
1
1
42
18
18
0
51
0
20
0
43
2
16
14
36
0
16
25
26
17
0
27
7
1
1
1

Details for one ADC test board

Top | ADC ASIC | FE ASIC | FEMB | By ADC ID | By FE ID | By ADC test board

ADC ASIC test results using test board# 6v4

Results

Show 10 entries Search:

Serial	Timestamp	Board	Config	DAQ host	Code version	DAQ pass
D0337	20170830T131322	6v4	adcTest_P1single_hothdaq4_cold	hothdaq5	1.0.40	False
D0418	20170830T123003	6v4	adcTest_P1single_hothdaq4_cold	hothdaq5	1.0.40	False
D0445	20170830T134944	6v4	adcTest_P1single_hothdaq4_cold	hothdaq5	1.0.40	False
D0447	20170830T142253	6v4	adcTest_P1single_hothdaq4_cold	hothdaq5	1.0.40	False
D0449	20170830T145539	6v4	adcTest_P1single_hothdaq4_cold	hothdaq5	1.0.40	False
D0451	20170830T152735	6v4	adcTest_P1single_hothdaq4_cold	hothdaq5	1.0.40	False
D0453	20170830T160115	6v4	adcTest_P1single_hothdaq4_cold	hothdaq5	1.0.40	False
D0455	20170830T163452	6v4	adcTest_P1single_hothdaq4_cold	hothdaq5	1.0.40	False
D0457	20170830T171104	6v4	adcTest_P1single_hothdaq4_cold	hothdaq5	1.0.40	False
D0460	20170830T174915	6v4	adcTest_P1single_hothdaq4_cold	hothdaq5	1.0.40	False

Showing 1 to 10 of 14 entries Previous 1 2 Next

(page link)

Summary

- **Cold Electronics testing computing** is in place, adequately sized, full featured, secure and with comprehensive configuration management and monitoring.
- **DAQ software** source is managed in git, tagged releases are made and semi-automatically deployed.
- **Results tracked** in file-system tree "DB" and with Sumatra.
- **Data summary web pages** are developed updated automatically as more data comes in.