



SCD Highlights

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CS All Hands Meeting
Tuesday, June 5, 2018

SCD in the context of the Lab-wide effort

SCD supports the science program of Fermilab through excellence in

- Operations of computing facilities and data centers
 - Middleware, workflow and data management services
 - Common software tools and frameworks
 - Scientific research
- DUNE (and projects leading to it) and CMS our top priorities

SCD improves efficiency, cost effectiveness, and performance of facilities, services, and software tools with R&D, through community collaborations, and ASCR and CompHEP projects.

- DUNE and HL-LHC/CMS our biggest challenges

Operations Highlights

HTC facilities continue to deliver:

- 20.3K job slots Tier-1, 17.0K job slots FermiGrid (average utilization in last 30 days)

Storage under a lot of pressure from experiment needs. Thanks to the storage team efforts we are keeping up (but will need to evolve architecture 😊)

- Transferred in/out of dCache: 5.2 PB CMS, 18.4 PB IF experiments*
 - Written to tape: 1.5 PB CMS, 2.1 PB IF experiments*
 - Read from tape: 0.5 PB CMS, 1.4 PB IF experiments*
- ❖ performance in last 30 days

One of the new 100PB tape libraries (for IF) installed and being commissioned; 2nd 100PB library for CMS soon

Operations Highlights

- Annual SCPMT review completed. Full report and response at <https://fermipoint.fnal.gov/project/sppm/Working%20Group%20Documents/Forms/2018report.as>
 - Requirements continue to support HEPCloud and elasticity
 - Biggest takeaway: work with DUNE and projects leading to DUNE to develop computing model
- FERRY : Unix account management project, goes live in September
 - Have demonstrated “orchestration” in SNOW
 - Thanks to the SNOW team for the efforts in this area!
- Security: successfully navigated the short notice announcement of OSG Certificate Authority (CA) retirement at end of May
 - Short term – all services renewed for another year.
 - Working with InCommon (service provider) to use as an additional CA.
- Data Management: Rucio, complete first evaluation phase for IF
 - Established collaboration with UK groups to provide service to DUNE

Preparation for protoDUNE operations

Expected protoDUNE-SP data rate from DAQ is 9.2 Gbit/s

- Successful Data Challenge 2, achieved:
 - From DAQ data logger to CERN EOS: 33.6 Gbit/s
(fast data quality monitoring accessed files from EOS)
 - From EOS to Castor (CERN tape): 25.0 Gbit/s
 - From EOS to Fermilab dCache: 16.0 Gbit/s
(production jobs accessed files from dCache or EOS)
 - Transferred ~300 TBbytes over 4 days, data registered in SAM
 - Using Rucio instance

protoDUNE Readiness Review

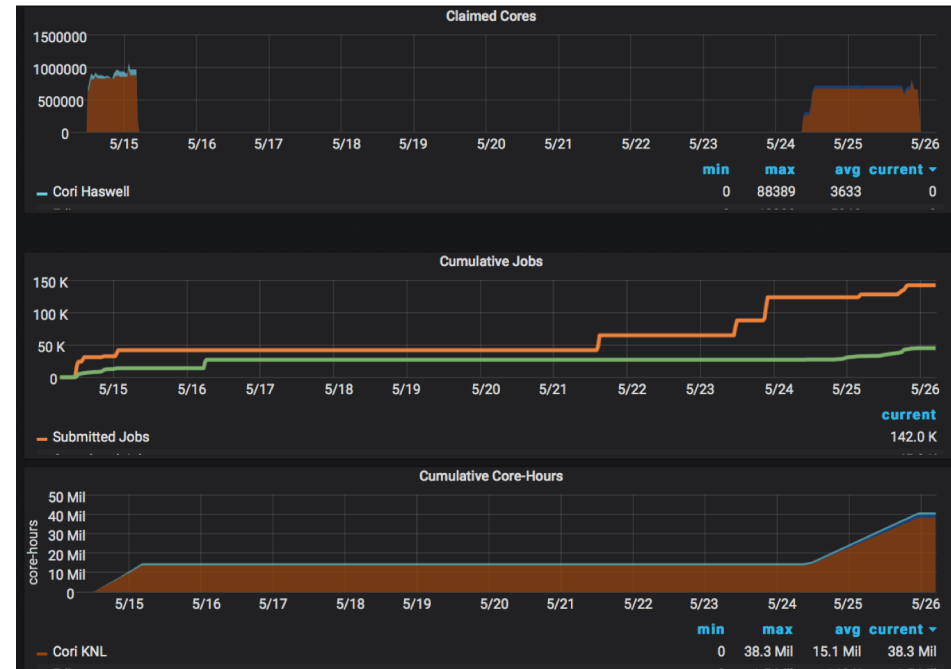
- Executive summary: "well on track to being able to accomplish its high level strategic goals"
- Concern over resource (mainly tape) availability given uncertainty in rates and readout (compression) scenarios
 - We are working with experiment and international partners to prepare

Computing Research Highlights

- GeantV alpha tag released in March 2018 to experiments for testing workflows and user interfaces
- CMS migrated to G4 10.4 with VecGeom ~two months after its release
 - first Geant R&D software component to be used in production by a major experiment
- Our Machine Learning team was part of a successful ASCR Leadership Computing Challenge: "Advances in Machine Learning to Improve Scientific Discovery"
- HEPCloud on track for commissioning to operations at the end of CY 2018. After that, focus on the active archival aspect of the facility.
- Our SciDAC and Computational HEP projects are making advances in important areas for our future program (DUNE, HL-LHC/CMS)
 - Analytics, tracking, accelerator modeling, software frameworks, ML, ...
- SCD fully engaged and contributing to the Community White Paper
- CMSSW multi-threaded in production (not new, but I like to brag about it), art to follow this summer
 - Essential for utilizing modern computing architectures

Research delivers in enhancing operations for science

- Through HEPCloud and the SciDAC “HEP Data Analytics on HPS” project, massive series of calculations were performed at NERSC to produce the NOvA antineutrino oscillation fits presented yesterday at Neutrino 2018
 - A total of ~40M core-hours, 2 runs sustained (~1M cores for 16 hrs and ~800k cores for 36 hrs)



Science & technology highlights

SCD scientists actively contribute to CMS, neutrino, and DES physics results (muons soon to come!). Also, work with colleagues from all areas at the lab to advance new research activities

- **QIS**: "Digital quantum computation of fermion-boson interacting systems" and "Electron-Phonon Systems on a Universal Quantum Computer", submitted – work with PPD theory
- **Beam Physics/PIP and PIP-II**: "High Intensity Space Charge Effects on Slip Stacked Beam in the Fermilab Recycler" –work with AD
- **CMS Phase 2 upgrade**: MIP Timing Detector concept fully developed and approved for Phase 2 –work with PPD
- Contributed to or lead several Quantum Information Science (**QIS**) Proposals submitted to OHEP in April –across the lab
 - Andy Li, our first QIS postdoc is on board!
- LDRD: successful first test of a **DUNE** Arapuca 72 MPPC (Multi-pixel photon counter) board, at room temperature with LED
- Investigations of the performance of the optical links design for **Mu2e**, resulted in the experiment switching the on-detector optical transceivers to VTRx (rad-hard transceiver developed as part of the Versatile Link LHC project)

Science Collaboration



Fermilab hosted the first ComPASS4 (accelerator modeling) collaboration meeting in April and the second “HEP Data Analytics on HPC” collaboration meeting in May (SciDAC projects we lead)