Computing All-Hands Meeting

Liz Sexton-Kennedy

November 5, 2018

Top 5 takeaways from director's Oct. 15 all-hands meeting

- LBNF far site and US-DUNE far detector must be baselined (receive CD-2) approval) in 2019.
  - Full pre-excavation construction work expected to begin in December in South Dakota.
  - Outstanding technical performance by ProtoDUNE at CERN, which recorded its first charged particle tracks and has met all technical specifications. Congratulations to the collaboration.

- PIP-II has achieved CD-1 and must be baselined (receive CD-2 approval) in 2019.
  - The project continues to receive broad support and maintain excellent technical progress.
  - Strong engagement with international partners continues.

Top 5 takeaways from director's Oct. 15 all-hands meeting

- LCLS-II cryomodule (CM) transportation issues are being addressed by a multi-lab team.
  - A solution is close and plan is to begin transporting CMs to SLAC in November.
  - CM assembly is on schedule, with all CMs exceeding specifications.

- Mu2e transport solenoid first production module coil successfully tested.
  - Continue to address challenges with Detector and Production solenoidal coil winding that is impacting schedule.

- LHC CMS HL-LHC detector upgrade project advancing toward CD-1 next spring and superconducting quadrupole magnet fabrication progressing to CD-2.

New Employees Since Jan. 2018 (Welcome!)

CCD
Sudha Balakrishnan
Joshua Kenward

OCIO
Jo Fazio
Gabriela Garcia

SCD
Sophie Berkman
Jose Berlioz
Allison Hall
Matti Kortelainen
Lorena Lobato Pardavila
Marianette Wospakrik

Foreign Visits

- In the event that any non-U.S. citizen will be visiting the lab, you must contact Fermilab's Foreign Visits and Assignments Specialist Melissa Ormond, mormond@fnal.gov, prior to their arrival. Approval is required for all such visits.

Diversity and Inclusion Employee Survey

- WDRS will be conducting a survey to identify our strengths and opportunities for improvement on different dimensions of diversity and inclusion including development opportunities, mentoring, engagement, leadership commitment, respect and recognition.

- Employees' perceptions will help us determine what actions we need to take to move diversity and inclusion forward at the lab.

- The survey will take place this coming winter. Watch for more information!

ITNA & Training Completion

Required ESH Training and ITNA Status for Employees

	Training Courses				Individual Training Needs Assessments			
Organization	Completed	Required	Percent	Employees	< 1 Year Old	Percent	Missing	Missing for New Hires
AD	7,133	7,419	96.15%	399	389	97.49%	0	0
APS-TD	4,897	5,152	[illegible]	283	279	[illegible]	0	1
CCD	1,009	1,011	99.80%	98	98	100.00%	0	0
CD	363	363	100.00%	42	42	100.00%	0	0
DI	1,122	1,171	95.82%	117	112	95.73%	1	0
ES	3,081	3,223	95.59%	107	101	94.39%	0	0
FE	4,091	4,198	97.45%	171	167	97.66%	0	0
FI	670	702	95.44%	69	63	91.30%	0	0
LBNF/LBNF	275	331	83.08%	26	23	88.46%	2	0
LBNF/SDSD	19	23	82.61%	3	1	33.33%	0	1
ND	1,372	1,479	92.77%	101	97	96.04%	0	0
PIPII/PIPII	203	223	91.03%	18	15	83.33%	0	0
PPD	4,340	4,556	[illegible]	329	295	[illegible]	4	0
SCD	1,568	1,585	98.93%	170	164	96.47%	0	0
WR	547	550	99.45%	53	48	90.57%	0	0
Fermilab	**30,690**	**31,986**	**95.95%**	**1,986**	**1,894**	**95.37%**	**7**	**2**

> 95% | 90-95% | < 90%

ESH&Q required training for all 3 groups = 99.6%

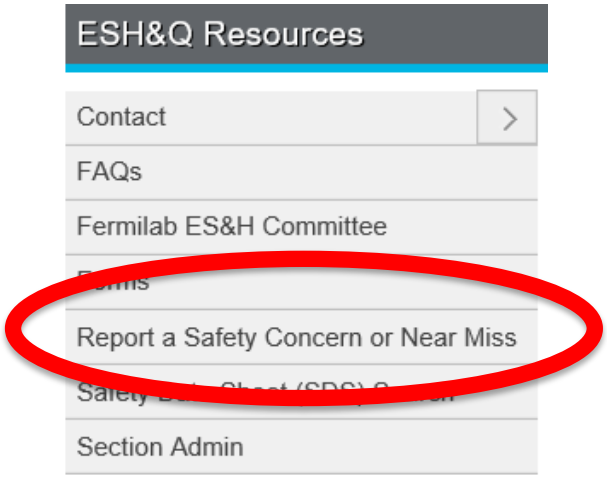
ITNA completion = 98.8%

Keep up the good work!!

Fermilab

ESH&Q Notable Items

- Multiple FESHM chapter updates
- Three minor injuries and zero OSHA recordables since Jan. 1
- New avenue for reporting near misses on ESH&Q website
  - Go to ESH&Q internal site under ESH&Q resources:



- New Work Planning and Control tool being developed for labwide use

Leadership changes on Oct. 1, 2018

Quantum Science initiative has been established and reports to Joe Lykken, Chief Research Officer. **Panagiotis Spentzouris**, previously the head of the Scientific Computing Division, leads the effort.

Jim Amundson, previously the head of Fermilab's Scientific Software Infrastructure Department, has been named head of the Scientific Computing Division.

Scientific Computing Division

James Amundson

Computing All Hands

2018-11-05

This talk

- Perspectives
  - On where we came from and where we are going with computing
  - On where we are going with our experiments
- Division Status

Introductions

Hello.

Why are we here?

Fermilab

https://www.fnal.gov

Fermilab Experiments and Projects

http://news.fnal.gov/fermilab-at-work/experiments-and-projects/

Currently running Fermilab-hosted experiments

LArIAT
MicroBooNE
MINERvA (E938)
Muon g-2
NOvA

Particle astrophysics experiments (past, present, future)

CDMS (E891)
COUPP (E961)
Dark Energy Survey
DarkSide (E1000)
GammeV
Holometer (E990)
LSST
Pierre Auger Observatory (E881)
Sloan Digital Sky Survey (E885/E949)

Approved future Fermilab-hosted experiments

DUNE
ICARUS
Mu2e
SBND

LHC-related activities

LHC Physics Center
U.S. CMS (E892/E919)
U.S. LHC (E893)
U.S. LHC Accelerator Research Program

Other

Fermilab/NICADD Photoinjector Laboratory (E886)
International Linear Collider
Liquid-Argon TPC R&D
Long-Baseline Neutrino Facility (LBNF)
Muon Collider
PIP-II
Rad Hard Vertex Detector
Test Beam Facility
Tevatron Electroweak Working Group
Tevatron New Phenomena Working Group
U.S. Lattice QCD
Very Large Hadron Collider

SCD's contribution to the lab mission

- What do we have to do with these experiments (and projects)?
- Everything!
  - We help take the data
  - We store the data
  - We help process the data
  - We help analyze the data
- Computing professionals, staff, engineers and scientists all contribute
- Your work is crucial to every aspect of the U.S. particle physics programs – without computing there would be no modern particle physics
- I could not be happier to be here to help

Where are we going?

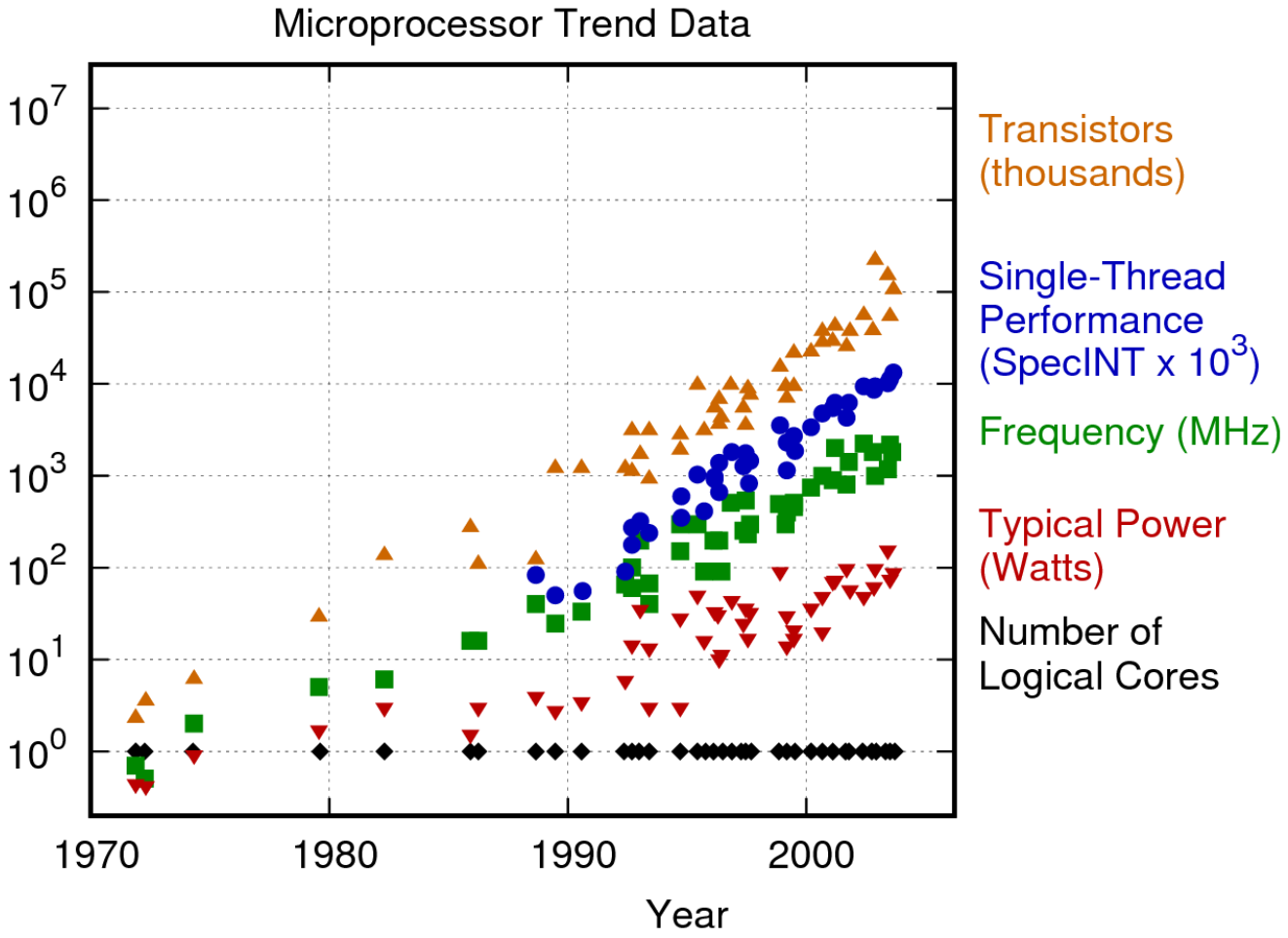
- Big changes are coming in computing
  - But… big changes have happened before

- Let's see how we got here…

“Moore’s Law” – the good old days

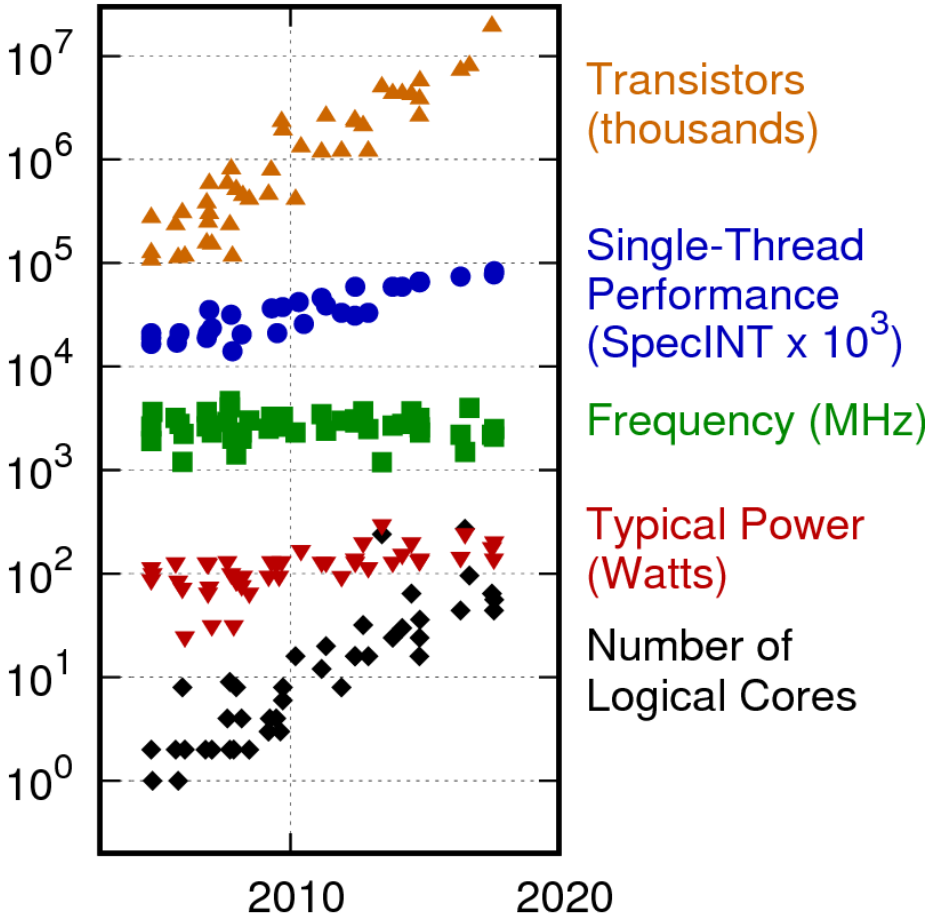
https://www.karlrupp.net/2018/02/42-years-of-microprocessor-trend-data/

Original data up to the year 2010 collected and plotted by M. Horowitz, F. Labonte, O. Shacham, K. Olukotun, L. Hammond, and C. Batten
New plot and data collected for 2010-2017 by K. Rupp

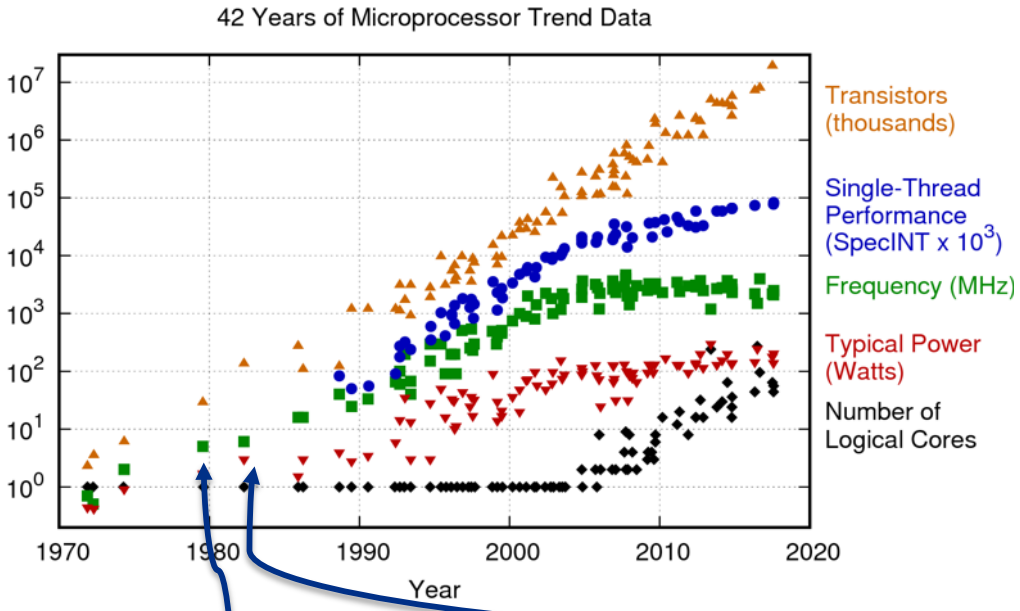


“Moore’s Law” – recent times

Trends have changed



Ancient (personal) history

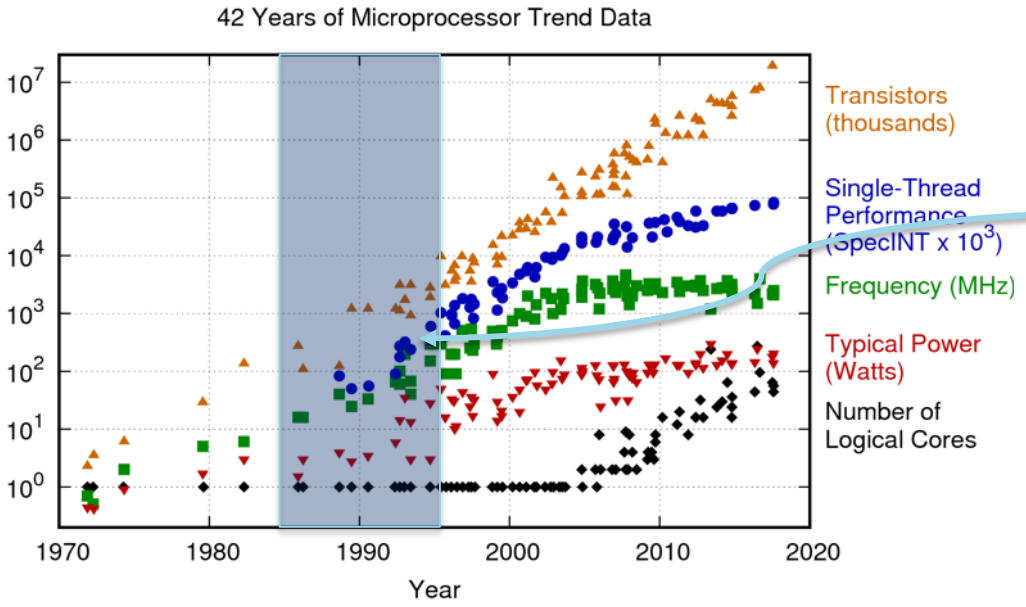


First (1/2) computer
Sinclair ZX80
3 MHz Z80
1kB RAM
(including VRAM!)

Second computer
Apple IIe
1 MHz 6502
48kB RAM

First paid programming job
Computer dating app for student council
Pure assembly

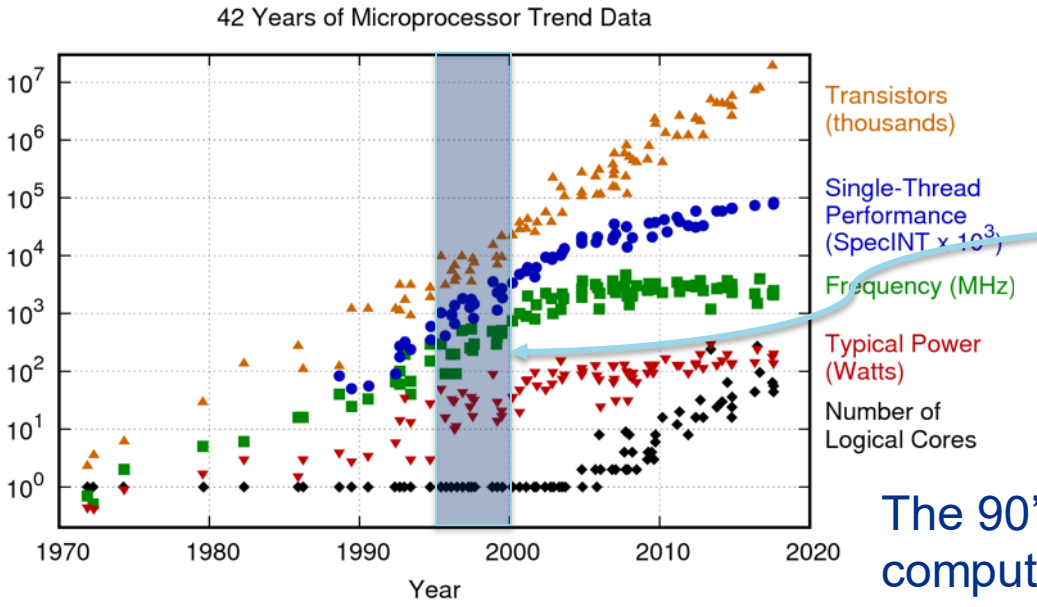
Physics history



1985-1993
University of Minnesota
BS Physics
University of Chicago
PhD Particle Theory

DEC VAX
with the **VMS** operating system was the most popular HEP computing platform in the 80's
Fortran was the language of Physics

Physics history



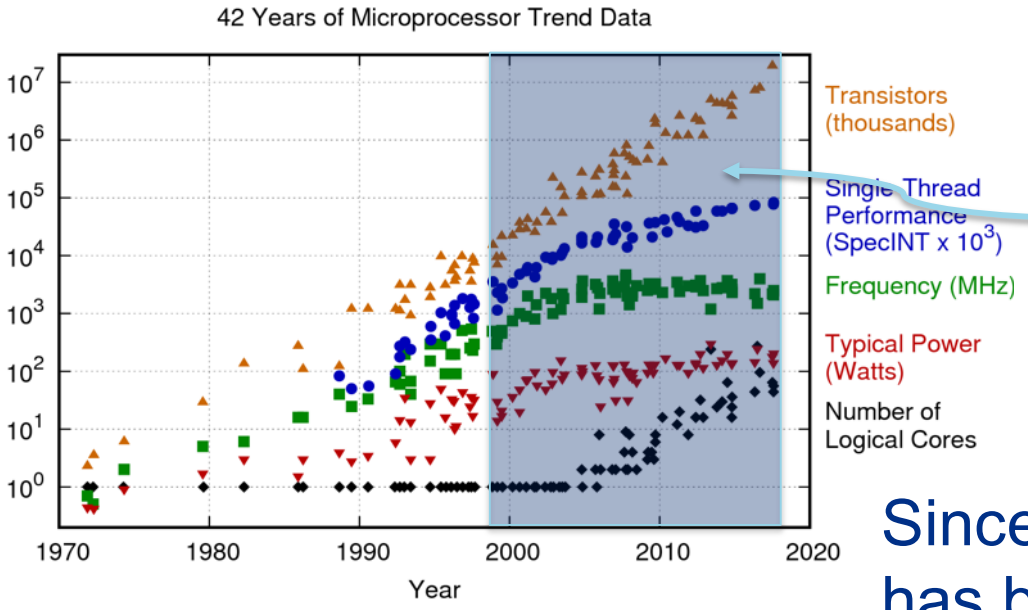
1993-1998
University of Wisconsin
Particle Theory Postdoc
Michigan State University
Particle Theory Postdoc

The 90's saw a transition to **Unix**-based computers and **C++**

Many people were skeptical that physicists could ever move from **VMS** to **Unix** and from **Fortran** to **C++**

Nonetheless, **proprietary Unix** workstations and **large shared-memory machines** came to dominate HEP

Current era



Fermilab Computing

1998-2001

- SoftRelTools for CDF and D0
- CMS Grid Computing

2001-2018

- Accelerator Simulation
  - Synergia
  - HPC
- SSI Department

Since the early 2000's, HEP has been dominated by large clusters of **x86-based Linux** machines

Many people were skeptical that physicists could work without large shared-memory machines

Computing is changing

- Architectures are changing
  - Driven by solid state physics of CPUs
    - Multi-core
    - Limited power/core
    - Limited memory/core
    - *Memory bandwidth increasingly limiting*
- High Performance Computing (HPC, aka Supercomputers) are becoming increasingly important for HEP
  - 2000s: HPC meant Linux boxes + low-latency networking
    - No advantage for experimental HEP
  - Now: HPC means power efficiency
    - Rapidly becoming important for HEP, everyone else
- New technologies will change our workflows
  - Containers are one example

Exascale computing is coming

President Obama, July 29, 2015:

EXECUTIVE ORDER

CREATING A NATIONAL STRATEGIC COMPUTING INITIATIVE

By the authority vested in me as President by the Constitution and the laws of the United States of America, and to maximize benefits of high-performance computing (HPC) research, development, and deployment, it is hereby ordered as follows:

…

Sec. 2. Objectives. Executive departments, agencies, and offices (agencies) participating in the NSCI shall pursue five strategic objectives:

1. **Accelerating delivery of a capable exascale computing system that integrates hardware and software capability to deliver approximately 100 times the performance of current 10 petaflop systems across a range of applications representing government needs.**

…

Exascale

http://science.energy.gov/ascr/research/scidac/exascale-challenges/

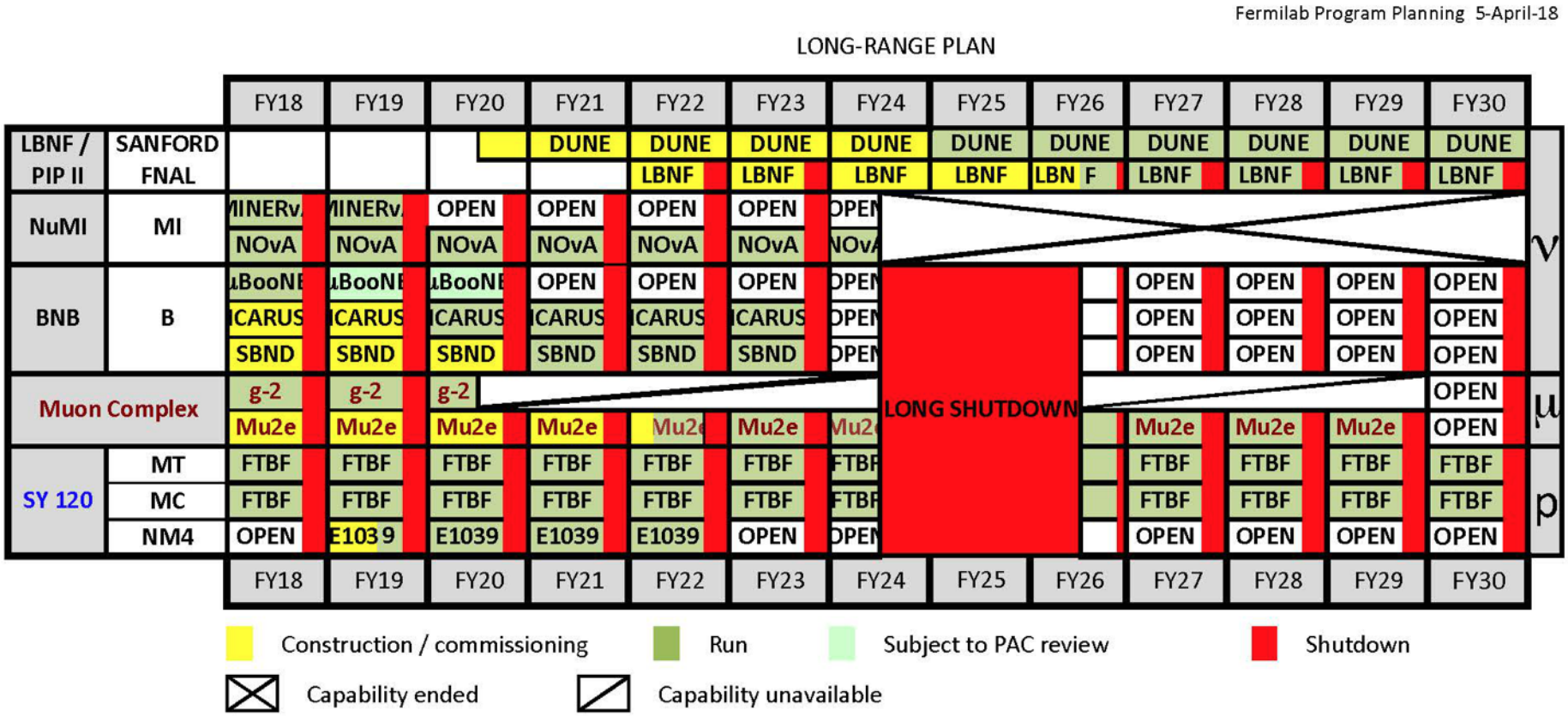
- Power. Power, power, power.
  - Naively scaling current supercomputers to exascale would require a dedicated nuclear power plant to operate.
    - ALCF's Mira: 4 MW, 0.01 exaflop
    - "The target is 20-40 MW in 2020 for 1 exaflop"
- Exascale computing is the leading edge of advances of computing architecture
  - The same changes are happening outside of HPC, just not as quickly
    - Optimizing for Exascale is really optimizing for the future
- Storage of large-scale physics data sets will remain our job
- Future U.S. computing resources will be dominated by the Exascale machines

This talk

- Perspectives
  - On where we came from and where we are going with computing
  - On where we are going with our experiments
- Division Status

Experiments and collaborations

- Fermilab accelerator-based experiments



- New now: g-2
- New soon: ICARUS, SBND, Mu2e

International collaborations are the future

- Our future is dominated by international collaborations (HL-LHC and LBNF/DUNE)

Outlook for the future

- Computing is changing
  - New architectures, HPC, Exascale
    - More threads
    - Memory access will be more expensive
  - New technologies
    - Containers
- Experimental collaborations are becoming more international
  - Need to seek collaborative computing solutions

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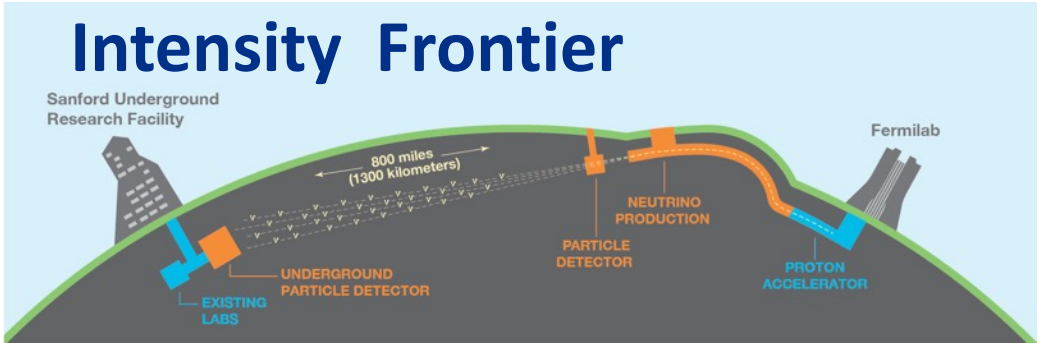
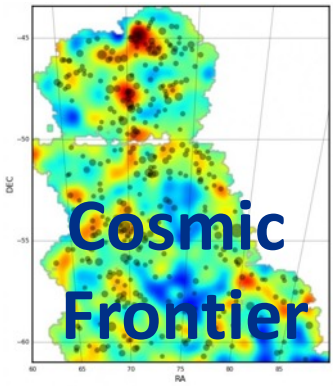
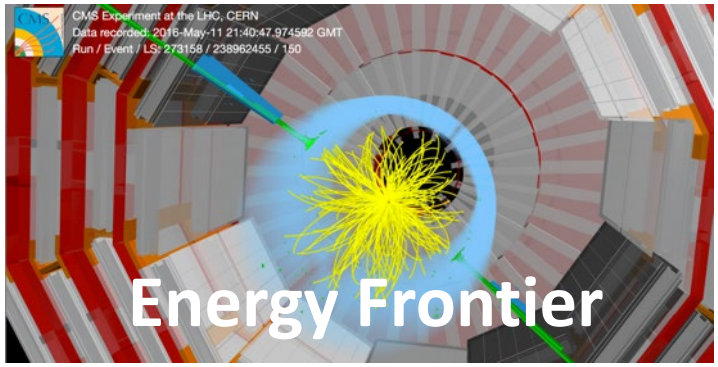
Scientific Programs Quadrant

- SCD scientific staff lead research on supported experiments
  - SCD encourages research and mentors postdocs and young scientists

- Intensity Frontier
  - **Neutrinos**: DUNE, NOvA, MINERvA, MicroBoone, ICARUS, SBND and LArIAT
  - **Muons:** Mu2e and g-2
- Cosmic Frontier
  - DES, DESI and LSST
- Energy Frontier: CMS
- Particle & Accelerator Theory







American Physical Society Fellow

- Congratulations to senior scientist Elizabeth Buckley-Geer
  - Her 2018 APS fellow award recognizes the level of scientific achievement to which all SCD scientists aspire.

- APS Citation

  For the creation and leadership of the Dark Energy Survey Strong Lensing Group, including discovery and confirmation of numerous strong lenses and multiply lensed quasars and their application to new measurements of cosmic dark matter and dark energy.

- Nominated by the Division of Astrophysics

SSA: Scientific Computing Applications (new name) [Daniel Elvira]

- **New group**: Neutrino Simulations led by Laura Fields
- **New group**: Machine Intelligence and Reconstruction led by Rob Kutschke

- Completed Geant4/Genie Interface (neutrino simulations have access to Geant hadronic models)
- GeantV (next generation detector simulation) vectorization complete; CMS using alpha release; Beta soon
- Geant4 support for experiments + model variation, profiling, uncertainties

- New version and improvement to Genie (neutrino simulation)
- Phase 1 Integration of LArSoft and Geant4 nearly complete
- Automated LArTPC data reconstruction fully vetted (for uBooNE)

- Cosmology/Astro workflow pipeline (WLPIPE) enables LSST & DES analyses (paper published)
- Paper in ArXiv on Deep Learning and Lensing of Cosmic Microwave Background

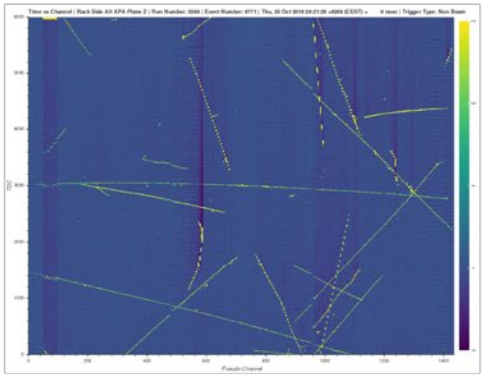
- Three Accelerator modeling posters at IPAC; paper published on instability development with space charge (relevant for DUNE)
- Commissioned and put into general use the setup for rapid evaluation of photon detectors in LAr using the Material Test Station

SSA: Scientific Software Infrastructure [Chris Jones] (new head)

- CMS Software:
  - Integrating GPU algorithms in data processing framework
  - MC simulation jobs now efficient to very large number of cores (ran millions core hours)
- LArSoft and *art* development teams merged into **SciSoft team** (led by Kyle Knoepfel and Erica Snider)
- Multithreading in *art* for parallel processing of events
- Improved LSST observing schedule simulation with realism
- Significant speed improvements to DES Year3 cluster cosmology with C++ modeling pipeline
- C++ library using HDF5 for tabular data for analysis (NOvA using)
- Root performance improvements to Trees and Histograms
- Led organization of Fermilab's participation in **Grace Hopper Celebration of Women in Computing** conference
- Fermilab Computational Science Internship Program Established

SSA: Real-Time Systems Engineering [Liz Buckley-Geer]

Major successful effort to readout **ProtoDUNE** with *art-daq* based DAQ; also working on SBND



fMESSI superconducting readout for 20K pixel camera working at SUBURU telescope

Developed low threshold electronics for **skipper CCDs** (all FNAL experiments + Quantum Imaging)

ARAPUCA (was LDRD) light collection for DUNE is baseline option in TDR

(better than 10x improvement over prev detector)

Realized synergies for optical links projects between CMS phase 2 and Mu2e

Mu2e trigger & DAQ on time and on budget - production design complete - now implementing; rad-hard Tracker board complete

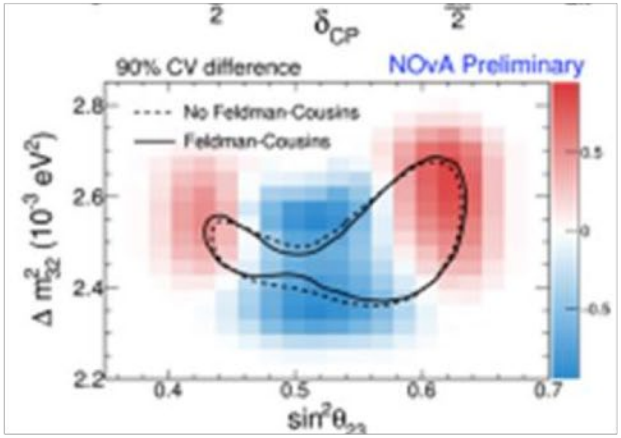
OTSDaq growing list of customers; used at Fermilab Test Beam Facility

Captain+/+X boards produced and tested

NIM+ (PREP modernization) v2 in production

SciDAC Projects
[Jim Kowalkowski, Giuseppe Cerati, JFA]

- **HEP Data Analysis on HPC:** Scientific achievement with NOvA - large scale analysis at NERSC (30M CPU hours)



- Event generator tuning; large parameter scans of Pythia on HPC

- **HPC Reconstruction:** Improved physics and timing of CMS tracking prototype; large speed improvements on LArTPC hit finding prototype

- **ComPASS4 (Accelerator Modeling):** Integrated Synergia (beam dynamics simulation) with MARS (radiation simulation) for automated accelerator design

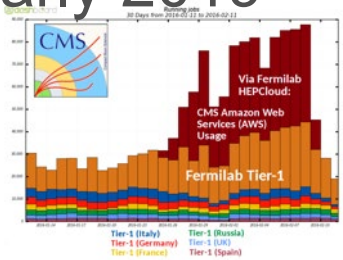
SCF: Data Movement and Storage [Gene Oleynik]

- DMS put into production two 100PB IBM tape libraries, 92 LTO8 tape drives
  - **A *big* effort with help from many groups, Thanks to all!** RFP, procurement, demolition of 2 Oracle libraries, facilities, electrical, fire-suppression, fiber-channel and networking infrastructure, mover computer procurement and installation
  - **Enstore development** to support TS4500 library and LTO8 drives
  - **Dealing with LTO8 media unavailability** due to corporate patent infringement cases.
  - **All experiments are converted over to LTO media**.
- Upgraded dCache from 2.6 to 4.2 with Fermilab developed components:
  - **dCache-View** admin interface enhancements, **xrootd 3rd party copy**.
  - Resilient Manager provided an effective stop-gap solution for user code distribution
- Networking Research team has joined the department. Welcome!
  - **mdtmFTP version 1.0.2** released, 590+ downloads, **SC'18 demo**
  - **BigData Express** under evaluation at multiple sites, **SC'18 demo, INDIS'18 paper**
- Amidst all of this the **operations** team kept **data storage operating well!**

SCF: Experiment Computing Facilities [Glenn Cooper]

- Working with experiments to prepare for DAQ computing: ICARUS, Mu2e, SBND, DUNE

- HEPCloud: Going into production early 2019
- Containers



DOE granted ATO

  - In use for batch jobs (FermiGrid, CMS Tier 1)
  - Testing infrastructure to build, test, store containers
  - Testing tools for container orchestration/management

- "Normal operations"

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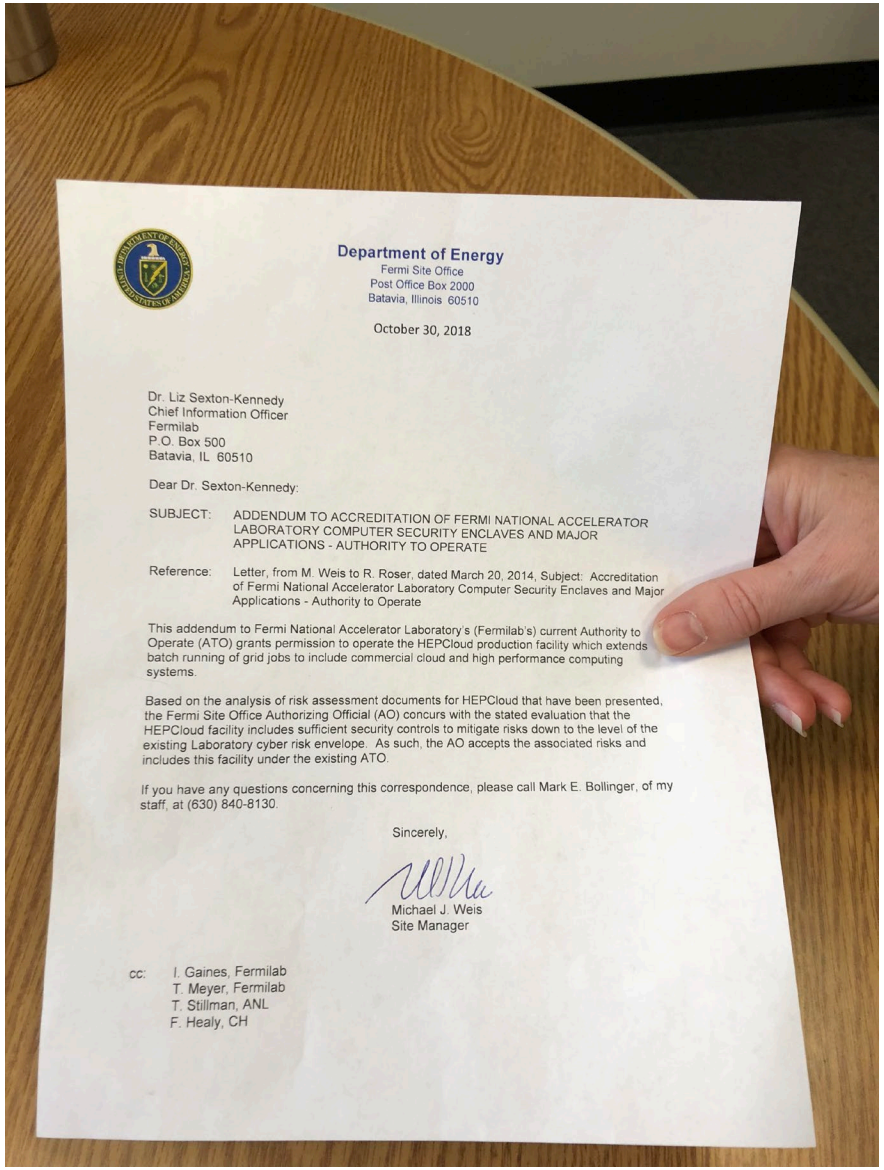
HEPCloud granted authorization to operate by DOE

Liz has the ATO in hand



Department of Energy
Fermi Site Office
Post Office Box 2000
Batavia, Illinois 60510

October 30, 2018

Dr. Liz Sexton-Kennedy
Chief Information Officer
Fermilab
P.O. Box 500
Batavia, IL 60510

Dear Dr. Sexton-Kennedy:

SUBJECT: ADDENDUM TO ACCREDITATION OF FERMI NATIONAL ACCELERATOR LABORATORY COMPUTER SECURITY ENCLAVES AND MAJOR APPLICATIONS - AUTHORITY TO OPERATE

Reference: Letter, from M. Weis to R. Roser, dated March 20, 2014, Subject: Accreditation of Fermi National Accelerator Laboratory Computer Security Enclaves and Major Applications - Authority to Operate

This addendum to Fermi National Accelerator Laboratory's (Fermilab's) current Authority to Operate (ATO) grants permission to operate the HEPCloud production facility which extends batch running of grid jobs to include commercial cloud and high performance computing systems.

Based on the analysis of risk assessment documents for HEPCloud that have been presented, the Fermi Site Office Authorizing Official (AO) concurs with the stated evaluation that the HEPCloud facility includes sufficient security controls to mitigate risks down to the level of the existing Laboratory cyber risk envelope. As such, the AO accepts the associated risks and includes this facility under the existing ATO.

If you have any questions concerning this correspondence, please call Mark E. Bollinger, of my staff, at (630) 840-8130.

Sincerely,

Michael J. Weis
Site Manager

cc: I. Gaines, Fermilab
T. Meyer, Fermilab
T. Stillman, ANL
F. Healy, CH

Literally

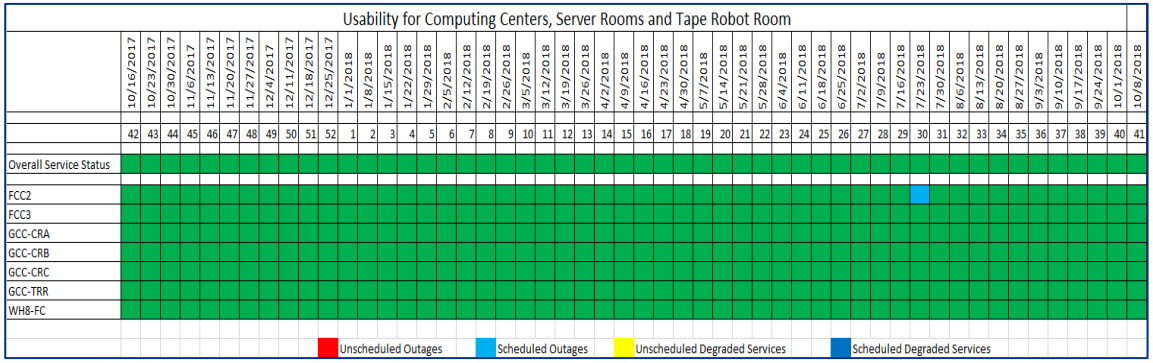
Fermilab

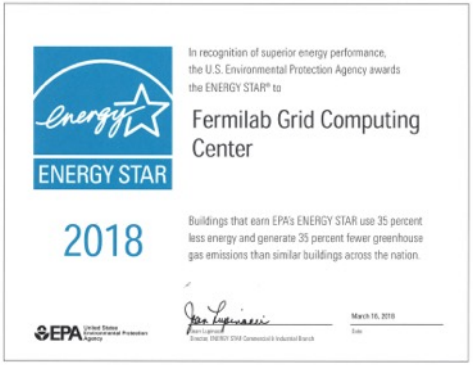
SCF: High-Performance Computing [Jim Simone]

- LQCD facility delivers world-class computing to USQCD scientific projects.
  - Integrated FLOPS delivered at or above DOE Project's benchmark pace.
  - Fermilab consistently leads in ratings on USQCD customer satisfaction survey.
  - Kudos to Alex Kulyavtsev, Ken Schumacher, Amitoj Singh, Alexei Strelchenko, and Rick Van Conant.
- Fermilab institutional HPC cluster
  - Funded by USQCD national Project and Fermilab SCD.
  - Amitoj leads co-design effort with LQCD and experiment stakeholders.
  - IC will extend LQCD computing and deliver HPC computing to experiments.
  - IC will provide upgrade path from aging Wilson cluster.
- Exascale Computing Program (ECP)
  - Alexei S. research on LQCD algorithms suitable for exascale computing.
  - Phys. Rev. D 97, 114513 (2018), and Comp. Phys. Comm. 233, 29-40 (2018).

SCF: Data Center Operations [Adam Walters]

- One scheduled outage of FCC2 July 20 to retire an ‘End of Life’ UPS
- Assisted with the delivery and installation of the IBM TS4500 Libraries
  - Retirement and disposal of two SL8500 Libraries
- Successfully mitigated: ✓4 water leaks; ✓3 cooling events; ✓3 Un-scheduled UPS/ATS/Generator events; ✓1 Un-scheduled Lab power outage; ✓6 Scheduled Lab power outages





Green Strategies In Computing - Docdb 6540

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SCS: Scientific Distributed Computing Solutions [Tanya Levshina]

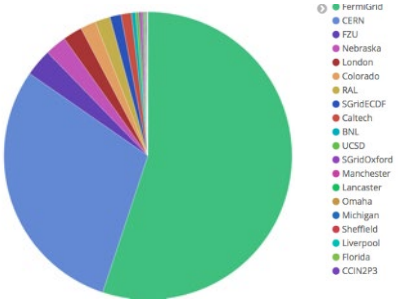
FIFE Support Team: handled 710 tickets opened by FIFE experiments and CMS LPC users since April. On-boarded several new experiments.

FERRY

Frontier Experiments RegistRY: account registry and quota management. Integrated with SNOW and numerous services. In production since September 15th!

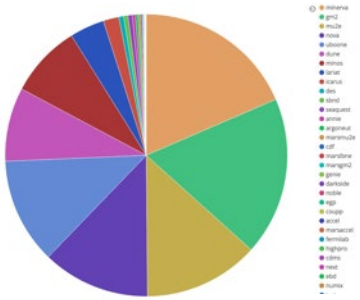
Landscape: Shifter dashboards, protoDUNE monitoring of data movement at CERN and Fermilab.

Continuous Integration provides a comprehensive framework to test and validate their offline production and analysis code on the supported platforms. Is used by 9 FIFE experiments and 4 SCS projects.



Successful **protoDUNE production campaigns** ran on FermiGrid, OSG, CERN and European GRID using FIFE tools.

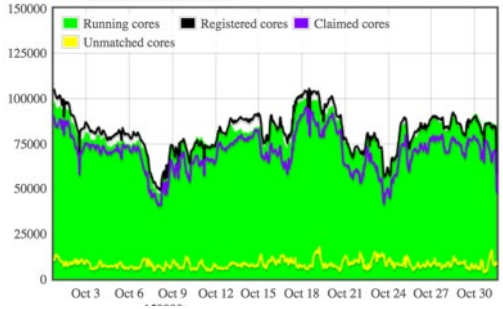
SCS: Scientific Distributed Computing Solutions [Tanya Levshina]



JobSub handled 50M jobs (500 unique users) during last 6 months. Provides reliable and scalable solution for all FIFE experiments. Working on HEPCloud integration and Rapid User Code distribution.

DOE granted ATO

HEPCloud Program: Applied to DOE for ATO. Successful CMS and NOvA runs at NERSC. Testing AWS and GCE. Continuing Decision Engine development and testing. Working with FIFE on-boarding documents.



GlideInWMS: wide user community that includes CMS, HEPCloud, FIFE, OSG, LIGO and GLOW. Production factory supports 72 groups from 14 frontends. The project had 7 releases since April. Implemented singularity support, improved the efficiency in the resources provisioned, modernized the code in preparation for Python3. Continued strong collaboration with HTCondor team.

SCS: Scientific Data Processing Solutions [Brian Yanny]

- Beginning the migration of CMS data management to Rucio - the emerging community project for data management and distribution
- ProtoDUNE data taking is cataloging and transferring multiple petabytes of raw data from CERN to Fermilab
- Deployed a prototype Rucio instance for DUNE and started using it to distribute ProtoDUNE data
- The IFBeam database has integrated collecting ProtoDUNE beam instrumentation data from CERN
- Major new release of the Production Operations Management System for Intensity Frontier workflow management
- Striped Data Analysis Platform demonstrated to CMS, DES, others. 120TB cluster has been built for CMS Panda dataset.
- Job Traceability trainings and security drills at the USCMS VO with T2 and T3 Site administrators.
- Implemented a database for tracking collaboration membership and affiliations for DUNE

In summary

- Your work is crucial to every aspect of the U.S. particle physics program
- Many important things are going on in the division
- Changes are on the horizon
  - New computing architectures
  - New technologies
  - International collaboration will be the new default mode of operation

CCD + OCIO All-Hands

Jon Bakken

November 5, 2018

Nigel's Top 5

What does Nigel's Top 5 have to do with CCD & OCIO?

- Priority: PIP-II & LBNF/US-DUNE must be baselined 2019
- LBNF: South Dakota construction start Nov…thank you for focus on getting pre-excavation package completed
  - DUNE: great success with protoDUNE…congratulations
- LCLS-II…thank you for focus on transporting cryomodules
- Mu2e…thank you for focus on production solenoid coil
- LHC Upgrades…..thank you for focus on pulling timing project together with other major upgrades including magnets
- Quantum science…thanks for teleporting..congrats on awards
- IOTA….. Congratulations first beam (electrons) in IOTA.

- Everyone should know that it has everything to do with us!
  - We are either directly working on these projects, like SURF networking, or are providing support allowing our colleagues to accomplish these tasks.
  - I encourage everyone to read the web pages about these projects to understand more of lab's goals, & therefore, also its needs.

Four Observations

- Making lists always means something is left off. Everything we do is important & we value everyone's work. My apologies if your work isn't mentioned.
- Remember, Safety & Security are always on every list. These items are integral to everything we do. Stop & think! Ask for help if unsure.
- We work in teams in which we need everyone's talents:
  - Multiple technical teams, testers, project management, communications, enterprise architecture, service management – all are required for a successful project.
- Last year's effort reporting indicated we spent 80% of our time on operational activities & 20% on projects.
  - Operations is critical to keeping lab functioning - we must maintain an efficient, well-functioning & secure infrastructure for the lab
  - Many thanks!

ISO20k Recertification Audit – Nov. 5-8

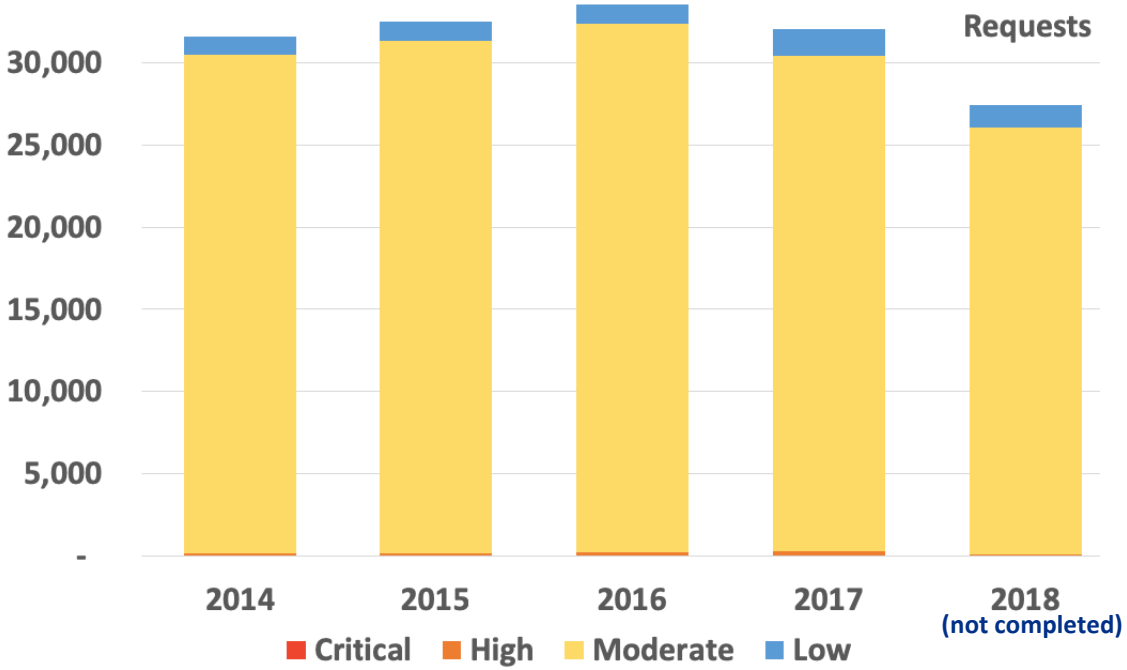
Computing is executing at a higher level now than it was before we adopted the ITIL framework.

- Framework provides an accepted set of standards
  - Incidents, Change, Request, Problem, & more
  - Documentation is also a key part of framework
    - Resolving incidents means providing a technical solution & documenting it. A record that only says “fixed” is not very useful. We all need to do better here.

- Why do we certify?
  - An external review demonstrates we are following consistent industry standard IT practices.
  - Demonstrates to lab & DOE that we are efficient, effective & good stewards of the lab funds we manage.

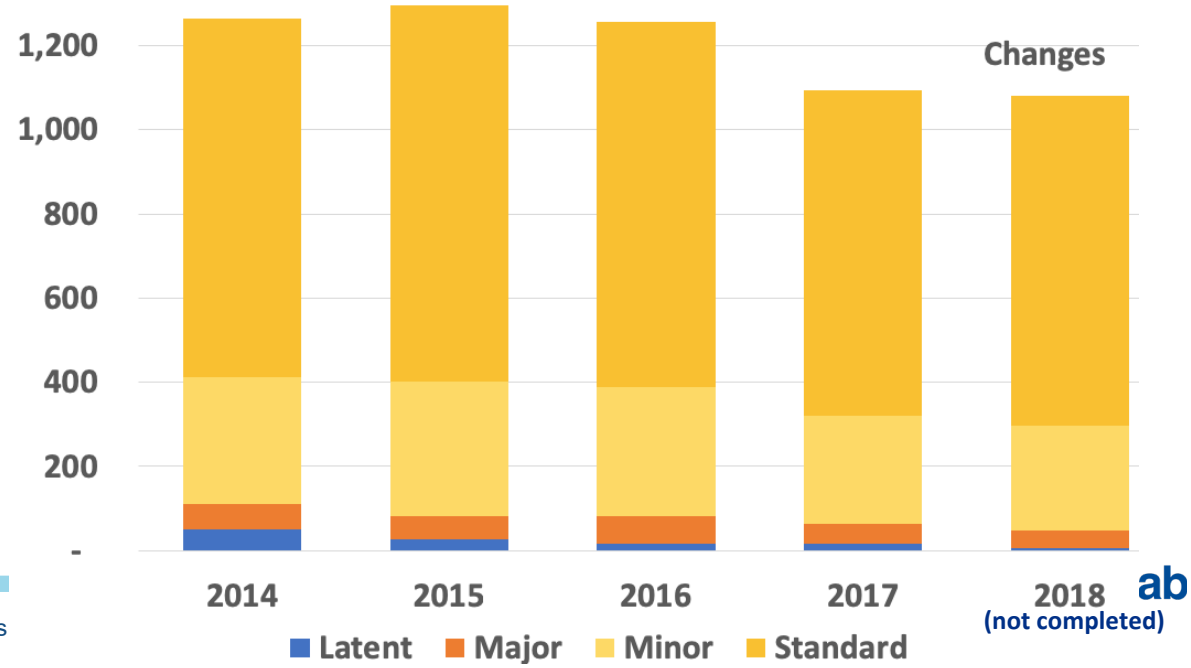
Some stats…

Requests ←



↓ Work load is roughly the same for the past 5 years

Changes →



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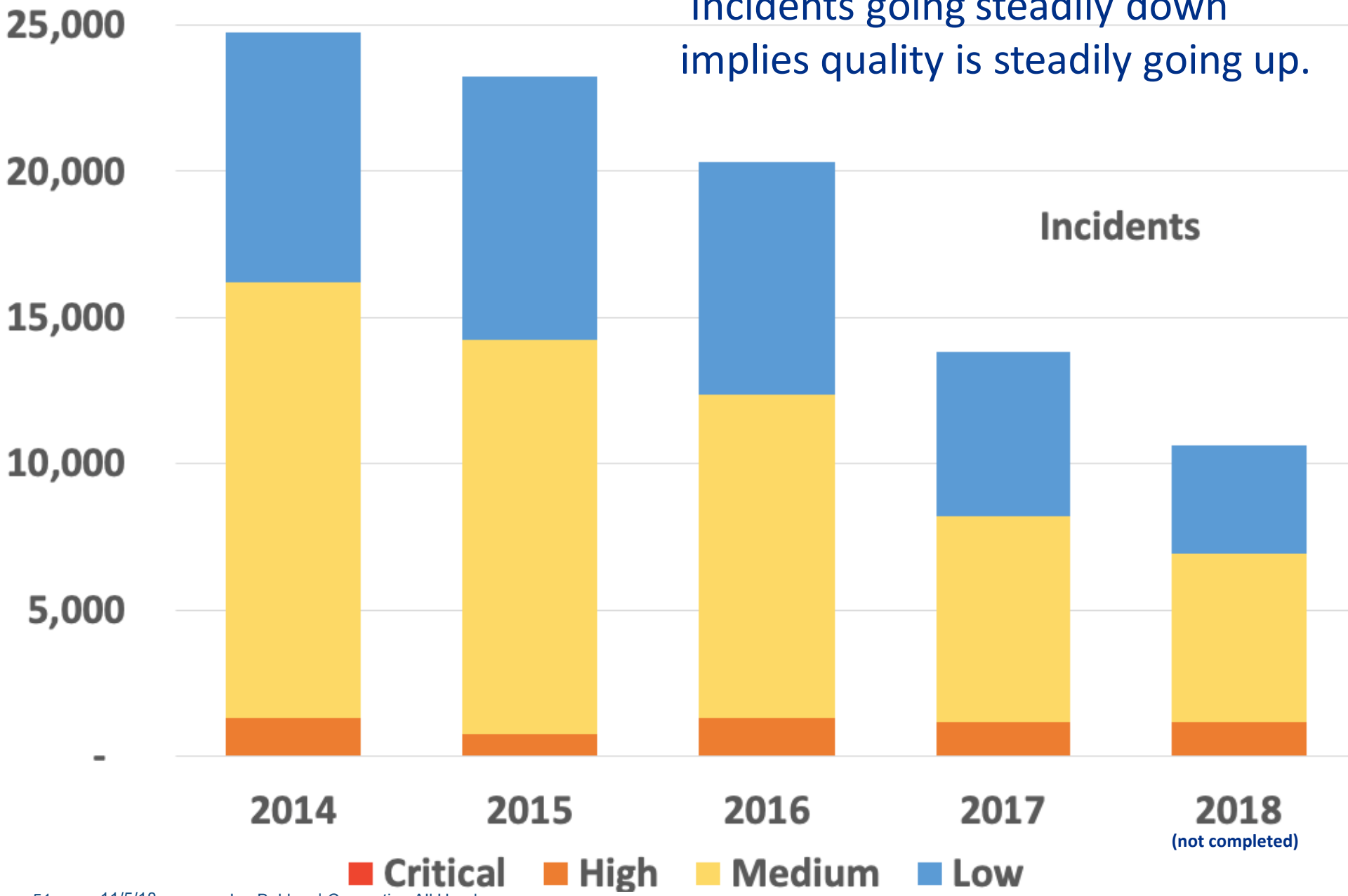
Some stats to back up claim

Incidents going steadily down implies quality is steadily going up.



Planning & Enterprise Architecture

I often hear, “I know what Computing has done – that is communicated well, but I don’t have any idea about what Computing is working on right now.”

- The answer I give to this question is that we work through Strategic Plans, developed in collaboration with the lab & yearly Tactical Plans that indicate how we plan to achieve strategic goals.

- There are two meetings I recommend you attend, or listen via Zoom
  - Community Collaboration Discussion Meeting (CCDM) occurs every other Thursday at 10 AM in FCC1W
    - Discussion about initiatives that introduce significant changes on our systems & our application’s architectural environment.
  - OPS & Project Status meetings at 1PM Mondays
    - Allows everyone to hear all weekly updates.

Project Management

Lattice QCD Program – a long & very successful program at the lab.

- DOE review in May
  - Very successful, no formal recommendations
  - Two suggestions for the project to consider & two for the collaboration
- FY18 user survey results
  - Overall Satisfaction: 97%
  - User Support: 97%
  - System Reliability: 95%
  - Responsiveness of Staff: 98%
- What's next?
  - Working to build first institutional cluster at Fermilab that will be used jointly by USQCD Collaboration, CMS, and Fermilab Neutrino Experiments.

Supplier Management

- Successful negotiations with numerous vendors
  - Ask for help if you need any contract or license assistance
  - Example: eliminated thousands of Oracle database licenses no longer needed after Run2
- Centrally managed lab licenses are carefully controlled & monitored
  - Over the past 4 years we have been able to move existing unused licenses to new requesters
  - Have not had to pay any true-up costs to Oracle & Microsoft
  - D/S approaching us & asking for help managing their unique licenses
- With our managed service contractor NTT, developed detailed Runbook that lists the work we expect NTT to perform
- Working to reduce our printer fleet through right-sizing to minimize cost in terms of resources & future Managed Print contracts.
- What's next?
  - Right sizing our license count before renewal of upcoming 3-5-yr EA agreements with Adobe & Microsoft (Can not true down)

Cybersecurity

- Major emphasis on phishing awareness – a huge threat to lab
  – Think before you click! Ask for help if unsure.
- We've had three successful audits this year:
  - DOE Office of Science, Office of Inspector General, Crowe Horwath
- We've extended coverage of our default-deny firewall that has had minimal disruptions to lab's science program
- We've added extra functionality to email & web security to meet requirements of DHS BOD 18-01
  - Requires https & stricter allowable methods (TLS)
- Enhanced NCIS's ability to find more devices on network
  - 3,000 new devices were detected after this change was made.
- What's next?
  - Planning started to require MFA for VPN access (rollout Jan. 2019)
  - Planning to migrate existing MFA infrastructure to use Yubikeys
    - New models are fully NIST certified
    - Eliminates RSA exemption to DOE policy

Replacement of 5ESS, aka VoIP Project

Our phone service uses a 1980's AT&T 5ESS switch.

- In 2012, AT&T said they will discontinue service to 5ESS by 2020
- In 2020, our AT&T 5ESS lease contract ends
- Should we need to continue with AT&T 5ESS past Dec 2020, our phone system costs will increase from $750K/year to $9.75M/year (10/2017 quote)

Project has 3 major components:

- Enhance Offsite Service – 2 independent paths, completion ~Dec 2018
- Construction – Wilson Hall, Aspen East, Eola Road, completion ~Dec 2018
- Equipment – 5 major analog gateways across site, completion ~June 2020
  - Allows lab to use existing handsets & convert to VoIP as required

IARC, FCC, WH5E, WH13, & WH Creative Services have been fully converted to VoIP, Directorate in progress

- Annual cost avoidance of ~$92K

Site Access & Badging Project, with ESH&Q & WDRS

Project started with a PEMP Notable Outcome – Objective 8.3.1

- Evaluate the lab's badging & site access policies to ensure that all personnel accessing site have sponsorship & risk-based processes are in place to monitor activities
- A common misconception is this project is creating new rules & limiting access to lab. NOT true.

- Plan was developed & go-ahead was given to implement a single portal to manage physical & remote access requests for employees, users, authorized guests, & contractors
  - Modern system will streamline processes & deliver an integrated approach for inviting, processing, & starting onboarding
  - Effort required in WorkDay, ServiceNow, & a new DataService app

- Initial "back-office" tasks are being finished.
- Expected completion is mid 2020, depending on funding.

Work Planning & Controls Project, with ESH

- WPC project will streamline business processes for work planning & drive what needs to be completed for a set of work, based on established criteria & controls
  - Consolidates different applications & forms used by D/S
  - Provides automated workflows
  - Will eliminate many paper forms
  - Will eliminate redundant applications

- Release 1 DONE. Ongoing with other releases.

- Demos provided to D/S – have shown interest in adding their unique processes to WPC

TeamCenter Upgrade

Our platoon of experts completed upgrade of all TeamCenter modules to V11

- Very long project that faced many obstacles. Finished Oct. 28, 2018
- Upgrade included:
  - TeamCenter modules
  - Structure manager
  - Dispatcher
  - Associated CAD programs
  - Lifecycle viewer
  - Workflows
- This was a lab-wide effort – received significant help from AD, APS-TD, & PPD

Finance Team

- FY18 fiscal year ended at end of September.
  - Our Finance team “closed the books” for all computing budgets.
  - Balanced Research B&R within $25K for research
- We have a new lab-wide budgeting system (BPS).
  - Plan was for those individuals who entered data into old Budget-input system to enter FY19 data into BPS.
  - Our Finance team shouldered this entire responsibility & loaded budget for FY19 into BPS
  - Our Finance team also is keeping our old Budget-input system up to date until reporting is available from BPS.
- What’s next?
  - Heavily involved with BPS User Acceptance Testing for budget execution module
  - Assisting with rollout of BPS tool to computing dept heads

Networking

- Zoom – it's a resounding success at the lab!
  - 19 Zoom Rooms installed. 31 more rooms in progress or in planning
- Migrated core services onto new F5 load balancers, retiring old system
  - New system is more resilient, able to survive a failures in any 2 of 3 locations (FCC2, FCC3, GCC), has higher capacity to handle services, & lowers overall maintenance costs
- Recent major networking upgrades include
  - 1) increased offsite internet connectivity to 3x 100Gb/s
  - 2) increased site-VPN user capacity by 10x
  - 3) increased site-interconnect infrastructure to support more 100Gb/s & 10Gb/s connectivity
  - 4) continued consolidation of legacy switching infrastructure
- What's next?
  - Increase Guest Wireless bandwidth to 10Gb/s & move service behind site-firewall

Applications & Databases

- With FESS, deployed Release 2 (of 5 planned) of Self-Service Property
  - Modernized property system & included listing of custodian's property
  - Includes ability to electronically transfer assets, update locations & update asset owners
- With Finance, implemented OBIEE for ProCard reporting
  - Replacement for Discoverer
- With Finance, deployed Release 2 (of 4 planned) of BPS
  - Provides lab-wide budgeting capabilities
  - Modernizes our budgeting system
- FermiDash core upgraded to new look & feel using SQL Reporting Services
  - Changes were well received by MSO & DOE Site Office
- What's next?
  - Direct payment to employees for reimbursements – eliminates paper checks
  - Implement Procurement Cloud Service in eBS to automate processes in Procurement, Accounting & Receiving

ServiceNow Program

- FERRY is an SCD application that provides a central attribute repository for scientific applications, for example, disk quota or data set access rights
  - ServiceNow team provided underpinning integration infrastructure
  - From my perspective, the most important non-SCD component of this work was creation of an Activity-based Catalog Workflow Engine (AWE) in ServiceNow.
    - This provides a configurable workflow engine for any catalog item
    - Discussions started to get AWE noted as a ‘record of invention’
- Kingston upgrade – Well coordinated & had minimal service disruption
- Telephone Repair process was implemented to replace paper based process. Allows end users to better track progress of their repair.

ServiceNow Program, continued

- What's next?
  - Automated method to regularly exercise all defined on-call paging
  - Grants – infrastructure to create, manage, & revoke grants to access web sites, service & captive accounts, system exemptions, etc.
  - Node Registration – new process for central management of devices on our networks

Web Program

- With Office of Communication, we have modernized many public websites & made them more effective at delivering lab's message to the public.
  - Including our own History and Archives site
- We have also migrated many websites under our Central Web umbrella, where security & access is strictly controlled.
- Enterprise Search has been deployed, allowing searches of DocDB content
- Deployed a modern Library catalog SharePoint application, replacing an unsupportable legacy system

- What's next?
  - Upgrade to SharePoint 2019 to provide greater flexibility & features for managing content as well as better integration with Office365.

INSPIRE, TechPubs, Records

- Achieved PEMP Notable outcome on publicly available accepted manuscripts.
  - DOE Goal set at 85%, measured after 1 year after publishing
  - 2017 = 93.1% 2016 = 95.6% On track for 2018
  - Note – we achieve these goals by leveraging our INSPIRE work

- Database of 8k+ offsite records loaded from legacy FileMaker system
  - Required all entries to be examined to ensure record owner is a current employee & Division/Section-Department names standardized.

- What's next?
  - INSPIRE: Continue author disambiguation program, leveraging the global ORCID initiative
  - Records: Large-scale destruction of expired records stored offsite, possibly 25% of our holdings