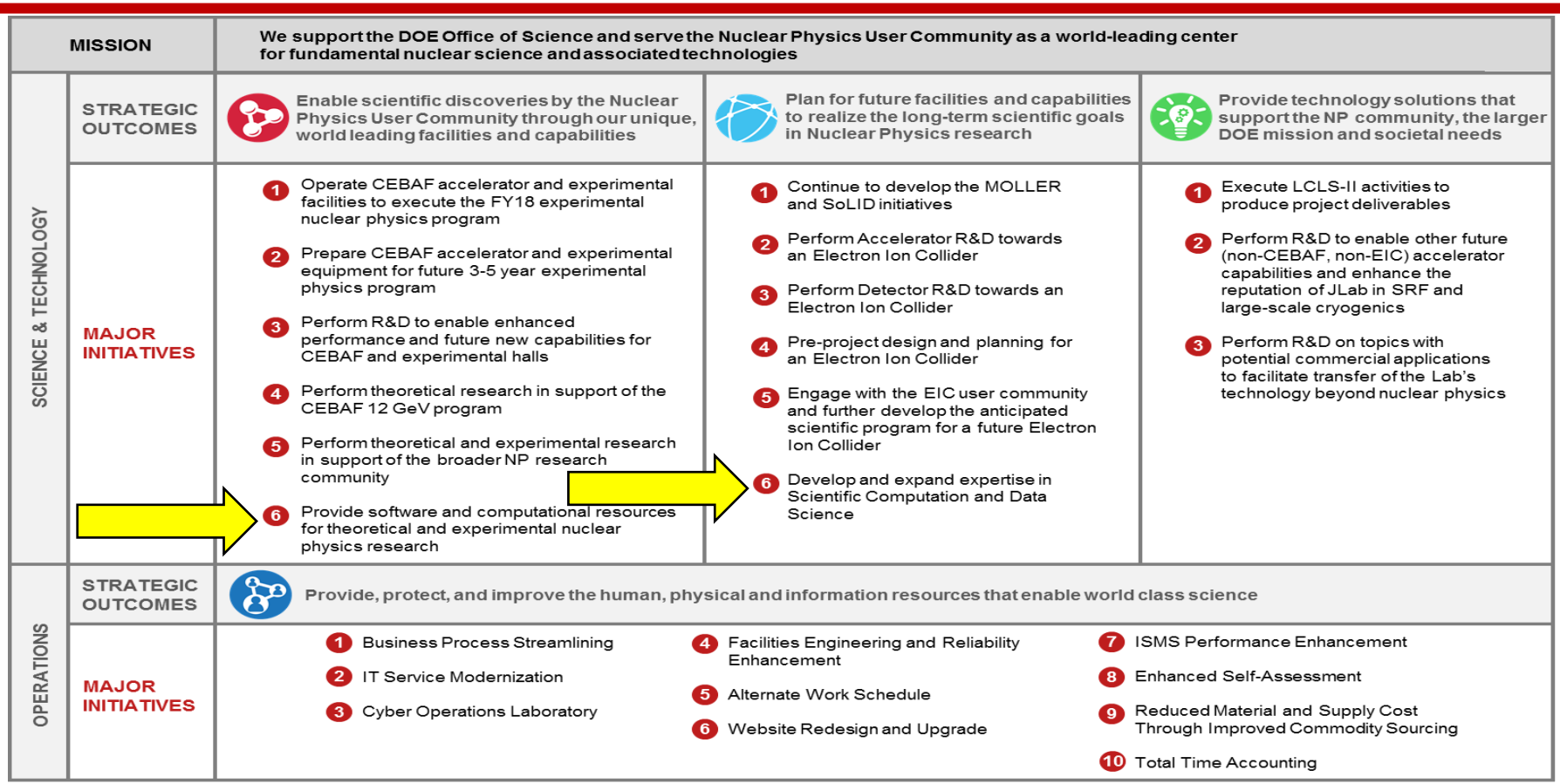
Computing Overview

Amber Boehnlein

Tuesday, November 6, 2018

Jefferson Lab

Jefferson Lab Agenda



The era of 12 GeV Science is coinciding with a revolution in computational techniques and disciplines

- Machine Learning
- Data Science
- Exascale Computing Project

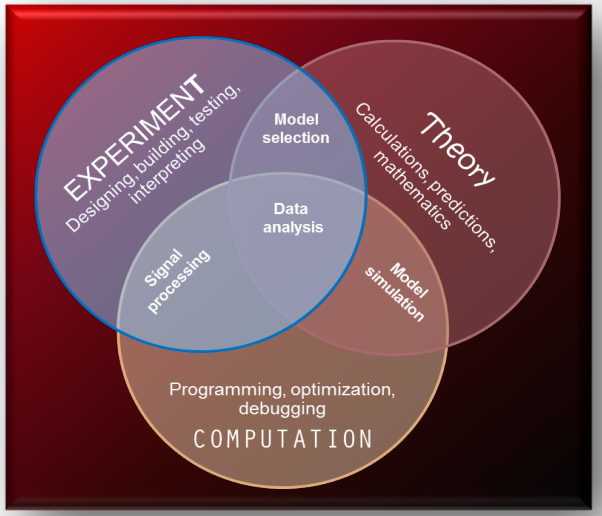
Experimental Physics

- CEBAF
  - Starting 12 GeV Era
  - Four Halls (reference agenda) slide
  - Summary of document to DOE—use of offsite resources and status
  - Approved experiments timeline
    - Ramping up weeks of running to 34-37weeks/year
  - Summary of document to DOE—use of offsite resources and status
    - Reference Graham's resource talk

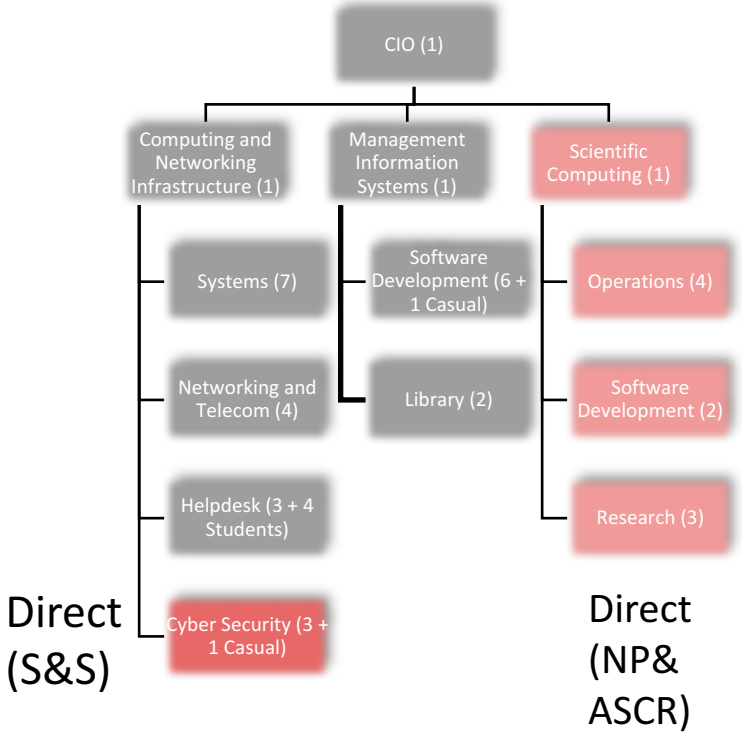
IT Overview/Resources

- Summary of responsibilities
- Quick overview of resources—reference Chip/Sandy talks

Resources



Software & Computing Effort (EXP) (FTEs)				
	DAQ	Halls	IT	Total
Online	2.3	7.5	0	9.8
Offline	0.7	10.5	5	16.2
Total	3	18	5	26



Staff is CS professionals, computational scientists and physicists at different career levels

EXP effort is self-reported

Software & Computing Effort (LQCD) (FTEs)			
	FY17	FY18	FY19
SciDAC-3	1.8	0.5	0
SciDAC-4	0	0.6	0.6
ECP	2	3	3
LQCD-HW	2.9	2.3	2.3
Total	6.7	6.4	5.9

Jefferson Lab Agenda

MISSION		**We support the DOE Office of Science and serve the Nuclear Physics User Community as a world-leading center for fundamental nuclear science and associated technologies**		
SCIENCE & TECHNOLOGY	STRATEGIC OUTCOMES	Enable scientific discoveries by the Nuclear Physics User Community through our unique, world leading facilities and capabilities	Plan for future facilities and capabilities to realize the long-term scientific goals in Nuclear Physics research	Provide technology solutions that support the NP community, the larger DOE mission and societal needs
	MAJOR INITIATIVES	1 Operate CEBAF accelerator and experimental facilities to execute the FY18 experimental nuclear physics program 2 Prepare CEBAF accelerator and experimental equipment for future 3-5 year experimental physics program 3 Perform R&D to enable enhanced performance and future new capabilities for CEBAF and experimental halls 4 Perform theoretical research in support of the CEBAF 12 GeV program 5 Perform theoretical and experimental research in support of the broader NP research community 6 Provide software and computational resources for theoretical and experimental nuclear physics research	1 Continue to develop the MOLLER and SoLID initiatives 2 Perform Accelerator R&D towards an Electron Ion Collider 3 Perform Detector R&D towards an Electron Ion Collider 4 Pre-project design and planning for an Electron Ion Collider 5 Engage with the EIC user community and further develop the anticipated scientific program for a future Electron Ion Collider 6 Develop and expand expertise in Scientific Computation and Data Science	1 Execute LCLS-II activities to produce project deliverables 2 Perform R&D to enable other future (non-CEBAF, non-EIC) accelerator capabilities and enhance the reputation of JLab in SRF and large-scale cryogenics 3 Perform R&D on topics with potential commercial applications to facilitate transfer of the Lab's technology beyond nuclear physics
OPERATIONS	STRATEGIC OUTCOMES	Provide, protect, and improve the human, physical and information resources that enable world class science		
	MAJOR INITIATIVES	1 Business Process Streamlining 2 IT Service Modernization 3 Cyber Operations Laboratory	4 Facilities Engineering and Reliability Enhancement 5 Alternate Work Schedule 6 Website Redesign and Upgrade	7 ISMS Performance Enhancement 8 Enhanced Self-Assessment 9 Reduced Material and Supply Cost Through Improved Commodity Sourcing 10 Total Time Accounting

The era of 12 GeV Science is coinciding with a revolution in computational techniques and disciplines

- Machine Learning
- Data Science
- Exascale Computing Project

Grand Challenge and Gaps

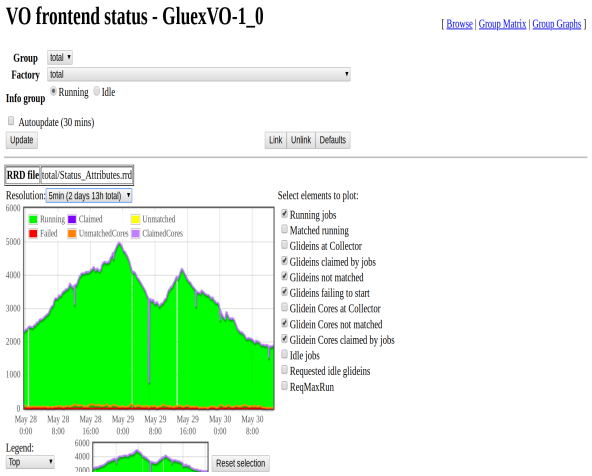
- Overview of Grand Challenge
- Reference talks about Gaps.

Experimental Computing Performance Plan

- Insure adequate computing resources with $XXXK investment
  - Use local farm for reconstruction, calibration and analysis
  - Use distributed resources for MC
  - Storage and associated bandwidth scaled to support all resources
- Open Science Grid
  - GlueX -6 institutions contribute resources
  - In a recent 2 week period ~1M core-hours
  - Expect yearly 35M-50M core-hours
  - Investigating options for CLAS12
- GlueX reconstruction code at NERSC
  - Scale test in July
  - Anticipate 70M core-hours/year
- Cloud Computing available for bursts

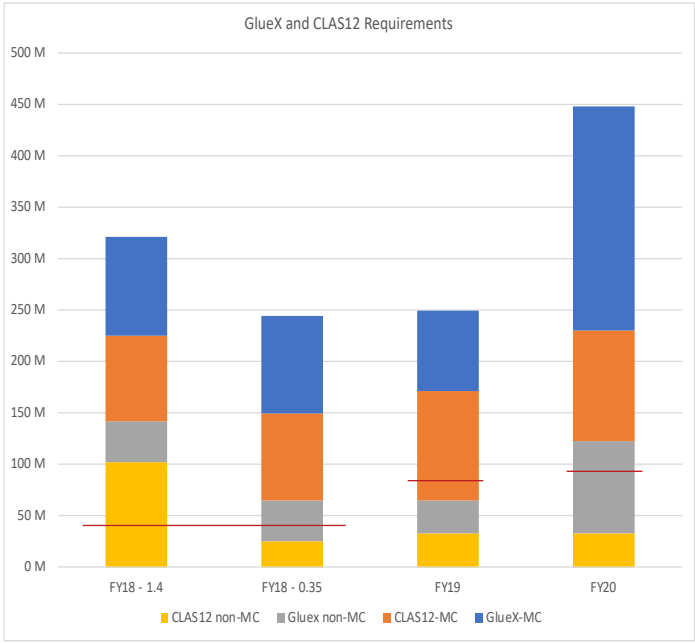
	Current	FY19	FY20
CPU (M-core-hours/year)	37	70	90
Scratch Disk & Cache Disk (PB)	0.65	1.1	2
Tape (GB/s)	3	5	7
WAN bandwidth (Gbps)	10	10	10

Current and Projected Capacity

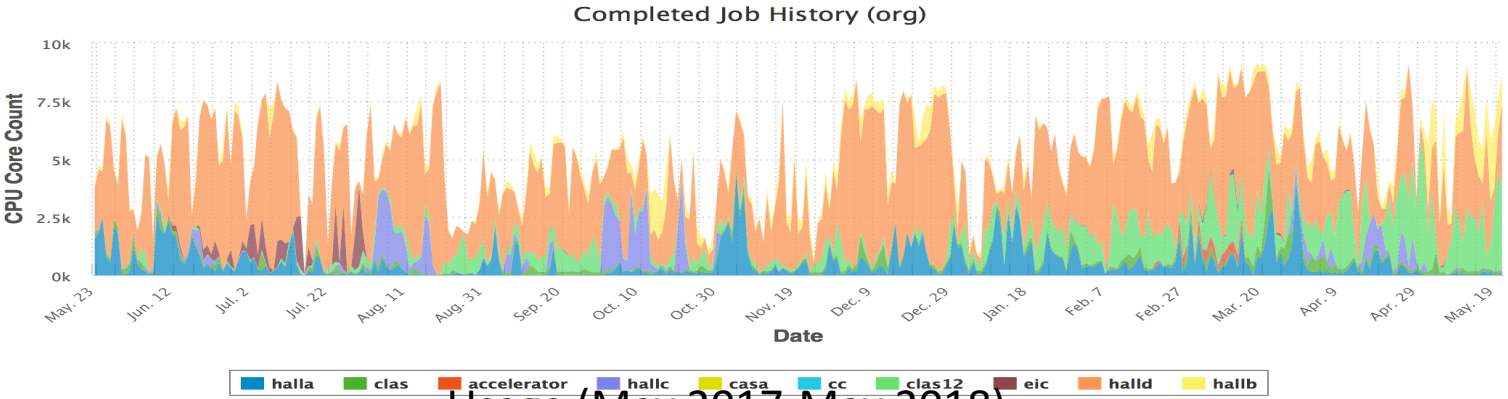


Experimental Computing Performance Plan

- Received recommendations to assess computing needs for Experimental and Theory programs
- Experimental program
  - Local resources at 'Shutdown' level
    - Investment needed
  - Spreadsheet Model projections
    - key parameters benchmarked against actual performance
    - Construct run scenarios



Projections



Usage (May 2017-May 2018)

Summary – Computing

- Computing provisioning meets the needs of the Facility
- Experimental Computing
  - Investment in FY18 & FY19 will support local data processing
  - Success with using Open Science Grid at GlueX institutions gives credibility to using distributed computing for Monte Carlo Production
- The significant needs for theoretical analyses of experimental data are emerging
  - Computationally, current needs are met with local resources and cloud computing
  - This emerging area is defining a collaborative computing strategy for the future

Recommendations from 2016 Review