Budget and Support Model

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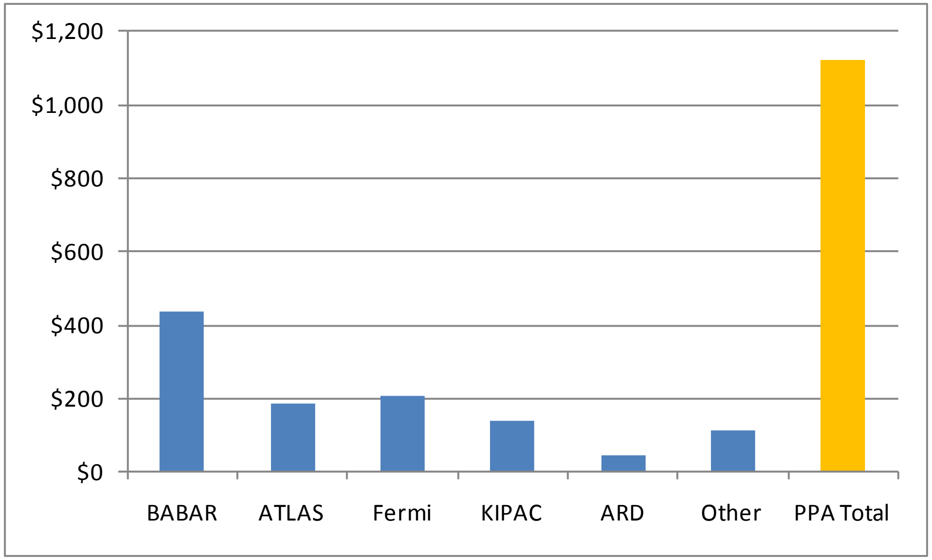
SLAC NATIONAL ACCELERATOR LABORATORY

Outline

- Manpower and cost summary
  - Recharge center
  - Scientific programs
- Issues:
  - Computing hardware for scientific community and scientific programs at SLAC
  - Existing and future community software tools
  - Existing and future framework and data management systems
  - Research on next generation software and hardware capabilities

Summary of operations budget

- Scientific computing operations (CD) support
  - Basic capability: 4 + 5.5 FTEs from SLAC indirects
  - Additional 5.5 FTEs direct charged to users, based on catalog of services
  - PPA passes costs through to individual science programs (ATLAS, BABAR, Fermi) or detector operations (all others)
- Additional operations support in programs

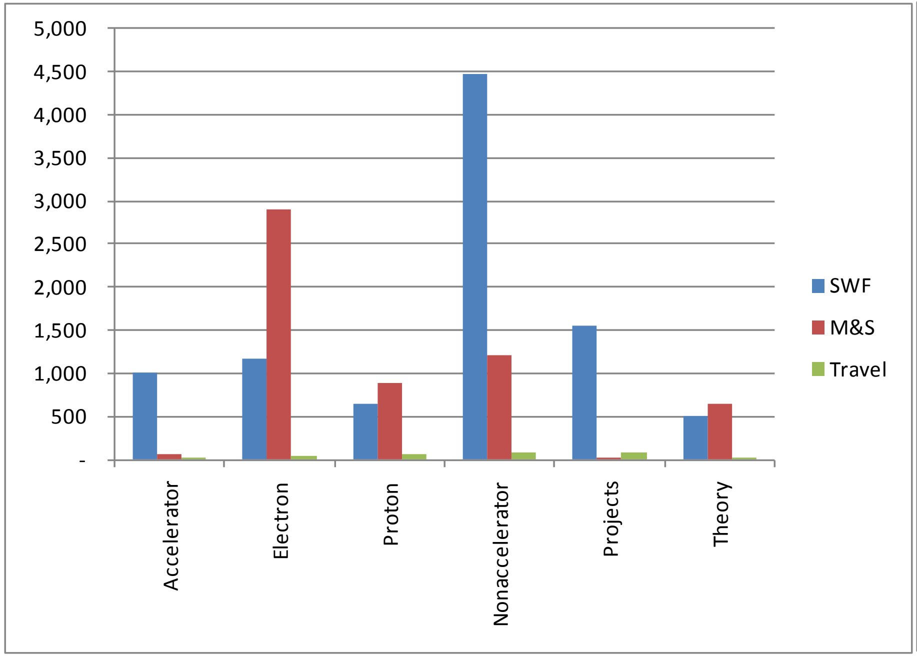


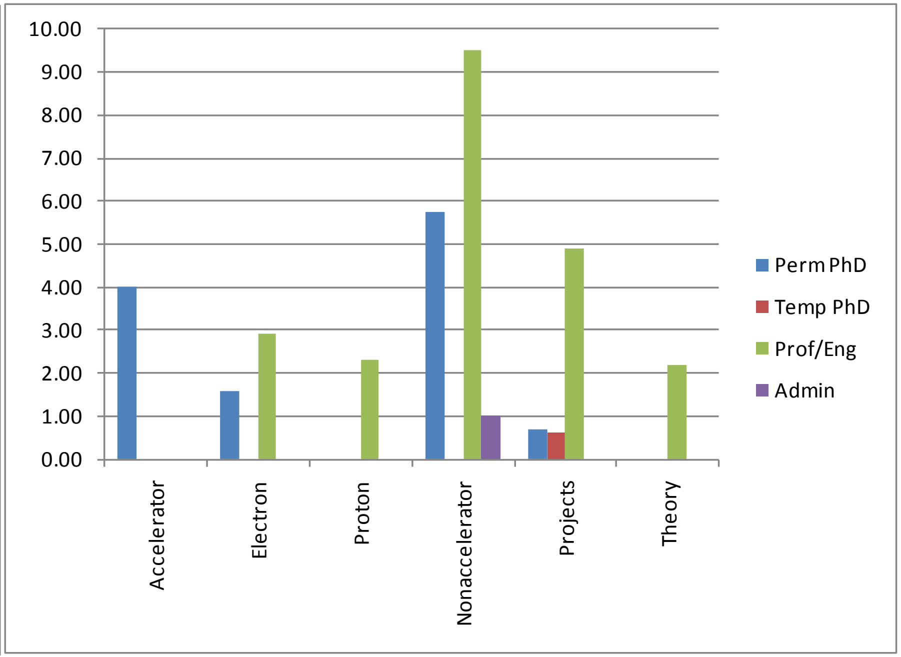
FY2011 recharge costs for HEP program

  - Small fractions of operations related activity in BABAR (0.5), KIPAC (0.5), CDMS (0.5) and Fermi ISOC (1.6 FTE)

Summary of scientific computing budget

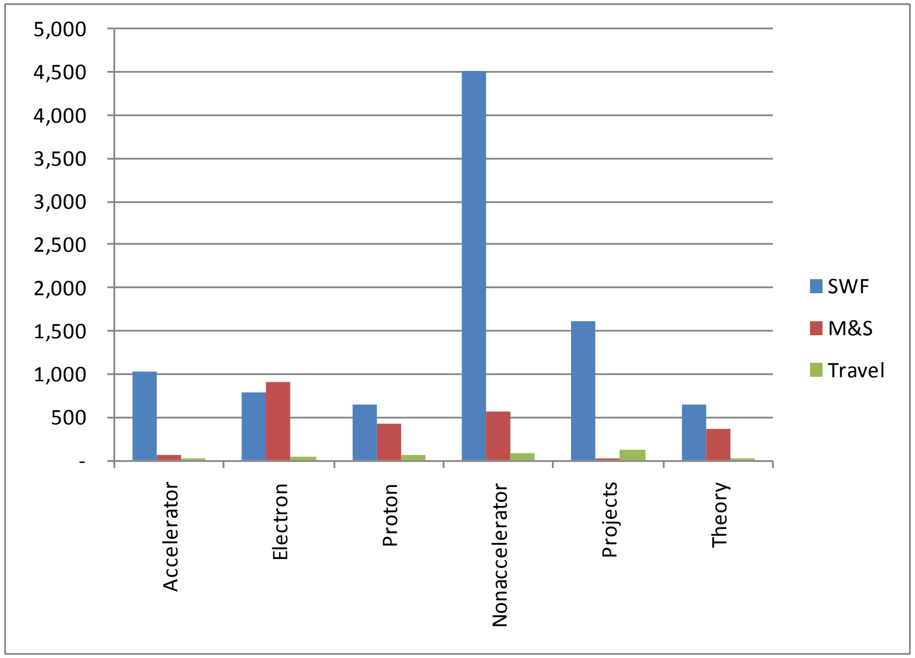
- FY2010: HEP carried most of the CD operations costs
  - About $4M of the M&S costs for BABAR (+others), ATLAS, Fermi
  - About 12 Perm PhDs and 22 Prof/Eng FTEs, with Fermi ISOC the dominant component

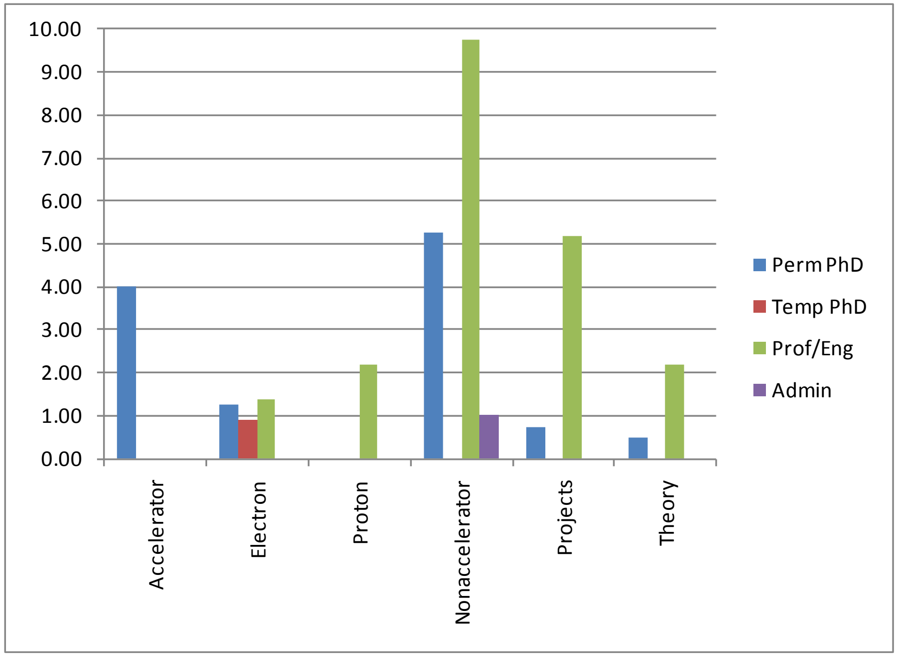




Summary of scientific computing budget

- FY2011: New recharge model
  - About $1.1M in M&S costs for BABAR (+others), ATLAS, Fermi
  - About 12 Perm PhDs and 21 Prof/Eng FTEs, with Fermi ISOC the dominant component





Areas in need of increased support

- Several existing initiatives are undermanned:
  - Need about 0.5 FTE in existing core GEANT4 effort; recommending 1 FTE for to restore EM support capability
  - Need 2 FTEs to support LCSim infrastructure as a community tool, in particular wide adoption for CLIC and Muon Collider detector studies
  - Need 0.5 FTE to support rapidly expanding adoption of xrootd, and development needs arising from this trend
  - SCA data management is short ~1 FTE to provide core support for existing experiments and develop new opportunities

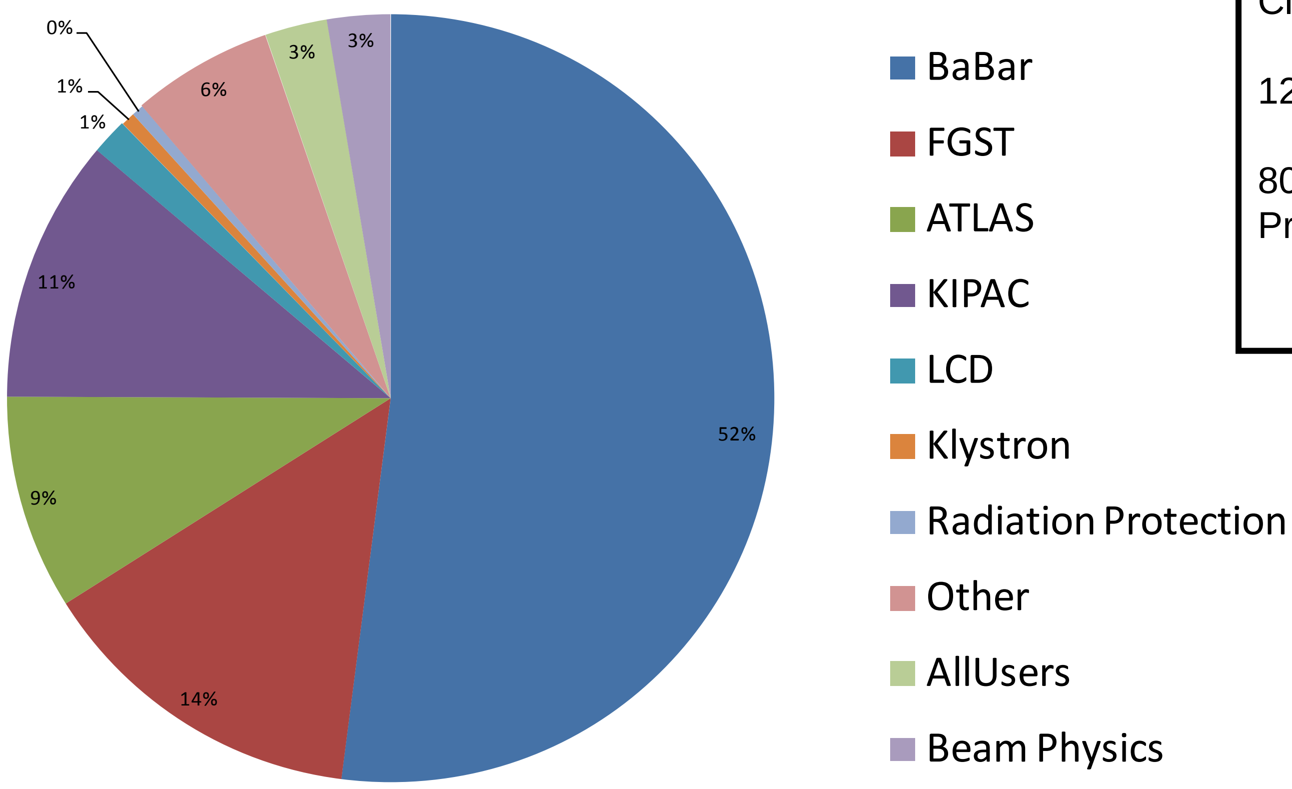
Computing Hardware Support

- Computing hardware for scientific community and scientific programs at SLAC: supporting capital and operations costs
  - No longer have a dominant experimental program (BABAR) to justify large-scale hardware investments and operating costs
    - Hardware will begin to ramp down in FY2011 with retirement as equipment reaches operational lifetimes
  - Existing hardware an essential resource for many other programs
    - Smaller experimental and theoretical programs
    - Satisfying peak demand by ATLAS, Fermi GST with shared resources
  - Examples:
    - Physics performance studies for SiD LOI and EDR
    - Simulation and analysis support for small-scale experiments: CDMS, EXO, CTA, next generation flavor factory,…
    - Cosmology simulations at KIPAC

SLAC HEP Computing Facilities

SLAC HEP CPU 9000 Cores

Average core age 2.6 years



72 Cores: SMP (SGI Altix)

768 Cores: Infiniband Cluster

128 Cores: Myrinet Cluster

8040 Cores: HEP Data Processing

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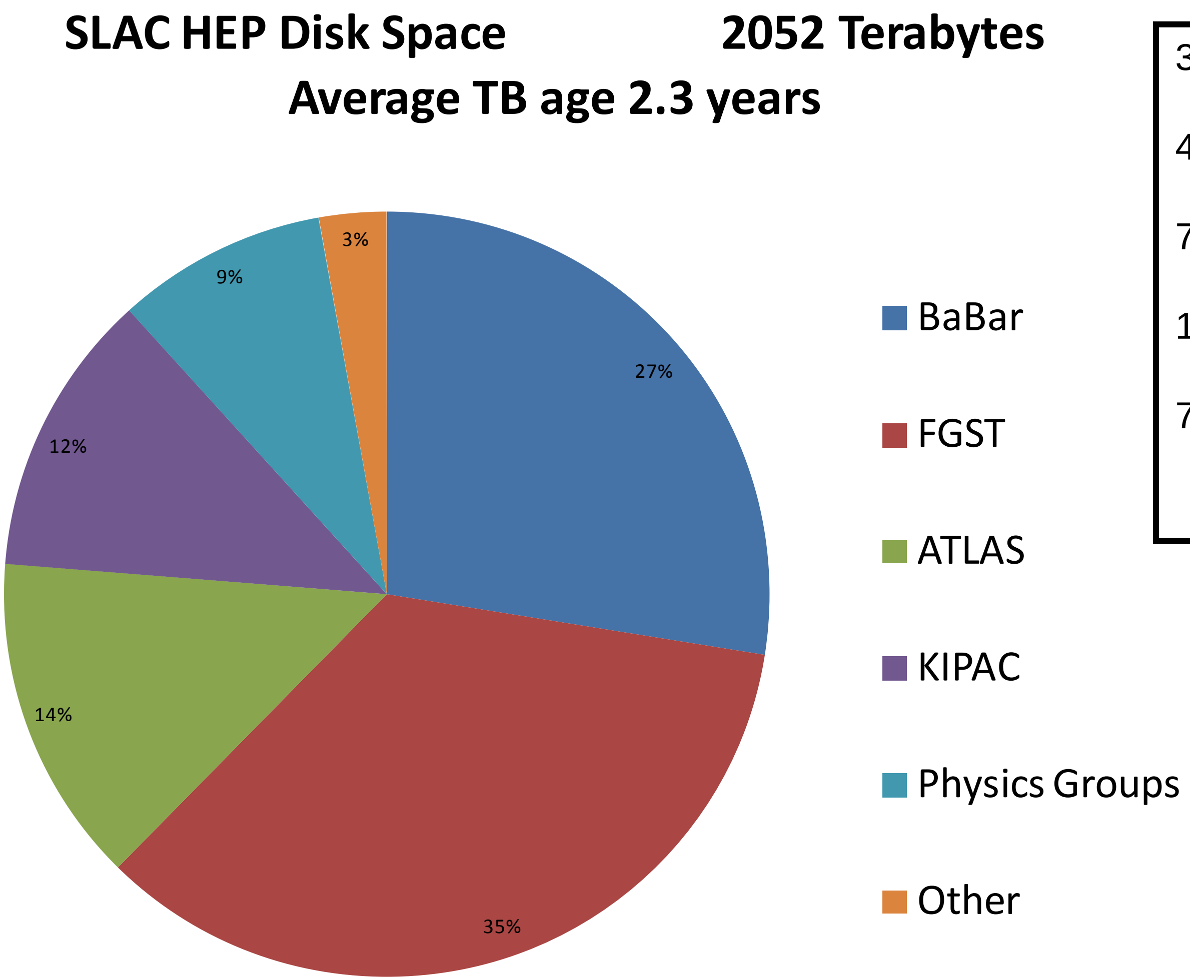
SLAC HEP Computing Facilities



34 TB: AFS

47 TB: NFS-Network Appliance

700 TB: NFS

1200 TB: xrootd

74 TB: Lustre, Objectivity …

Computing Hardware Support

- Future evolution of SLAC scientific computing hardware
  - Have now established a lab-wide cost recovery model
    - Basic operations supported by lab-wide indirects budget, with large-scale installations contributing incremental direct support
  - Hardware needs and operational costs for large scientific programs should continue to be proposal or program driven and funded
    - ATLAS Tier 2 and possible future expansion, Fermi GST, Computational Cosmology Collaboration, DES, LSST
  - Vitality of national laboratory HEP group depends on our ability to offer scientific computing access for small-scale uses as well
    - Batch sharing across large and small programs benefits all
- Recommendation
  - Continue a detector operations budget to support computing hardware acquisition and operations for small-scale needs

Community Software Tools

- Existing and future community software tools
  - G4, xrootd, SPIRES, LCSim, Blackhat, ACE3P,…
- Characteristics
  - Usually involve several laboratories engaged in development and user support, although joint management often informal
  - Have been and could be proposal and review driven
  - Some not adequately supported as a community tool at present, with more effort needed on usability, documentation, and user support in order to be adopted widely
- Recommendation
  - Support proposal driven community software tools to ensure basic development and adequate funding for essential software of wide community applicability

Framework and Data Management Systems

- Planned migration of existing and future framework and data management systems
  - Fermi GST applicable to EXO, CDMS, CTA, or other future experiments
- Benefits
  - Existing experiments benefit from managed migration of software expertise, which remains available at the laboratory
  - Future experiments benefit from not needing to reinvent basic framework and data management systems; inherit core expertise of mature systems
  - PPA SCA Department established as a means of effectively managing a capability across multiple program applications
    - Initial exploratory phase of transitions is challenging without some core funding
- Recommendation
  - Support ~50% of core software team on the HEP computing program to maintain continuity of development effort and to allow managed transitions
  - Remainder funded by benefiting past or future programs

Scientific Computing Research

- Future scientific computing R&D
  - Core team model augmented by specific projects, similar to Detector R&D approach
  - Typically ~50% support for core developers on HEP computing to provide stable platform
  - Examples include both hardware and software capabilities
    - Petacache, GPU-approach to simulations
    - Petascale database development: XLDB and SciDB
- Recommendation
  - Support a small core HEP computing effort in cutting edge hardware and software research and development
  - Portfolio should allow for a mix of mid- and high-risk investments with a range of possible innovation returns to HEP program

Summary

- SLAC has ongoing core expertise in HEP-related scientific computing and computing operations
  - Core capability in mid-scale and large-scale data management and scientific computing operations from Fermi and BABAR
  - Major player in many software tools, including GEANT4, ACEP3, ENZO, xrootd, etc
  - Core capability in large-scale and cutting edge database systems, including XLDB and SciDB
- Future scientific program will rely on many of the same capabilities
  - Support for data management needs of upcoming mid-scale experiments, including CDMS, EXO, CTA
  - Major role on LSST dark energy science center
  - Exciting opportunities in particle astrophysics and cosmology
  - Continue to support community tools and future R&D