Computing at SLAC

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The current status of computing at SLAC is described and future strategy is outlined.

Key words: SLAC; Computing; BaBar; HEP; Management.

1 Introduction

Computing at SLAC is provided by a combination of the SLAC Computing Services (SCS) and computing support teams within SLAC divisions. To convey SLAC's strategy for computing it is necessary to describe not only the hardware and software but also the evolving approach to the management of computing.

2 Current Hardware and Software used in SLAC Computing

Only a very simplified overview is needed to set the stage for a description of the strategy for future developments:

2.1 UNIX Service

The UNIX service is based on farms of IBM RS6000 machines. The total power is about 9000 MIPS and some 400 Gbytes of staging disk are in use. The five STK silos have a total capacity of 30 Tbytes. New STK Redwood drives are under test but not yet in production.

2.2 Site Network

The site network architecture is based on category 5 UTP to desktops, distributed switching with support for virtual LANs, and centralized routing. The category 5 UTP installations are continuing.

2.3 Business Systems

Over many years SLAC developed support for business services based entirely on IBM VM/CMS. A two-year project is underway to move all business services to commercial software (Peoplesoft) running on NT desktops with NT and UNIX servers.

2.4 Desktops

SLAC's desktops are adorned with 900 Macs, 850 PCs (47% NT), 850"UNIX" (44% Xterminals) and 250 VMS machines.

3 Management of SLAC Computing

Figure 1 gives a simplified view of how SLAC computing was managed up to the end of 1996. The figure also attempts to show the closeness of contacts between the SLAC Computing Services (SCS) and computing efforts elsewhere at SLAC. A notable feature of this structure was that SCS was "hidden" inside the Research Division but had, nevertheless, established a closer working relationship with Business Services than with many of the physics experiments. The overall coordination of computing activities across the division was provided by the Associate Directors Committee on Computing — a body necessarily composed of members with little time to think about computing.

In the course of 1997, SLAC will make some important changes to this structure, resulting in something like Figure 2. A new committee, the Computing Coordinating Committee (CCC), will formulate technical and policy proposals for submission to the ADCC. The CCC will be composed of people with substantial computing responsibilities and should work to achieve a coherent SLAC-wide approach to computing. The Director of SCS will chair the CCC, ensuring that SCS can take advantage of its structural proximity to physics research without being totally hidden in the Research Division.

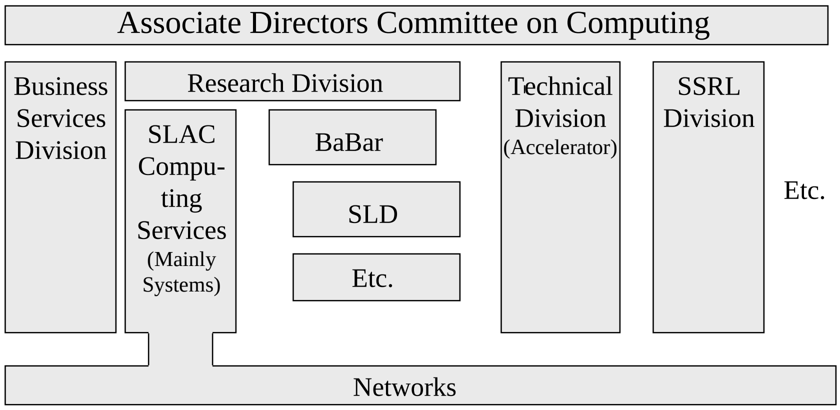

Fig. 1. A simplified view of the management of SLAC computing up to the end of 1996

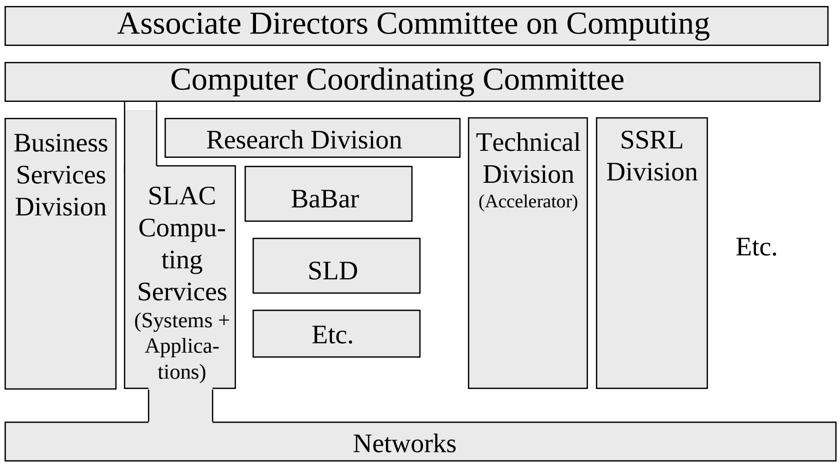

Fig. 2. A simplified view of the management of SLAC computing in 1997

4 Strategic Directions in SLAC Computing

4.1 Directions: BaBar

BaBar will take data in 1999. That is frighteningly close. The PEP II accelerator shows every sign of being ready early, putting further pressure on the BaBar collaboration. The stated needs BaBar are for data storage and access for 100 TBytes/year and at least 30,000 MIPS of computing power. These are achievable goals. The challenge for BaBar not be in buying raw power or storage but in building a responsive and competitive data analysis system.

BaBar has accepted this challenge and has entered a brave new world of Object Oriented reconstruction, simulation and data access. BaBar will be the first experiment to use the GEANT4 Object Oriented simulation toolkit for high-statistics physics. Babar will also be the first experiment to use an Object Database for all data. This approach should bring revolutionary improvements in the flexibility of data analysis. Development of the BaBar Object Database will be performed by collaborating teams at SLAC/SCS and LBL working closely with the RD45 project at CERN.

BaBar has made a number of technical choices:

- Objectivity DB has been chosen as the Object Database Management System for BaBar. In common with other database management systems, Objectivity DB does not manage tape-resident data directly. HPSS will manage the tape-resident data and will be directly interfaced to Objectivity.
- BaBar is struggling to limit or even reduce the number of flavors of UNIX it must support. At this moment they do not want to hear about any other operating system. We do not expect this narrow focus to survive into the operating phase of Babar.
- Current written plans are centered on “pizza box” farms of processors as the principal computing resource. However, large symmetric multiprocessor systems look increasingly attractive in view of the demands and capabilities of the Object Database Management System.
- Although BaBar has not yet developed firm plans for a distributed analysis strategy, there have already been suggestions that one or more significant analysis centers may be created in Europe.

5 Directions: Networks

Remaining “unmanageable” wiring is being systematically replaced by category 5 UTP within buildings and fibers between buildings. The approach of concentrating routing at a central location, but supporting highly distributed switched virtual LANs where appropriate, is working well and appears to be scalable to meet likely traffic growth.

SLAC users have come to expect good performance from the site networks, but are almost uniformly dissatisfied with wide-area networking. SLAC itself cannot solve their problems but recognizes the importance of a coordinated and continuous attack on problems, whether technical, financial or political.

6 Directions: Business Services

The two-year transition from home-made software on VM to commercial software (Peoplesoft/Oracle) running under NT and UNIX is due to end in late 1997. The plan to "go live" with a completely new system on October 1, 1997 has many similarities to the startup of a major experimental program.

The new business services software will transform the role of Windows NT from a non-critical "enthusiast's" operating system to that of a critical service for SLAC. Industrial-strength NT support will be an absolute requirement.

SLAC business services were deeply dependent on VM. SLAC is trying to minimize the modifications to and customizations of the new software so that the pain of an inevitable future transition is lessened.

7 Directions: Desktops

The inventory of SLAC desktops described above gives no clear pointers to the future. For these pointers it is necessary to turn to the marketplace. In the marketplace NT appears ascendant, Macs seem doomed and Unix, on the desktop, strongly threatened. However, although the marketplace drives strategic directions, disfavored machines do not disappear overnight. It is many years since VMS was the market's system of choice, but the 250 VMS desktops at SLAC show no sign of a rapid decline.

Desktops are notoriously manpower intensive, both for users and support staff. SCS already offers efficient central support for UNIX desktops; for NT desktops the urgent need is recognized and SCS will collaborate with *ad hoc* support groups to provide site-wide support. As a first step an efficient, centrally managed, environment is planned to be available to Business Services (the best behaved group of users) by the end of 1997. This environment will then be extended to other user groups.

Current plans center on immediate use of Microsoft's SMS systems management package. SMS is understood to be a relatively inelegant and manpower-intensive product. It will be superseded by the Microsoft's Zero Administration Workstation software whenever this is released and is stable.

8 Directions: General

SLAC intends to make its computing activities more efficient by achieving an appropriate use of central services and a high level of cooperation between the divisions. The management technique that has been chosen is the "carrot". Central services must be made attractive and a coherent hardware and software purchase strategy must be achieved by offering good support for the "right" products.

The days when an experiment-specific or laboratory-specific approach to computing could be justified or successfully hidden have long gone. High energy physics must approach its computing problems in a globally collaborative manner. These statements are easy to make, but collaboration is difficult and requires special efforts and encouragement. SLAC intends to collaborate with the wider HEP community on Object Oriented simulation and Object Databases, and will seek to collaborate on other areas of common interest such as desktop management.