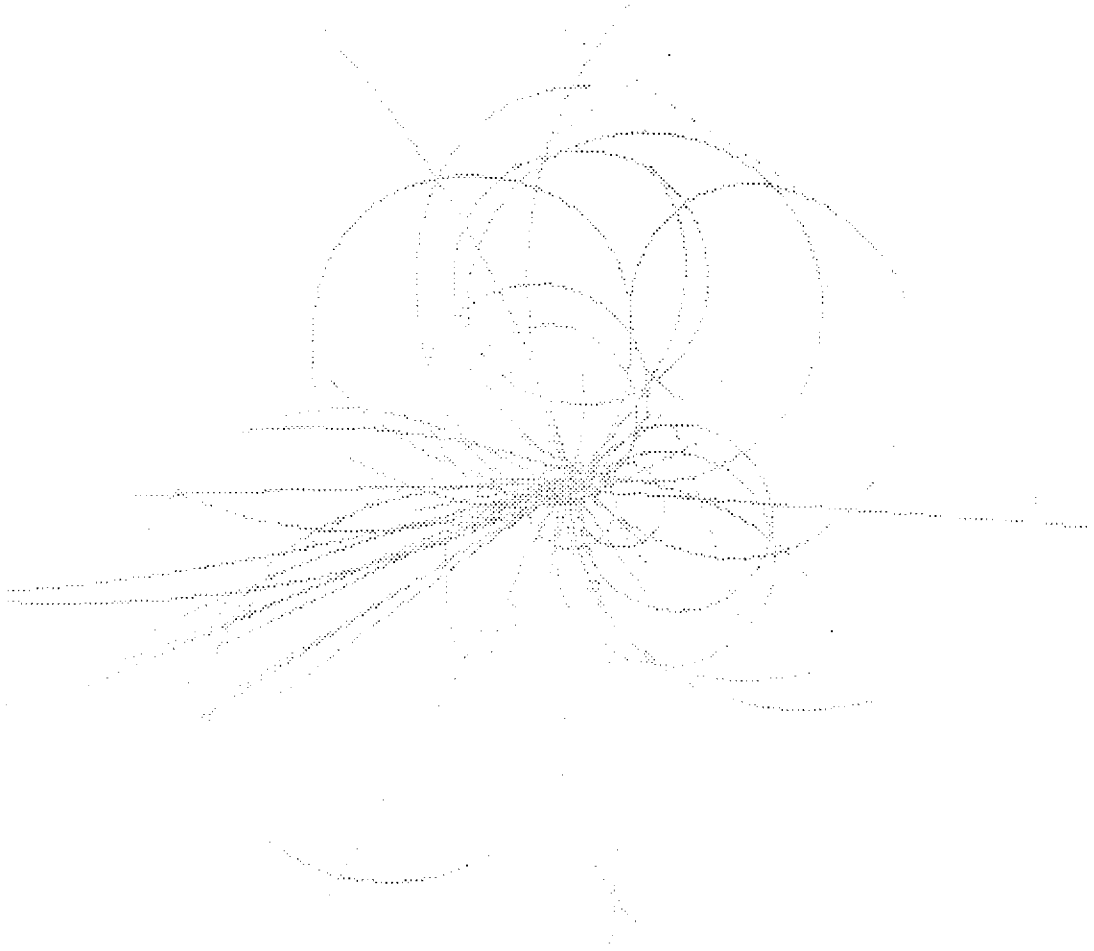
Superconducting Super Collider Laboratory



ADP RESOURCES

Strategic Plan
and
FY91/92 Short-Range Plan

September 19, 1990

SUPERCONDUCTING SUPER COLLIDER LABORATORY

ADP RESOURCES

STRATEGIC PLAN
AND
FY91/92 SHORT-RANGE PLAN

19 September 1990

Approved by:

E. Jack Story, Associate Director
Laboratory Technical Services Div.

Approved by:

Philip O. Leibold, Deputy Assoc. Dir.
Laboratory Technical Services Div.

Reviewed by:

9/24/90
Robert Hahn, Manager
Computer Protection Program

SUPERCONDUCTING SUPER COLLIDER LABORATORY

2550 Beckleymeade Avenue
Mail Stop 1014
Dallas, TX 75237-3946
(214) 708-5055• FAX (214) 708-0015

Re: 6235-L91-03

19 December 1990

Mr. Antonio F. Tavares, Chief of Staff
U.S. Department of Energy
MS 1025
Dallas, Texas 75237

Dear Tony:

Subject: Your letter of 29 Nov. 1990 re OSSC Headquarters Comments on the Strategic and Short Range Plan

The above referenced letter requests a response to concerns about SSCL's ADP Resources as given in the Strategic and Short Range Plan for FY91/92.

This is our response to the following question:

Item 1. The plan does not present the big picture of ADP procurement for the entire project life including funds source by WBS element. Without the WBS spread it is difficult to determine which work effort/group is purchasing the identified hardware.

Reply: The SSCL has updated the existing tables found under "Item 2, ITR Solution," for each division with a Work Breakdown Structure (WBS) number for each requirement for FY91 only and they are attached. PB/MK information will be submitted shortly.

It is suggested that the revised pages, dated 12/28/90, be inserted in the information previously provided. Please contact me at the above phone number, or Phil Leibold on 708-5011, if you have any further questions.

Sincerely yours,

Robert Hahn, Manager
COMPUTER PROTECTION PROGRAM

RH/bac
Attachment

c: Phil Leibold
Newell Ramsey
Paul Reardon
Dick Russell
Jack Story
Don Jacobson - ADP Office
Sandra Williams - ADP Office

Superconducting Super Collider Laboratory

2550 Beckleymeade Avenue
Mail Stop 2020
Dallas, TX 75237-3946
(214) 708-1711• FAX (214) 708-1710

Re: 6235-L91-01

Procurement & Contracting

3 December 1990

Mr. Terrell C. Cone, Contracting Officer
U.S. Department of Energy - OSSC
2550 Beckleymeade Ave., MS 1025
Dallas, TX 75237-3946

Dear Mr. Cone:

Subject: Additional Information for the SSC Laboratory Strategic Plan and Short Range Plan (Reference: 6235-L90-29)

The attached document is the input from the Architectural-Engineering/Construction Management (AE/CM) subcontractor to the SSC Laboratory which is PB/MK Corporation. The contents of the PB/MK plan are in accordance with the overall SSC Laboratory Strategic and Short Range Plan and will be consolidated into the portion of the plan previously submitted for the Conventional Construction Division.

Your review and approval of this remaining document is requested.

Please contact Phil Leibold (708-5011) or Bob Hahn (708-5055) of Laboratory Technical Services Division if there are any questions regarding the SSCL input.

Sincerely,

Richard R. Russell
Director of Procurement

DJ/RRR/djc
Attachment

cy: S. Brumley
R. Schwitters
R. Van Ness
D. Vest - Subcontract File
C. Langford-DOE/Chicago
D. Hamacher-DOE/Chicago

Superconducting Super Collider Laboratory

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Procurement & Contracting

Re: 6235-L90-29

24 September 1990

Mr. Terrell C. Cone, Contracting Officer
U.S. Department of Energy - OSSC
2550 Beckleymeade Ave., MS 1025
Dallas, TX 75237-3946

Dear Mr. Cone:

Subject: SSC Laboratory Strategic Plan and Short Range Plan for ADP Resources

The enclosed Strategic Plan, dated 19 September 1990, presents the current organizational structure, planning and procurement process, and ITR strategies of the SSC Laboratory. The document addresses the operation, function, communication and control of ADP resources required by the Superconducting Super Collider Laboratory (SSCL).

The enclosed FY91/92 Short Range Plan identifies the need, acquisition cost, method of acquisition and source of funding for new ADP resources projected for the next two fiscal years for all SSCL divisions except Magnet Systems Division. The MSD plan has been drafted and final division review is pending, therefore, this plan will be submitted under separate cover. Your review and approval of the remaining divisions are requested.

Please contact Phil Leibold (708-5011) or Bob Hahn (708-5055) of Laboratory Technical Services Division if there are any questions regarding the SSCL input.

Sincerely,

Richard R. Russell
Director of Procurement

DJ/RRR/bc
Enclosures

cy: S. Brumley
R. Schwitters
R. Van Ness
D. Vest
Subcontract File

C. Langford-DOE/Chicago
D. Hamacher-DOE/Chicago

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STRATEGIC PLAN

I. OVERVIEW

A. Mission Statement

At the inception of the Superconducting Super Collider (SSC) project, a Central Design Group based at Lawrence Berkeley Laboratory provided preliminary design criteria to scope the project and determine its feasibility. Many of the applications programs they developed remain in use and are critical to the future design of the SSC. Since that time, Universities Research Association, Inc., (URA) has been designated by the U.S. Department of Energy (DOE) to be the management and operations contractor to develop the SSC Laboratory. This is a long term project involving many technical activities and requiring computing services to support a wide variety of administrative and scientific requirements. Early efforts to satisfy these requirements have led to the acquisition of two minimal VAX systems, the installation of an extensive local area network and a variety of wide area networking connections. These resources are used in coordination with numerous PCs and UNIX-based compatible workstations.

SSC Laboratory personnel are located in several buildings located near Dallas, about fifteen miles from the final location in Waxahachie, Texas. The Laboratory is undergoing a period of rapid growth, both physically and in the number and complexity of its tasks. This growth requires extraordinary measures to maintain current activities and prepare for future tools to enhance productivity.

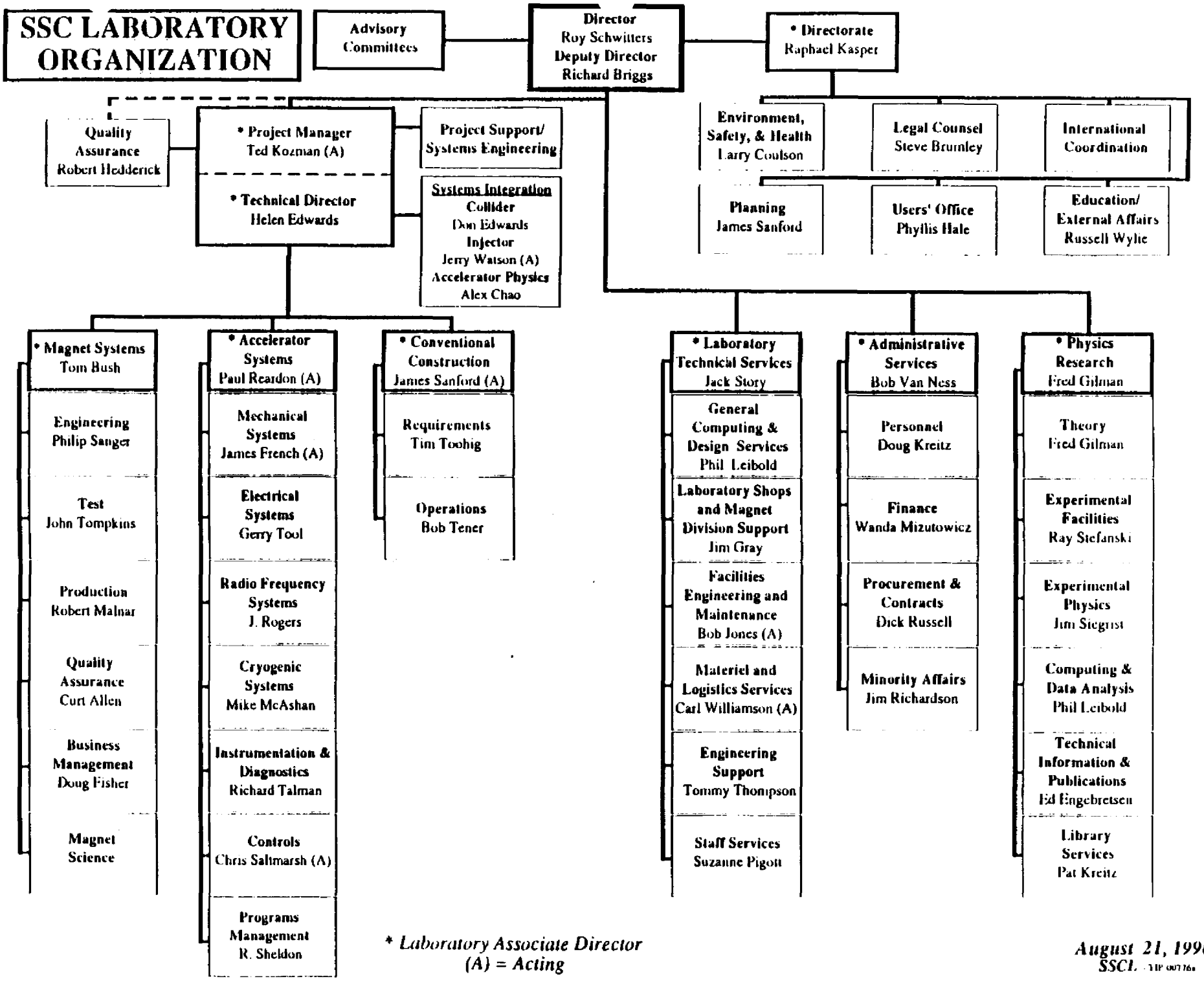
The SSC Laboratory work force will grow to approximately 1,000 employees by FY91. Scientific and administrative data processing requirements for resources include general purpose ADP equipment, Automated Office Support Systems (AOSS), Computer-Aided Design/Engineering (CAD/CAE) and Telecommunications, including both local and wide-area networks. These requirements will increase in order to manage the project efficiently and provide communications throughout the high energy physics scientific community. Large and small-scale computing resources will be needed to meet requirements related to the SSCL, including accelerator and detector design activities.

B. Organizational Structure

The current organizational structure of the SSC Laboratory is shown on the following page. The administrative tasks are carried out under the direction of the Administrative Services Division, which is responsible for Procurement and Contracts, Finance, Personnel, and Minority Affairs. The scientific tasks are directed through a Project Manager and Technical Director, and include technical divisions, namely, Accelerator Systems, Magnet Systems and Conventional Construction. In addition, the Physics Research Division provides support for detector physics and simulation.

Laboratory Technical Services (LTS) has been designated as the focal point for the acquisition, management and monitoring of ADP hardware and software required by the SSC Laboratory for both administrative and scientific applications. The General Computing and Design Services Group of LTS has been identified as the services group responsible for operation, maintenance, network management, system and applications programming for administrative computing and all communications resources at the SSC Laboratory.

SSC LABORATORY ORGANIZATION



* *Laboratory Associate Director*
(A) = Acting

August 21, 1990
SSCL

The SSC Laboratory Deputy Associate Director of LTS has been appointed as the Senior ADP Official responsible for Automated Data Processing (ADP) activities. This official will develop an operational guideline for the management of Automated Data Processing in order to document management policy and procedures for the implementation of DOE Orders 1360.1A, 1360.2A and other related orders. This guideline will cover SSCL practices related to the acquisition, use and control of ADP and will serve as the basis for developing planning documents.

The Laboratory consists of six divisions working together to design and construct the research facility. The three Project Management Divisions (Magnet, Accelerator and Conventional Construction) have the task of developing and building the SSCL facility. Three support divisions (Physics Research, Laboratory Technical Services and Administrative Services) provide related services. Each Project Management division has specific products or systems to design while each support division has many complex, interrelated tasks. The common element for all divisions is their need for computing equipment to carry out their mission.

The Magnet Systems Division is responsible for magnetic measurements including magnet quench test data management, finite element analysis, cable database development, and prime item specification. The Magnet Test Laboratory will handle hardware control and monitoring; data management and archiving; on line setup of data for presentation and analysis; and off line simulation comparison.

The Accelerator Systems Division is responsible for magnet parameters; integration of magnets, tunnels and conventional systems; development and integration of injection accelerators; design of experiments and detection devices; lattice design and tracking; E778 data analysis; accelerator database development; operations simulation and studies of correction schemes.

The Conventional Construction Division is responsible for architectural and engineering management for the project, including continuation of the original conceptual design work initiated by RTK Engineering. This work will be expanded to include site layout of buildings, structures and utilities.

The Physics Research Division is responsible for the detector simulation effort required for the SSC physics program. In order to support the distributed HEP community, simulated events data will be centralized and will be made available to the detector collaborations.

The Laboratory Technical Services Division provides user and system level support to the SSCL. The Computing Services/Information Services Group supports general purpose computing and networking including hardware and software acquisition, development and implementation, training, documentation and communications. The Computing and Communications/CADD Systems group supplements design and drafting services as well as administrative computing resources of other divisions Laboratory-wide.

Within LTS, the Computing & Communications Group has been assigned the tasks of providing general computing support, networking, and communications, as well as the analytical and support functions of information systems for the Laboratory. A long-range strategy whereby an integrated array of Management Information Systems, called the Centralized/Integrated Information Repository, has been prepared to reduce redundancy, raise data integrity and optimize resource management. Tangible benefits include lower computing costs, lower labor requirements, increased efficiency and effective configuration control.

Throughout the Lab, Administrative Services directs such functions as Personnel, Finance, Procurement and Contracts, and Minority Affairs.

C. Strategic Approach

The planning for ADP, AOSS, CAD/CAE and telecommunications equipment is driven by the need for completing specific technical and administrative tasks within each division of the SSCL. Much of the effort for each division has been presented in the Field Test Plan and Acceptance Report published earlier this year and in the CDR presented to DOE this past summer. Some specific technical milestones of the project that are driving the need for computer and communications equipment are the following:

Baseline Schedule (SEP. 90)
Major Project Milestones

Number	WBS	Description	Date
M1-1	2.1.1	A-E/CM Letter Contract & NTP	AUG. 90
M1-2	3.0	Baseline Validation Complete	JUL. 90
M1-3	1.2	CDM Authorization to Incur Costs	NOV. 90
M1-4	3.0	SEIS Record of Decision (ROD)	DEC. 90
M1-5	2.1.1	Start SSC Civil Construction	MAR. 91
M1-6	1.1.8.8.23	Accelerator String Test Complete	OCT. 92
M1-7	1.2	Start First Half Sector CDM Delivery	APR. 94
M1-8	5.0	Notice to Proceed (NTP) Experiment Halls	JAN. 93
M1-9	1.1.6	First Collider Half Sector - Start Installation	MAR. 94
M1-10	1.1.2	LINAC Start Commissioning (600 MeV)	OCT. 94
M1-11	1.1. 6	First Collider Half Sector - Start Cooldown	MAR. 95
M1-12	1.1.4	MEB Start Commissioning	APR. 96
M1-13	5.0	Beneficial Occupancy of Large Experiment Halls	JAN. 97
M1-14	1.1.5	HEB Start Installation	AUG. 96
M1-15	1.1.4	MEB Test Beams Available	OCT. 96
M1-16	1.1.5	HEB Start Commissioning	OCT. 98
M1-17	5.0	West Detectors - Start Commissioning	MAR. 99
M1-18	1.1.6	Collider - Start Commissioning (beam)	MAR. 99
M1-19	1.1.6	Beam to Exp. (End of Project/Begin Op)	SEP. 99

D. Planning & Procurement Process

1. Planning Process

The Strategic Plan presents the organizational structure, acquisition process and strategies of the SSC Laboratory and also addresses support requirements involving the operation, function and control of of ADP, AOSS, CAD/CAE systems, and communications.

The Short-Range Plan identifies the need, performance data, acquisition cost, maintenance cost, method of acquisition and source of funding for FY91/92 acquisitions from $25K to $1 Million. ITR requirements have been tabulated by each division and are summarized in the following SSCL Summary by Acquisition Strategy and Funding Sources (Table 1).

If funds are not available for proposed acquisitions in a given year, the requirement will be postponed to the following year.

2. Procurement Process

All ADP procurements are approved in accordance with 1360.1A and 1360.2A guidelines. The approved plans will be used to coordinate and approve purchases for the current fiscal year. ADP procurements are currently reviewed by the Deputy Associate Director and Computer Protection Program Manager (CPPM) prior to their acquisition.

ADP over $25K, not covered on an approved plan, and procurements under $100K will be documented with a short memo following 1360.1A guidelines and must be approved by the CPPM. Procurements over $25K will include additional justification, e.g., a complete plan, which must be approved by the SSCL Deputy Associate Director, the CPPM and DOE/Chicago Operations.

In FY90 the Laboratory received approval of the Statement of Strategy which was used as a basis for approving procurements under $25K/system. The Statement of Strategy has been revised as it will be applied in FY91. (See APPENDIX A.)

E. Summary Totals for FY91/92

Table 1 presents a summary of planned acquisitions for FY91 and FY92.

TABLE 1: SSCL SUMMARY TOTALS BY ACQUISITION STRATEGY AND FUNDING SOURCES

Organization		FY91 Acquisition	FY91 Competitive	FY91 Sole Source	FY92 Acquisition	FY92 Competitive	FY92 Sole Source
ASD Totals		$7,758,000	6,273,000	1,485,000	$7,037,000	4,557,000	2,480,000
	Capital	6,167,000	4,712,000	1,455,000	6,787,000	4,307,000	2,480,000
	M&S	1,591,000	1,561,000	30,000	250,000	250,000	
CCD Totals		$215,000	5,000	210,000	$123,000	20,000	103,000
	Capital	168,000		168,000	61,000		61,000
	M&S	47,000	5,000	42,000	62,000	20,000	42,000
LTSD Totals		$7,631,000	5,391,000	2,240,000	$5,409,000	3,209,000	2,200,000
	Capital	3,716,000	2,645,000	1,071,000	3,289,000	2,059,000	1,230,000
	M&S	3,915,000	2,746,000	1,169,000	2,120,000	1,150,000	970,000
MSD Totals		$6,728,000	3,911,000	2,817,000	$4,362,000	2,353,000	2,009,000
	Capital	5,015,000	3,911,000	1,104,000	3,492,000	2,353,000	1,139,000
	M&S	1,713,000		1,713,000	870,000		870,000
PM Office		$90,000		90,000			
	Capital						
	M&S	90,000		90,000			
PRD Totals		$6,929,000	5,610,000	1,319,000	$12,193,000	10,630,000	1,563,000
	Capital	5,208,000	4,475,000	733,000	10,317,000	9,480,000	837,000
	M&S	1,721,000	1,135,000	586,000	1,876,000	1,150,000	726,000
SSCL Totals		$29,351,000	21,190,000	8,161,000	$29,124,000	20,769,000	8,355,000
	Capital	20,274,000	15,743,000	4,531,000	23,946,000	18,199,000	5,747,000
	M&S	9,077,000	5,447,000	3,630,000	5,178,000	2,570,000	2,608,000

II. ITR STRATEGIES

A. Standards

The SSCL General Computing and Design Services Group provides the leadership to define standards for the use, systems management, training and support for all applications. They also critique all acquisitions of ADP hardware and software to determine the suitability of proposed solutions and configurations. This group coordinates the planning process and provides effective consultation in applying ADP to a wide range of work.

B. Software and Applications

Initial procedures for controlling the acquisition, development and use of applications software for administrative data processing have been implemented. Commercial software is acquired for administrative applications whenever possible and enhanced in-house, if necessary, in order to meet requirements or operational procedures. Ad-hoc committees are formed under the leadership of an Associate Director in order to provide a study and develop recommendations for specific applications.

C. Data Administration

No classified data is processed and sensitive unclassified data is identified and controlled under guidelines of DOE Order 1360.2A. System integrity of the PC/workstations is the responsibility of the division associated with the employee accessing data residing on that system. Each user or owner will be made aware of the proper procedures for backing up files and has sufficient access to the backup hardware. Individuals saving data on a PC/workstation are instructed how to secure or lock the data to control access. The sensitive data will not be stored on a distributed file server.

In the distributed environment of the SSC Laboratory several different file and application servers are used. Each server is independently maintained and backed up periodically. Full backups are done weekly while incremental backups are performed as required. In this environment, PC/workstations are configured with sufficient disk capacity to permit local storage of important data files independent of the server. Current weekly image backup tapes are stored in a different building from the server.

D. Support Structure

Software licensing concerns are handled by the technical support representative or consultant to assure that software is registered with the vendor and to coordinate upgrades to maintain licenses. Once the hardware warranty has expired, maintenance becomes the responsibility of the primary user who coordinates these services with the appropriate support representative. The Laboratory Technical Services Division is developing a Laboratory-wide maintenance service using in-house personnel and commercial vendors.

Because it is important to provide an adequate computing capability for the general user community as well as those involved with specific design tasks, the SSCL will take advantage of existing HEP computers and DOE and NSF supercomputer centers available for sharing.

E. Training and Education

On-site and remote training are provided by vendors supplying the systems. A one-year term agreement is being competitively bid for the various system types to include fixed price basic training. Such courses will be offered to appropriate personnel with the coordination of the Computing Services Group. Application-related classes involving highly specific instruction for new products will be held as necessary. An in-house training program has been developed by the Computing Services Group for courses, such as Mac Orientation, Microsoft Word, and Wingz, and will be expanded as the need arises. A Training Room has been equipped with ten Mac computers to provide a hands-on experience for each student.

Information Services Group will sponsor training in highly specialized software courses, such as Powerhouse, and Relational Data Base Management Systems (RDBMS).

F. Technical Assessment

New equipment is usually demonstrated in live vendor presentations arranged to get hands-on experience with different products. These demonstrations are an effective means of assessing the competition and answering technical questions prior to soliciting a bid.

G. Evaluation

All SSCL divisions share a common need to access, analyze and display data from simulations or real measurements. This requires a unified approach to accessing and displaying data to permit tools and information to be shared among the divisions. To meet this goal ADP standards are being established. Current efforts are concentrated on determining market limitations restricting the efforts of SSC physicists and analysts to do productive work along the critical path and bring critical codes/systems to a productive state. A strong capability to support UNIX workstations has been assembled as well. The Laboratory is a member of the Open Software Foundation and participates in its developments.

H. Security

SSCL subscribes to an unclassified computer security program established in accordance with DOE Order 1360.2A. As per this order, a Computer Protection Program Manager (CPPM) has been appointed by the Director of the SSC Laboratory to implement unclassified computer protection policies and procedures. The CPPM is also responsible for developing and reviewing guidelines for ADP planning & acquisition.

Sensitive unclassified data is identified in the application development process. The VAX system processing such data will be subject to review and reevaluated every three years with regard to the sensitivity of the data and the adequacy of the protection devices.

I. Telecommunications and Networking

Communications resources are vital tools for the design, construction and eventual operation of the Laboratory facilities. Resource integration, maintenance, monitoring, operation and emergency planning are critical elements which are being addressed as plans and designs are developed. All elements of communications resources are integrated through the current single management entity, the Communications Group, which will facilitate the construction and operation of the Laboratory's communications systems.

Media management is the most important aspect of communications. Despite the rapid evolution of communications standards and systems, communications media technology has remained stable. Media infrastructures can be specified for the current facilities and prevailing technologies used at the time future facilities are occupied. Because all communications groups are within a common management structure, integration of different communications requirements into common plans will be performed wherever practical. Currently, teams are assembled from the various groups and given the task to develop media specifications and designs for buildings and facilities in their early design phases. These teams will also provide the systems and procedures for managing shared media resources. A media management and integration group may be formed in the future.

The expanding use of telecommunications resources in high energy physics and the energy sciences is expected to continue throughout the lifetime of the SSCL. Accessing data will be important as the operation of the accelerator begins. Even as the design of the detectors begins using simulation programs, communications resources will play a key role in facilitating the effective utilization of computing resources which use networks as a system bus between processor elements and storage devices.

Seamless network communications to all SSCL facilities for all phases of design, construction and operation of the Laboratory will continue. The effectiveness of the existing distributed computing environment is dependent on maintaining a high-performance, flexible network infrastructure. To meet this goal, every office or modular cubicle is wired with jacks for data and telephone. Wiring plants are geographically distributed within the facilities to wiring closets which are then connected via trunk cables (thick-wire Ethernet, fiber and wire-pairs) to a central wiring room. The data closets house multiport transceivers for Ethernet, gateways and star controllers for AppleTalk and distributed terminal servers which provide local access to VAX and other systems at each location.

The LAN wiring arrangement is extendable into each building using a variety of media (twisted-pair wire, microwave, coaxial and fiber optic cable) with sufficient components to establish a LAN link to the SSCL campus in FY91 as well. Every distributed computing element, and all PC/workstations, will be accessible from any SSCL facility, independent of geography.

The distributed computing environment relies on WANs and LANs based on standard protocols. Local computer networking provides the virtual system bus between all resources--from desktop to compute engine--which use the network for the communications path. In such an environment, transport media, interface hardware/software and network management facilities are provided to support all SSCL facilities in all phases of design, construction and operation.

All PC/workstations have access to the Energy Sciences Network (ESnet) which supports TCP/IP and DECnet protocols. The OSI protocol suite will be used by the SSC Laboratory when supported by ESnet. A circuit to UT Dallas is leased for the National Science Foundation (NSFnet) and Texas High Energy (THEnet) access. Five T-1 circuits, with appropriate routing equipment, are maintained by ESnet and provide the majority of our WAN needs.

An important consideration in the near future will be the ongoing migration to GOSIP. SSCL major vendors have assured the Laboratory management that they will be GOSIP-compliant and implement the GOSIP protocol is their offerings.

ACCELERATOR SYSTEMS DIVISION

STRATEGIC PLAN, PART III

AND

FY91/92 SHORT-RANGE PLAN

19 September 1990

Approved by:

Paul Reardon, Acting Associate Director
Accelerator Systems Division

III. ITR Needs for Accelerator Systems Division & Systems Integration Groups

MISSION OBJECTIVES

The Accelerator Design and the Systems Engineering Groups are responsible for the accelerator injector and collider design, commissioning, and operation.

The Collider Group is responsible for the overall requirements of the collider and coordination of the engineering design, systems tests and commissioning effort specific to the collider rings.

The Injector Group is responsible for the overall design and requirements of the injector and coordination of the engineering design, systems tests, construction, and commissioning effort specific to the injector linac and rings.

The Accelerator Physics Group performs analytical and calculational studies for the SSC. The main emphasis is on integration and optimization of the various beam and accelerator parameters throughout the entire chain of accelerators. These studies include considerations of systems and operational issues as derived by working closely with the Collider and the Injector Groups.

The Accelerator Systems Division (ASD) is organized into Engineering Systems Groups. These groups have the responsibility for the design, fabrication, procurement, installation, and assembly of the components and systems that comprise the accelerator chain. See Table 1.

The Program Management Group is responsible for establishing project management interfaces, systems engineering and integration, administrative services, and procurement interfaces for the division. The program management staff will also carry out such functions as QA, reliability, and safety. These programs are presently in support of the needs of both the Systems Integrations Group and the ASD.

The Instrumentation and Diagnostics Group is responsible for instruments that measure beam properties and for using those measurements to perform routine accelerator adjustments. Included is precision timing using low-level RF and synchronization of beam transfers between accelerators. Instruments include beam position, current, profile, and loss monitors. This includes maintaining a unique centralized database of lattice parameters and using computers to simulate operational performance of the various accelerator adjustment algorithms. This group also provides support of workstation computation and computer networking for ASD as a whole.

The Controls Group provides a control system for the entire accelerator train. This system must allow the timely commissioning of the separate machines and the complex, and ultimately be suitable for operating the accelerator as a whole. This group will also make operating control structures available for the surface test, PIF and the linac, for example. This activity will use prototype configurations of hardware and software systems aimed as staging posts for the final integrated accelerator control system.

The Mechanical Engineering Group is responsible for the design, specification, procurement, installation, and checkout of mechanical systems for all of the accelerators from ion source through the collider rings. This includes the mechanical design of all linac components, design of the LEB and MEB conventional magnets, all spool pieces and correction magnets for the HEB and collider rings, support stands for all systems, vacuum pumping systems, installation tooling, and magnet handling equipment. Mechanical engineering and shop support is provided to other laboratory groups

The Cryogenics Engineering Group is responsible for the conceptual design, specification, engineering design, procurement, installation, operation and maintenance of the cryogenic system of the SSC.

The Electrical Engineering Group is responsible for the design, specification, procurement, installation, and initial operation of electrical systems for all of the accelerators from ion source through the collider rings. These electrical systems include main magnet power supplies, correction element power supplies, kicker pulsers, beam line power supplies, and quench protection systems for the superconducting magnets of the HEB and collider rings. Electrical engineering support is also provided to other Laboratory groups.

The RF Engineering Group is responsible for the design, production, installation, test, operation and maintenance of the linac, LEB, MEB, HEB, and collider RF systems. This group works in conjunction with the Injector and Collider Groups to produce RF system performance specifications and milestone schedules. After developing a make-or-buy plan, the group then produces technical specifications for the components needed to deliver highly reliable, easily maintainable and cost effective RF systems that meet the specifications for the equipment to be developed internally.

A. ITR Requirements for ASD

1. Information Systems (IS)

IS CURRENT ENVIRONMENT

The administrative computer needs of ASD are currently handled using Laboratory Technical Services Division computing resources.

IS PLANNED ENVIRONMENT

The IS environment will be supported by LTS as per the LTS Division's future plan.

2. Computing Resources (CR)

2.1 Automated Data Processing (ADP)

ADP CURRENT ENVIRONMENT

ASD and System Integration Groups are responsible for the ongoing SSCL accelerator physics, theoretical and analytical studies of accelerator problems that are both generic and specific to individual accelerators, as well as in the development of new accelerator design proposals. The organizations are responsible for the conceptual design of the accelerators and their subsystems, including requirements definitions, the overall specification, and preliminary engineering design. The ADP equipment in the following table (Table 1) is used to support this work as well as the following sub tasks. ASD undertakes the implementation and fabrication of test subsystem and system components for model and prototype assembly at a level below the final manufacturing prototype stage, together with sufficient development to check all engineering concepts and functional design.

All systems and subsystems tests are also the responsibility of ASD. This primarily involves assembly and operational checkout of integrated assemblies such as the accelerator system string tests, which bring together and test all the different repetitive components of an accelerator in an environment analogous to the final construction environment. Technical integration and interfaces

Table 1

Sl No	System Type	Quantity	System Function
1	Sun 4/370	1	ADUWN Server
2	Sun 4/330	4	ADUWN Auxiliary Server
3	Sun 4/330	1	ADUWN Database Server
4	Sun 4/330	1	ADUWN Database Server
5	Sun 4/330	1	MCAD Auxiliary Server
6	Sun 4/260	1	Diagnostics Server
7	Sun 3/160	1	ADUWN Auxiliary Server
8	Sparcstation 1	16	Scientific Workstations
9	Sparcstation 1+	22	MCAD/Scientific Workstations
10	SparcstationSLC	21	Scientific Workstations
12	Sun 3/110	2	Scientific Workstations
13	Sun 4/110	1	Scientific Workstations
14	Sun 3/50	4	Scientific Workstations
15	Decstation	1	Scientific Workstations
16	HP9000	1	Scientific Workstations
17	NEXT	8	Scientific Workstations
18	HP 345	1	MCAD Workstations
19	Apollo	2	Scientific Workstations
20	Imagen Printer	2	ADUWN Sharable Printer
21	Exabyte Tape Drives	2	ADUWN Sharable Tape Units
22	Network Accelerator	1	ADUWN Protocol Procesor
23	Color Plotter	1	MCAD Plotter

for the accelerators are managed in conjunction with the Project Management Office. This role is carried out primarily by the Injector, Collider Groups, and the Systems Engineering function, who coordinate the oversight of the Conventional Construction Division, the Magnet Systems Division, and the Accelerator Systems Division Engineering Groups for activities directly associated with the accelerator design and construction. Additional interface responsibilities wherein the requirements of the physics program must be integrated into the accelerator design are shared with the Physics Research Division.

ASD has primary responsibility for the design, planning, and systems integration of each of the injector-accelerators (linac, LEB, MEB, HEB, and collider) technical systems. The Magnet Systems Division is responsible for the design and fabrication of the super-conducting dipoles and quadrupoles for the collider and HEB. In order to formulate an R&D plan to support the long-term construction effort, four major milestone activities have been selected for detailed development of specific plans: The string test, Installation of collider first sector major components, Implementation of the linac, and Commissioning of the MEB.

The Accelerator Systems String Test is a ground-level R&D test facility to be located at E1. The initial goal is to test a half-cell of magnets and components, while the long-term goal is to assemble and operate up to 600 m of preproduction components. The Prototype Installation Facility (PIF) is an underground test area used to gain geological information during the conventional construction phase and to prototype and test design features of the tunnel and shafts following beneficial occupancy. The initial goal is to assemble and test a half-cell of magnets and components in this underground area by FY93. Schedules and plans are being developed to support the start of installation of all systems for the first collider sector in FY94. A SEIS Record of Decision is required in FY91 at the latest in order for the refrigerator building and tunnel sections to be available at the required time. The Linac Operation will be the first SSC accelerator operating at the SSC site; quality beams and reliable operation of the linac are necessary for commissioning of all future accelerators and for the final operation of the complex. With the commissioning of the MEB, test beams will become available for detector development and calibration. Development of the HEB will be deferred relative to other activities associated with these milestones. Detailed design will begin as personnel become available from the collider design effort.

ADP PLANNED ENVIRONMENT

General ADP equipment is needed to outfit new staff as they arrive. This equipment will include electronic workstations, microcomputers, simulation systems, general large scale computers, powerful mini-computers and mainframes. ADP equipment in support of cryogenic and mechanical needs includes mechanical and special purpose measurement instrumentation devices. A number of instruments and associated computer aids are required for survey and metrology.

In the Collider area, ADP equipment will be used for acquisition of the test station components including cryogenic storage dewars and magnetic measurement devices in preparation for correction element testing at SSCL.

In the Injector area, ADP equipment will be used to provide computer workstations for additional staff members and to set up the prototype test stands for the linac and RF system. A data retrieval computer has been supplied to TAC in support of the emittance-measuring system.

In the Accelerator Physics area, ADP equipment will be required in support of the Laboratory operation; the R&D effort associated with design leading to construction of the SSC accelerators; the engineering design, test, inspection, and installation of the accelerator technical components; and operation of the various accelerators as they are commissioned and become operational.

In the Controls area, general purpose development computers, peripherals and electronic test equipment will be acquired to support investigations. More general purpose computers, test and development equipment will be acquired. R&D equipment will also be used for prototype systems servicing the string tests at SSCL and Fermilab, linac systems at SSCL and TAC, and cooling systems at SSCL. This equipment will include network systems and real time control computers.

In the Systems Engineering and Integration area, ADP equipment is used to develop SSCL plans, processes, procedures, and specifications. System specifications defining the overall Laboratory, linac, LEB, MEB, HEB, collider, and test beams will be developed on future ADP resources to fully establish the baseline to which design efforts must conform. Integrations sequences for injectors and the first collider sector will be developed with supporting schedules.

2.2 Automated Office Support Systems (AOSS)

AOSS CURRENT ENVIRONMENT

Office automation resources are supported under the direction of Instrumentation & Diagnostics with additional service provided by LTS Division as needed.

AOSS PLANNED ENVIRONMENT

Is specified and procured by Instrumentation & Diagnostics Group supported by LTS as needed.

2.3 Computer Aided Design/Manufacturing (CAD/CAM)

CAD/CAM/CAE CURRENT ENVIRONMENT

The Mechanical Engineering (ME) Group oversees the specification, design and construction of cryogenic systems, superconducting and superconducting correction magnets, normal magnets, RF systems, and installation/alignment systems. UNIX-based workstations and Unigraphics II software are currently being used to meet the CAD/CAE requirements. Computing resources for the Electrical Engineering (EE) involve both ECAD and CAE systems which support the electrical engineering design efforts in the Accelerator Division.

CAD/CAM PLANNED ENVIRONMENT

In the Mechanical Engineering area, CAD equipment will be acquired to outfit a laboratory for the development of system and component designs. CAE workstations, peripheral equipment and software will used by other engineers and designers.

In the Cryogenics Engineering area, computers will be used for control system development, for CAD and for engineering design, and more will be needed. ADP equipment is also being used for the establishment of a laboratory for component testing and for instrumentation development.

In the Electrical Engineering area, CAD, CAE and ECAD workstations will be procured to support the design and implementation of the accelerator system components and systems.

In the RF Engineering area, ADP items are being used to provide computer and CAD/CAE workstations. Further expansion of the RF Group will require additional purchases of both computers and CAD/CAE workstations. Development of the prototype linac RF system and its operation as a test stand for RFQ testing will require the procurement of additional equipment.

3. Telecommunications (TC)

TELECOMMUNICATIONS STRATEGY

ASD is supported by LTS Division in telecommunications resources planning. The aforementioned hardware and software, whether existing or planned for future acquisition, will be integrated into the general Laboratory-wide system supported by LTS. Contents of this plan will provide input to LTS for planning future telecommunications resources.

B. FY91/92 Short-Range Plan for ASD

SHORT-RANGE PLAN

Organizational Function: Accelerator Systems Division

I. TABULATION OF REQUIREMENTS

		FUNDING	FY91	FY92
1.	IS	Operating	$30K	
2.	CR			
	ADP	Capital	4525K	2805K
		Operating	646K	700K
	AOSS	Capital	N/A	N/A
		Operating	N/A	N/A
	CAD/CAE	Capital	2950K	1850K
		Operating	142K	375K
	COMM	Capital	363K	250K
		Operating		

CAPITAL=High Value Capital(>$5K)
OPERATING=M&S (<$5)

II. MINI-ACQUISITION PLAN

Operational Function: Accelerator Systems Division

1. ITR NEED

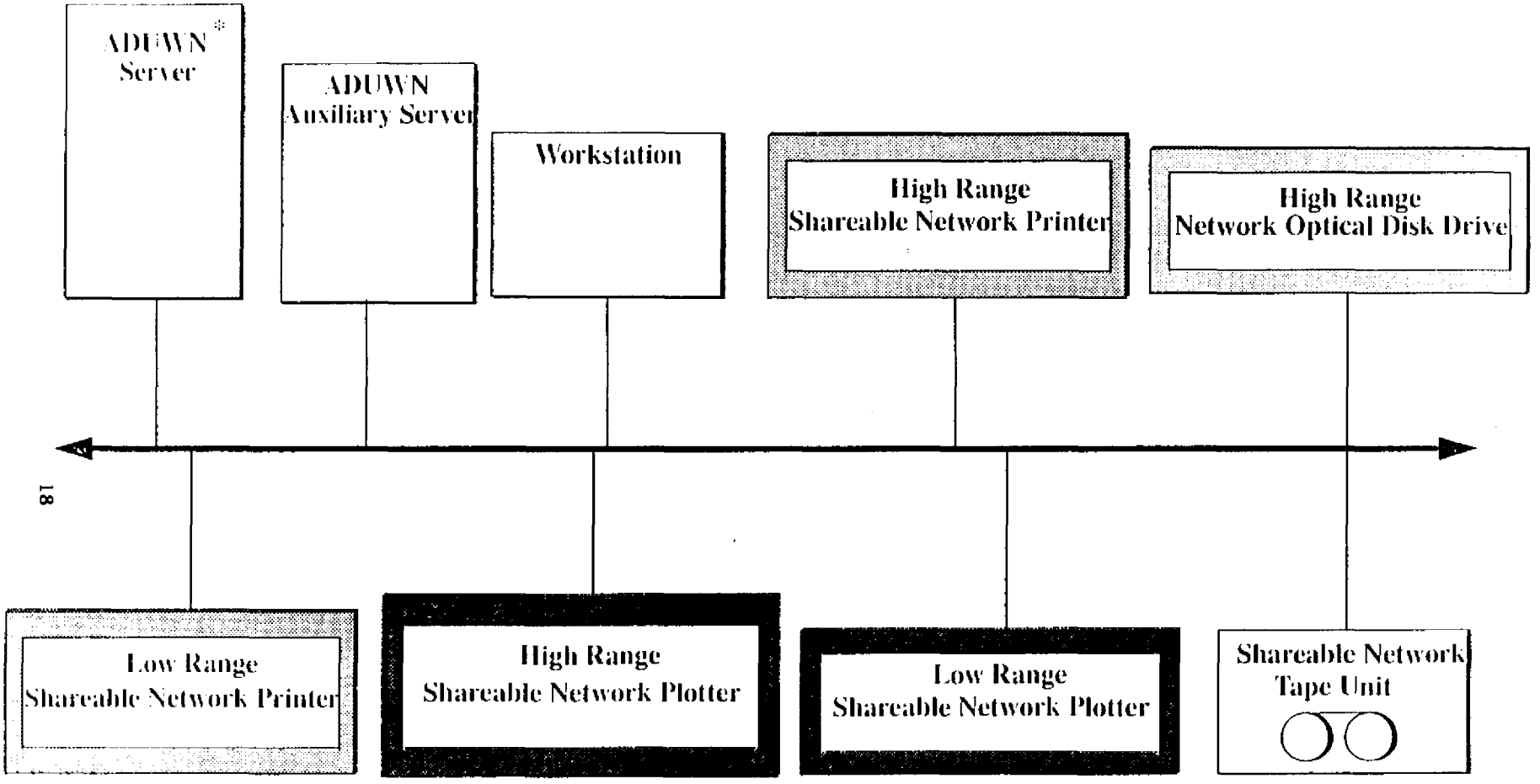
IS

Installation support for the Time Machine project management scheduling software is needed to initiate program usage by ASD. The SSCL Master Schedule currently resides on Time Machine and supplemental copies are available in each Laboratory division. The proposed support will implement a copy of the software which will be used to augment the division's ability to develop an internal schedule for the ASST.

ADP

The Accelerator Systems Division (ASD) Instrumentation and Diagnostics (I&D) Group is responsible for implementation and administration of the division's UNIX Workstation Network (ADUWN) (Figure 2). The ADUWN consists of a cluster made up of a server, auxiliary servers, scientific workstations, CAD workstations and a network accelerator. Various peripherals--which include printers, tape units and color printers--are shared by the ADUWN servers, auxiliary servers and workstations via an Ethernet-based Local Area Network (LAN). The support tasks of the I&D Group involve both hardware and software acquisitions, scientific computing, in-house

Figure 2



* Accelerator Division UNIX Workstations Network

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hardware maintenance, CADD, system usage monitoring, computer networking, network traffic; and system/network security.

A computational server (Figure 3) is needed to meet the demands of the scientists and engineers who develop both vectorized and parallel algorithms and computer simulations. Network file servers, database servers and slave servers are required to meet the requirements of the end-user scientific workstations. One generic database file server and one compute server will be required. In addition, one UNIX file system master server and five UNIX auxiliary slave servers are required. Scientific workstations on hand mainly consist of low-, mid- and high-range UNIX workstations (Figure 4). Those workstations, which feature a rate of 12-25 MIPs, currently serve as workbenches for scientists and engineers. The user will have access through these workstations to the network file servers, computer servers, the simulation processor, Internet and numerous peripherals and software tools on the network.

The Accelerator Systems Division Controls Group computing needs call for workstations to be utilized to develop software for the control system planned for the accelerator systems of the collider (Figure 5). The proposed Controls network will consist of a file server, auxiliary server, real-time systems and scientific workstations. Peripherals will be shared across the network.

The I&D Computer Support Section provides in-house system hardware maintenance for auxiliary servers and workstations. Only major pieces of hardware such as file servers, printers and plotters are placed on maintenance contracts. Maintenance of the workstations is provided by modest over-capacity workstation components like the CPU, hard disks, memory, monitors and power supplies. This spare capacity, about 10% of the workstation capacity, is currently being used as a part of the regular workstation array. In the event of hardware failures, components are transferred from the spare workstations and the malfunctioning part sent in for repair. As the technology advances and faster, more reliable architectures are implemented, the current system implementation should provide migration paths for systems, memory, disks and graphics. The upgrade path should also provide protection of the current investment in system hardware and software.

The existing Hypercube IPSC/860 Simulation Processor currently features 64 nodes. An upgrade is possible, but not likely, in FY92 to add 64 more nodes, thereby expanding the processor to serve 128 nodes. Careful evaluation of the parallel processor needs will be made to determine the adequacy of the present configuration.

Additional peripherals will be acquired for shared access by all of the ADUWN servers, auxiliary servers and workstations via the LAN. Commercial software packages will also be acquired as necessary to support future application needs. Consultants may be contracted as needed to tailor general software packages to SSCL specifications.

CAD/CAM/CAE

The network cluster supporting the Mechanical Engineering Group (ME) will consist of UNIX workstations, a UNIX file and database server and auxiliary servers. Peripheral resources are shared across the network (Figure 6). ME will also need software such as FLUENT, a finite volume NAVIER-STOKES equation/heat transfer solver. This software will be used to analyze complex two and three dimensional fluid flow with heat transfer to understand how fluid transfers heat from the outside of the spool piece to the inside of the cryogenic lines.

The proposed electrical system will support schematic capture, analog and digital simulation, PCB layout and RF design (Figure 7). Peripherals such as plotters and tape drives are provided as shareable network resources.

Figure 3

Accelerator Division UNIX Workstations Network (ADUWN)

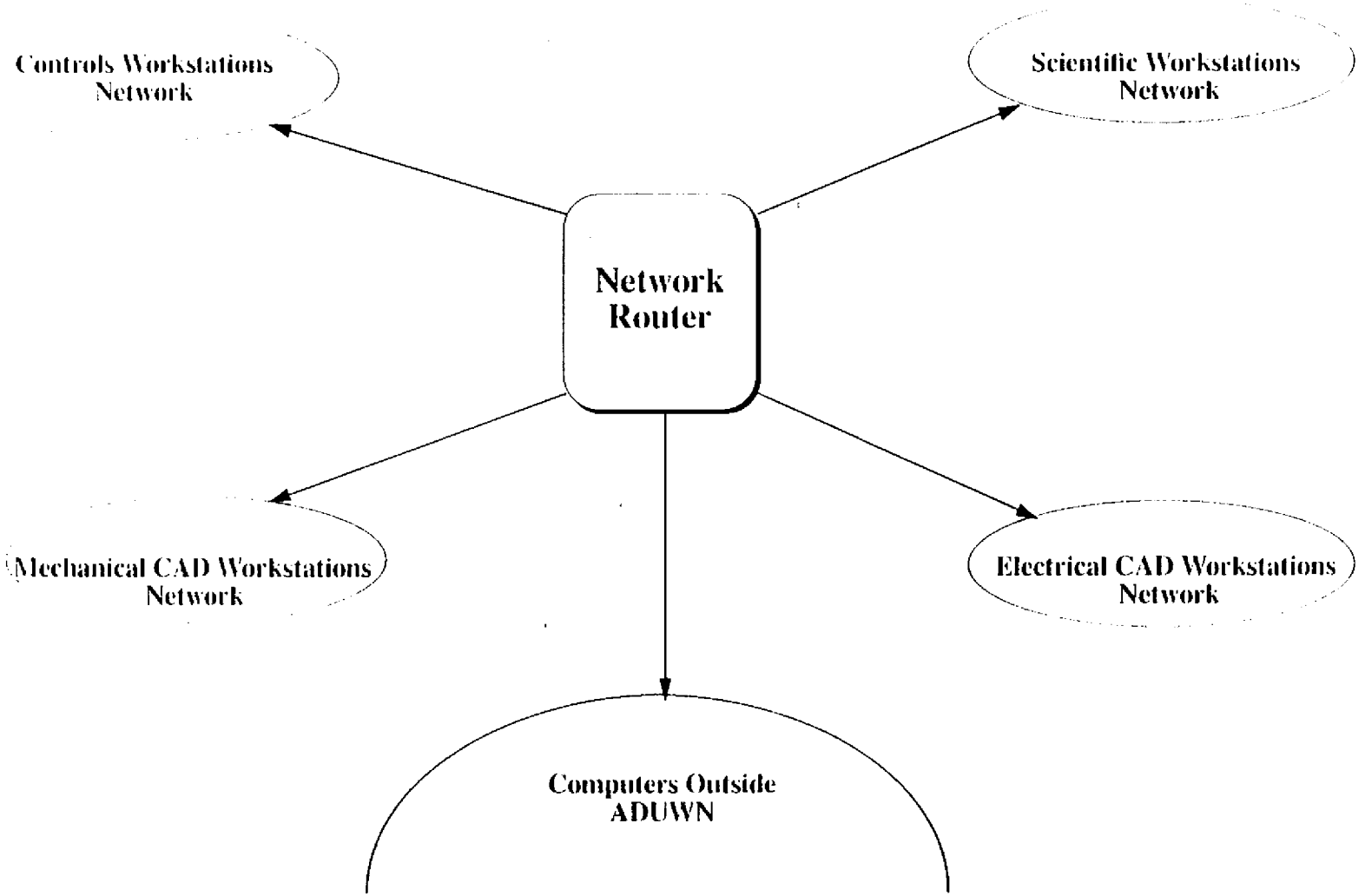

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Figure 4

Scientific Workstations Network Configuration

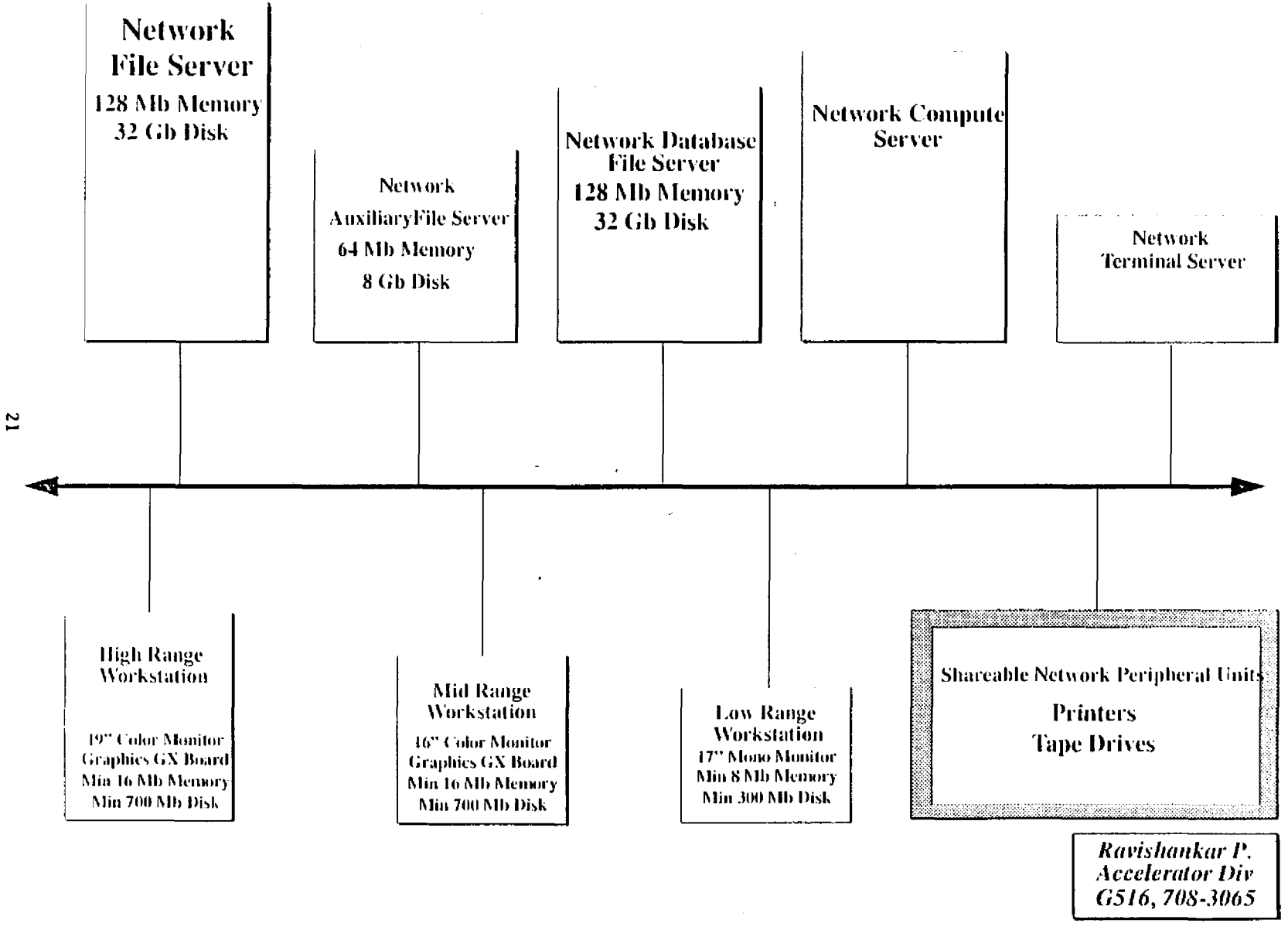

Figure 5
Controls Group Workstations Network Configuration

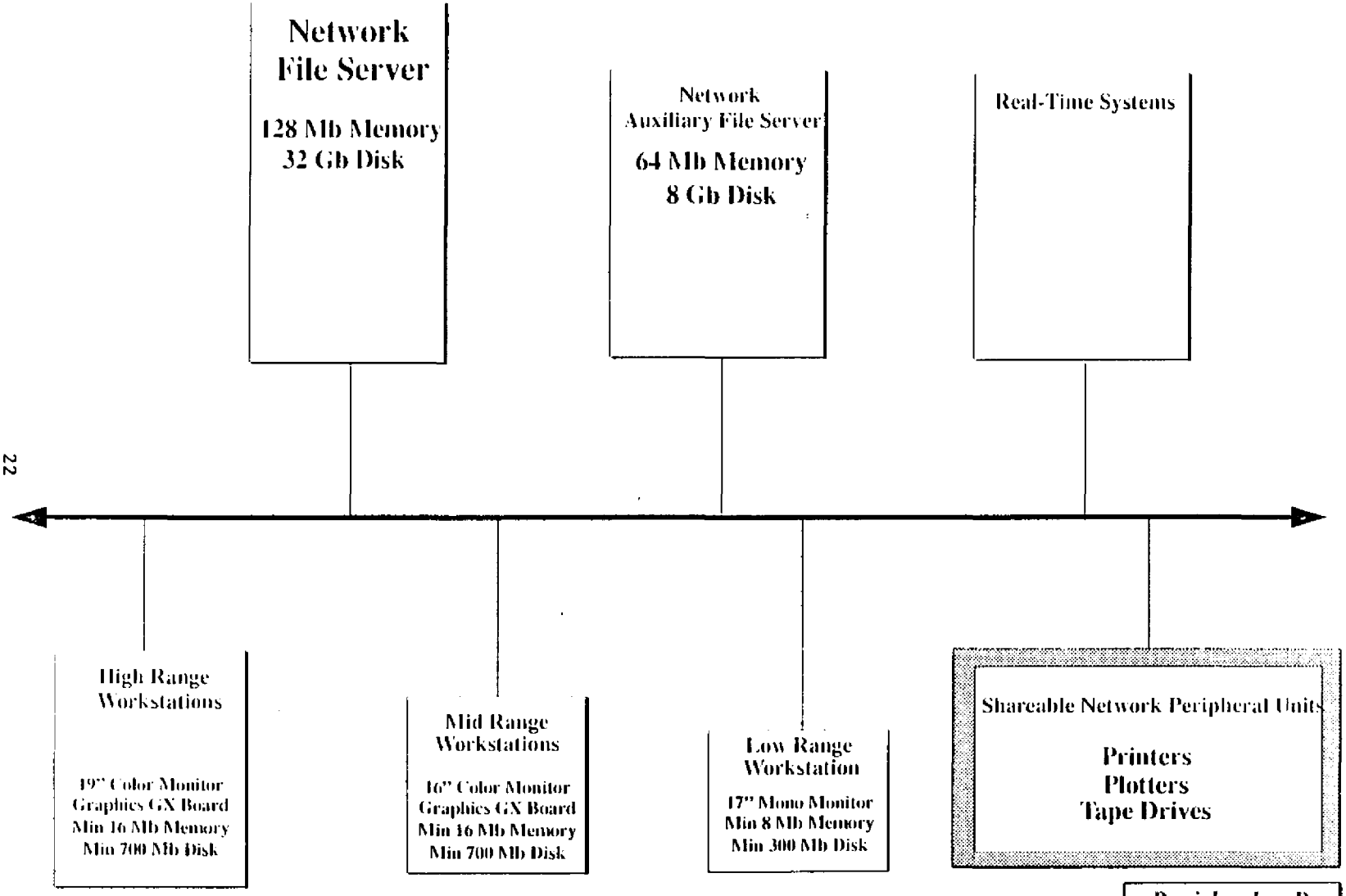

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Figure 6
Mechanical CAD Workstations Network Configuration

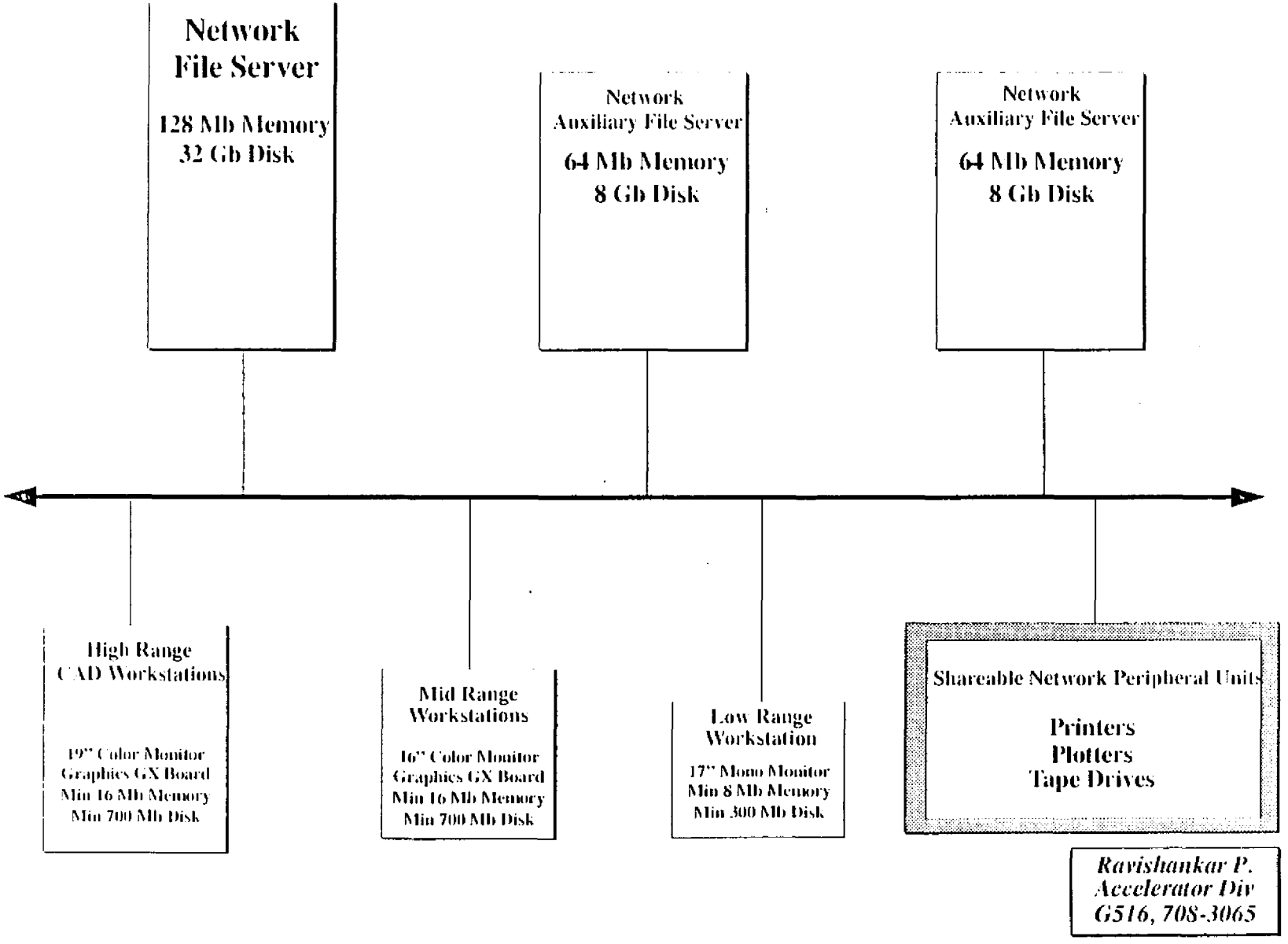
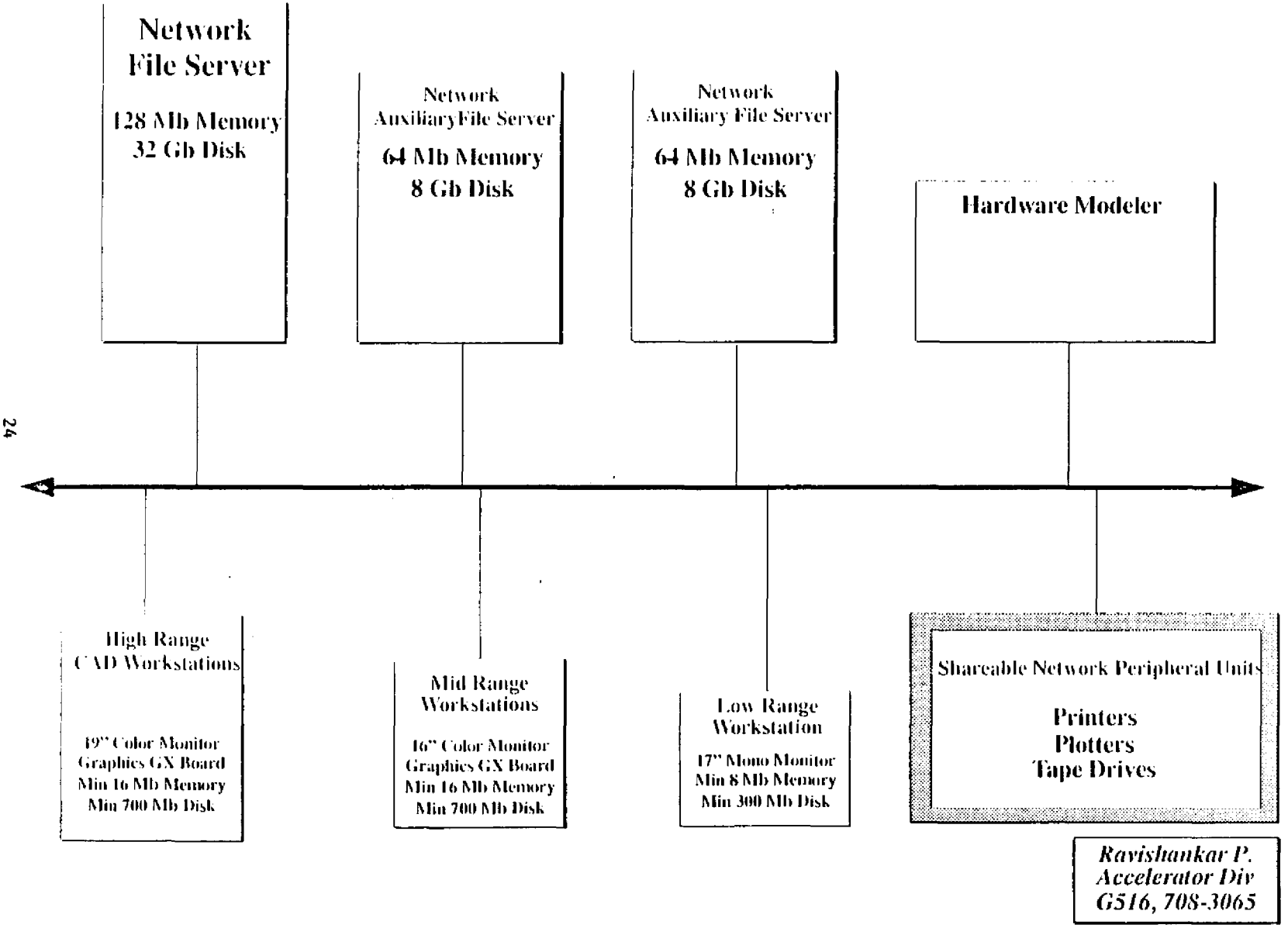


Figure 7
Electrical CAD Workstations Network Configuration



COMM

The workstation environment is supported by the aforementioned LAN which provides access to all local workstations and peripherals as well as remote machines worldwide. The major components of the LAN are routers, transceivers, terminal servers, network monitors and transmission media. Each group of ASD and SI will have its own subnet and communicate with one another and the Laboratory as a whole via routers. Network protocol processors will be installed to improve the performance of various servers and auxiliary servers. A combination of hardware and software tools will be used to monitor and diagnose various network components on the ADUWN. To meet the advanced networking needs, FDDI controllers will be installed on various file servers of the ADUWN. These controllers provide 10 times the band width of Ethernet, more capacity for a more appropriate response time on the network. The ADUWN will also provide access to workstations via modem/terminal-servers which will help users to log into their workstations via telephone lines.

2. ITR Solution

Following is a list of ADP and CAD/CAE computer ware in excess of $25K to be acquired in FY91/92:

Accelerator Systems Division (AS) Requirements	Acq. Cost ($K)	Maint. Cost ($K)	Procure-ment Strategy	Funding FY 1991	WBS No.	Control No.
IS						
Time Machine S/W Support	30K	3K	PR, SS	MS	1.1.8	AS91001
ADP						
Network File & Computational Servers						
UNIX File System Server	150K	12K	PR, SS	CP	4.2.1	AS91002
(3) UNIX Auxiliary Servers	270K	27K	PR, SS	CP	4.2.1	AS91003
Database System Server	150K	12K	PR, SS	CP	4.2.1	AS91004
Networking Hardware	100K	10K	PR, FC	CP	4.2.1	AS91005
Sub Total	670K					
Scientific Workstations						
(50) Low Range Workstations	200K	20K	PR, FC	CP	4.2.1	AS91006
(50) Mid Range Workstations	500K	50K	PR, FC	CP	4.2.1	AS91007
(25) High Range Workstations	350K	35K	PR, FC	CP	4.2.1	AS91008
(125) 700 Mb SCSI Disk Drives	192K	19K	PR, FC	CP	4.2.1	AS91009
Unplanned Workstations	500K	50K	PR, FC	CP	4.2.1	AS91010
Sub Total	1742K					
Hardware Maintenance/Upgrades						
(3) Auxiliary Servers	120K	12K	PR, SS	CP	4.2.1	AS91011
(5) High Range Workstations	100K	10K	PR, FC	CP	4.2.1	AS91012
(5) Mid Range Workstations	75K	8K	PR, FC	CP	4.2.1	AS91013
(6) Low Range Workstations	30K	3K	PR, FC	CP	4.2.1	AS91014
Upgrade Sun 4/370 to Sun 4/490	65K	7K	PR, SS	CP	4.2.1	AS91015
Upgrade Sun 4/260 to Sun 4/470	50K	5K	PR, SS	CP	4.2.1	AS91016
Sub Total	440K					

***KEY:** See Following Page.*

Accelerator Systems Division (AS) Requirements	Acq. Cost ($K)	Maint. Cost ($K)	Procurement Strategy	Funding FY 1991	WBS No.	Control No.
Controls Group						
(20) UNIX Workstations	400K	40K	PR, FC	CP	4.2.1	AS91017
UNIX File System Server	175K	18K	PR, FC	CP	4.2.1	AS91018
(2) UNIX Auxiliary Servers	150K	15K	PR, FC	CP	4.2.1	AS91019
(2) Real Time Systems	200K	20K	PR, FC	CP	4.2.1	AS91020
Sub Total	925K					
Peripherals & Software						
(2) Electrostatic Plotters	80K	8K	PR, FC	CP	4.2.1	AS91021
(3) ImageServer XP	75K	7K	PR, FC	CP	4.2.1	AS91022
Miscellaneous Software	250K	25K	PR, FC	MS	4.2.1	AS91023
Sub Total	405K					
CAD/CAM/CAE						
Mechanical Engineering						
(41) UNIX Workstations	1025K	100K	PR, FC	CP	1.1.8	AS91024
UNIX File System Server	175K	18K	PR, SS	CP	1.1.8	AS91025
(6) UNIX Slave Servers	300K	30K	PR, SS	CP	1.1.8	AS91026
Database System Servers	175K	18K	PR, SS	CP	1.1.8	AS91027
FLUENT Software	31K	31K	PR, FC	MS	1.1.8	AS91028
(60) CAD/CAM/CAE Software	1200K	120K	PR, FC	MS	1.1.8	AS91029
(2) Intergraph CAD Systems	80K	8K	PR, FC	MS	1.1.8	AS91030
Sub Total	2986K					
Electrical Engineering						
(12) High Range UNIX W/K	240K	24K	PR, FC	CP	1.1.8	AS91031
(11) ECAD W/K & Software	660K	66K	PR, FC	CP	1.1.8	AS91032
Hardware Modeler	80K	8K	PR, FC	CP	1.1.8	AS91033
(2) Auxiliary Servers	180K	18K	PR, FC	CP	1.1.8	AS91034
Sub Total	1160K					

KEY: PR = Purchase
L = Lease
SS = Sole Source
FC = Competition
CP = Capital
MS = Operational

Accelerator Systems Division (AS) Requirements	Acq. Cost ($K)	Maint. Cost ($K)	Procurement Strategy	Funding FY 1992	Control No.
Network File & Computational Servers					
Compute Server	125K	15K	PR, FC	CP	AS92035
UNIX File System Server	150K	13K	PR, SS	CP	AS92036
(3) UNIX Auxiliary Servers	270K	27K	PR, SS	CP	AS92037
Database System Server	125K	13K	PR, SS	CP	AS92038
Sub Total	670K				
Scientific Workstations					
(50) Low Range Workstations	200K	20K	PR, FC	CP	AS92039
(75) Mid Range Workstations	750K	75K	PR, FC	CP	AS92040
(25) High Range Workstations	350K	35K	PR, FC	CP	AS92041
(125) 700Mb SCSI Disk Drives	192K	19K	PR, FC	CP	AS92042
Sub Total	1492K				
Hardware Maintenance/Upgrades					
(2) Auxiliary Servers	80K	8K	PR, SS	CP	AS92043
(10) High Range Workstations	200K	20K	PR, SS	CP	AS92044
(10) Mid Range Workstations	150K	15K	PR, SS	CP	AS92045
(6) Low Range Workstations	30K	3K	PR, SS	CP	AS92046
Sub Total	460K				
Controls Group					
(20) UNIX Workstations	400K	40K	PR, FC	CP	AS92047
UNIX Auxiliary Server	75K	8K	PR, FC	CP	AS92048
Real Time System	100K	10K	PR, FC	CP	AS92049
Sub Total	575K				
Simulation Processor					
Upgrade IPSC/860 to 128 Nodes	950K	95K	PR, SS	CP	AS92050
Peripherals & Software					
(2) Electrostatic Plotters	80K	8K	PR, FC	CP	AS92051
(2) ImageServer XP	50K	5K	PR, FC	CP	AS92052
Miscellaneous Software	250K	25K	PR, FC	MS	AS92053
Sub Total	380K				

KEY: PR = Purchase, L = Lease; SS = Sole Source, FC = Competition; CP = Capital, MS = Operational

Accelerator Systems Division (AS) Requirements	Acq. Cost ($K)	Maint. Cost ($K)	Procurement Strategy	Funding FY 1992	Control No.
CAD/CAM/CAE					
Mechanical Engineering					
(9) UNIX Workstations	225K	18K	PR, FC	CP	AS92054
UNIX File System Server	175K	18K	PR, SS	CP	AS92055
(4) UNIX Slave Servers	200K	18K	PR, SS	CP	AS92056
Database System Servers	175K	18K	PR, SS	CP	AS92057
CAD/CAM/CAE Software	200K	18K	PR, FC	CP	AS92058
Intergraph CAD System	40K	18K	PR, FC	CP	AS92059
Sub Total	1015K				
Electrical Engineering					
(8) High Range UNIX W/K	160K	18K	PR, FC	CP	AS92060
(15) ECAD W/K & Software	900K	18K	PR, FC	CP	AS92061
Hardware Modeler	80K	18K	PR, FC	CP	AS92062
UNIX File Server	175K	18K	PR, FC	CP	AS92063
(2) Auxiliary Servers	180K	18K	PR, FC	CP	AS92064
Sub Total	1495K				

KEY: PR = Purchase; L = Lease; SS = Sole Source; FC = Competition; CP = Capital; MS = Operational

3. Excessed ITR

None.

III. LEASE AND SERVICE MAINTENANCE CONTRACTS

Lease and/or service maintenance agreements in effect over $10K include the following:

	FY91	FY92
Sun Server Hardware	60K	36K
Sun Peripheral Hardware	45K	25K
ECAD System Software	175K	200K
Application Software	75K	125K
Unspecified Vendor Maintenance	100K	100K
Database, ANSYS & Other App. S/W Maint.	200K	300K

ADP RESOURCES

CONVENTIONAL CONSTRUCTION DIVISION

STRATEGIC PLAN, PART III

AND

FY91/92 SHORT-RANGE PLAN

19 September 1990

Approved by:

for JAS

James Sanford, Acting Associate Director
Conventional Construction Division

IV. ITR Needs for Conventional Construction Division

MISSION OBJECTIVES

The mission of the Conventional Construction Division (CCD) is to provide the Laboratory technical staff with physics research facilities that meet their technical requirements of experimentation and equipment operation within a planned budget and time frame. (See Figure 1.) The mission encompasses monitoring and managing PB/MK during design and construction phases to ensure the integrity of the delivered facilities. It also encompasses the delivery of a product that is as efficient as possible to operate and to maintain, as well as to upgrade in order to meet future experimentation equipment and needs.

The facilities that are to be designed and constructed will be represented on contract drawings and other documents. The information that is to be contained on the delivered documents will also be represented electronically on the CAD/CAE system. The CAD/CAE electronic representation of the facilities will consist of a full graphical model with all design, construction, operation, maintenance, and enhancement information necessary to operate and maintain the facilities as a state-of-the-art research laboratory. The intelligent information associated with the model will be stored both graphically and textually and will be managed as a relational base of data for the operational design life of the laboratory. The information will be an integration of all of the technical divisions of the laboratory and all of the research equipment used by the divisions as well as all of the conventional facilities that house the equipment.

A. ITR Requirements for CCD

1. Information Systems (IS)

IS CURRENT ENVIRONMENT

Conventional Construction Division (CCD) does not operate a separate Information Systems capability. Laboratory Technical Services (LTS) provides access to those resources via the Laboratory networks.

IS PLANNED ENVIRONMENT

LTS will continue to maintain and operate the IS resources for the SSCL.

2. Computing Resources (CR)

2.1 Automated Data Processing (ADP)

ADP CURRENT ENVIRONMENT

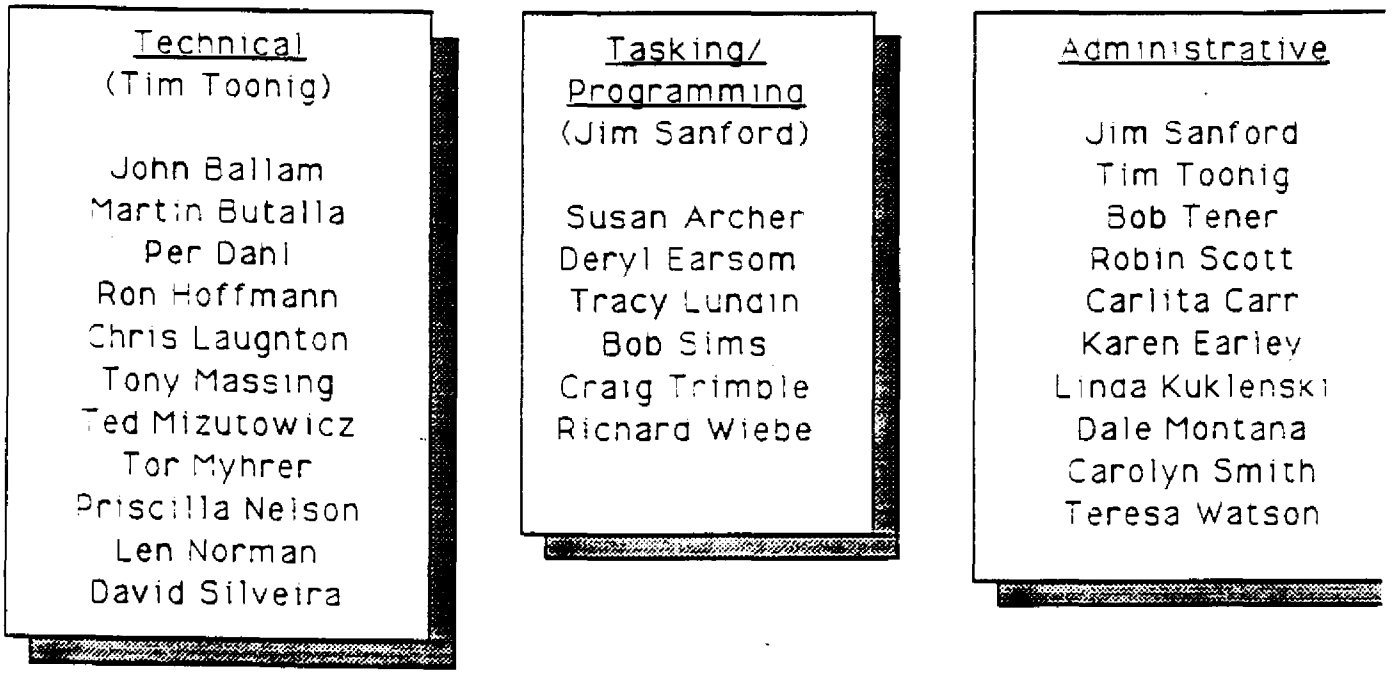
Refer to Laboratory Technical Services Strategic Plan, Part III, ITR Needs.

ADP CURRENT ENVIRONMENT

Refer to the LTS future plans for ADP in their Strategic Plan.

Figure 1

CCD ORGANIZATION



2.2 Automated Office Support Systems (AOSS)

AOSS CURRENT ENVIRONMENT

The Macintosh is the primary personal computer for the everyday CCD administrative activity (Figure 2). IBM-compatibles are also used to support these functions as well as being graphics workstations running Intergraph Microstation. The PC's are interconnected via networking for mail services and interactive communication. Laser printers are also connected to the network in support of daily clerical and administrative functions as well as some elementary graphics plotting.

Current software used on the Macintosh personal computers includes Macdraw, Powerpoint, Macdraft, and Canvas for elementary graphics display and drafting functions; Microsoft Word for word processing functions; Calendar Maker for time management and scheduling functions; and Aldus Pagemaker for desktop publishing. Current software in use on the IBM-compatible personal computers are: Intergraph Microstation for accessing design files within the Intergraph CAD/CAE system; Microsoft Word and Word Perfect for word processing functions; Microsoft Excel and Lotus 123 for spreadsheet applications; Open Plan, Time Line, and Microsoft Project for planning and scheduling functions; Procomm for telecommunications; Maclink for accessing foreign system data files; PCTools, Microsoft Windows, and other utility software for file management and maintenance; ADINA for finite element analysis; and network software for network communications.

AOSS PLANNED ENVIRONMENT

As CCD grows in personnel, everyone will be supplied with their own desktop personal computer. Those involved primarily in administrative, clerical, or project task management functions will be supplied with either Macintosh or IBM-compatible personal computers (Figure 3). Others involved in engineering technical requirements who need to interface with the CAD/CAE arena will be furnished with an IBM-compatible personal computer for their daily administrative functions. Intergraph Microstations will be used as pseudo CAD/CAE workstations for reviewing and accessing graphics design files on IBM-PCs. The PCs will be network-linked for communication between the IBM-compatible and the Macintosh environments. Laser printers will be furnished as required by the workload. Laser plotters will furnish convenient check plot tools on the network.

2.3 Computer Aided Design/Manufacturing (CAD/CAM)

CAD/CAM/CAE CURRENT ENVIRONMENT

Intergraph graphics workstations provide the engineering technical staff access into the graphical design files of PB/MK and the SSCL. The hardware is network-connected via the servers of both PB/MK and the SSCL. Intergraph 6000 series workstations comprise the primary modeling, design and drafting equipment. The IBM-compatible PCs are used for secondary conceptual design and design review workstations with the Intergraph software making them limited graphics workstations. Both the personal computer workstation and the Intergraph 6000 series workstation are available Laboratory-wide. Mass storage for the CAD/CAE facilities electronic model and data are provided by the server(s) hard drives of LTS and PB/MK.

The current software environment in the CAD/CAM/CAE area reflects capabilities of two dimensional drafting and three dimensional designing interactively within the Intergraph IGDS. Drawings are produced through IGDS that support the conceptual design phase of the SSCL facilities. The drawings are relatively unintegrated and are stored and maintained as independent design graphics files. Other software packages include Intergraph INROADS and DEMANDS which support roadway design and drafting functions and design file checking and reviewing functions respectively. Current software also supports mapping and surface layout functions.

Figure 2

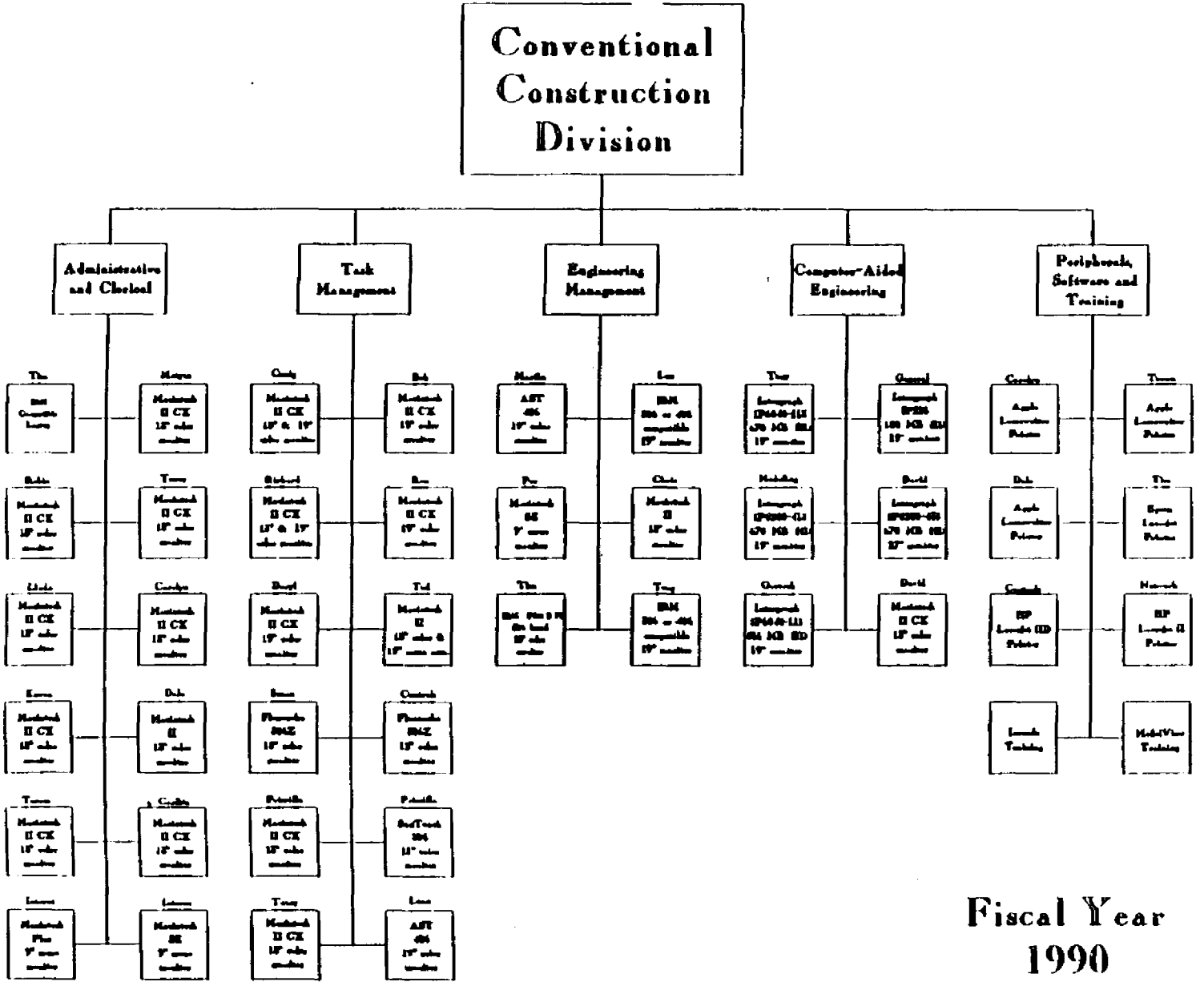
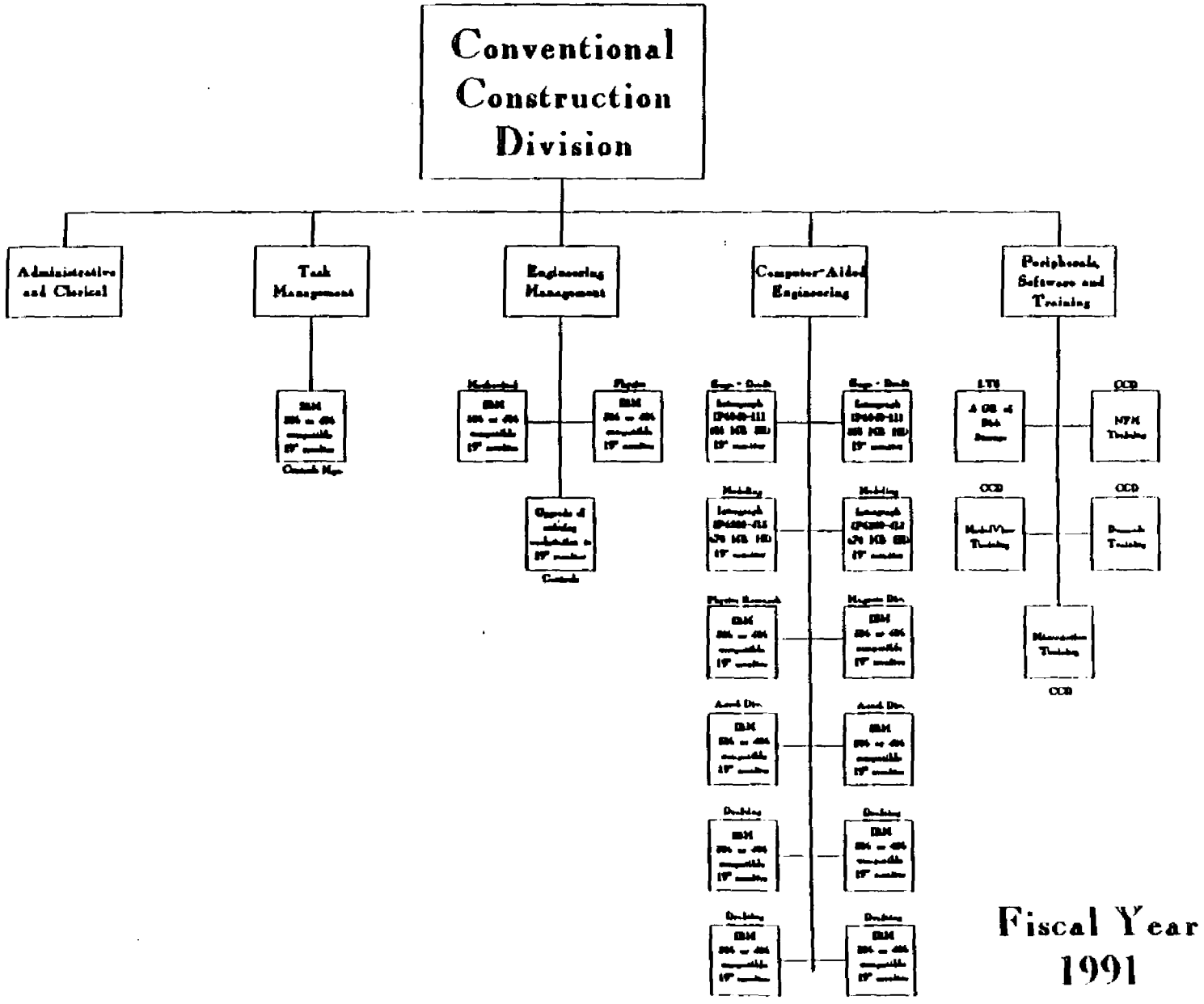

Conventional Construction Division
Administrative and Clerical
Task Management
Engineering Management
Computer-Aided Engineering
Peripherals, Software and Training
Fiscal Year 1990

Figure 3


Conventional Construction Division
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Peripherals, Software and Training
Fiscal Year 1991

CAD/CAM/CAE PLANNED ENVIRONMENT

Intergraph graphics workstations will continue to provide the base-level graphical environment for access to and enhancement of the facilities electronic model and associated base of data. Those involved in operational and maintenance aspects of the SSCL are envisioned to have Intergraph workstations to run the facilities model application. The long range vision encompasses enough mass storage capability to house the entire base of data of the model and associated intelligence within one system of hardware peripherals accessible by every graphics workstation on the network. Graphics workstations will be the operation, maintenance, and modification design and engineering tool enhancing the facilities model for the design life of the SSCL. Every person with a need to access the model will have an individual graphics workstation, with a central pool of graphics workstations and peripherals available as additional resources for future enhancements, training, and public relations (Figure 4).

Planned software includes any necessary for effective use of the facilities electronic model which will be generated by PB/MK during design and construction and subsequently released to the SSCL for use. This will include the Oracle RDBMS and Intergraph modeling packages like Plant Design System and/or Engineering Modeling System. These packages will be integrated for the access of the intelligent data and graphical objects of the facilities model. The CCD and the PB/MK plans, though submitted separately, must be considered integral over the various phases of the SSCL.

3. Telecommunications (TC)

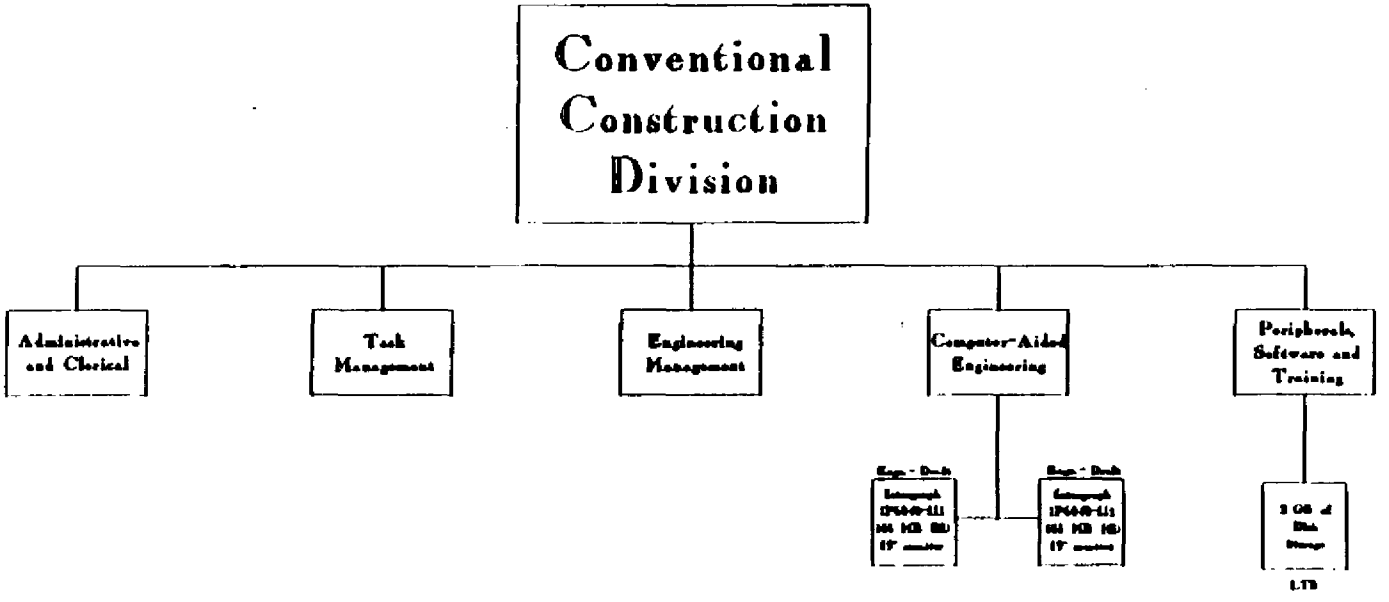
CURRENT TELECOMMUNICATIONS ENVIRONMENT

CCD is supported by LTS in telecommunications resources planning. The aforementioned hardware and software, whether existing or planned for future acquisition, will be integrated into the general Laboratory-wide system supported by LTS. Contents of this plan will provide input to LTS for planning future telecommunications resources.

PLANNED MINOR TELECOMMUNICATIONS SYSTEMS

Future telecommunications hardware and software must support the following level of effort within CCD-PB/MK: High speed telecommunications lines must connect interactively the SSCL with PB/MK's Red Bird mall office and PB/MK's Waxahachie office, both of which are scheduled to be operational simultaneously in FY91. The design files which will be transmitted across the network that connects all three locations are approximately 2 Mbytes each in size. Interactive file referencing will occur at an average rate of 20 to 30 files simultaneously. Envisioned are peaks of 15 Intergraph workstations and 15 personal computers accessing files graphically from the SSCL arena. PB/MK may peak at approximately 24 CAD workstations and over 200 personal computers with about 20% of them acting as graphics workstations.

Figure 4



Fiscal Year 1992

B. FY91/92 Short-Range Plan for CCD

SHORT-RANGE PLAN

Organizational Function: Conventional Construction Division

I. TABULATION OF REQUIREMENTS

1. IS	FUNDING	FY91	FY92
	Operating	$42K	$42K

2. CR	FUNDING	FY91	FY92
ADP	Capital	N/A	N/A
	Operating	N/A	N/A
AOSS	Capital	44K	40K
	Operating	15K	12K
CAD/CAE	Capital	168K	61K
	Operating	53K	42K
COMM	Capital	N/A	N/A
	Operating	N/A	N/A

CAPITAL = High Value Capital (over $5K not including sales tax)
OPERATING = M&S (hardware under $5K and software)

II. MINI-ACQUISITION PLAN

Operational Function: Conventional Construction Division

ITR NEED

CAD/CAE

Since CCD is responsible for the facilities requirements, an accurate as-built electronic facilities model containing all of the intelligence from which the contract documents were generated will be built and maintained during the design and construction phases. The model will transfer to the SSCL facilities management function as an operation and maintenance tool. Building the model during the design phase and incorporating design changes during the construction phase are necessary in order to deliver an accurate representation of the actual facilities.

The CAD/CAE modeling group within CCD are the primary users of the five Intergraph graphics workstations running modeling software and INROADS used for the support of the modeling. In addition to the workstations, personal computers running Intergraph Micro-station software will be used for design review and conceptual design input by those within CCD who are responsible for the technical requirements.

In FY91, additional Intergraph workstations will be acquired to support the increased flow of design information and modeling requirements to be handled by the growing CCD modeling staff.

All CCD technical requirements personnel will have access to the facilities model for design review.

Intergraph workstations as well as personal computer workstations running Intergraph Microstation will be available to other SSCL personnel for design review and design input. An additional 1/2 GByte of mass storage is planned for this year's activity but should be coordinated with LTS's planned system global storage requirements. Six weeks training on modeling software and IGDS will also be necessary.

An additional 2GBytes of mass storage will be required as the electronic model grows, to be coordinated in FY91 with LTS plans for storage requirements Laboratory-wide. Two additional Intergraph workstations will be made available to other SSCL divisions to meet the increased demand of design review and design/construction change-order input from this year onward.

2. ITR Solution

Following is a list of the CAD/CAE hardware in excess of $25K that will be acquired in FY91 and FY92:

Conventional Construction Division (CC) Requirements	Acq. Cost ($K)	Maint. Cost ($K)	Procurement Strategy	Funding FY 1991	WBS No.	Control No.
Intergraph CAD Workstations	168K	21K	PR, SS	CP	2.1.1	CC91001
1/2 Gbyte Disk Storage	5K*	1K	PR, FC	MS	2.1.1	CC91002
Modeling Software	42K	5K	PR, SS	MS	2.1.1	CC91003
Sub Total	215K					

Conventional Construction Division (CC) Requirements	Acq. Cost ($K)	Maint. Cost ($K)	Procurement Strategy	Funding FY 1992	WBS No.	Control No.
Intergraph CAD Workstations	61K	7K	PR, SS	CP		CC92004
2 Gbyte Disk Storage	20K*	4K	PR, FC	MS		CC92005
Utility CAD Software	42K	5K	PR, SS	MS		CC92006
Sub Total	123K					

KEY: * Although less than $25K, this item is provided as input to other plans.

PR = Purchase	SS = Sole Source	CP = Capital
L = Lease	FC = Competition	MS = Operational

3. Excessed ITR

None.

III. LEASE AND SERVICE MAINTENANCE CONTRACTS

Service maintenance agreements in effect are as follows:	FY91	FY92
Intergraph CAD hardware	$21K	$28K

ADP RESOURCES

THE PB/MK TEAM

UNDER THE SUPERVISION OF THE CONVENTIONAL CONSTRUCTION DIVISION

STRATEGIC PLAN, PART III

AND

FY91/92 SHORT-RANGE PLAN

1 November 1990

Approved by:

Paul H. Gilbert, Project Director
The PB/MK Team

III. ITR Needs for PB/MK - SSCL Architect Engineer /Construction Manager

MISSION OBJECTIVES

The mission of the PB/MK team is to manage the design and construction of the conventional facilities and civil works to meet SSCL technical requirements, budget constraints and schedule needs for the SSC while complying with the requisite standards of quality, safety, occupational health, and environmental protection.

Facility design will be produced and documented by Computer Aided Design and Engineering systems (CAD/CAE) which presents the most cost-effective method of design and production while providing full integration of engineering analysis, three-dimensional facility modeling, and attribute data management into a comprehensive facility information system. Costs and schedule will be controlled by an integrated cost and schedule control system which will provide management visibility across every element of the design and construction process. Technical scope will be controlled by established systems engineering techniques including configuration management, interface control, and document control. Each area will be supported by automated data base applications forming a complete project-wide information management solution.

An organization-wide, networked computer system is required to support and integrate the design and management systems and provide the necessary information tracking, distribution, and management. These systems also support office automation applications and the PB/MK Team's internal data processing requirements. The Information system will be linked into the SSCL's network providing on-line access to information and communications.

A. ITR Requirements for PB/MK

1. Information Systems (IS)

IS CURRENT ENVIRONMENT

PB/MK's current environment consists of several Foxpro applications for document control, correspondence control, and administrative functions in stand-alone mode. The PC sub-net is currently being implemented. The backbone to integrating the collection management and distribution of all technical project data will be through the development of information systems which will utilize commercially available software developed into project specific applications.

The primary IS development software will be a project-wide Relational Data Base Management System (RDBMS) operating on data base servers on the network. The primary RDBMS software will use the same operating system as the SSC Laboratory, which is currently undetermined, operating on a VAX and FoxPro running on a subnet in the PC environment. Support application programing software will be used such as C, PRO C, BASIC, and Clipper, as well as indexing and expert system software. Ultimately, all technical information system data bases will be integrated into a distributed system that will include all relevant technical information including images of drawings, technical documents, and associated facility attribute information.

IS PLANNED ENVIRONMENT

PB/MK's planned environment for Information Systems will be a distributed/cooperative processing model with separate data bases existing on three servers: a primary data base server to support RDBMS processing; a PC server for FoxPro application development and administrative data base development; and a CAD server to support graphic attribute processing. All data bases will be accessible through the main server.

Turn-key information handling systems will be used for acquiring third party published technical data. An image-based technical drawing management system will be used to access and manage graphic drawing information. Short term storage will reside on conventional magnetic media at PB/MK. Long term optical storage will be provided by the SSCL via network access to their optical storage devices. Information Systems to be developed for the project include;

Executive Information System (EIS) An on-demand project management application providing current status of schedule, cost, and selected management indicators.

System Engineering Information System (SEIS) Including document control, technical baseline management, configuration management and change control.

Geographic Information System (GIS) A spatial data base of facility related information developed from the CAD model. Applications include a land and mapping information system, utility infrastructure, and facility infrastructure system. The GIS will be used as a graphic interface for other information systems.

Construction Management Information System (CMIS) Computer applications to automate the collection and management of information processed in the field.

Facility Information System (FIS) An electronic representation of the conventional facilities consisting of a full graphical model linked to a component data base. A spatial index to the model will be provided from the GIS application. The information associated with the model will be used to support design and construction of the facilities and turned over to the SSCL for a facility operations and maintenance tool.

2. Computing Resources (CR)

2.1 Automated Data Processing (ADP)

ADP CURRENT ENVIRONMENT

PB/MK's current ADP resources consist of PC-based applications supporting Administration, Procurement and Project Control. Key software applications include in-house developed FoxPro, Open Plan, Micro Text and Lotus programs. Microsoft Word and Word Perfect are used for word processing. Each application will be enhanced for network operations and functionality.

ADP PLANNED ENVIRONMENT

The planned ADP environment will include processor platforms for networking and support MIS applications for administration, procurement and project controls. A VAX 4000/300 server will support the major networking file services and provide the computer processing for VAX-based engineering applications. Administration, Procurement and Project Control will work on a PC sub-net operating on Banyan Vines over a 10baseT Ethernet hosted by a PC network server. Planned applications include:

Administration	Procurement	Project Controls
Accounting	Sub-Contracts Administration	Project Scheduling
Applicant Tracking	Purchase Order System	Cost Estimating
Office Inventory Management	Requisition Control System	Cost Control Engineering
Payroll	SDB Reporting System	
Personnel Data base		
Word Processing		

2.2 Automated Office Support Systems (ADP)

AOSS CURRENT ENVIRONMENT

Office automation systems includes desktop automation tools for the PC and Macintosh systems. Support will be provided for spreadsheet, word processing, desk-top organizers, E-mail, desk-top graphics, and personal file administration. All personal computer systems will permit access to the office automation tools. The PCs will be networked for communications between all systems including the DOS and Macintosh environments.

IBM compatibles are the primary systems in use with several Macintoshes being used by administrative assistants and for graphic applications. Office automation tools are available to all personal computers PB/MK is currently using. IBM compatible systems all operate under a Windows 3.0 environment . All systems are using laser printers for hard-copy output.

Current DOS-based software includes Word (Windows); WordPerfect 5.0 (text processing); Excel, Lotus 123 and WingZ (Spreadsheets); FoxPro (Data Base); Xtalk (Communications); and PC tools, Windows 3.0 and XTREE (File management). Omnipage optical character recognition software is also being used on a HP Scanjet scanner.

Macintosh software includes MS Word (text processing); Excel (Spreadsheets); FoxBase+ (Data Base); Cricket Presents, MacDraw, and Canvas (Graphics); MacLink *Plus* (DOS Connectivity); and Aldus PageMaker (Desktop Publishing).

AOSS PLANNED ENVIRONMENT

The standard networked PC configuration will be an IBM compatible 386SX with a color monitor. Macintosh systems will be used in each division to support much of the graphic production tasks for reports, charts, and provide an interface with the SSCL's electronic distribution of information from their Macintosh systems. Office automation and communication software has been selected to be compatible between the Macintosh and DOS systems. Each system will be connected to the network and will use network versions of software wherever possible. Applications will be developed to streamline repetitive tasks and to standardize formats. A standard project interface will be developed for users to launch into the primary office automation applications.

Printers and other peripherals will reside on the network and will support work groups consisting of approximately four stations. Staff involved primarily in project management, administration, and technical support will have systems at their desks. PCs will also be used as technical workstations for engineering, and will support graphic access to CAD drawings for the engineers.

2.3. Computer Aided Design/Manufacturing (CAD/CAM)

CAD/CAM/CAE CURRENT ENVIRONMENT

PB/MK has no CAD systems presently in-house. Plans are to use CAD for the design and documentation of all design drawings for the project. The primary focus during the selection and implementation of the systems will be the capability of each system for engineering design. During the design process, an electronic model representing the major elements and components of the facilities will be created in a three dimensional data base. Indexed to this model will be attribute data reports for the component data. The model will be kept updated during construction in order to deliver an accurate representation of the actual facilities. The model and the completed attribute data reports will be developed into a Facility Information System that will be transferred to the SSCL CCD division and subsequently to the SSCL Facility Management Division to support operations and facility management.

CAD/CAM/CAE PLANNED ENVIRONMENT

Graphic CAD workstations will be the prime platform for design and engineering applications as well as the primary platform for drawing production. A central CAD server will support the file and software sharing between stations to allow retrieval of background information from other disciplines. Workstations will be located throughout the engineering areas to facilitate direct communications between the CAD operators and engineers. Operators will be assigned based on their engineering discipline experience. A small "drafting pool" will be maintained to cover peak demands from the discipline operators and assist in packaging contract sets. This area will also serve as a central pool of graphics workstations and peripherals that will be made available as additional resources for future enhancements, training, and public relations.

Planned software includes graphic kernel packages upon which design and engineering modules are layered. Specific applications include: Architectural Design; Civil Design; Design Review; Facility Modeling; Geotechnical Design; GIS and Mapping Applications; and Structural Design.

A Relational Data Base Management System (RDBMS) will be provided to support attribute data and parametric design capabilities of the software. These packages will be integrated for the access of the intelligent data and graphical objects of the facilities model. Attribute information will be entered by the engineers from PCs as the relevant data is available and not necessarily when the drawings are created. This package will conform to the as-yet undetermined SSCL RDBMS.

3. Telecommunications (TC)

CURRENT TELECOMMUNICATIONS ENVIRONMENT

PB/MK is implementing a project-wide Local Area Network (LAN) providing distributed applications running in a multi-vendor, multi-protocol environment. The network architecture consists of a Decnet Local Area Network, A TCP/IP CAD sub-network, and a Banyan PC sub-net operating over Ethernet 802.3 10 baseT configured in a star topology. Each employee work-area will be wired with twisted pair cables terminating at a patch panel in the computer room. Any workstation can then be linked to a particular network via a concentrator and jumper cables.

The PB/MK LAN will be integrated into the general SSCL-wide system via a T1 line and Cisco routers. Additional communication capabilities will be provided back to the home offices via 56KB multiplexers and high speed dial-up fractional T1 lines (56KB). When PB/MK relocates to the Waxahachie site, the SSCL will provide communication access through their proposed T3 capability back to the Lab and the local POP in South Dallas. Each system on the LAN will also have modem access through a network modem pool.

Existing data communications systems include the twisted-pair wiring and patch panels installed by the phone company in concert with the telephone installation. Each current employee work area has a RJ45 data connection to access the network. The PC server is on order.

PLANNED MINOR DATA COMMUNICATIONS:

Future telecommunications levels between PB/MK and the SSCL will be required to support transmission of graphic design files across the network. The average file size is approximately 2 Mbytes each, with an average transfer of 20 to 30 files simultaneously. Envisioned are peaks of 15 Intergraph workstations and 15 PCs accessing graphics files from the SSCL and back to PB/MK. PB/MK will have about 24 CAD workstations and more than 200 PCs with about 20 percent of the PCs acting as graphic workstations. Planned minor equipment include a Compaq SystemPro server, concentrator, uninterrupted power supplies, and modems. Other components include Cisco routers, a network analyzer, terminal servers, and the T1 connection to the SSCL.

B. FY91/92 Short-Range Plan for PB/MK

SHORT-RANGE PLAN

Organizational Function: PB/MK - SSCL Architect Engineer /Construction Manager (AE/CM)

I. TABULATION OF REQUIREMENTS:

1. IS *		FUNDING	FY91	FY92
		Operating	$125K	$ 82K

2. CR **		FUNDING	FY91	FY92
	ADP	Capital	330K	81K
		Operating*	86K	30K
	AOSS	Capital	290K	112K
		Operating	616K	188K
	CAD	Capital	555K	270K
		Operating	374K	156K
	COMM	Capital	67K	40K
		Operating	43K	10K

CAPITAL = High Value Capital (over $5K not including sales tax)
OPERATING = M&S (Hardware under $5K and Software)

II. MINI ACQUISITION PLAN

Organizational Function: PB/MK - SSC Architect Engineer /Construction Manager(AE/CM)

ITR NEED

ADP

Information Technology Resources for the PB/MK team is critical to meet design and construction schedules for the SSCL conventional facilities. The SSCL requires electronic deliverables of all technical information including digital model and attribute data of the conventional facilities in an Intergraph format. This Short-Range Plan includes the required equipment and software, in the most cost effective configuration, for PB/MK to manage the design and construction of the conventional facilities and civil works to meet SSCL technical requirements, budget constraints, and schedule needs.

The initial effort in ADP will be to establish the cost scheduling,estimating, and project control applications. Also of first priority will be to implement System Engineering applications. To do this, the master database server shown under ADP must be in place. Of equal importance is finalizing administrative and procurement applications.

CAD/CAM/CAE

This plan represents the first procurement of CAD/CAE for PB/MK. Initial work will include taking the conceptual design files from the SSCL and continue design activities in the E1 (N15) site

area for the MDL, MST, and ASST. Acquisition of mapping and verification of the ISP and survey monumentation require the GIS/Mapping applications to be acquired immediately. The Projection Manager application is the best automated procedure available to do the geodedic transformations between surface and plane coordinate systems. Engineering design software will be used in the design of the aforementioned facilities. This equipment will be used on a two shift basis when peak loads require.

COMM

Fundamental to the integrated systems approach is early establishment of networking resources. The Cisco router will allow the on-line transfer of project data between the SSCL and PB/MK. Two network protocols will be available to use, TCP/IP and DECNET. Communications between PB/MK, their home offices, and sub-consultants will be by the recently available high-speed dial-up lines. Before the only option for 56KB communications has been through the use of expensive lease lines. Fractional T1 dialup gives the same performance on an as-needed basis. The multiplexing equipment along with the modem equipment will allow the use of this technology. The Internet Portal will allow transfer across networks through an intermediate protocol.

2. ITR SOLUTION

Following is a list of equipment and hardware in excess of $25K to be aquired in FY91 and FY92:

Parsons Brinkerhoff & Morrison Knudsen (PB) Requirements	Acq. Cost ($K)	Maint. Cost ($K)	Procurement Strategy	Funding FY 1991	WBS No.	Control No.
Vax Server	250K	–K	LS, FC	CP	2.5.1	PB91001
2.2 GB Disk	47K	–K	LS, FC	CP	2.5.1	PB91002
Sub Total	297K					
CAD Server	55K	4K	LS, FC	CP	2.5.1	PB91003
CAD Workstation	40K	5K	LS, FC	CP	2.5.1	PB91004
Plotters	101K	12K	LS, FC	CP	2.5.1	PB91005
HS Printer	27K	3K	LS, FC	CP	2.5.1	PB91006
Sub Total	223K					
Cisco Router	35K	–K	LS, FC	CP	2.5.1	PB91007
ADP Other (5-25K)	44K	–K	LS, FC	CP	2.5.1	PB91008
AOSS Other (5-25K)	665K	–K	LS, FC	CP	2.5.1	PB91009
CAD/CAM/CAE Other	341K	–K	LS, FC	CP	2.5.1	PB91010
COMM Other	38K	–K	LS, FC	CP	2.5.1	PB91011
Sub Total	1088K					

Parsons Brinkerhoff & Morrison Knudsen (PB) Requirements	Acq. Cost ($K)	Maint. Cost ($K)	Procurement Strategy	Funding FY 1992	WBS No.	Control No.
Disk Storage	48K	–K	LS, FC	CP		PB92012
CAD Workstation	79K	8K	LS, FC	CP		PB92013
Cisco Router	35K	–K	LS, FC	CP		PB92014
Sub Total	162K					

KEY: PR = Purchase LS = Lease FC = Competition SS = Sole Source CP = Capital MS= Operational

3. EXCESSED ITR

None.

III. LEASE AND SERVICE MAINTENANCE CONTRACTS

The following details the lease and maintenance costs of the above equipment. It is PB/MK intention to lease all ITR equipment and purchase all software.

	ACQUISITION COST FY91	ACQUISITION COST FY92	LEASE * COST FY91	LEASE COST FY92	MAINT** COST
ADP	$340.6K	$86.3K	$118.5K	$148.6K	$17.3K
AOSS	665.2K	168.0K	231.5K	290.0K	35.6K
CAD/CAE	563.4K	270.3K	196.1K	290.1K	48.2K
COMM	72.8K	49.1K	25.3K	42.4K	3.2K
	$1,642.0K	$537.7K	$571.4K	$771.1K	$104.3K

* Lease Costs were determined by taking the aquisition cost and multiplying it by a factor of .087 to determine a quarterly lease cost. For purposes of this budget, it was assumed that all equipment for a fiscal year would be procured in the first quarter.

** Maintenance costs apply to FY92 only. Equipment will be under warranty for FY91. For PC's not under warranty for a full year, PB/MK will provide self maintenance.

ADP RESOURCES

LABORATORY TECHNICAL SERVICES DIVISION

STRATEGIC PLAN, PART III

AND

FY91/92 SHORT-RANGE PLAN

19 September 1990

Approved by:

E. Jack Story, Associate Director
Laboratory Technical Services Division

V. ITR Needs for Laboratory Technical Services Division

MISSION OBJECTIVES

The Superconducting Super Collider Laboratory (SSCL) consists of six divisions working together to design and operate a DOE High Energy Physics research facility. The Laboratory Technical Services (LTS) Division provides support services for the SSCL project. This division, like the others, has many complex, interrelated tasks to perform. One element common to all divisions is the need for computing equipment to carry out the SSCL mission. This plan introduces LTS and describes its role in accomplishing the Laboratory's present and future goals as pertains to the global computing environment.

Computing & Communications Organization

LTS provides both user and system level computing and communications support and services to the SSCL. Due to the diverse nature of the Laboratory's computing and communications needs, LTS has established five separate groups to concentrate efforts in these areas. Collectively, they support the general purpose computing, design/drafting and networking needs of the Laboratory. This work includes acquisition, development and implementation hardware and software, as well as documentation, training and communications. Although they are separate in function, they share a common mission to support the SSCL. And while they have independent objectives, they work interdependently to achieve as much value-added integration as possible. By meeting these objectives, LTS assists in providing major resource optimization benefits essential to planning and control functions throughout the Laboratory. The five groups are as follows:

1. Computing Services - The efforts of Computing Services (CS) are primarily concentrated in Information Systems (IS) and Automated Office Support Systems (AOSS). Since both areas are quite large in scope, Computing Services divides its resources to support four projects. Each project area has individual mission objectives which, when combined, form the mission objectives for the total group. The project areas and individual objectives are described as follows:

- User Services - The mandate of User Services is to furnish support for the various and dynamic needs of computer users throughout the Laboratory. This involves coordinating the multifarious human and computer resources available to the SSCL in order to provide reliable competent service and contact points for computing support.

- Computer Training - The goal of Computer Training is to promote the human/computer interface at the Laboratory. Through both formal classes and one-on-one tutoring sessions, all SSCL personnel will have the opportunity to become readily productive in using both their ADP and AOSS computer systems.

- Technical Support - The Technical Support section is charged with providing general consulting, systems analysis, configuration guidance, software specifications and development, procurement, and implementation support Laboratory-wide.

- ADP Planning - The ADP Planning section provides guidance and direction in the development of documentation such as acquisition proposals, strategic plans, computer security, and both short-range and long-range plans in the support of acquiring computer hardware and software resources and services. Its basic mission is to provide central leadership for the development of planning that identifies all levels of need for computer resources.

By promoting effective IS and AOSS services at the SSCL, Computing Services is--and will continue to be--the focal point for optimizing the Lab's computing resources to support the majority of computer users at the Laboratory.

2. Information Services - Information Services distributes its resources into MIS Support and MIS Analysis functions. As with Computing Services, both project areas have individual mission objectives, which combine to form the overall mission objective for Information Services.

- MIS Support - The MIS Support section seeks to provide management with the necessary business and scientific information to efficiently operate the Laboratory. To facilitate this, programmatic support for various MIS operations is the primary focus of this project sphere. This includes the maintenance of existing applications, as well as new system development.

- MIS Analysis - The primary goal of MIS Analysis is to develop long-range strategy whereby an integrated array of management information systems can be implemented at the Lab. By implementing a Centralized/Integrated Information Repository, redundancy will be reduced, data integrity raised and resource management optimized. Tangible benefits include lower computing costs and labor requirements, improved efficiency and configuration control.

By combining these two separate objectives, the mission of Information Services translates to providing start-up, interim, and long-term MIS solutions, services, and support to the Laboratory.

3. Computer Operations - Computer Operations provides the operations and system management of the SSCL computing and networking environment. This includes multiple operating systems, local and wide-area networks, and support of a diverse global user community of scientists and administrative personnel.

Computer Operations installs, operates, and maintains computing resources throughout the SSC Laboratory for all local personnel, the detector collaborations, and other physicists and engineers. These resources feature many of the programming tools and the networking support required for interaction with the High Energy Physics research laboratories throughout the U.S. and Europe.

The primary goal of Computer Operations is to provide a consistent and reliable computing and networking environment for the SSCL user community by meeting the following objectives:

- Develop policies and procedures to insure a productive environment for users.
- Evaluate and analyze computer resource utilization and capacity planning.
- Use software tools to provide consistency for users between various operating systems.
- Implement system-level security practices and plan for disaster recovery.
- Centralize administration for consistent user interfaces and improved quality of operation.

4. Project Design Support - The efforts of Project Design Support are primarily concentrated in the areas of Computer-Aided Design/Engineering (CAD/CAE) which include the following activities:

- General planning and operational support for all CAD/CAE activity at the Laboratory.
- Services for LTS and other organizations not having established design/drawing staffs.
- Engineering drawing reproduction services for all SSCL organizations.
- Management of the central technical document and database storage facility.

The overall objective of the Project Design Support Group is to provide high-quality, cost-effective design/drafting services to all in-house customers. Working in a distributed environment, this organization has the charter to provide operational and user support on an as-needed/as-requested basis and provide centralized services that reduce costs, improve performance, maintain continuity, and guarantee quality of operation.

5. Communication Services - Communications Services implements, operates and maintains electronic communications for the SSCL. Their mission is to ensure a consistent, reliable communications environment for the user community using a variety of communications media which provide connectivity both locally and worldwide. One of the primary goals is to apply communications as a tool to help facilitate the construction of the SSCL accelerator and support the operation of the SSCL scientific program.

The scope of the services provided by this group encompasses the following project areas which provide the systems and support for a wide range of communications disciplines.

- Administration - Administration develops policies and procedures, budgets, plans, and coordinates support efforts.
- Telecommunications (Voice) - Telecommunications provides the system management of all telephone-related systems for all Laboratory buildings and facilities.
- Networking - Networking provides computer networking systems and services for the SSCL which include all LAN/WAN connectivity.
- Video Services - Video Services provides audio/visual, video teleconferencing, technical video taping/editing equipment and services, and photography support of the Laboratory.
- Radio Engineering - Radio Engineering manages all RF communications systems including radio paging/dispatching, repeaters, safety communications, CATV and microwave.

Each area shares a common management and administrative support structure. In its management role, Communications Services is positioned to effectively integrate communications technologies, share resources, lower costs and reduce duplication of effort.

6. Engineering - Engineering Services is divided into two primary groups, Engineering Standards and Engineering Support, which interface to and establish standards for MIS, CAD/CAE systems, documentation, property control, configuration management and networks. The following objectives have been established for the Engineering Services:

- Support the Project Management Office and selected laboratory divisions by providing engineering specialists to set engineering standards in all disciplines as required.
- Assist Program Management in the preparation of policies, functional procedures, standards and methods to be used in the development of the Laboratory.
- Assist all groups in the interpretation and implementation of SSC Laboratory, DOE, OSHA and other design specifications and/or requirements.

The scope of Engineering Standards, which is a project management function supported by LTS, encompasses engineering design, drafting, workmanship, fabrication, testing and maintainability of final products. Before becoming Laboratory policy, standards and procedures in these areas are reviewed and approved by Engineering Standards. Engineering Support provides engineering design support to the Accelerator and Physics Research divisions with technical direction taken from the divisions' management.

A. ITR Requirements for LTS

1. Information Systems (IS)

IS CURRENT ENVIRONMENT

The Information Systems (IS) environment satisfies SSCL needs for developing design criteria of computing systems, networks, applications software and databases which augment access, analysis and formatting of management data. It also provides project schedules, budgets and status of costs data required by DOE regulations. Policies and procedures have been created to implement IS support and systems and user level documentation to describe the capabilities and supplement access to management-related data from local systems. Integration of IS systems to automate and support project management objectives is the key element guiding the design of computing and communications resources. Criteria is being established to identify commercially available IS applications software which will be maintained by in-house programmers.

Specifications will be developed to identify interface criteria for representative databases to ensure continuity for interchanging data between MIS applications. Guidelines governing modification of software will be developed to ensure standard software will run on standard hardware configurations for access from all Laboratory work areas over the network.

IS PLANNED ENVIRONMENT

An IS strategic plan has been prepared to facilitate the development and implementation of computing and communications resources by giving project personnel access to management data for monitoring the project and reporting performance findings.

The current IS environment includes software resources which will be evaluated as part of a plan to develop resources for the long term. The ultimate goal of the IS must be to achieve as much value-added integration as possible using flexible, scaleable, highly productive, easy to use commercial tools. These tools, in conjunction with well designed business procedures, will allow the SSCL to develop a comprehensive system.

A major goal to be accomplished in the immediate future includes acquisition of Procurement, Finance, Human Resources and Payroll software packages to implement the first phase of the MIS Strategic Plan developed in FY90. There will need to be a tie-in to the training program to address commercial MIS and other software applications.

2. Computing Resources (CR)

2.1 Automated Data Processing (ADP)

ADP CURRENT ENVIRONMENT

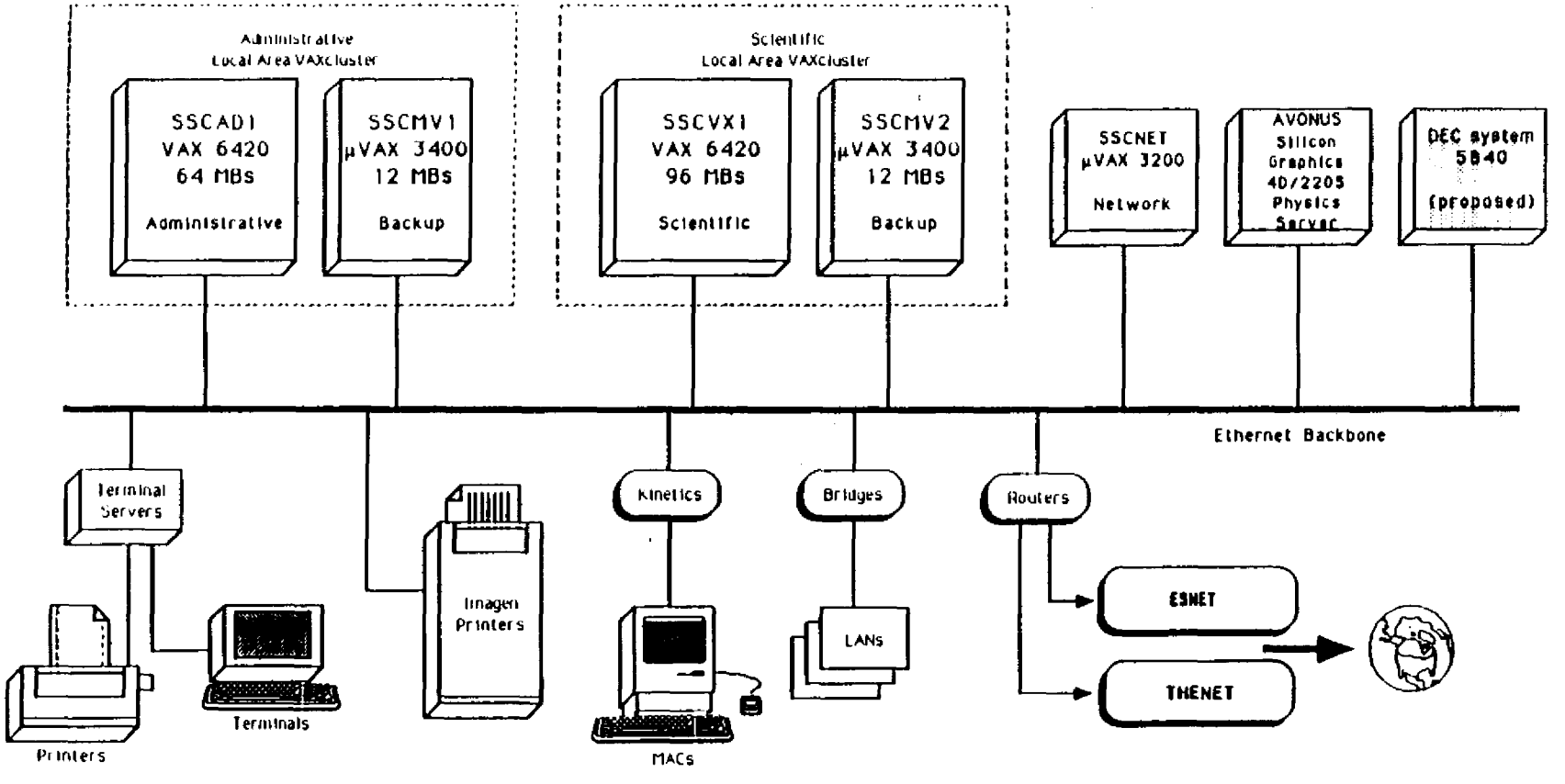
The current SSCL computing environment supports a multi-vendor, networked computing environment which includes two VAX 6420s, two VAX 3400s, a Silicon Graphics server, SUN/4 servers, Macs and IBM PCs (Figure 1). The VAXs are configured as two local area VAXclusters. One VAXcluster serves the general scientific needs of the laboratory and the other VAXcluster serves as the Administrative system (Figure 2). Each VAXcluster includes one VAX 6420 and one VAXserver 3400. The 3400 series systems are both configured with 8mm tape subsystems to support backups and CDrom systems for software distribution. The Administrative 3400 also supports an optical disk subsystem for additional archival needs.

A distributed network of ADP hardware and software provides access to these central computing resources and services as necessary to support this environment. In addition to centralized facilities, the computing strategy has been to implement a distributed environment of workstations.

Figure 1

SUPERCONDUCTING SUPER COLLIDER
COMPUTING RESOURCES

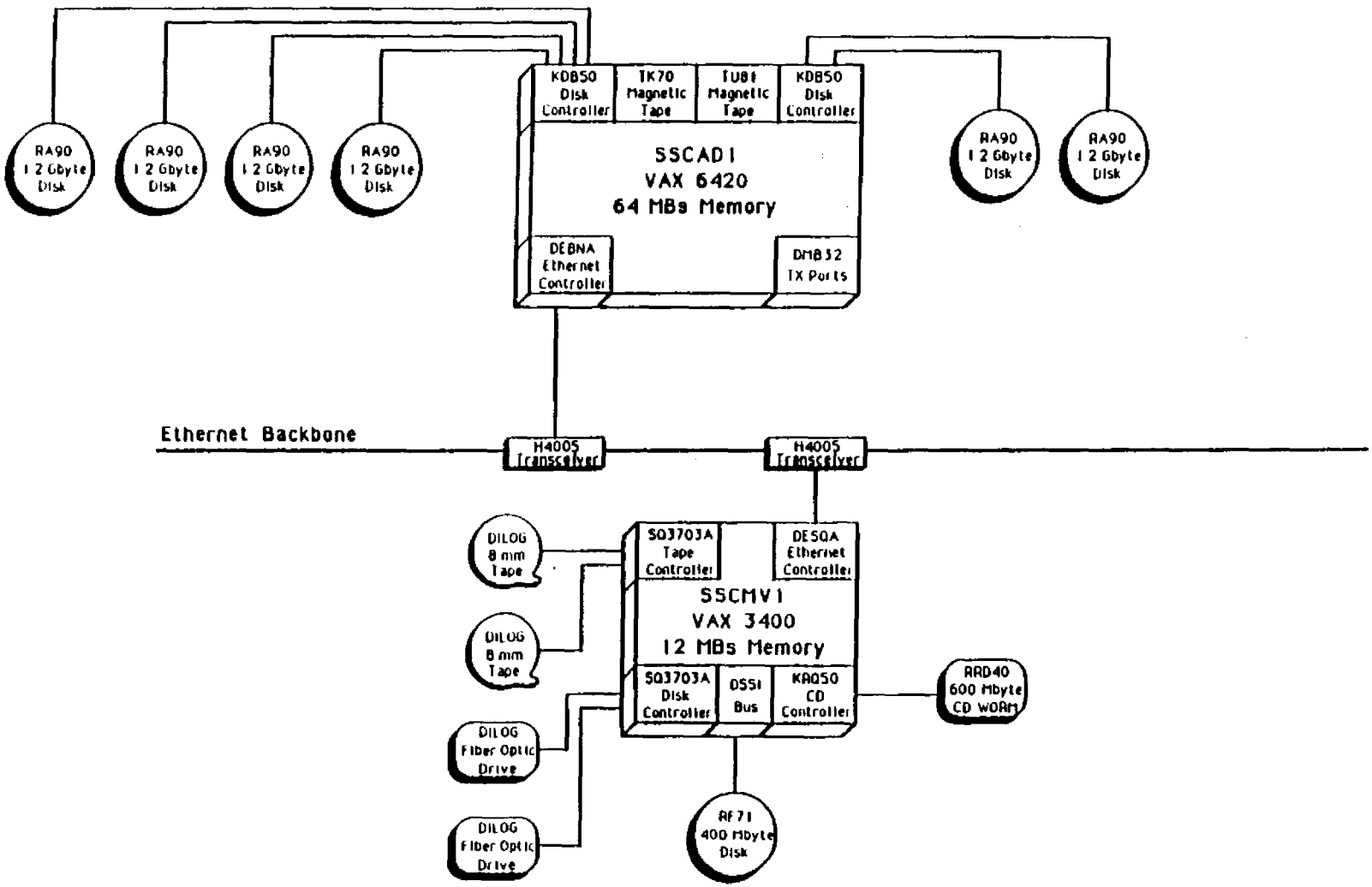
FY90 - FY91



Dave Somogyi
August 1990

Figure 2

SSC Administrative VAXcluster Configuration



Dave Somogyi
August 1990

The Laboratory is migrating towards seamless integration of a wide range of computing resources from personal computers to mainframe computer systems. LTS will serve as the focal point for the design and implementation of integrated computing resources to all divisions of the Laboratory.

ADP PLANNED ENVIRONMENT

Currently available technology provides the means for an efficient distributed computing environment. This environment will provide the means for satisfying SSCL and DOE requirements by developing design criteria for computing systems, networks, applications software and databases. These resources augment access, analysis and formatting of management data creating policies and procedures regarding support activities, and provide systems and user level documentation which describe computing capabilities and supplement access to management-related data from local systems. This support is designed to facilitate the development and implementation of SSCL computing and communications resources by giving project personnel access to data for monitoring the project and reporting findings regarding performance.

The distributed computing environment will also provide the mechanism for determining costs associated with computing during the development and construction of the Laboratory. The current strategy is to eventually implement fully integrated systems for the following areas:

- Business/Administrative Support
- Detector/Experiments Design & Simulation
- Accelerator Design & Simulation
- General Purpose Engineering Development
- Scientific Computing Utilities
- CAD/CAE/CAM
- Databases
- File Service & Archiving
- Network Services (LAN, WAN)
- Print Services
- Plotting Services
- Telecommunications
- Software Development
- Commercial Software
- Maintenance
- Training

Future hardware and software criteria will be influenced by existing resources acquired during start up of the SSCL. Subsequent systems will include as part of their implementation, plans for integrating existing resources and criteria for data access. The primary architecture will be clusters of workstations integrated across a LAN having access to various software applications. Included in this network will be a matrix of compute engines providing access to very high-end computer power. Each cluster will consist of workstations and a server. Standard commercial software will be used to avoid duplication of effort and provide complete system and user level documentation.

The rapid growth of the Laboratory is reflected in the growth of the user community, the computing resources and the complexity of the network. Most tasks, such as implementing the 4000 MIPs computing resource and tertiary storage system or the UNIX server for general computing, are driven by user needs. DOE orders dictate the need for other resources such as secured off-site storage of weekly image backups for all supported systems. Other significant planned acquisitions include upgrades of the VAX 6420's to VAX 6460's and the purchase of a VAX 9000 series computer to be added to the existing Administrative VAX cluster.

2.2 Automated Office Support Systems (AOSS)

AOSS CURRENT ENVIRONMENT

Support personnel use several types of word processors, personal computers and microcomputers for scientific and management work. Many useful applications have been developed on specific systems in order to optimize productivity and minimize the effort required to support these systems. An evaluation process is performed to define the requirements, balance them against available resources and assign priorities according to overall need.

A typical timesharing system is made accessible to cognizant SSCL personnel to ensure optimal productivity. Distributed computing begins with PCs and workstations on the desk of each scientist, engineer and administrator. It is made successful by maintaining a "rich" networking environment by defining standards for networked applications and opening sufficient applications gateways. By exploiting the flexibility of the LANs and WANs with the appropriate hardware and software, a wide range of computer resources are supported for compute-intensive tasks.

The Macintosh is the primary desktop system used at the SSCL. Among the many functions it provides, such as spreadsheet and graphics applications, word processing is the most visible. Terminal emulation programs provide access to the VAX and other mainframe systems available on the WAN. Centralized Mac services, such as file and Email servers, network modems and network services (AppleTalk for distributed LAN services), exist in most SSCL groups. IBM personal computers and IBM compatible PCs are used primarily to support special scientific and engineering functions such as fluid dynamics modeling, CAD/CAE, project management and inventory control. PC system central services are provided via an Ethernet LAN linked to a dedicated server which supplies file service, modem pooling and shared printing capabilities.

AOSS PLANNED ENVIRONMENT

The SSCL computing strategy is to implement a distributed environment of computers supported by local and wide area networks. This environment is essential for providing the responsiveness necessary for optimum productivity of personnel, and brings the computing power to the user where it is needed. Distributed computing begins on the desk of the individual scientist, engineer, or administrator, thus there is an emphasis on personal computers and workstations which represent a class of computers with a wide range of capabilities.

By investing large amounts of money in personal computers and workstations, the SSCL has set a precedent supporting distributed processing. By employing relatively cheap computing power at the desktop, computing demands on large, expensive, centralized processors is decreased. Some computing resources are still best maintained as centralized systems. The most effective use of a distributed computing environment is to exploit distributed and centralized resources utilizing the best resource for a particular task. As the degree of system interaction increases, the complexity also increases. Heterogeneous hardware platforms, operating systems, networking protocols and applications software tend to create confusion for the user as well as the system integrator.

2.3 Computer Aided Design/Manufacturing (CAD/CAM)

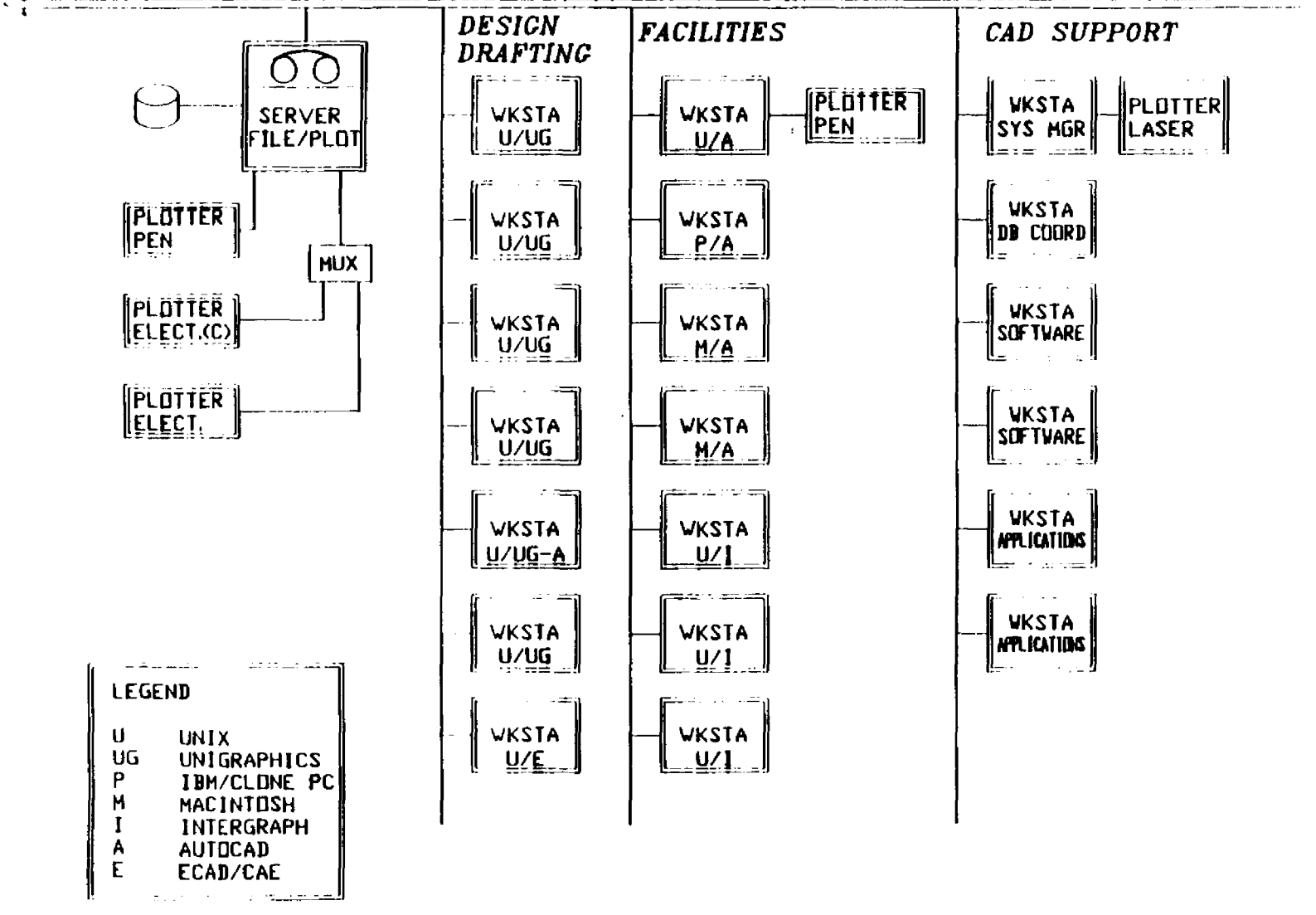
CAD/CAM/CAE CURRENT ENVIRONMENT

The resources needed to meet the requirements for Computer-Aided Design involve three separate activities: Architectural (CAD), Mechanical (CAM), and Electrical (CAE). The Project Design Support organization has addressed these activities by developing a software specification to establish a Laboratory software standard. Architectural and mechanical software standards have been set as Intergraph and Unigraphics II, respectively. A specification is currently being prepared in order to enter into a competitive evaluation of ECAD systems for electrical engineering activities.

The CAD/CAM/CAE configuration developed over the past year consists of equipment as diverse as an Intergraph file/plot server, UNIX and Macintosh based workstations and miscellaneous plotters (Figure 3). This equipment serves the design/drafting and file maintenance needs for systems in the LTS, Accelerator, Conventional Construction and Physics Research divisions as well as Laboratory-wide CAD support. It also provides a gateway into the Laboratory for data arriving from the Architectural Engineering/Construction Management (AE/CM) organization.

Figure 3

LTS CAD NETWORK
FY-90



CAD/CAM/CAE PLANNED ENVIRONMENT

The SSCL and LTS technical data management and design support requirements will drive the expansion and upgrading of the existing system. Plans call for two file/plot servers to be used to provide CAD data storage and backup services for LTS, Conventional Construction and Physics Research divisions and to drive centrally located output devices (Figure 4). The CAD support workstations will be used for user applications, software development, training, database integrity, data translation, and system operations support. Facilities workstations will be used by personnel in the Facilities Engineering and Project Design Support Groups of LTS who are responsible for the engineering, maintenance, and documentation of existing and future plant facilities.

Design/Drafting workstations will be used to support LTS and organizations without their own staffs, as well as overflow work from the technical design divisions. This effort will continue to grow as facilities are built and accepted for beneficial occupancy. The Technical Database Storage and Management System will be used as a central controlling and archiving system for the entire SSCL technical design database. It is expected to have relational database management software and sufficient expandable storage space to handle approximately 2.3 TBytes of data. It will continue to be expanded over the life of the project. Output printers and plotters will be acquired as needed.

3. Telecommunications (TC)

MAJOR ACCOMPLISHMENTS OF FY90

As part of its support effort, Communications Services has facilitated temporary communications needs of the SSCL and established video teleconferencing facilities. This group has also provided specifications and design of communications systems for the master campus and planned radio services at the master campus. In the interim, they have also maintained temporary voice communications in use at the existing Stoneridge facilities.

In the near future, Communications Services will also establish communications services to East IR experimental area; facilitate installation a of PBX system at the master campus; and establish communications operations on the master campus for message centers, Help Desks, telephone operations, radio dispatching and emergency communications.

RECONCILIATION TO FY90 PLAN

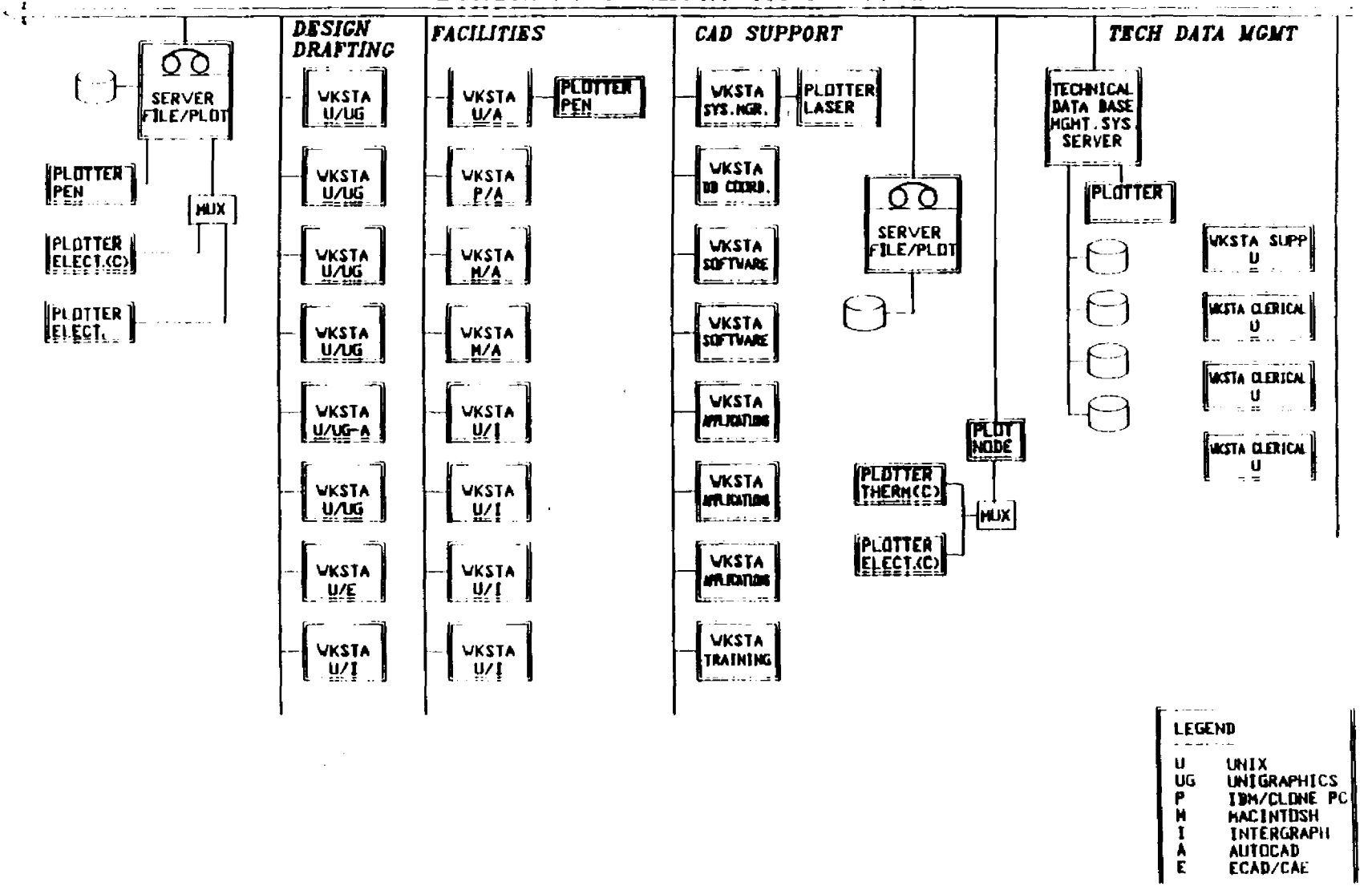
There is no FY90 plan to reconcile.

EXISTING TELECOMMUNICATIONS SYSTEMS

An aggressive networking plan is being followed which supports existing networks (DECnet, NSFnet, BITnet, MFEnet) to maintain communications with the High Energy Physics community. Because of the diversity of protocols represented (TCP/IP, DECnet, MFEnet and RSCS), multiple connections have been maintained to foster communications with universities involved in HEP, DOE laboratories and NSF-funded supercomputer centers. Each of these Wide-Area Networks (WAN) offer different accesses, protocols, and topologies. The following WANs are used to communicate with other HEP facilities: BITnet (Research), ESnet (Energy Science), THEnet (Texas High Education), HEPnet (High Energy Physics) and Internet. Most of the WAN services are provided by the ESnet which support the TCP/IP and DECnet and use the OSI/GOSIP protocol suite. Internet is a collection of networks including NSFnet and regional university and military networks (e.g., Defense Data Network).

Figure 4

LTS CAD NETWORK
FY--90 THRU FY--92



These efforts involve a diverse assemblage of protocols, media, and standards. The design of the current Local Area Network (LAN) promotes transparent communications between distributed PCs and workstations at all SSCL facilities. The LAN backbone is provided by a campus-wide Ethernet which uses twisted-pair wire for individual drops to offices, Ethernet coax distribution within buildings and fiber optics between buildings. The flexible, high level LAN infrastructure provides flexible local access with connections to a high-speed Ethernet backbone. Local Ethernet segments are geographically distributed and traffic is isolated from the backbone with Ethernet bridges. A higher speed backbone can be installed if needed by using Fiber Optic cable and FDDI. Fiber Optic cable is installed between each building; the topology is designed to use FDDI when requirements exceed the capacity of a single Ethernet backbone. Some point-to-point Fiber Optic connections support direct workstation-to-server connections as well as future high speed network systems and protocols (Figures 5 and 6 attached).

Network traffic is localized by using bridges to isolate geographically logical sub-networks. Wide Area Network (WAN) connectivity is provided by ESnet, which has installed four T-1 circuits to support our external networking needs.

The SSCL currently operates four types of voice communication systems--System 75 Generic 1 (400 stations at Beckleymeade); System 75 EPN (400 stations at Autobahn); System 75 XE (100 stations at North Hampton); and Centrex (30 stations at Executive Way)--which are leased on a month-to-month basis. A number of Southwestern Bell Telephone lines are used for power failure stations, for fax line communications and one for the warehouse location on Parkerville Road.

PLANNED MINOR TELECOMMUNICATIONS SYSTEMS

Administration will direct the design and operation of all communications systems and resources for the Laboratory. They will facilitate the integration of communications resources in order to reduce the project's communications costs by eliminating redundancy.

Telecommunications will provide the systems management of all telephone-related systems by compiling requirements and developing specifications, and by installing and maintaining systems. They will also provide the telephone switchboard, Help Desk operations and radio dispatching. They will operate and maintain a temporary leased PBX system used at the Dallas Stoneridge facility until a system can be acquired for installation in Ellis County in the permanent facilities.

Network Services will maintain data communications networking services for the SSCL to include network design and specifications for the Stoneridge facility and other Ellis County facilities. This group will establish LANs and moving WAN communication capabilities to the main campus. LANs provide the virtual system bus between all resources, from desk tops to compute engines which will be used both locally (on site) and remotely (off site) by scientists and engineers for the development and operation of the SSCL. SSCL-specific international or domestic links may be needed to support design elements of accelerator and detector components. Most of the WAN services are provided by T-1 circuits of the Energy Sciences Network (ESnet) which supports the TCP/IP and DECnet. The network will use the OSI/GOSIP protocol suite when it is supported on ESnet. Future WAN access technology includes T-3 connectivity on a network backbone with corresponding increased speed in tail circuits. Plans call for upgrading the NSFnet to T-1 for the universities. 100 Kb/sec is needed immediately for the users of workstations.

An additional T-1 connection to the universities' ESnet is planned by April 1992 (Figure 7). In addition, upgrades to the tail circuits will enable a fractional T-1 capability to exist by October, 1991. Networking support will also be provided for the Physics Research 4000 MIPS detector simulation computing resource and the Accelerator Systems Hypercube computing resource.

Figure 5

SSC Network as of 8-14-90

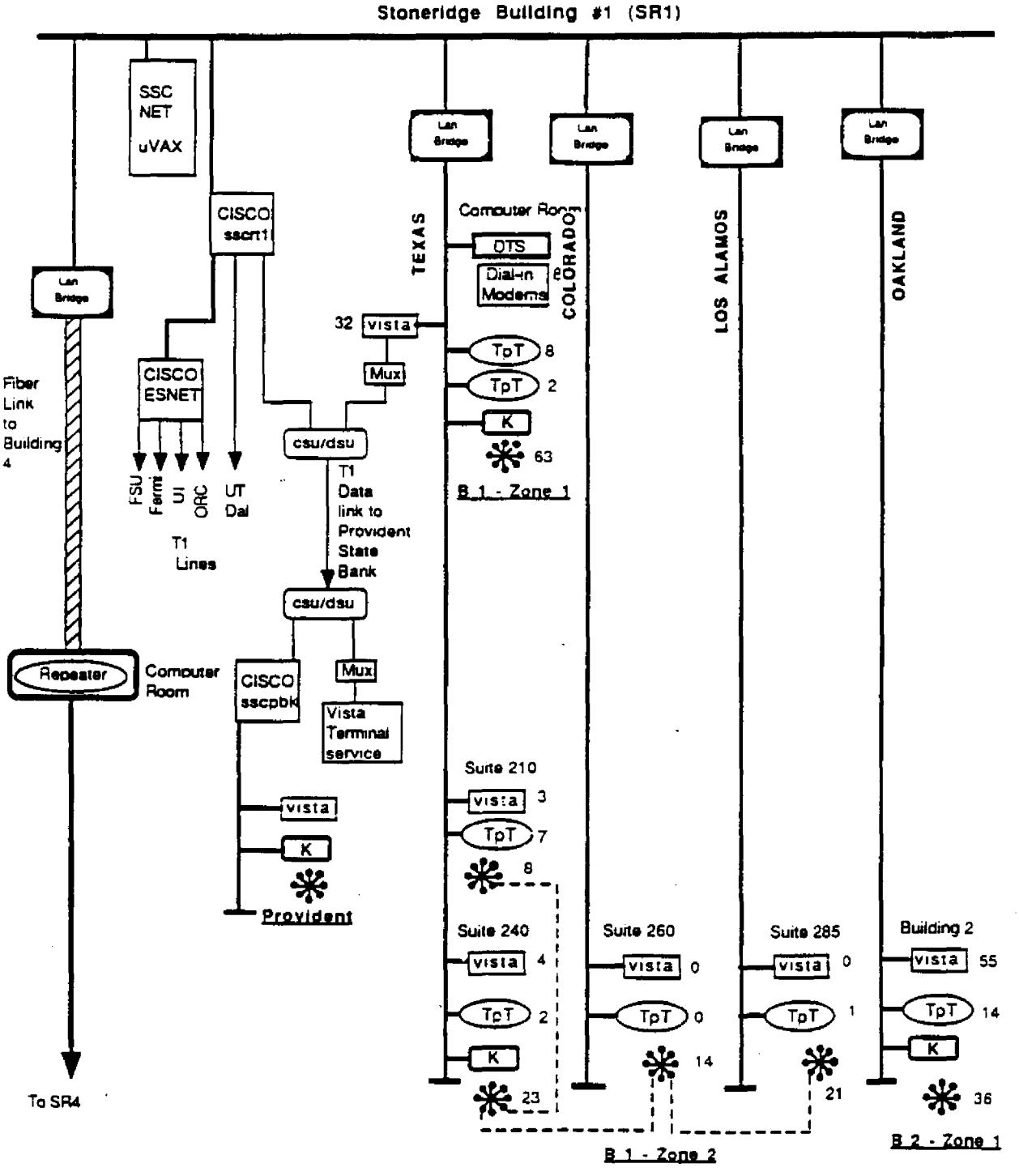


Figure 6

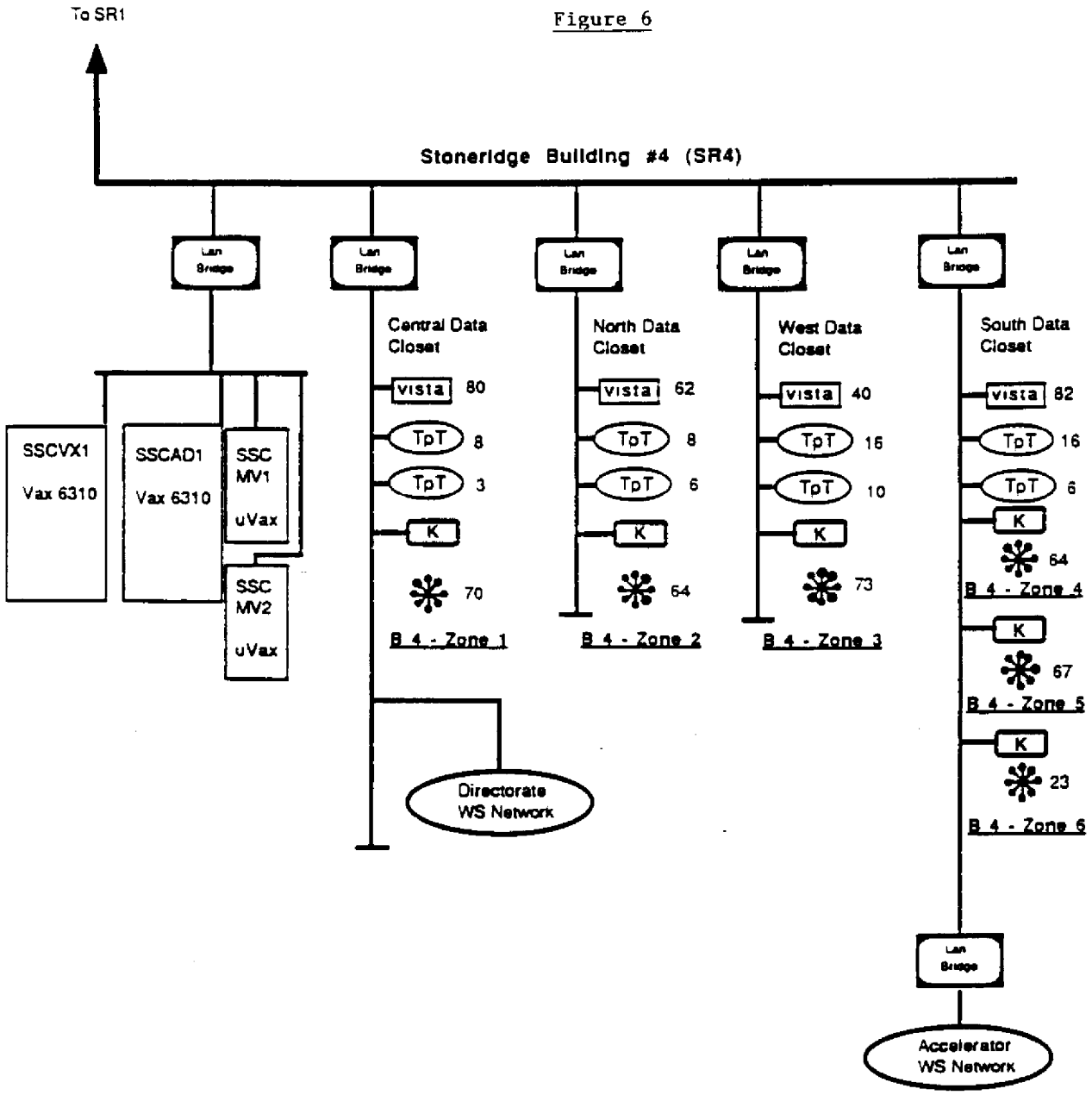
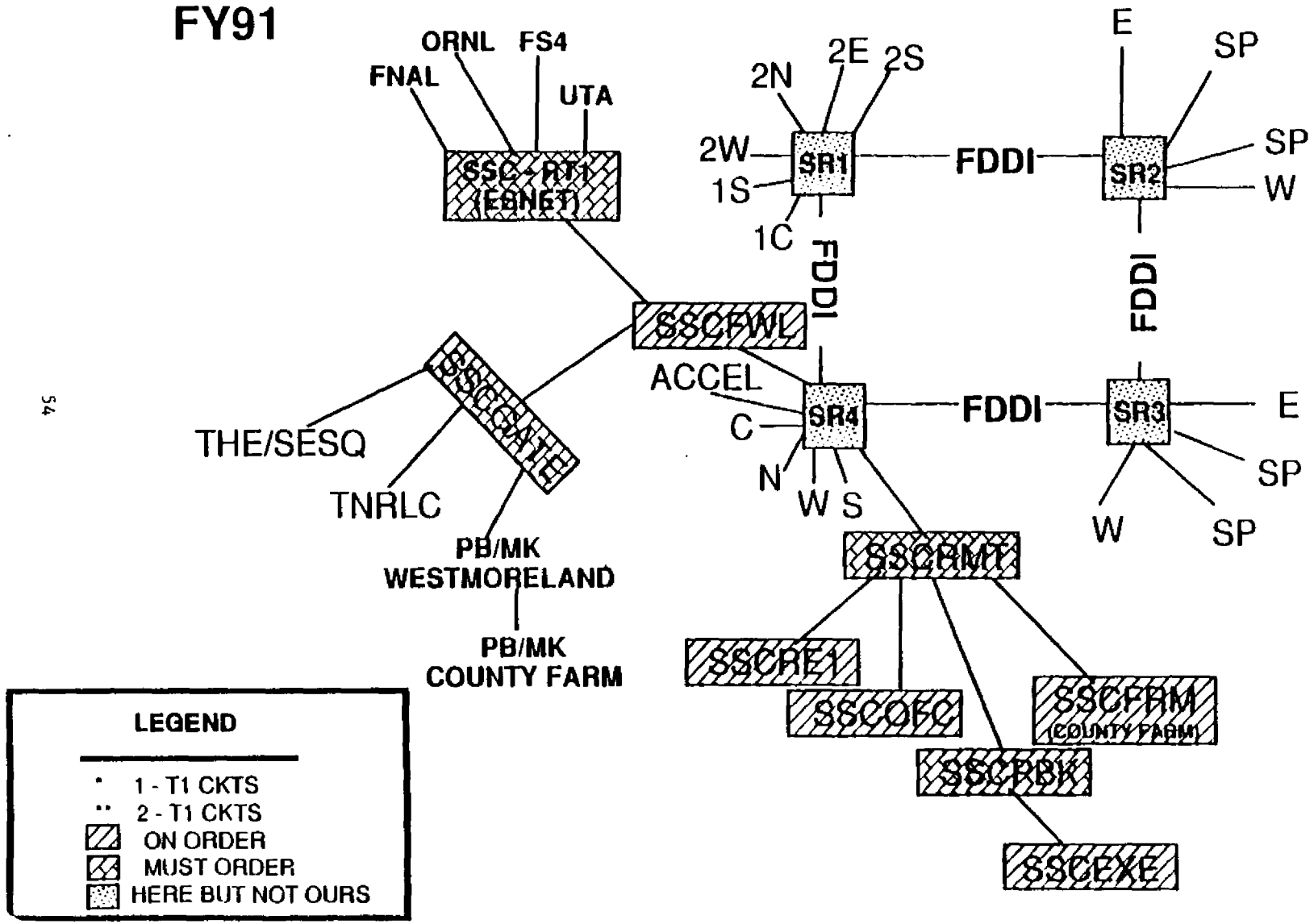

To SR1
Stoneridge Building #4 (SR4)
Lan Bridge
Lan Bridge
Lan Bridge
Lan Bridge
Lan Bridge
SSCVX1
Vax 6310
SSCAD1
Vax 6310
SSC MV1
uVax
SSC MV2
uVax
Central Data Closet
vista 80
TpT 8
TpT 3
K
70
B 4 - Zone 1
North Data Closet
vista 62
TpT 8
TpT 6
K
64
B 4 - Zone 2
West Data Closet
vista 40
TpT 16
TpT 10
K
73
B 4 - Zone 3
South Data Closet
vista 82
TpT 16
TpT 6
K
64
B 4 - Zone 4
K
67
B 4 - Zone 5
K
23
B 4 - Zone 6
Directorate WS Network
Lan Bridge
Accelerator WS Network

Figure 7

SSCL DATA NETWORK FY91



Video Services will provide audio/visual, video teleconferencing, technical video taping/editing equipment and services, and photography support for the Laboratory. Video teleconferencing has proved to be a valuable tool coordinating meetings over long distances. This effort will include over 30 video teleconferencing systems between Dallas and Ellis County in support of the Magnet R&D program, administration of the Laboratory, and detector collaborations. Basic photography equipment is available to support both technical and public relations photography. Future plans also call for providing satellite broadcasting for educational program support.

Radio Engineering will manage RF communications systems including radio paging/dispatching, repeater systems, safety communications systems, CATV and microwave systems. They will support leased and temporary radio equipment, radio paging and a dispatching system. They will install permanent radio systems to support security, safety, dispatching and construction activities when facilities are on the Ellis County campus. They will maintain a main campus CATV system used for internal broadcasting of information and events. They will also maintain a microwave system which will be used for data, video, and telephone communications between campuses.

PLANNED MAJOR DATA COMMUNICATIONS SYSTEMS:

No systems will exceed the $1M development threshold.

TELEPROCESSING SERVICES PROGRAM:

SSCL Operations do not contract for any TSP Program data usage.

B. FY91/92 Short-Range Plan for LTS

SHORT-RANGE PLAN

Organizational Function: Laboratory Technical Services

I. TABULATION OF REQUIREMENTS:

1. Information Systems	Funding	FY91	FY92
Commercial Software	Operating	$850K	$700K
2. Computer Resources	**Funding**	**FY91**	**FY92**
ADP (Administrative)	Capital	850K	1250K
	Operating	1440K	1240K
ADP (Scientific)	Capital	1440K	1910K
	Operating	1440K	1910K
AOSS	Capital	1081K	1750K
	Operating	100K	120K
CAD/CAE	Capital	1,000K	510K
	Operating	500K	545K
COMM	Capital	780K	580K
	Operating	890K	890K

CAPITAL = High Value Capital (over $5K not including sales tax)
OPERATING = M&S (Hardware under $5K and Software)

II. MINI ACQUISITION PLAN

Organizational Function: Laboratory Technical Services

ITR NEED

IS

Information Services provides project leadership and implementation responsibility through systems analysis, programming, and computing support for Management Information Systems (MIS) required by the SSCL. A long-range MIS Implementation Strategy has been developed with the goal to accommodate MIS requirements through integrated and complimentary information systems which are readily accessible by administrative and technical management.

The MIS Implementation Strategy has identified several major functional areas that are associated with a major business function of the SSCL. The following thirteen areas require ADP capability and must have requirements defined and a feasibility assessment conducted:

- Procurement
- Finance
- Human Resources

- Document Control and Configuration Management
- Travel Reservation
- Property Management
- Project Management
- Environment, Safety, and Health
- Total Quality Management
- System Engineering Management System
- Construction Management
- Public Relations
- Logistics

In order to optimize critical resource utilization at lower cost, while providing timely and accurate information, Information Services has identified and prioritized the elements which will implement the tightly integrated MIS of the Implementation Strategy. Those elements which are required first will establish the foundation for further MIS implementation goals. These elements include a Relational Data Base, CASE tools and compilers followed by the first phase of MIS applications software. Within MIS, FY91 needs call for applications products which support Procurement, Finance and Project Management (WBS, Schedule, C/S^2). FY92 will address the needs of MIS application software for Property Management and Document Control & Configuration.

The specifications for the Relational Data Base system have been formulated. Technical and cost evaluation of several RDBMS products are complete. Critical to the acquisition of the product is the ability to run on the existing SSCL multiple hardware systems, distributed architecture support, network support, SQL support, and the availability of MIS application software packages for those identified in the MIS Implementation Plan. With these specifications in mind, the evaluation summary and recommendations have been forwarded for RDBMS product acquisition.

CASE tools, implemented for the development environment, will provide accurate estimates of new systems development efforts, will improve programmer efficiency, and will establish a common environment to support future applications development. These tools will be used throughout the entire development cycle for information capture, requirements definition, analysis, design, and integration. The CASE tools will operate in a UNIX environment and support standard methodologies for the following: structured analysis & design, provisions for version control, entity-relationship modeling, X-Windows, integrated data dictionary, multiple concurrent users, consistency checking between models, and extensibility for adding application-specific information. This tool will also have interfaces to other following tools: document processing (Framemaker, Interleaf); programming environments (COBOL, C, C++, Saber-C); design and performance simulation (Scientific and Engineering Software); Data Interchange Formats and relational database.

A variety of other tools designed to facilitate software development activities are also planned. Compilers such as C, C++, as well as COBOL, are envisioned for DEC and UNIX environments. Miscellaneous software will include items such word processing and spreadsheets. In this category, maintenance of applications software has been estimated at 12% of the purchase price.

Information Services has developed a long-range MIS Implementation Strategy for the global support of Laboratory-wide information systems in the areas of administration and management. There is a need for analytical services to conduct an independent assessment concerning the feasibility of this plan. As other such plans are developed over the next two years, similar reviews will be necessary. These assessments will be an independent and unbiased verification of the plans and be conducted by senior specialists with expertise in large-scale information systems and integration. These reviews will provide identification and analysis of business management as well

as technical problems and opportunities. Because these plans will support the SSCL for the next five to ten years, expert review is critical to further the probability of a successful implementation.

Technical training requirements for Computer Services, Information Services and Operations relate to the functional areas of relational data base, 4GLs, MIS application software packages and the developmental workstation server (UNIX). Technical personnel will require training to effectively use the planned Relational Data Base system. The same is true for the UNIX-based workstation server. MIS application software procured in FY91 and FY92 (i.e.; Finance, Procurement, Document Control) along with CASE Tools and 4GL will be properly implemented by well-trained technical personnel. Training costs also include one course for each of fifty technical individuals for the purpose of general professional development. A combination of vendor-provided and in-house training is planned. Vendor-supplied training for each of the functional areas is envisioned for a minimal number of the technical staff. Individuals having related expertise will then conduct in-house training for the balance of the staff involved with that function.

Contract programming services have been included to continue the services of three consultants currently available to Information Services. These services consist of handling service requests which are initiated by user-requested projects. There is currently an extensive backlog. These services will also be utilized for large development projects. One such example is the sub-contract MIS project for the Finance and Procurement groups. These activities will be used as the baseline for other projects which are anticipated to occur over the next two years.

Technical solutions will be provided by competitive procurement of applications and systems software. The selected vendor software product is not expected to entirely satisfy all requirements. Vendor-supplied systems which are presently in operation are also expected to undergo revision. One such example is the Procurement package supplied by DELTEK which requires modification to accommodate the laboratory's procedure for commitment and obligation transactions. Other revisions to the existing MIS applications are anticipated in areas of integration and interface to the newly acquired MIS applications. For unsatisfied requirements, vendor enhancement costs have been included to either contract or perform in house the needed modifications.

A Maintenance Management System (MMS) will be acquired to manage the large inventory of SSCL equipment, facilities and vehicles. This software will provide the management data needed to schedule both general and preventive maintenance activities for these items. The system will support imaging whereby an interactive exploded view maintenance screen appears for each item. This feature will reduce the downtime in case of failures and speed up preventive maintenance during normal operations. Considering the anticipated size of the database and the nature of the processing requirements, it appears SSCAD1 best suits this application. Of the centralized systems that have been reviewed, only System Works features the necessary mainframe environment and imaging capability. This system will be in place by FY92 to support the maintenance of existing buildings and equipment . The initial MMS will be followed with modules for Drawing Library Control, Motor Pool Maintenance and Curator Image Storage and Retrieval.

The SSCL will need five "Prom-Blowers" for the Magnet and Accelerator Divisions. The machines are for programming PROMS and similar programmable devices which will be used on the printed circuit boards and other electronic devices used in the instrumentation, control devices, and alarm systems.

Effective materials management is critical to the construction of the SSCL, and coordination of materials procurement across the engineering divisions (ASD, MSD and CCD) is best accomplished through Material Requirements Planning (MRP). MRP integrates the master production schedule with inventory/material control and procurement to assure timely and accurate delivery of raw materials, purchased components, and finished assemblies. Benefits include effective materials planning to reduce construction schedule perturbations, reduced material

inventories, and effective budget planning. The system will contain a total engineering list of materials needed for the SSC which will be maintained by Engineering and Design & Drafting. The MRP system is designed to satisfy the needs of the SSCL manufacturing environment through manufacturing, financial and management reporting capabilities. The system will streamline the MRP operation to run efficiently through integration of inventory, purchase, production, scheduling, engineering, and cost accounting. There will be immediate and shared access to timely information to tie together all functional areas. The system will be real time, permitting simultaneous users to perform inquiry, data entry and updates. The MRP system will also use the engineering design list of materials as the source for all material transactions including cost, scheduling, receiving, issuing, and inventory counts. In addition, the system will provide management with visibility of engineering changes, quote versus actual cost, shipments with overages or shortages, returns and allowances, open purchase orders, critical parts information, and delivery schedules including impact of shortages.

ADP

In the administrative computing area supporting SSCL Management Information Systems (MIS) applications, hardware projections indicate significant growth. The VAX 6420 will be upgraded to a VAX 6460 in FY91 and then to a VAX 9000 series system in FY92. Removable optical disk and increased on line disk capacity have been incorporated to meet planned data storage needs. Miscellaneous peripherals will supplement the projected VAX upgrades. These upgrades provide capacity in support of new IS applications and the implementation of advanced development tools (Fourth Generation Language Software, CASE Tools) for programming and reporting. These upgrades will also improve the responsiveness of the existing computer processing environment and allow for optimum productivity. Plot/print servers will provide centralized plotter driver services for the expected increase in Laboratory-wide user activities. File servers will be used for expected increases of working-file storage and backups in support of users Laboratory-wide.

Currently, separate mail service is available for local DEC users, UNIX users, MAC users, and IBM-PC users at the SSCL. These separate mail systems permit exchange of mail readily between DEC and UNIX since standard software and communications interfaces exist, but awkwardly to MAC or IBM-PC systems where conforming interfaces do not exist. Mail service into and out of the national and international community is simple for DEC and UNIX users, difficult for MAC and IBM-PC users. Electronic mail servers have been identified which will bridge the mail systems together by providing appropriate software and communications interfaces. This server will then forward mail to the user's associated mail system, provide for standard mail interfaces (SMTP), and simplify the addressing of all incoming mail.

A workstation server and software have been planned to support Computing Services & Information Services in their development , implementation, quality assurance, document control, and relational data base implementation activities.

Microcomputers are planned for the Testing & Evaluation Laboratory within Computing Services for the maintenance, repair, and checkout of Laboratory-wide equipment..

In the scientific computing area, hardware projections indicate a slower rate of growth for the VAX systems. The current VAX 6420, however, will be upgraded to a VAX 6460 in FY91. Additional upgrades to the VAX 6460 are planned for FY92. Removable optical disk, increased on line capacity, and magnetic tape drives will supplement existing data media. A LTS UNIX file server for general-purpose applications will be acquired to support Laboratory-wide UNIX processing. Other peripherals will round out the hardware procurement.

Major software procurement includes a Relational Data Base package, 4GL and CASE tools designed to improve programmer productivity. Applications software will address needs in such

functional areas as graphics, publications tools, language-sensitive editors, additional networking software, macsyma and mathmatica. Miscellaneous software to be acquired includes such items as word processing, spreadsheets and conversion packages.

The anticipated move to the main campus in Ellis County in FY92 has been included in the costs.

AOSS

Distributed computing will be supported with workstations and office automation systems at the desk of each employee. The workstations will support IS and AOSS activities for the SSCL as well as general computing applications. These workstations will be grouped in clusters to local servers to share access to high-end application file servers, peripherals and data storage devices.

CAD/CAM/CAE

A file and plot server will be added to support Intergraph systems working-file storage and backup. The proposed server will be used to maintain CAD data generated on the Unigraphics II mechanical CAD system, the AutoCad equipment and other equipment to be acquired in the future.

Proposed CAD/CAE workstations will serve as work platforms for a variety of users including design/drafting, facilities engineering and data management personnel. Each designer or drafter will have the equivalent of one UNIX-based workstation including disk storage, memory, software and network access. Additional printers, plotters and other peripheral devices will be necessary due to an increase in the number of system users and the diverse locations that must be served. Most will be acquired in a competitive environment, however, several may be acquired from a proprietary vendor due to existing operations and a need to maintain compatibility.

A CAD/CAM/CAE Data Management system with software will be used to control and maintain technical document release, revision and archiving for the entire Laboratory technical database. It will operate under a Relational Data Base Manager and will be configured to keep released records including drawings, specifications and other technical design data on line for access by authorized Laboratory personnel. This system is being configured and operated for the Project Management office by Laboratory Technical Services Project Design Support personnel. Plans call for system expansion several times during the lifetime of the design and construction project.

COMM

Under the assumptions for FY91, Network Services will support the E1 North Campus facilities as well as the County Farm and other Ellis County locations. This requires that we extend our local and wide area network to all Ellis County facilities. A Network Management system that has the ability to passively monitor the entire network including all of its sub nets is required to maintain control of the Network. Increasing the backbone speed in FY91 will be required because of the increased number of sub nets and the extreme flexibility required for Network to operate efficiently. An update is planned for the existing twisted pair equipment to the 802.3 10 BASET standard which can be monitored and controlled by an existing management system. All of the new facilities have to be wired to handle user requirements and to assure functionality with existing systems.

The Laboratory has received approval to acquire a PBX system to serve 200 users at the master campus in Ellis County and 200 users at the County Farm location. The existing leased voice communications equipment will serve the voice requirements of Ellis County until the main campus is complete. Voice communications requirements for FY92 have not been completely defined. Current needs will be expanded as necessary to handle the population growth of the Laboratory.

Video Services is planning up to 30 video teleconferencing systems hookups by FY92 throughout the SSCL to support the Magnet R&D, Laboratory administration and detector collaborations.

In the radio engineering area, paging and repeater services will continue to be leased locally until the move is made to the main campus. Applications will be made to the NTIC in FY91 for radio frequencies needed in future years. Some portable communications equipment will be leased in FY91 as an interim communications capability. Plans for FY92 call for acquisition of a tower to accommodate radio system and microwave communications traffic. This tower will be established as the focal point for communications activity until the master campus is complete.

2. ITR Solution

Following is a list of the ADP, AOSS, CAD/CAM/CAE and COMM hardware and software in excess of $25K that will be acquired in FY91 and FY92:

Laboratory Technical Services Division (LT) Requirements	Acq. Cost ($K)	Maint. Cost ($K)	Procurement Strategy	Funding FY 1991	WBS No.	Control No.
IS- Administrative						
(5) Data/IO Devices	106K	3K	PR, SS	CP	4.4.5	LT91001
Maintenance Mg'mt System	315K	35K	PR, SS	MS	4.4.5	LT91002
MRP System	546K	82K	PR, FC	MS	4.4.5	LT91003
Warehouse Control System	35K	5K	PR, FC	MS	4.4.5	LT91004
Relational DataBase System	150K	15K	PR, FC	MS	4.4.5	LT91005
MIS Applications S/W	400K	40K	PR, FC	MS	4.4.5	LT91006
CASE Tools	50K	5K	PR, FC	MS	4.4.5	LT91007
Compilers	25K	3K	PR, SS	MS	4.4.5	LT91008
MIS Analytical Services	200K	0	PR, FC	MS	4.4.5	LT91009
Technical Training	200K	0	PR, FC	MS	4.4.5	LT91010
Contract Programming	200K	0	PR, FC	MS	4.4.5	LT91011
Vendor Enhancements	275K	0	PR, SS	MS	4.4.5	LT91012
Workstation Server S/W	180K	13K	PR, FC	MS	4.4.5	LT91013
Sub Total	2682K					
IS-Scientific						
Relational DataBase System	200K	10K	PR, FC	MS	4.4.13	LT91014
CASE Tools	50K	5K	PR, FC	MS	4.4.13	LT91015
Compilers	25K	3K	PR, SS	MS	4.4.13	LT91016
Applications Software	200K	10K	PR, SS	MS	4.4.13	LT91017
Other Software	25K	2K	PR, SS	MS	4.4.13	LT91018
Sub Total	500K					
ADP-Administrative						
VAX 6420 to 6460	400K	65K	PR, SS	CP	4.4.5	LT91019
Removable Optical Disk	100K	10K	PR, FC	CP	4.4.5	LT91020
Electronic Mail Server	100K	10K	PR, FC	CP	4.4.5	LT91021
Printer/Plotter	110K	11K	PR, FC	CP	4.4.5	LT91022
Computer T&E Micro	30K	3K	PR, SS	CP	4.4.5	LT91023
Sub Total	740K					
ADP-Scientific						
VAX 6420 to 6460	400K	57K	PR, SS	CP	4.4.13	LT91024
Removable Optical Disk	100K	10K	PR, FC	CP	4.4.13	LT91025
On Line Mass Storage Disk	100K	10K	PR, FC	CP	4.4.13	LT91026
Printer	40K	4K	PR, FC	CP	4.4.13	LT91027
ANSYS Server	100K	10K	PR, SS	CP	4.4.13	LT91028
UNIX File Server	75K	8K	PR, SS	CP	4.4.13	LT91029
Sub Total	815K					

KEY: PR = Purchase, LS = Lease; FC = Competition, SS = Sole Source; CP = Capital, MS= Operational

Laboratory Technical Services Division (LT) Requirements	Acq. Cost ($K)	Maint. Cost ($K)	Procurement Strategy	Funding FY 1991	WBS No.	Control No.
AOSS						
Tech Support Workstations	57K	6K	PR, FC	CP	4.4.5	LT91030
MIS Support Workstations	60K	6K	PR, FC	CP	4.4.5	LT91031
Workstation Software	69K	7K	PR, SS	MS	4.4.5	LT91032
Sub Total	186K					
CAD/CAM/CAE						
File/Plot Server & Upgrade	100K	12K	PR, FC	CP	4.4.6	LT91033
Data Management System	350K	20K	PR, FC	CP	4.4.6	LT91034
CAD Support UNIX W/S	100K	11K	PR, FC	CP	4.4.6	LT91035
MCAD D/D UNIX W/S	30K	4K	PR, FC	CP	4.4.6	LT91036
ECAD D/D UNIX W/S	75K	8K	PR, FC	CP	4.4.6	LT91037
Facilities UNIX W/S	60K	7K	PR, SS	CP	4.4.6	LT91038
Data Management UNIX W/S	70K	7K	PR, FC	CP	4.4.6	LT91039
Printers/Plotters	70K	8K	PR, FC	CP	4.4.6	LT91040
ECAD Applications	35K	4K	PR, FC	MS	4.4.6	LT91041
D/D Applications	75K	8K	PR, SS	MS	4.4.6	LT91042
Facilities Applications	60K	7K	PR, SS	MS	4.4.6	LT91043
Local Data Management	25K	5K	PR, SS	MS	4.4.6	LT91044
Raster File Management	25K	3K	PR, SS	MS	4.4.6	LT91045
Database Management S/W	250K	13K	PR, FC	MS	4.4.6	LT91046
Sub Total	1325K					
COMM						
500 MIP Resource	100K	0	PR, FC	MS	4.4.7	LT91047
Hypercube	100K	0	PR, FC	CP, MS	4.4.7	LT91048
Network Management	270K	22K	PR, FC	CP, MS	4.4.7	LT91049
FDDI Routers	208K	15K	PR, FC	CP	4.4.7	LT91050
Equipment Upgrade	160K	9K	PR, LS	CP, MS	4.4.7	LT91051
Wiring	200K	0	PR, FC	MS	4.4.7	LT91052
E-1 PBX Installation/Lease	54K	0	PR, FC	CP	4.4.7	LT91053
T-1 Link to Beckleymeade	12K	0	PR, FC	CP	4.4.7	LT91054
County Farm PBX Install/Lease	54K	0	PR, FC	CP	4.4.7	LT91055
T-1 Link to Main Campus	25K	0	PR, FC	CP	4.4.7	LT91056
Video Teleconferencing	300K	0	PR, FC	CP	4.4.7	LT91057
Sub Total	1483 K					

KEY: PR = Purchase LS = Lease FC = Competition SS = Sole Source CP = Capital MS= Operational

Laboratory Technical Services Division (LT) Requirements	Acq. Cost ($K)	Maint. Cost ($K)	Procurement Strategy	Funding FY 1992	Control No.
IS-Administrative					
MRP Support Fee	0	82K	PR, SS	MS	LT92058
Maintenance Management System	200K	35K	PR, SS	MS	LT92059
Relational Data Base System	200K	40K	PR, FC	MS	LT92060
MIS Applications S/W	200K	40K	PR, FC	MS	LT92061
CASE Tools	60K	6K	PR, FC	MS	LT92062
Compilers	25K	3K	PR, SS	MS	LT92063
MIS Analytical Services	150K	0	PR, FC	MS	LT92064
Technical Training	100K	0	PR, FC	MS	LT92065
Contract Programming	200K	0	PR, FC	MS	LT92066
Vendor Enhancements	225K	0	PR, SS	MS	LT92067
Workstation Server S/W	140K	14K	PR, SS	MS	LT92068
Other Software	50K	5K	PR, SS	MS	LT92069
Sub Total	1550K				
IS-Scientific					
CASE Tools	60K	6K	PR, FC	MS	LT92070
Other Software	100K	10K	PR, SS	MS	LT92071
Sub Total	160K				
ADP-Administrative					
VAX 9000 Series Upgrade	950K	50K	PR, SS	CP	LT92072
On Line Mass Storage Disk	100K	10K	PR, FC	CP	LT92073
Electronic Mail Server	50K	5K	PR, FC	CP	LT92074
Computer T&E Micro	30K	3K	PR, SS	CP	LT92075
Sub Total	1130K				
ADP-Scientific					
VAX Upgrades	200K	10K	PR, SS	CP	LT92076
Removable Optical Disk	100K	5K	PR, FC	CP	LT92077
ANSYS Server Upgrade	50K	5K	PR, SS	CP	LT92078
On Line Mass Storage Disk	100K	3K	PR, FC	CP	LT92079
Sub Total	450K				
AOSS					
MIS Support Workstations	36K	4K	PR, FC	CP	LT92080
Workstation Software	55K	5K	PR, SS	MS	LT92081
Sub Total	91K				

KEY: PR = Purchase, LS = Lease; FC = Competition, SS = Sole Source; CP = Capital, MS= Operational

Laboratory Technical Services Division (LT) Requirements	Acq. Cost ($K)	Maint. Cost ($K)	Procurement Strategy	Funding FY 1992	Control No.
CAD/CAM/CAE					
Data Management System	90K	11K	PR, FC	CP	LT92082
CAD Support UNIX W/S	25K	3K	PR, FC	CP	LT92083
MCAD D/D UNIX W/S	50K	6K	PR, FC	CP	LT92084
ECAD D/D UNIX W/S	30K	3K	PR, FC	CP	LT92085
Facilities UNIX W/S	50K	6K	PR, SS	CP	LT92086
Data Management UNIX W/S	30K	3K	PR, FC	CP	LT92087
Printer/Plotters	80K	9K	PR, FC	CP	LT92088
Rasterizing Scanner	80K	9K	PR, FC	CP	LT92089
ECAD Applications	35K	4K	PR, SS	MS	LT92090
D/D Applications	75K	8K	PR, SS	MS	LT92091
Facilities Applications	40K	4K	PR, SS	MS	LT92092
Local Data Management	25K	2K	PR, SS	MS	LT92093
Database Management S/W	80K	9K	PR, FC	MS	LT92094
Sub Total	690K				
COMM					
500 MIP Resource	100K	0	PR, FC	MS	LT92095
Hypercube	100K	0	PR, FC	CP, MS	LT92096
Network Management	270K	22K	PR, FC	CP, MS	LT92097
FDDI Routers	208K	15K	PR, FC	CP	LT92098
Equipment Upgrade	160K	9K	PR, FC	CP, MS	LT92099
Communications Tower	40K	0	PR, FC	CP	LT92100
Microwave System	60K	0	PR, FC	CP	LT92101
Video Teleconferencing	450K	0	PR, FC	CP	LT92102
Sub Total	1388K				

KEY: PR = Purchase, LS = Lease; FC = Competition, SS = Sole Source; CP = Capital, MS = Operational

3. Excessed ITR

None.

III. LEASE AND SERVICE MAINTENANCE CONTRACTS

Current lease and/or service maintenance agreements over $10K include the following:

	FY91	FY92
Server Maintenance	$22K	$31K
Workstation/Software Maintenance	55K	75K
Peripheral Maintenance	12K	18K
Database Mgt. System Maintenance	25K	70K

MAGNET SYSTEMS DIVISION

STRATEGIC PLAN, PART III

AND

FY91/92 SHORT-RANGE PLAN

19 September 1990

Approved by:

Roger W Cook FOR T. BUSH

Tom Bush, Associate Director
Magnet Systems Division

VI. ITR Needs for Magnet Systems Division

MISSION OBJECTIVES

Magnet Test & Data Management

The Magnet Systems Division Magnet Test & Data Management Group (MT/DM) is responsible for testing of the superconducting magnets to be produced by the SSCL and industry, for data analysis of test results, and for creating and maintaining a central database of Laboratory magnet information. Up to 50 personnel including managers; test and engineering physicists; electrical engineers and engineer associates; control, database and system programmers; system administrators, data aides and support staff will be assigned to the following sections:

- The Test Operations Section is responsible for the testing of the superconducting magnets at the SSCL's Magnet Test Lab. They are also responsible for acceptance testing and reliability testing, developing test plans, supervising magnet test, developing performance summaries, and supporting testing at Fermilab and Brookhaven.

- The Test Analysis Section is responsible for the acquisition and management of magnet test data and the generation of test reports. They develop studies of quench currents and origins, quench propagation and quench protection. They also develop data analysis software, perform detailed analyses of magnet behavior, and prepare calculations and models as necessary to understand magnet performance data.

- The Magnet Test Laboratory (MTL) Instrumentation & Controls Section is responsible for development of the MTL including hardware, software and special instrumentation. It is also responsible for the installation, checkout, and operation and maintenance of the instrumentation systems in the MTL. This section works in cooperation with Accelerator Systems Divisions Controls Group and the Magnet Systems Division Production Group.

- The Data Management Section is responsible for the development of a database management system for the magnet information. This information includes data on the construction of the SSC magnets, including physical properties, full configuration data, test results on the component materials and data associated with the magnet tests. This involves the development and maintenance of a multi-gigabyte data storage system. The section is also responsible for support of the UNIX workstations for analysis and database use including programming support for data analysis and display.

Engineering

The Magnet Systems Division Engineering Group (MSD/EG) is responsible for the development, analysis and design of the various cold masses, interconnects and cryostats of the following magnets: The Collider Dipole Magnet (CDM); the Collider Quadrupole Magnet (CQM), the High Energy Booster Collider Magnet (HEBCM) and the High Energy Booster Quadrupole Magnet (HEBQM). They provide similar support services for other specialty magnets within the Superconducting Super Collider project.

The MSD/EG Mechanical Computer-Aided Design Section is responsible for most of Magnet System Division's tooling MCAD design. In order for the MSD mission to be accomplished within DOE's schedule, they make use of and rely heavily upon CAD/CAE/ECAD resources.

A. ITR Requirements for MSD

1. Information Systems (IS)

IS CURRENT ENVIRONMENT

The majority of administrative computer needs of Magnet Systems Division are currently handled using Laboratory Technical Services Division supplied computers and software such as the administrative VAX, SSCAD1, and DELTEK software.

IS PLANNED ENVIRONMENT

In addition to the administrative tasks handled using LTS-supplied MIS resources, several MSD Business Management users rely on local, in-house software residing on desktop Macintoshes. Both of these means for satisfying business management tasks will be expanded as needed in the future. The primary planned acquisition to support the administration of engineering drawings and related documentation will be an Optical Disk Imaging/Document Control System. This system will tie into the existing AppleTalk and Ethernet networks in order to search for and provide access to design documents. The Macs will be used for this access initially, though plans are to later add UNIX workstations and IBM compatibles (Figure 1). Initially, there will be 10 concurrent users, though plans may require expansion of the system to accommodate more than 100 users.

2. Computing Resources (CR)

2.1 Automated Data Processing (ADP)

ADP CURRENT ENVIRONMENT

Magnet Test & Data Management

MT/DM currently has a Sun 4/280 file server for 15 UNIX workstations. This includes workstations ordered in FY90 but not yet received. There are 16 Macintosh desktop systems, two PCs and two dumb terminals. The group also has three UNIX workstations located at other HEP Laboratories as well as a Concurrent Masscomp 6450 (UNIX) system with two workstations for development of the MTL (Figure 2). The UNIX portion of the net is a tightly integrated, shared resource. The Macintoshes, while connected to the LAN, are mostly independent. Almost all personnel have either a UNIX workstation or a Macintosh. The future model of the computing resources has one workstation desktop system on everyone's desk.

The MT/DM central database of magnet information can be viewed as an information system for all magnet scientists. This database currently resides on a Sun file server with about 1 Gb of on-line storage dedicated to the databases. Optical drives supply WORM easily accessible archival storage. The relational database software is Sybase running on a UNIX operating system. Other sections currently are developing software tools for data analysis. Besides the UNIX tools there are a DECNET emulator for the database server, compilers (FORTRAN, and C) and Math libraries (IMSL).

Engineering

MSD/EG relies upon the ADP resources provided by Laboratory Technical Services Division to support their automated data processing needs. Planning for Short Magnet Test software development occurred in FY90, though steps were not taken this year to implement this capability.

MSD OPTICAL DISK IMAGING/DOCUMENT CONTROL SYSTEM

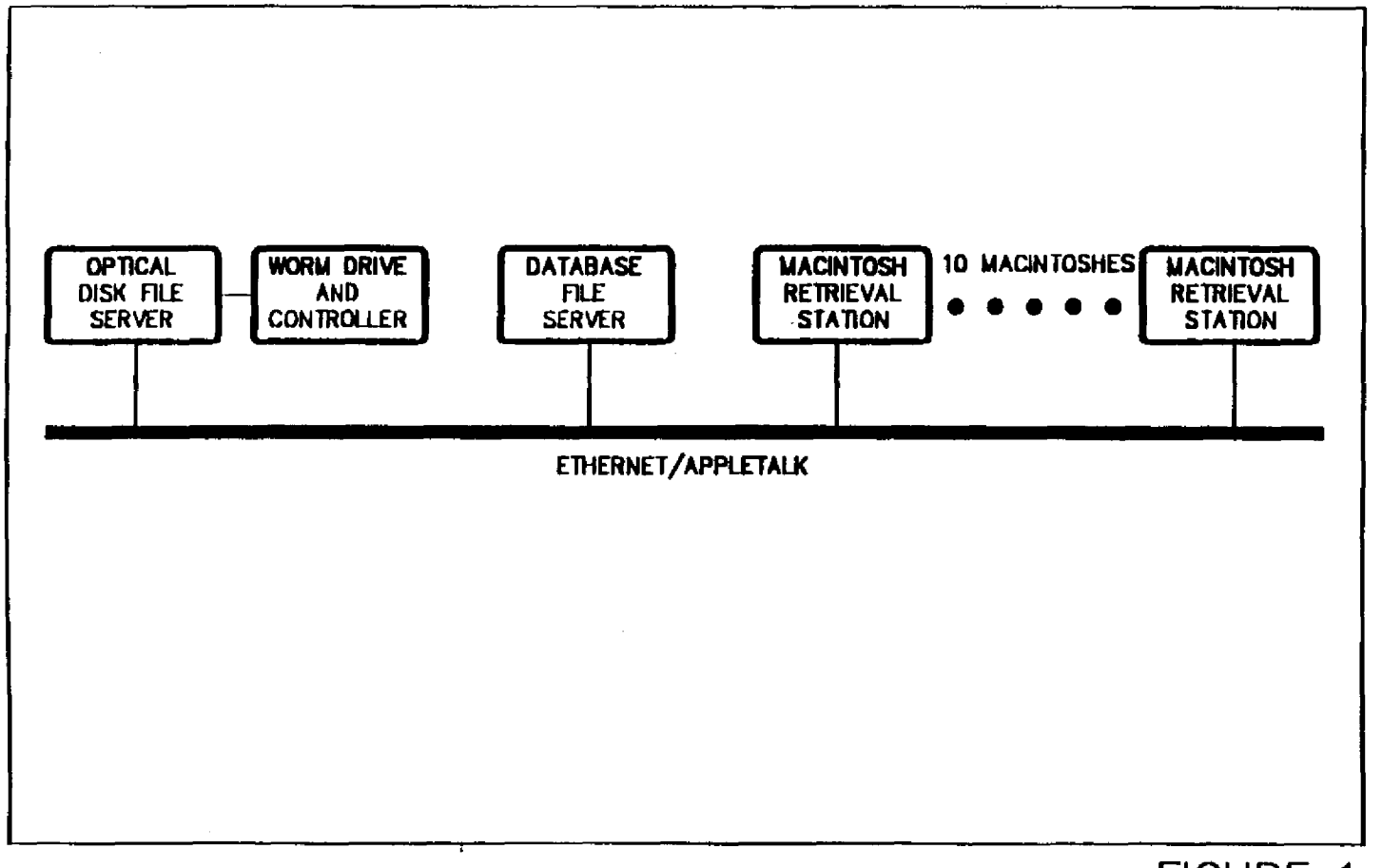


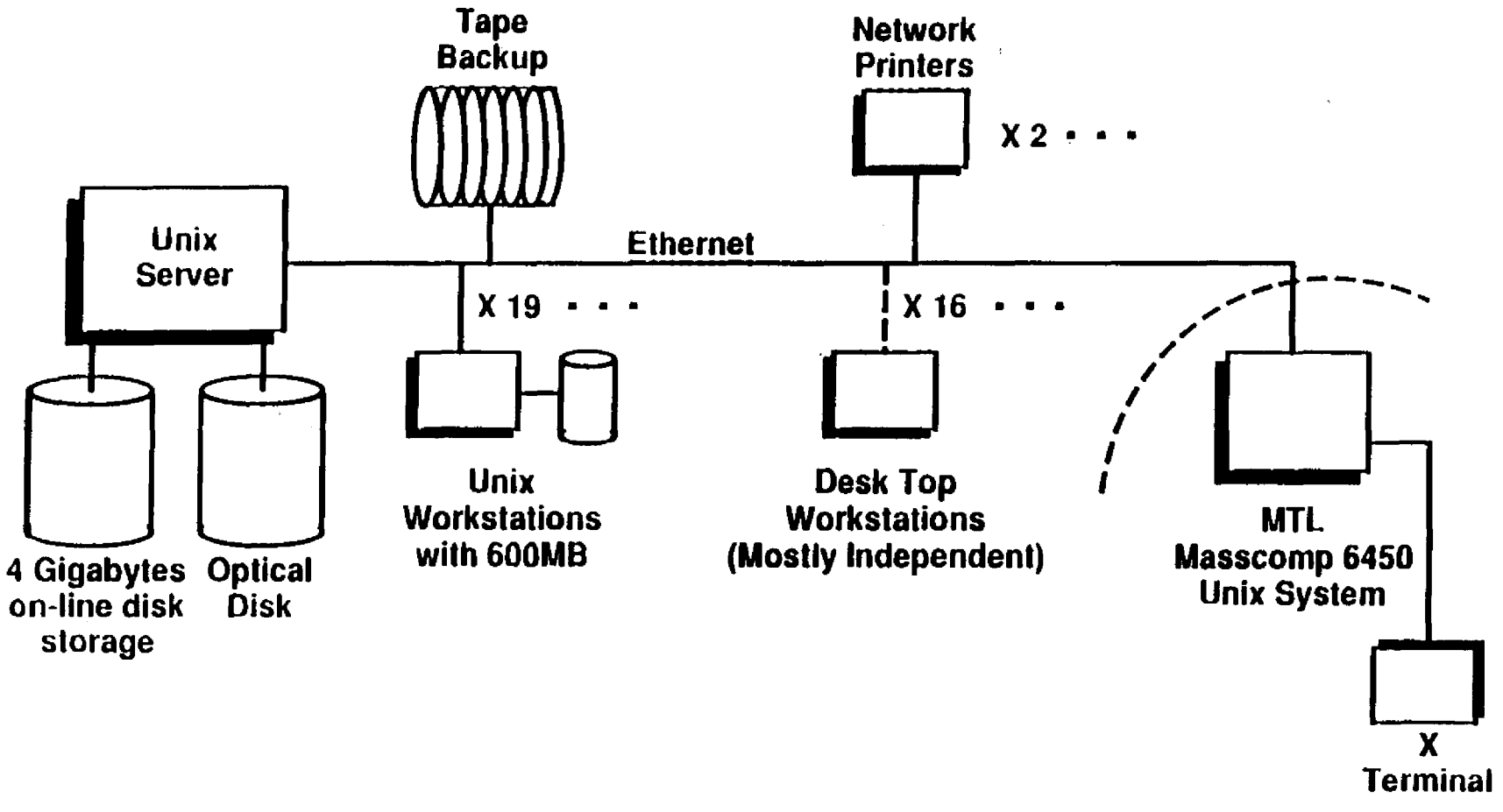
FIGURE 1

70

Figure 2

Magnet Test and Data Management Subnet

Current System



ADP PLANNED ENVIRONMENT

Magnet Test & Data Management

In performing its operations, MT/DM will make effective use of state-of-the-art computing resources. Besides personal workstations with their personnel productivity software, the group will require data analysis workstations, database and workstation servers, peripherals such as disk drives, tape drives, and printers, and a wide range of instrumentation and computer equipment to run the Magnet Test Lab. Distributed and network computing will be achieved by connecting this equipment to a common local area network.

Each system will have some local storage. For the UNIX systems this allows keeping the core of the operating system, the user's files, and the disk swap space local to the workstation, thereby decreasing the network traffic. The distributed network environment shares CPU, disk and peripherals using industry standards such as UNIX, the X Window System (applicable from the Macintosh and PCs), the NSF and/or the Andrew File System, and the TCP/IP network protocols.

Up to nine desktop systems and 14 UNIX workstations will be acquired along with two database servers. The current server is acting as both a database server and as a workstation server and will become just a workstation server after acquisition of the two servers, one of which will be dedicated to the database. This will total three servers with each supporting about ten UNIX workstations with two of these servers dedicated to non-database jobs. Extra printers and tape drives for backup will also be acquired.

For the MTL, two Servers (one for configuration and databases and one for controls and analysis); one Cryo-computer system; one Interlock/Building computer system and a Power supply computer system will be acquired (Figure 3). Eight Operator Consoles such as low-end workstations or Xterminals and three Data Analysis workstations are also planned. Up to 20 VME single-board computers will be acquired for the warm and cold magnet test stands in addition to a large (>20 Gb) secondary storage system such as an erasable optical jukebox disk drive (Figure 4).

Secondary licenses for Sybase, software development tools (compilers, relational database tools, graphics packages, user interfaces) for MTL instrumentation & control, data analysis packages (both mathematical and graphical) and statistical packages will be procured. Each UNIX system will require software to duplicate the productivity tools usually found on a PC such as a paint package, a spreadsheet package and a "point and click" environment for file manipulation.

All the database servers will require on the order of 10 gigabytes of on-line storage for the magnet data alone and tens of gigabytes of easily available archival storage, such as provided by optical drives.

Engineering

The aforementioned relationship is expected to continue for the foreseeable future. In the Short Magnet Test software development area, four UNIX workstations and ancillary hardware and software will be acquired for use in the creation of specialized test software. These resources will be networked via Ethernet (Figure 5). Additionally, a VME bus analyzer and a LAN analyzer will be acquired to perform troubleshooting of the various data collection paths that will be utilized by the Short Magnet Test equipment.

Figure 3

Magnet Test and Data Management Subnet

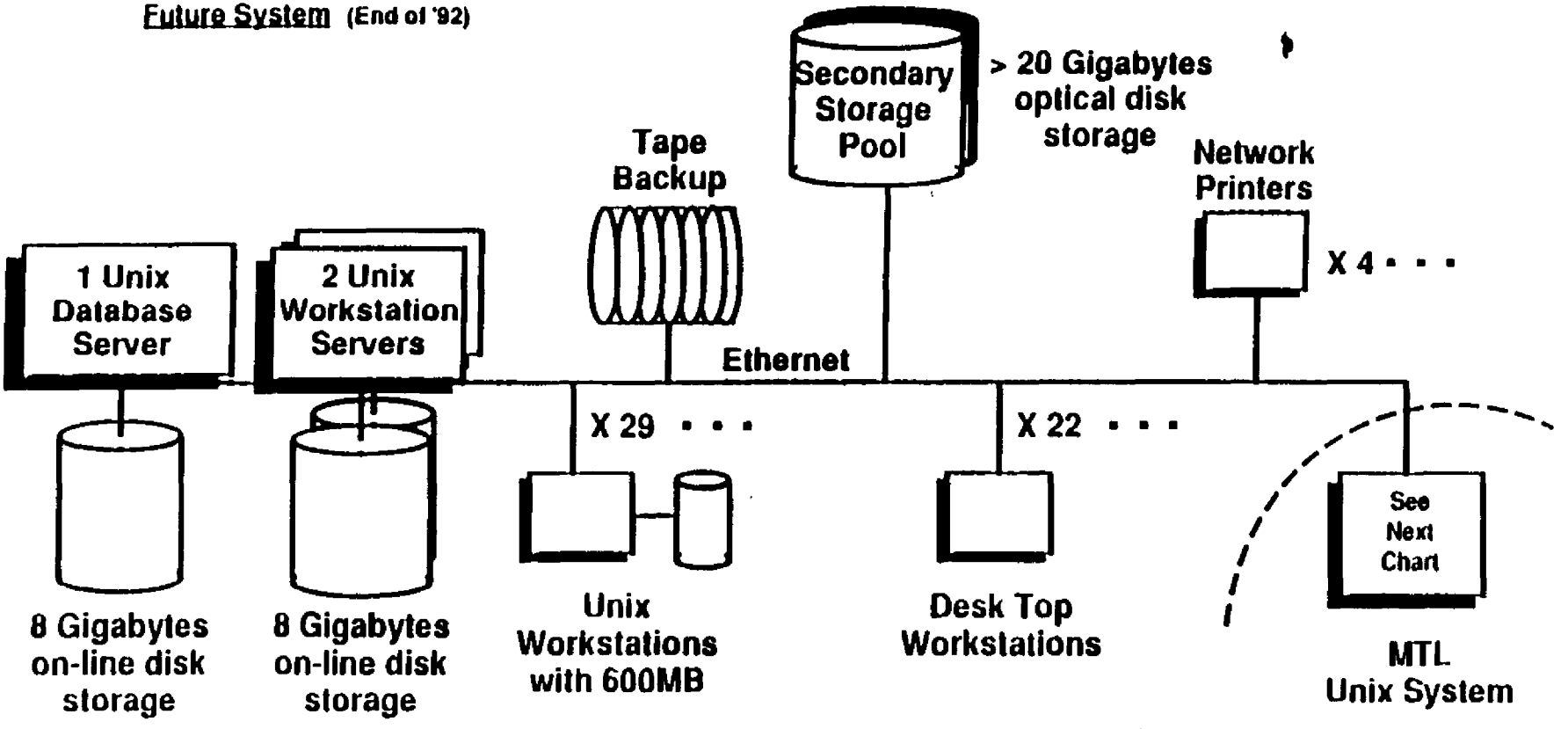
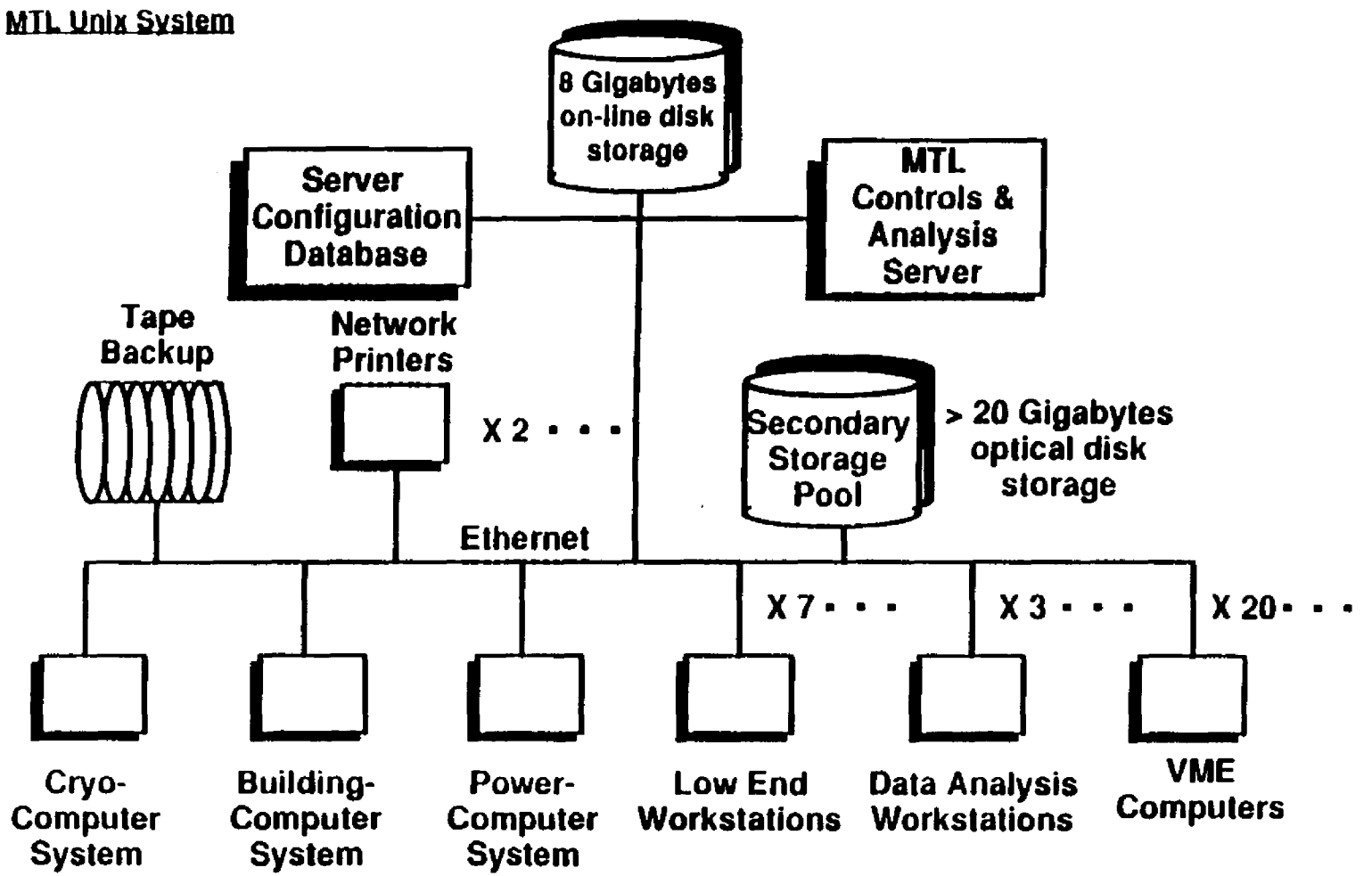


Figure 4

Magnet Test and Data Management Subnet



SHORT MAGNET TEST SOFTWARE DEVELOPMENT PLANNED ENVIROMENT

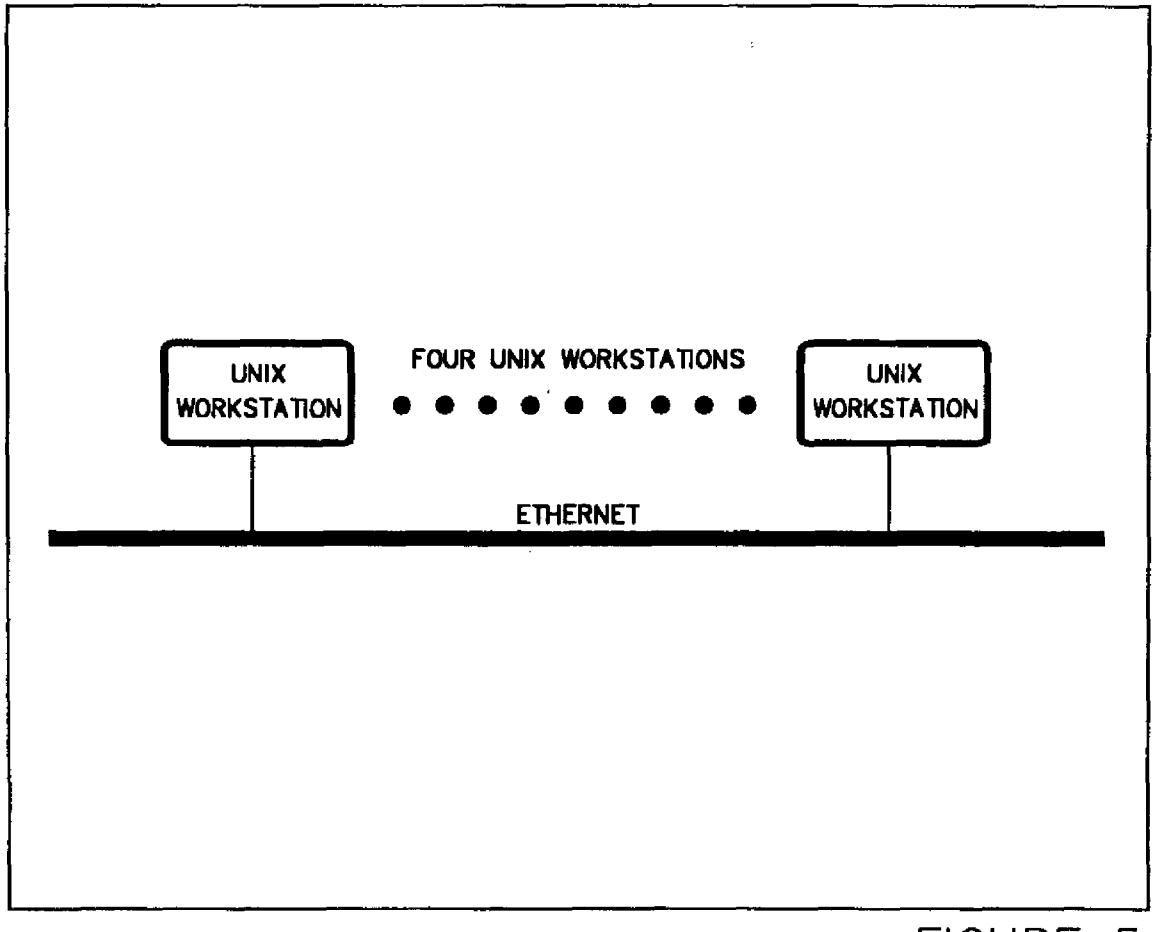


FIGURE 5

2.2 Automated Office Support Systems (AOSS)

AOSS CURRENT ENVIRONMENT

Office support resources for both MT/DM and MSD/EG are coordinated and provided by the Magnet Administration Group, with service and support provided by LTS.

AOSS PLANNED ENVIRONMENT

The UNIX workstations and Macs will be connected to the appropriate LANs. Hardware and software for these connections--including all the network communications repeaters and equipment to connect the Apple Network to the Ethernet--has been supplied by LTS.

2.3 Computer Aided Design/Manufacturing (CAD/CAM)

CAD/CAM/CAE CURRENT ENVIRONMENT

The existing Mechanical Design (MCAD) configuration is a distributed processing environment of 11 individual 3-D workstations, running the Unigraphics II MCAD software tied together with a central file and plotter server via NFS/Ethernet (Figure 6). MSD/EG also has six 3-D workstations, similarly configured and running Unigraphics II, located at Fermi National Accelerator Laboratory (FNAL). These workstations are tied back to MSD in Dallas via an Ethernet network link. Two MCAD compute servers running Unigraphics II are available for access by any MSD engineer using the Macintosh located on their desktop. This capability was intended to be provided for up to 24 engineers in FY90, however, these UGII licenses have been deferred until FY91 for engineers who need access to the design database or the MCAD resource.

In the Computer-Aided Engineering (CAE) area, MSD/EG currently uses one deskside UNIX workstation for ANSYS modeling of the various SSC magnets. Each office is also equipped with a Macintosh personal computer which can tie into the SSCL Scientific VAX to run additional ANSYS models (Figure 7). Due to Lab-wide competition for the VAX compute resource and overall lack of disk space, however, this mode of computing has not performed satisfactorily.

CAD/CAM/CAE PLANNED ENVIRONMENT

FY91 will see continued growth in MCAD requirements resulting in the acquisition of additional MCAD resources. Plans call for adding 30 new 3-D workstations and one MCAD compute server. Along with larger disk storage, a 9-track tape backup unit will be acquired to meet DOE disaster recovery requirements. Fifty-four additional Unigraphics II licenses will be purchased (including the 24 UGII seats deferred in FY90) to run on the hardware (Figure 8). Existing systems will also be upgraded. These new resources will be added to a proven distributed processing environment based on NFS and Ethernet that was successfully developed and implemented throughout FY90.

CAE will shift from the existing centralized computing environment to a distributed computing environment of networked workstations and servers (Figure 9). This network will be composed of 25 UNIX workstations equipped with sufficient memory and disk space to complete mid-range finite element studies and development of algorithms associated with magnet optimization techniques, graphics, artificial intelligence, and quench behavior analysis. These will be networked with a heavy-duty compute server that will be dedicated to running high-end finite element studies and two 3-D visualization workstations. All these compute resources will be using a variety of analysis codes such as ANSYS, TOSCA, PE2D, CINDA/SINDA, TRASYS, and other relevant codes as needed. A central file server will be utilized for file storage and to perform non-computational network tasks like data center, application software storage, mail and backups.

MSD CAD CURRENT CONFIGURATION

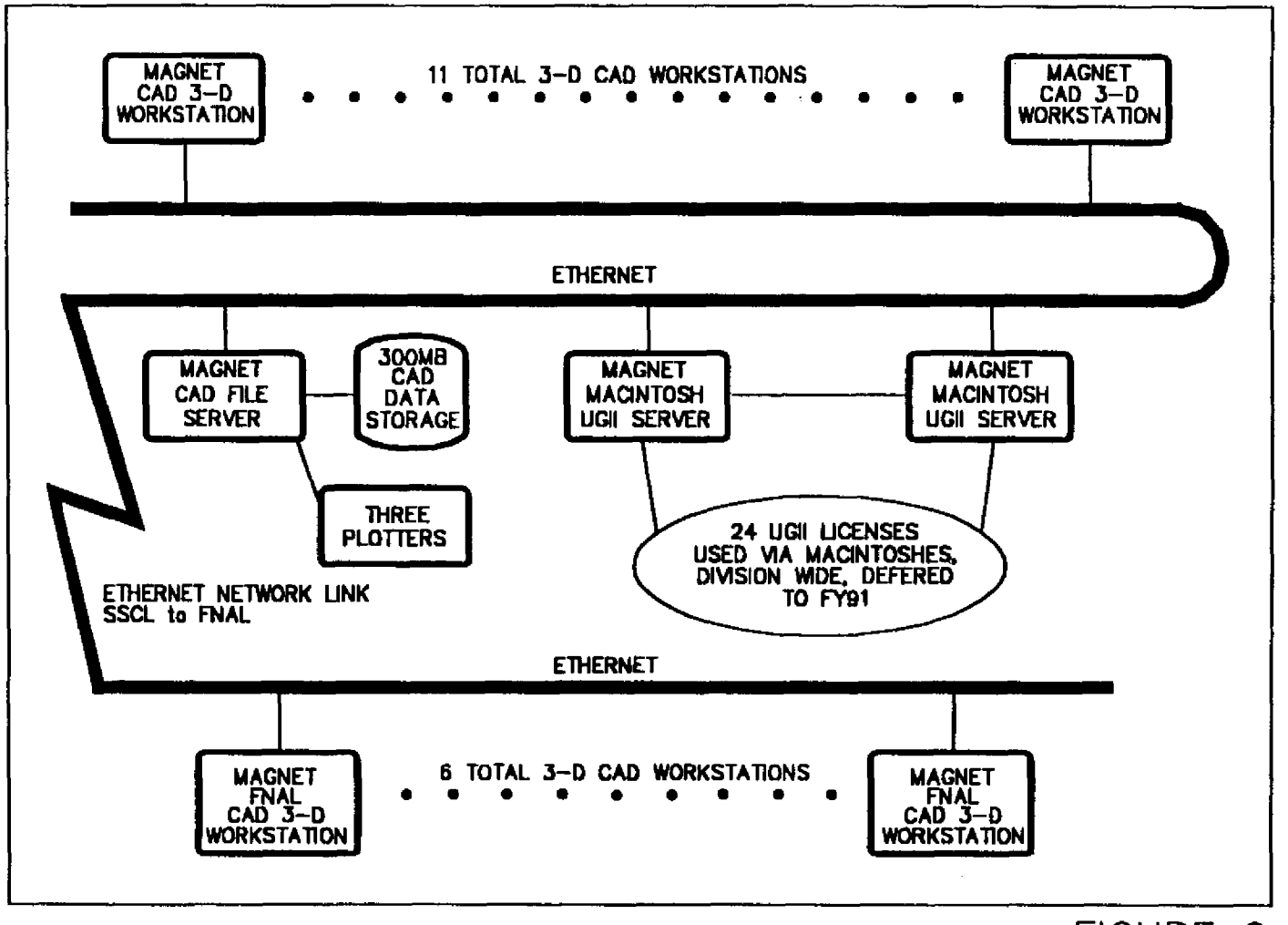


FIGURE 6

CAE CURRENT ENVIROMENT

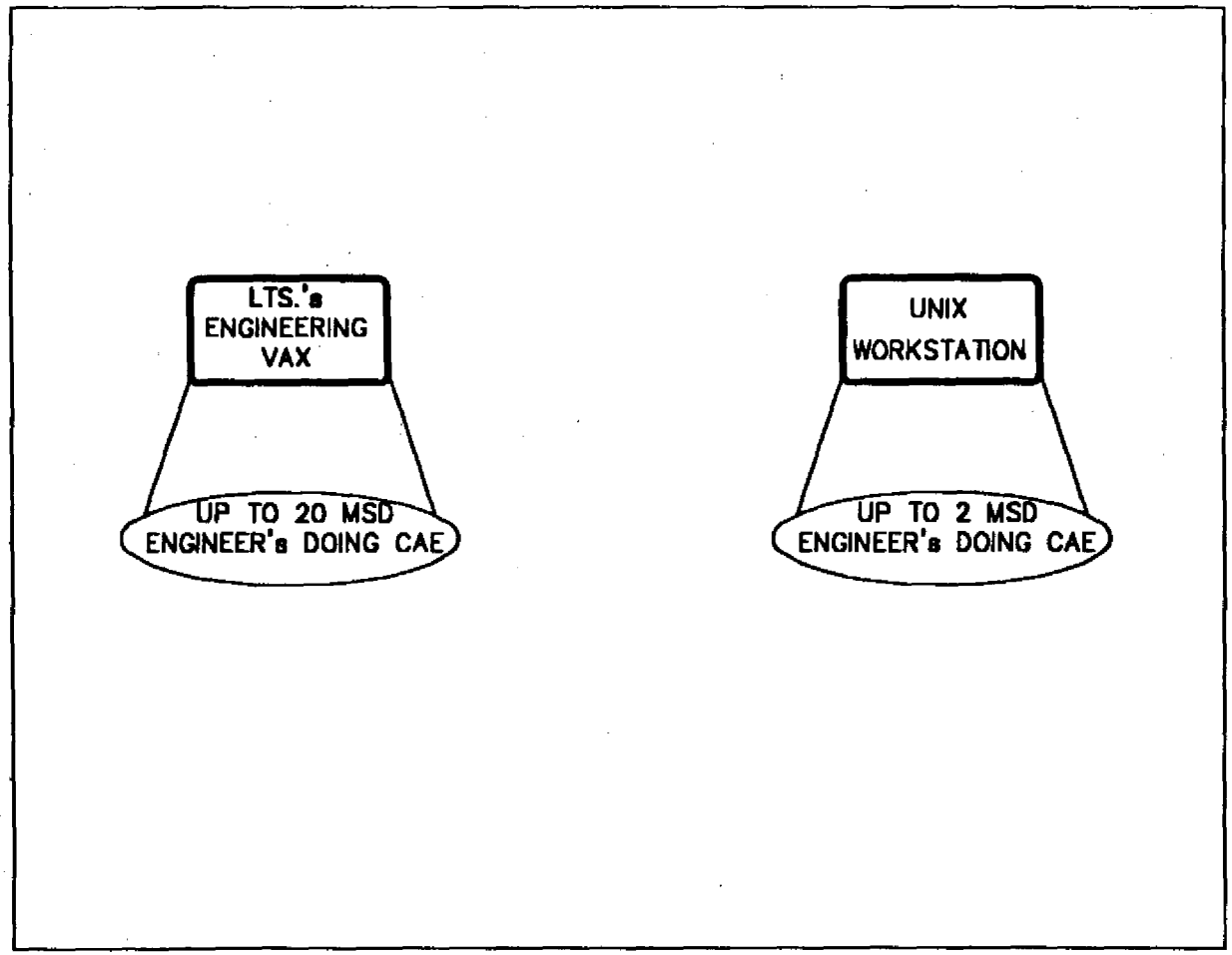


FIGURE 7

FY91 MSD CAD PLANNED CONFIGURATION

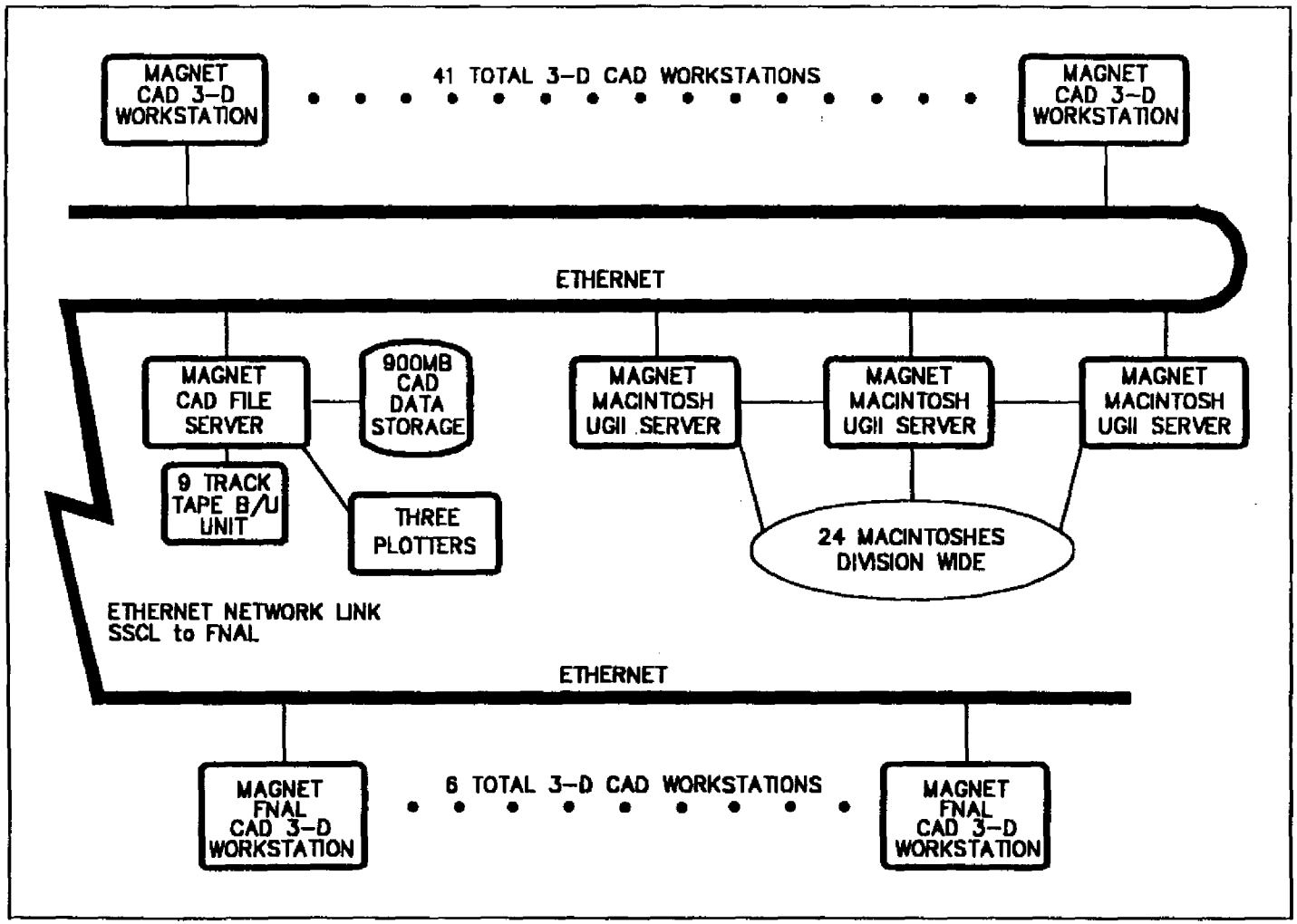


FIGURE 8

CAE PLANNED ENVIROMENT

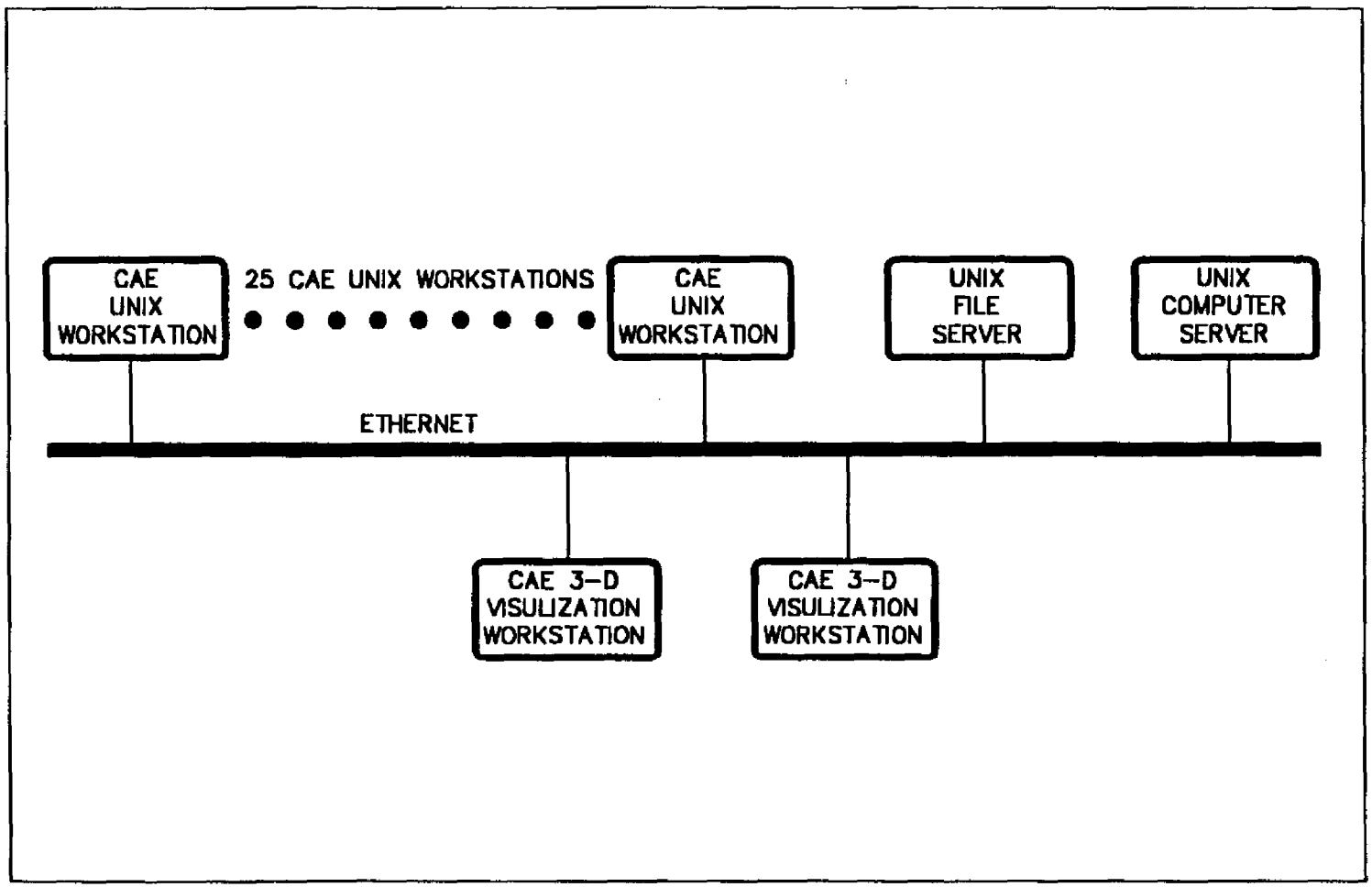


FIGURE 9

In response to Short Magnet Test needs, plans call for acquisition of four ECAD 486 workstations and associated ECAD software. They will be used primarily in the design of custom hardware needed for quench data collection and in the design of magnet power supplies. These systems will be networked together with existing MSD/EG computing resources to allow for the sharing of files and plotters (Figure 10).

3. Telecommunications (TC)

TELECOMMUNICATIONS STRATEGY

MSD is supported by LTS in telecommunications resources planning. The aforementioned hardware and software, whether existing or planned for future acquisition, will be integrated into the general Laboratory-wide system supported by LTS. Contents of this plan will provide input to LTS for planning future telecommunications resources.

ECAD PLANNED ENVIRONMENT

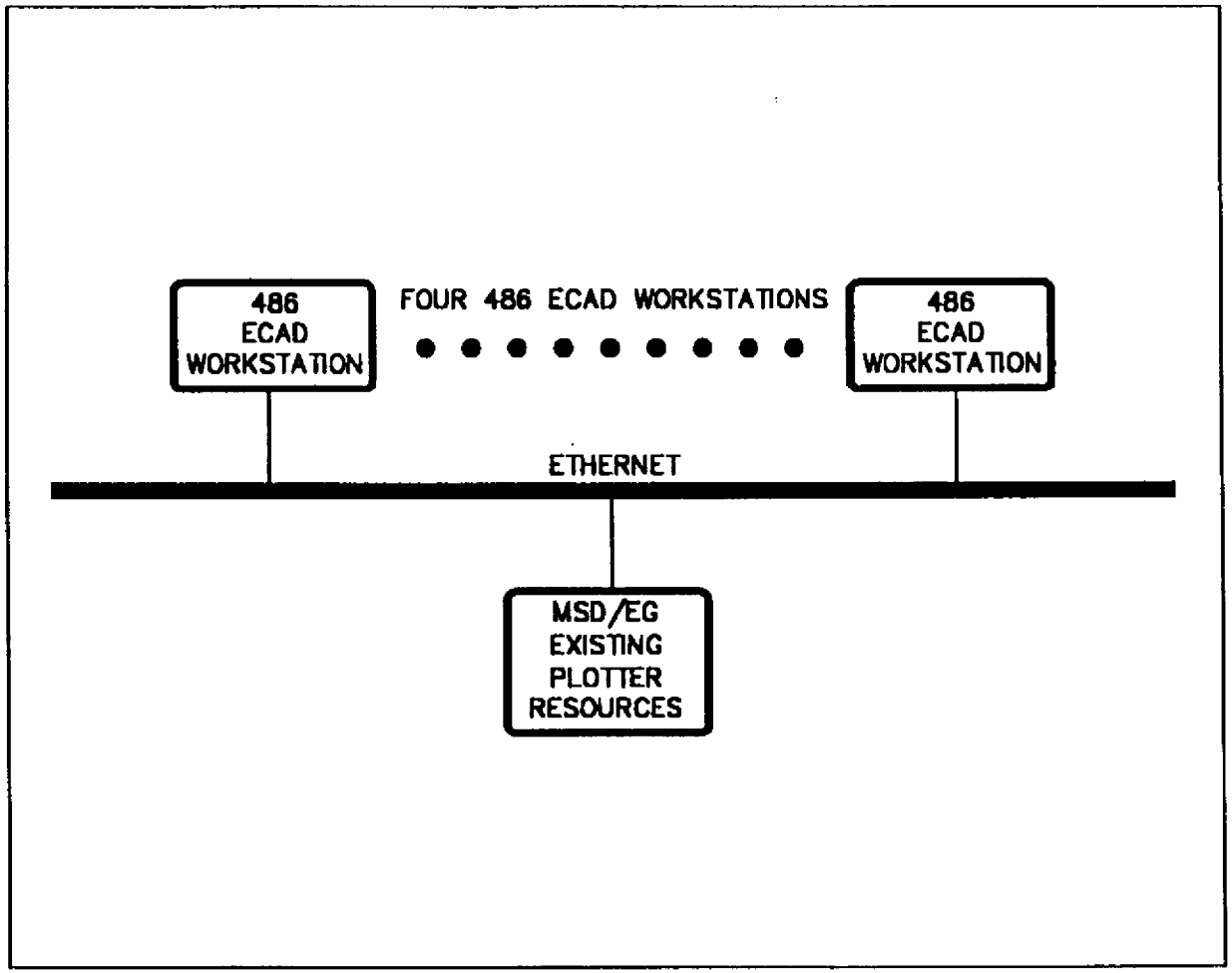


FIGURE 10

B. FY91/92 Short-Range Plan for MSD

SHORT-RANGE PLAN

Organizational Function: Magnet Systems Division

I. TABULATION OF REQUIREMENT

1. IS COMMERCIAL SOFTWARE

The following figures include Magnet Test & Data Management, Magnet Engineering, Magnet Test Laboratory and Magnet Business Management. Telecommunications is supported by LTS.

IS *	FUNDING	FY91	FY92
	Capital	$685K	$420K
	Operating	465K	211K

2. CR

		FUNDING	FY91	FY92
Magnet Test & Data Mgt.	ADP	Capital	$698K	$518K
		Operating	155K	156K
	AOSS	Capital	40K	30K
		Operating	10K	10K
Magnet Test Lab	ADP	Capital	284K	482K
		Operating	120K	240K
Magnet Engineering	ADP **	Capital	420K	355K
		Operating	200K	200K
	MCAD	Capital	2,800K	1,900K
		Operating	1,733K ***	1,050K
	CAE	Capital	979K	538K
		Operating	581K	600K
	ECAD	Capital	90K	65K
		Operating	70K	60K
	COMM	Capital	N/A	NA
		Operating	N/A	N/A

CAPITAL = High Value Capital (over $5K not including sales tax)
OPERATING = M&S (Hardware under $5K and Software)

* Includes figures for Business Management and Magnet Engineering.
** Figures represent items for Short Magnet Test software development.
*** Includes 24 UGII seats deferred from FY90.

II. MINI ACQUISITION PLAN

Organizational Function: Magnet Systems Division

1. ITR Need

IS

An Optical Disk Imaging/Document Control System will be acquired to serve as the primary means by which released engineering drawings and related documentation will be stored, retrieved and tracked within MSD. This Document Control system will consist of an optical disk file server and a separate database file server tied into MSD's existing AppleTalk and Ethernet networks. Searches for and access to design documents will occur from existing resources, starting initially with the Division's Macintoshes and later expanding to UNIX workstations and IBM compatibles. This system will eventually tie into a Laboratory-wide Document Control system that is still in the process of being defined.

ADP

Magnet Test & Data Management

Short Magnet Test Facility will use the four Sun workstations to communicate to the SPARC engine 1E boards to collect data from the superconducting magnets. This data will be stored on the Sun 4/490 file server. The associated software (Sybase, Data Views, RDBX Works and VxWorks) is used with the above hardware. The 19" color monitors are used to display the data captured. The database server and workstation servers supply file resources to the 29 UNIX workstations on hand by the end of FY92. It is best to have these functions in different servers. The database server will be accessed by magnet scientists at the SSCL and other HEP laboratories. The workstation server will serve the MT/DM Group's graphical and data analysis needs.

The Magnet Test Laboratory will need one server to temporarily store the magnet database and another server will have the configuration parameters for the MTL tests. These servers will act as backups for each other to increase the MTL availability. Secondary storage is needed to off-load the large amount of quench and magnetic measurement data acquired during the magnet tests.

A User Interface Toolkit (UI) is to be used to create an easy-to-use operator interface for the MTL. There is a need for at least one development license and multiple end-use licenses. The analysis tools are needed to do graphical data analysis on the acquired magnet data. The tools must be easy to use by physicists and engineers and provide 2 and 3-D graphical capabilities with a wide range of mathematical functionality. The relational database tool will be used to drive the data acquisition hardware database as well as be an interface to Sybase on the main database server. It must be compatible with Sybase (SQL based).

Engineering

An IS Optical Disk Imaging/ Document Control System consisting of an optical disk file server and a separate database file server tied into MSD's existing AppleTalk and Ethernet networks will be acquired in early FY91. It will serve as the primary means by which released engineering drawings and related documentation will be stored, retrieved and tracked within MSD.

MSD's analysis functions (ANSYS and others) are to be moved from a centralized computing structure using the LTS central VAX, to a distributed environment based on UNIX workstations networked with UNIX file and compute servers. Associated network hardware, memory, hard disks, output devices and a 9-track tape unit will also be purchased. The MSD VAX ANSYS

license will be converted to a 16-user license for use with the new distributed compute resources. Additional CAE software (TOSCA, PE2D, CINDA/SINDA and TRASYS) along with various CASE tools, math libraries and compilers will also be acquired.

Short Magnet Testing will need to buy four UNIX workstations, along with programming and CASE software so that development of the necessary software for the real-time collection and processing of magnet testing data can begin. A LAN analyzer and a VME bus analyzer will also be needed to perform troubleshooting of the various data collection paths used by the testing equipment. A line printer will also be purchased for program output along with two more workstations, a central file server, output devices, network upgrades and graphics upgrades.

CAD/CAM/CAE

Major MSD computing resource needs are concentrated in MCAD, CAE, ECAD and software development. Acquisition of additional MCAD resources will be required in order to stay abreast of magnet design demands as magnet engineering and tooling continues to ramp up. CAE acquisitions are aimed at shifting reliance from LTS's centralized VAX computer to distributed processing via desktop workstations clustered with servers. ECAD hardware and software will be acquired to begin designing specialized testing data acquisitioning electronics for the Short Magnet Test and to start development of the software that will collect and process the testing data.

Thirty MCAD 3-D workstations will be acquired during FY91 to meet manpower projections for design and tooling requirements of the Collider Dipole Magnet (CDM), Collider Quadrupole Magnet (CQM), High Energy Booster Collider Magnet (HEBCM) and High Energy Booster Quadrupole Magnet (HEBQM), and their cold masses, interconnects and cryostats. This will also require the procurement of 54 additional Unigraphics II licenses, 30 for the new 3-D workstations and 24 which were postponed from FY90. FY92 projections will require the procurement of another 20 3-D workstations and 20 Unigraphics II (UGII) licenses.

Additional UGII compute servers will be required to handle the expected increase in engineering usage of UGII. A 9 track tape backup system will be acquired to meet DOE disaster recovery requirements. Existing workstations will be upgraded with additional memory, CPU and graphic enhancements. This provides the older systems with increased capacity, computing power and throughput at a cost that is cheaper than replacing them with newer ones. The MCAD network will also be upgraded to a fiber-optic system.

MSD/EG CAE's aforementioned shift to workstations will provide MSD/EG with a computing environment to allow a greater number of CAE analytical models to be done. To achieve this, 25 CAE work-stations, a file server, advanced compute server and two 3-D visualization workstations will be acquired. MS/EG CAE will also require an additional 15 workstations in FY92 and at least one additional file server and compute server. It is also expected that existing workstations will have to be upgraded along with the network, disk storage capacity and the output devices.

Specialized test data collection hardware will need to be designed using four ECAD workstations and software. These workstations will be of the 486 variety and be used to run the Orcad and PSPICE ECAD software. A PLD programmer and software is also to be acquired. Two more workstations with ECAD software and one more PLD programmer and software are also planned.

All new workstations (and new hardware in general) will be by competitive bid. Exceptions to this policy will be those workstations running unique and highly specialized software. Upgrades to existing systems will have to be done on a sole-source basis. This is due to the proprietary nature of the existing systems and of the upgrades themselves. The MCAD, CAE, ECAD and the software development software will have to be sole-sourced because of their proprietary nature.

2. ITR Solution

Following is a list of ADP, CAD/CAE/ECAD, and COMM hardware and software in excess of $25K that will be acquired in FY91 and FY92:

Magnet Systems Division (MS) Requirements	Acq. Cost ($K)	Maint. Cost ($K)	Procurement Strategy	Funding FY 1991	WBS No.	Control No.
Magnet Test & Data Management						
Database Server	100K	10K	PR, FC	CP	4.2.2	MS91001
MTL Configuration Server	200K	20K	PR, FC	CP	4.2.2	MS91002
Secondary Storage	100K	10K	PR, FC	CP	4.2.2	MS91003
(10) UNIX Workstations	160K	16K	PR, FC	CP	4.2.2	MS91004
(6) 1-Board CPUs (VME)	30K	3K	PR, FC	CP	4.2.2	MS91005
UI Tool	20K	2K	PR, SS	MS	4.2.2	MS91006
Analysis Tool	25K	3K	PR, SS	MS	4.2.2	MS91007
RDB Tool	30K	3K	PR, SS	MS	4.2.2	MS91008
Sun 4/490	89K	9K	PR, FC	CP	4.2.2	MS91009
(4) Sun 4/65	47K	5K	PR, FC	CP	4.2.2	MS91010
Dataviews	29K	3K	PR, SS	MS	4.2.2	MS91011
SPARCengine 1E	28K	3K	PR, FC	CP	4.2.2	MS91012
Sub Total	858K					
Engineering & Short Magnet Test						
Optical Disk System	250K	20K	PR, FC	CP, MS	4.2.2	MS91013
(4) UNIX Workstations	240K	35K	PR, FC	CP	4.2.2	MS91014
Output Device	30K	3K	PR, FC	CP	4.2.2	MS91015
LAN Analyzer	30K	3K	PR, FC	CP	4.2.2	MS91016
VME Bus Analyzer	40K	4K	PR, FC	CP	4.2.2	MS91017
CASE & Misc. S/W Tools	100K	25K	PR, SS	MS	4.2.2	MS91018
Sub Total	690K					
CAD						
(30) 3D Workstations	1370K	40K	PR, FC	CP	4.2.2	MS91019
Unigraphics II S/W	1168K*	200K	PR, SS	MS	4.2.2	MS91020
UGII Compute Server	75K	8K	PR, FC	CP	4.2.2	MS91021
9-Track Tape System	30K	3K	PR, SS	CP	4.2.2	MS91022
Additional Disk Storage	45K	5K	PR, SS	CP	4.2.2	MS91023
Output Devices	60K	6K	PR, FC	CP	4.2.2	MS91024
W/S Network Upgrades	75K	8K	PR, SS	CP	4.2.2	MS91025
Graphics Upgrades	660K	66K	PR, SS	CP	4.2.2	MS91026
CPU Upgrades	141K	14K	PR, SS	CP	4.2.2	MS91027
Memory Upgrade	93K	9K	PR, SS	CP	4.2.2	MS91028
Systems Upgrade	60K	6K	PR, SS	CP	4.2.2	MS91029
Sub Total	3777K					

KEY: *Includes 24 UGII Licenses Postponed from FY90.

PR = Purchase	FC = Competition	CP = Capital
LS = Lease	SS = Sole Source	MS= Operational

Magnet Systems Division (MS) Requirements	Acq. Cost ($K)	Maint. Cost ($K)	Procurement Strategy	Funding FY 1991	WBS No.	Control No.
ECAD						
(4) 486 Workstations	50K	5K	PR, FC	CP	4.2.2	MS91030
(4) Orcad Software	16K	4K	PR, SS	MS	4.2.2	MS91031
(4) PSPICE Software	20K	2K	PR, SS	MS	4.2.2	MS91032
PLD Programmer	15K	2K	PR, FC	CP	4.2.2	MS91033
Sub Total	101K					
CAE						
(2) High-End Graphics W/S	136K	6K	PR, FC	CP	4.2.2	MS91034
File Server W/S	70K	7K	PR, FC	CP	4.2.2	MS91035
Compute Server W/S	25K	3K	PR, FC	CP	4.2.2	MS91036
(25) Analysis W/S	375K	37K	PR, FC	CP	4.2.2	MS91037
Additional Disk Storage	56K	6K	PR, FC	CP	4.2.2	MS91038
Memory Upgrades	105K	10K	PR, FC	CP	4.2.2	MS91039
9-Track Tape System	25K	3K	PR, FC	CP	4.2.2	MS91040
Output Devices	30K	3K	PR, FC	CP	4.2.2	MS91041
ANSYS Site License	120K	20K	LS, SS	MS	4.2.2	MS91042
CAE/CASE S/W	90K	46K	PR, SS	MS	4.2.2	MS91043
Presentation Software	50K	5K	PR, SS	MS	4.2.2	MS91044
Compilers/Math Libraries	45K	5K	PR, SS	MS	4.2.2	MS91045
Sub Total	1127K					
COMM						
Network Upgrades	175K	0	PR, FC	CP	4.2.2	MS91046

KEY: PR = Purchase LS = Lease FC = Competition SS = Sole Source CP = Capital MS= Operational

Magnet Systems Division (MS) Requirements	Acq. Cost ($K)	Maint. Cost ($K)	Procurement Strategy	Funding FY 1992	Control No.
Magnet Test & Data Management					
MTL Database Server	200K	20K	PR, FC	CP	MS92047
Workstation Server	100K	10K	PR, FC	CP	MS92048
(4) UNIX Workstations	64K	6K	PR, FC	CP	MS92049
(3) Analysis Workstations	50K	5K	PR, FC	CP	MS92050
(14) 1-Board CPUs (VME)	70K	7K	PR, FC	CP	MS92051
Sybase Secondary License	40K	6K	PR, SS	MS	MS92052
Secondary Storage	100K	10K	PR, FC	CP	MS92053
UI Tool	27K	5K	PR, SS	MS	MS92054
Analysis Tool	25K	5K	PR, SS	MS	MS92055
SPARCengine 1E	89K	9K	PR, FC	CP	MS92056
330M Disk Drives	67K	7K	PR, FC	CP	MS92057
Sub Total	832K				
Engineering					
Optical Disk System	100K	30K	PR, SS	CP, MS	MS92058
(2) UNIX Workstations	120K	62K	PR, FC	CP	MS92059
File Server	55K	5K	PR, FC	CP	MS92060
Output Device	15K	2K	PR, FC	CP	MS92061
Graphics Upgrades	25K	3K	PR, SS	CP	MS92062
CASE Tools S/W	75K	45K	PR, SS	MS	MS92063
Sub Total	390K				
CAD					
(20) 3D Workstations	720K	115K	PR, FC	CP	MS92064
(20) Unigraphics II S/W	420K	260K	PR, SS	MS	MS92065
UGII Compute Server	75K	8K	PR, FC	CP	MS92066
Additional Disk Storage	45K	4K	PR, SS	CP	MS92067
Output Devices	50K	5K	PR, FC	CP	MS92068
W/S Network Upgrades	75K	8K	PR, SS	CP	MS92069
Graphics Upgrades	420K	5K	PR, SS	CP	MS92070
CPU Upgrades	189K	19K	PR, SS	CP	MS92071
Systems Upgrade	210K	21K	PR, SS	CP	MS92072
Sub Total	2204K				
ECAD					
(2) 486 Workstations	25K	10K	PR, FC	CP	MS92073
(2) Orcad Software	8K	7K	PR, SS	MS	MS92074
(2) PSPICE Software	10K	1K	PR, SS	MS	MS92075
PLD Programmer	15K	2K	PR, FC	CP	MS92076
Sub Total	58K				

KEY: PR = Purchase, LS = Lease; FC = Competition, SS = Sole Source; CP = Capital, MS= Operational

Magnet Systems Division (MS) Requirements	Acq. Cost ($K)	Maint. Cost ($K)	Procurement Strategy	Funding FY 1992	Control No.
CAE					
(15) Analysis W/S	225K	112K	PR, FC	CP	MS92077
Compute Server W/S	35K	4K	PR, FC	CP	MS92078
Additional Disk Storage	28K	3K	PR, FC	CP	MS92079
CPU Upgrades	70K	7K	PR, FC	CP	MS92080
W/S Network Upgrades	75K	8K	PR, SS	CP	MS92081
Output Devices	30K	3K	PR, FC	CP	MS92082
ANSYS Site License	120K	12K	LS, SS	MS	MS92083
CAE S/W Tools	70K	66K	PR, SS	MS	MS92084
Presentation Software	40K	4K	PR, SS	MS	MS92085
Compilers/Math Libraries	35K	4K	PR, SS	MS	MS92086
Sub Total	728K				
COMM					
Network Upgrades	150K	15K	PR, FC	CP	MS92087

KEY: PR = Purchase; LS = Lease; FC = Competition; SS = Sole Source; CP = Capital; MS= Operational

3. Excessed ITR

None.

III. LEASE AND SERVICE MAINTENANCE CONTRACTS

Lease and/or service maintenance agreements are as follows:	FY91	FY92
ANSYS Site License	$120K	$120K
CRAY Time	50K	50K
MSD/EG Unigraphics II Software	200K	$260K
MSD/EG CAD Hardware Maintenance	165K	185K
MSD/EG CAD Software Maintenance	50K	70K
MSD/EG CAE Hardware Maintenance	75K	137K
MSD/EG CAE Software Maintenance	66K	94K
MSD/EG ECAD Hardware Maintenance	7K	10K
MSD/EG ECAD Software Maintenance	6K	8K
MSD/EG Short Magnet Test Hardware Maintenance	45K	62K
MSD/EG Short Magnet Test Software Maintenance	30K	45K

ADP RESOURCES

PROJECT MANAGEMENT OFFICE

STRATEGIC PLAN, PART III

AND

FY91/92 SHORT-RANGE PLAN

19 September 1990

Approved by:

Ted Kozman

Ted Kozman, Acting Project Manager
Project Management Office

VII. ITR Needs for Project Management Office

MISSION OBJECTIVES

The Project Management Office (PMO) is the focal point for all planning, control, and reporting of R&D and project construction activities of the SSCL. PMO allocates and authorizes funding for major SSCL divisions and is responsible for the collection, processing and distribution of information concerning the project. A centralized Management Information System under the authority of LTS provides the capability to compile project information and make it available for all inquiries. A cost/schedule information system has been implemented and basic control documents prepared for quality assurance, configuration management, and document control operations.

PMO is made up of the following groups which are responsible for specific technical areas required for overall project management: Engineering Standards, Environmental Affairs, Project Cost, Schedule and Reporting Systems, Cost Estimating, Systems Engineering and Integration Assistance. Each group's role is defined separately with respect to responsibilities and program activity.

The Engineering Standards Group is responsible of preparing the policies, standards and practices for electrical and mechanical systems, and for quality assurance for important factors of reliability, availability and maintainability. The group has completed a management plan document, developed software to implement the tracking system for technical documents, and written the drafting and engineering standards for the SSCL. This section has established a project management strategy room representing the various SSCL machine configurations, site layout, and related milestones and schedule planning.

The Environmental Affairs Group is responsible for providing site-specific data to the Argonne National Laboratory (ANL) for preparation of the Supplemental Environmental Impact Statement (SEIS), as well as drafting several sections of the SEIS for Argonne. This group also handles the programmatic agreement with the Texas Site Historic Preservation office.

The Project Cost, Schedule and Reporting Group (PCSR) is responsible for providing project management control systems and C/SCSC expertise to support project monitoring and reporting of contractor cost and schedule performance (Monthly Report and Cost Performance Report), project scheduling, budget planning and milestone maintenance. The PCSR also develops the documentation, system implementation and reporting to satisfy the contractual requirement for compliance with DOE Order 2250.1C. The scheduling section updates the integrated SSCL Master Schedule coordinating all SSCL efforts under the TRC. This group will also prepare the documentation required for the C/SCSC readiness review.

The Cost Estimating Group is responsible for baseline cost estimate updates and revisions, as well as maintenance of the project work breakdown structure (WBS). The cost estimating section developed a controlled cost data base for estimating project costs. The cost estimating process was used to generate the project baseline cost estimate provided to DOE.

The Systems Engineering & Integration Assistance function is handled by Lockheed Engineering Company. Lockheed provides systems engineers in the disciplines of planning, configuration management, analysis, and speciality engineering. The Systems Engineering Group has developed strategic plans including a Management Plan, a Configuration Plan, a Software Development Plan and a Reliability Program Plan. In Accelerator Systems Division, they have prepared a hierarchical analysis, specification tree, systems specification, interface control definitions and requirements document. In Magnet Systems Division, they participated in preparing the dipole magnet acquisition strategy paper, dipole magnet specification, reliability planning, and trade study on the

dipole magnet field study. In the Physics Research Division, they developed interface definitions and configuration management requirements in the SSCL and collaborations.

A. ITR Requirements for PMO

1. Information Systems (IS)

IS CURRENT ENVIRONMENT

Project Management (PM) is supported by the IS resources under the control of the Laboratory Technical Services Division for administrative information processing. The current environment involves all of the elements described in the Mission Objectives section.

IS PLANNED ENVIRONMENT

In the Engineering Standards Group, efforts will continue to formalize and implement standards for overall engineering requirements and for specialty disciplines such as cryogenics engineering.

In the Environmental Affairs Group, work will continue in providing more detail on the infrastructure requirements in order to specifically define the construction and operational water needs and the proposed sources of water for all sites. Once a Record of Decision is reached in FY91 this group's mission is completed and it may be disbanded.

In the PCSR Group, training of key personnel in their cost/schedule responsibilities will continue throughout the life of the project as will preparation of the SSCL Monthly Progress and Cost Performance Reports and preparation for the DOE validation of the SSCL CSCS (Cost Schedule Control System). Validation plans for internal and external C/SCSC (Cost/Schedule Control System Criteria) surveillance will be developed. The CSCS validation, which is contractually required, is expected to be accomplished in late FY91. SSC Laboratory personnel will participate in the validation of major subcontractors in FY91 through FY93. Surveillance of these subcontractors, as well as internal surveillance of SSCL performance, will continue for the life of the project. Regular, recurring surveillance will ensure valid, timely, and accurate performance measurement information, for effective internal management purposes, and reporting to the DOE. All required supporting documentation and training will be accomplished in order to have a valid CSCS management system at the SSCL. Maintenance of the validation will require a high level of management support and day-to-day surveillance of project activities.

The Cost Estimating Group will continue to provide support for I.C.E. reviews, furnish cost analyses of funding profiles and cost trends, and provide cost data in change control evaluations. The project coding structure will be coordinated for all divisions to permit higher level customers reporting summarization. There will also be continuing vigilance with respect to maintenance of the WBS and work package improvement.

In the Systems Engineering and Integration Group, priorities will be established for continued support for planning, analysis and specialty engineering. These include flow down of requirements from the system level to the component level, developing specifications, performing analyses such as risk analysis, failure modes and effects, optimization trade studies, requirements allocation and tracking, integration and installation plans and analysis.

2. Computing Resources (CR)

2.1 Automated Data Processing (ADP)

ADP CURRENT ENVIRONMENT

Project Management relies on the computing resources operated and maintained by Laboratory Technical Services Division for Automated Data Processing tasks. These resources include the Administrative VAX 6420 (SSCAD1) which houses the aforementioned IS software.

ADP PLANNED ENVIRONMENT

Growth of ADP hardware and software will continue as per the LTS plan.

2.2 Automated Office Support Systems (AOSS)

AOSS CURRENT ENVIRONMENT

Current office support equipment is configured in a hardware structure concept as shown in the following (Figure 1):

52 Macintoshes	13 IBM/Compatible PCs	3 Sun SPARCstations
5 H-P LaserJet Printers	5 Apple LaserWriter	1 H-P 7475A Plotters
1 LN03 Postscript Printer	10 Paint Jets	2 Colorview 300 Plotters
1 CalComp Plotter	1 Barco Video/Data Selector	1 Quartet Ovionics
1 PMO Server	1 DEC Terminal	1 Scanner

The Macintosh, which is the primary desktop system used in PM, is used for spreadsheet and graphics applications, word processing and database applications. Terminal emulation programs provide access to the VAX and other mainframe systems available on the WAN. The PM Office server, Centralized Mac services, network modems and network services round out the existing resources. IBM compatible PCs support special scientific, engineering, estimating and scheduling functions. They are also used in CAD/CAE and project management functions. The PC system central services are provided via an Ethernet LAN. Sun SPARC stations are also in place to provide communications with other divisions that have indicated an UNIX environment.

AOSS PLANNED ENVIRONMENT

The computing strategy of the Project Management Office is to maintain a distributed environment of computers supported by local and wide area networks as dictated by SSCL growth. This will provide the responsiveness necessary for optimum productivity of personnel, local computer power to the user, and communications with other divisions. There is no acquisition planned for new Project Management computing resources over $25K.

2.3 Computer Aided Design/Manufacturing (CAD/CAM)

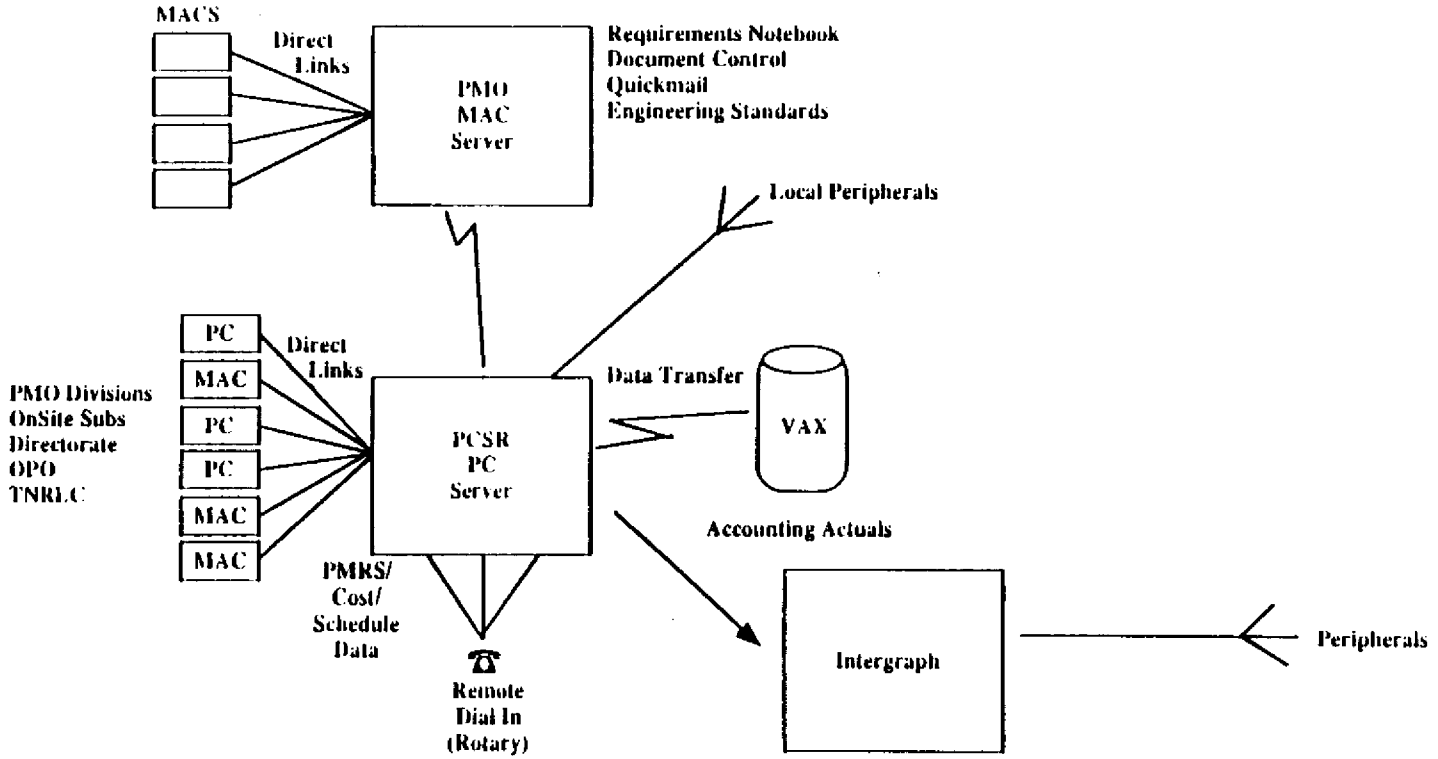
CAD/CAM/CAE CURRENT ENVIRONMENT

There are no existing systems related to CAD/CAM/CAE work.

CAD/CAM/CAE PLANNED ENVIRONMENT

There are no plans to implement CAD/CAM/CAE in Project Management.

PROJECT MANAGEMENT OFFICE HARDWARE STRUCTURE CONCEPT



- Data Collection
- Data Dispersal
- Data Translation
- Processing if workstation not configured
- Data backup/archive
- What if gaming
- Statusing data QA
- Baseline revision analysis

FIGURE 1

3. Telecommunications (TC)

TELECOMMUNICATIONS STRATEGY

PMO is supported by LTS in telecommunications resources planning. The aforementioned hardware and software, whether existing or planned for future acquisition, will be integrated into the general Laboratory-wide system supported by LTS. Contents of this plan will provide input to LTS for planning future telecommunications resources.

B. FY91/92 Short-Range Plan for PMO

SHORT-RANGE PLAN

Organizational Function: Project Management

I. TABULATION OF REQUIREMENTS

1.	IS		FUNDING	FY91	FY92
			Operating	$90K	$50K
2.	CR		FUNDING	FY91	FY92
		ADP	Capital	N/A	N/A
			Operating	N/A	N/A
		AOSS	Capital	$25K	$30K
			Operating	10K	12K
		CAD/CAE	Capital	N/A	N/A
			Operating	N/A	N/A
		COMM	Capital	N/A	N/A
			Operating	N/A	N/A

CAPITAL= High Value Capital (over $5K not including sales tax)
OPERATING= M&S (hardware under $5K and software)

II. MINI-ACQUISITION PLAN

Operational Function: Project Management

1. ITR NEED

Project Management Office (PMO) provides project management support and services to the SSCL. The Cost Estimating Group provides the SSCL with cost estimating/cost engineering services. The Project Cost, Schedule and Reporting Group provides SSCL with project budgeting, progress monitoring, and reporting functions. The Engineering Standards Group ensures and documents all drawings, specifications, sketches and calculations to meet minimum SSCL project standards. The Environmental Affairs Group supports DOE in applying for the project's Environmental Impact Statement. The Systems Engineering and Integration Group

establishes a process for defining, planning and performing the various system engineering analysis and specialty engineering support functions required to meet SSCL design criteria and construction specifications.

Project management scheduling software called Time Machine is required to help control the SSCL operations and facilitate CSCS/C reporting to DOE. Implementation and interface support will be necessary to answer issues such as information structuring, data management strategies, special processing requirements, custom output definitions and data exchange capabilities.

The PCRS Group implemented the EASYTRAK software package which supports SSCL planning and reporting activities. This product has not performed satisfactorily in supporting all aspects of the PCRS design criteria and functional requirements. An alternative method which combines the packages, Time Machine (for scheduling) and MPM/Control (for cost and C/SCSC reporting), is being implemented in FY91. Though a single product solution was preferred, the complicated integration requirements have proved unwieldy on the VAX-based EASYTRAK system. The proposed alternative is a PC-based, Novell environment which should provide a more useful, if less straightforward, database interface procedure for input of C/SCS data. Time Machine and MPM/Control will serve as the integration and translation software for the numerous PC-based project management packages used by the SSCL divisions and/or major subcontractors such as Open Plan, Primavera, MS Project, Time-Line and Artemis.

2. ITR Solution

Following is a list of the IS software in excess of $25K that will be acquired in FY91:

Project Management Office (PM) Requirements	Acq. Cost ($K)	Maint. Cost ($K)	Procurement Strategy	Funding FY 1991	WBS No.	Control No.
Time Machine Software Support	40K	4K	PR, SS	MS	3.1.3	PM91001
MPM/Control Software	50K	5K	PR, SS	MS	3.1.3	PM91002
Sub Total	90K					

KEY: PR = Purchase, LS = Lease; FC = Competition, SS = Sole Source; CP = Capital, MS= Operational

3. Excessed ITR

None.

III. LEASE AND SERVICE MAINTENANCE CONTRACTS

There are no lease and/or service maintenance agreements over $10K in effect.

ADP RESOURCES

PHYSICS RESEARCH DIVISION

STRATEGIC PLAN, PART III

AND

FY91/92 SHORT-RANGE PLAN

19 September 1990

Approved by:

Fred Gilman

Fred Gilman, Associate Director
Physics Research Division

VIII. ITR Needs for Physics Research Division

MISSION OBJECTIVES

The Physics Research Division (PRD) has the responsibility of developing the experimental systems for performing High Energy Physics (HEP) research at the SSC Laboratory. This effort includes development of the experimental facilities, experimental detectors including electronics and computing, and general computing facilities for theoretical and experimental HEP. The engineering efforts required to construct the experimental facilities and detectors will be centralized within the PRD which will require the acquisition of a large resource of CAD facilities and a central repository and a data base to maintain the associated documents and drawings. The PRD will provide the major portion of the computing and data acquisition environment needed to collect the pentabytes (10^{15} bytes) of data to be produced by the SSC detectors. In addition the PRD will be responsible for providing the ADP equipment required to store, reduce, and analyze the data collected.

A. ITR Requirements for PRD

1. Information Systems (IS)

IS CURRENT ENVIRONMENT:

The administrative computer needs of PRD are currently handled using Laboratory Technical Services Division IS resources.

The Physics Research Division has a requirement for an Information Handling System (IHS) to track and store physics and engineering documents relating to the design, development, and operation of the detectors. The requirement is similar to that of Project Management and the Collaborations, and will be met via a joint effort with these organizations. A set of preliminary requirements for the system have been developed as the prototype. The prototype will be used to define the procedures for the use of the advanced information handling system.

IS PLANNED ENVIRONMENT:

Experience with the prototype system will determine how it should be expanded and upgraded to meet the full requirements or if a new system should be acquired. This decision should be made in FY91. Physics Research will participate in the development of a Laboratory-wide MIS system.

2. Computing Resources (CR)

2.1 Automated Data Processing (ADP)

ADP CURRENT ENVIRONMENT

PRD has computing needs in the following areas: simulation of physics interactions, modeling and simulation of experimental detectors, data acquisition, data reduction, physics analysis of experimental data, and theoretical physics computations. The findings of several committees who have examined the needs for scientific computing in PRD are detailed in the following reports:

Report of the Task Force on Computing for the SSC (SSC-N-579 Dec., 1988);
Report of the SSC Computer Planning Committee (SSC-N-691 Jan., 1990);
Physics and Detector Simulation Requirements (SSCL-259 Mar., 1990);

Physics and Detector Simulation Facility Specifications (SSCL-275 May, 1990);
Report of the SSC Long-Range Computer Planning Committee (in preparation, 1990).

PRD currently uses several RISC/UNIX workstations networked to a common file-server. This network, which is equivalent to about 200 VAX 11/780's, is being used in development of the detector simulation facility and for the actual running of detector simulations. In addition, a VAX 6420 with the equivalent performance of 14 VAX 11/780's serves as a general purpose scientific/engineering analysis CPU with programming tools and networking support required for interaction amongst the HEP research laboratories throughout the U.S. and Europe (Figure 1).

Figure 2 presents the configuration for Phase I (500 MIPS) of the Physics and Detector Simulation facility that was submitted to the computer market with an RFP. The responses to the RFP will be reviewed and selection of a vendor or vendors will be made in early FY91.

The SSCL uses open systems and industry standards where possible for operating systems, languages, utilities, and protocols. To meet this goal the Laboratory has established a computing environment emphasizing the use of distributed, networked computing, graphics, and peripherals from multiple vendor sources. The SSCL is a member of the Open Software Foundation (OSF) and will install the OSF/1 operating system as soon as possible.

ADP PLANNED ENVIRONMENT

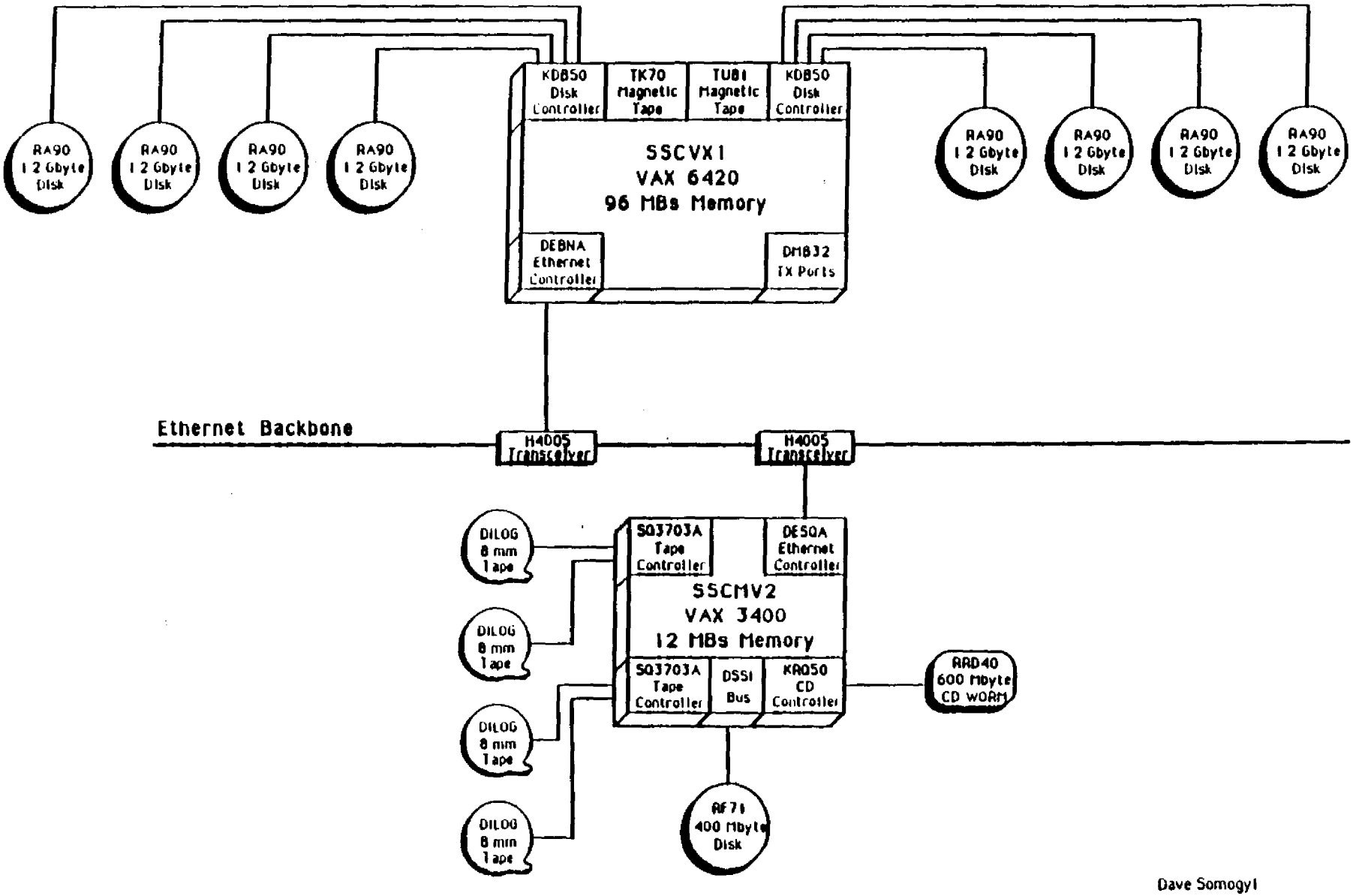
The PRD Computing group will require computing resources to support detector and experimental systems designs as well as to satisfy the overall laboratory networking requirements. Interactive computing is to be provided by a computer resource configured to support the simulation, reduction, analysis and presentation of event data. Phase II will include the acquisition of an additional 500 MIPS of computing power in the form of relatively low cost processor farms in FY91 and 3000 MIPS during FY92. It is expected that the computing needs of the SSCL and likewise the facilities required will continue to ramp-up throughout the decade. The central computing configuration will eventually have a capacity for 500 interactive users from a user population of about 2000. Storage systems for data access and archiving must be developed at a rapid pace. The simulation facility alone will require some 400 GB of disk and 6 TB of tape storage. By the end of the decade, experimental data generated by the detectors will be collected at a rate of about 1 TB per detector per day which implies the need to store penta-bytes of data each year. Application software products for analysis, data base management, display and reporting will also be required.

The SSCL computing strategy features a distributed environment of computers supported by local and wide area networks. This environment brings the computing power and desired responsiveness to the desk of each scientist or engineer, allowing local computation on multiple tasks in a graphical window environment. Workstations are clustered to file and compute servers which have a common hardware, software and network architecture. These clustered workstations have access to additional resources via the networks. Specialized applications servers will support higher applications such as engineering analysis codes, data base management systems, and modeling/simulation software.

Initial computing requirements for PRD are driven by detector simulation and design needs. These needs will require specialized resources from workstations to large compute engines throughout the design phase of the experiments at the SSCL. As the operational phase of the SSCL approaches, resources required for data reduction and analysis be will developed using high-MIP computers. As workstation technology becomes more prevalent and the ability to make effective use of distributed computing through the use of improved networking techniques such as FDDI becomes

Figure 1

SSC Scientific VAXcluster Configuration



Dave Somogyi
August 1990

Figure 2

PHYSICS & DETECTOR SIMULATION FACILITY [PHASE 1]

SYSTEM SOFTWARE

1] MANAGEMENT/ ADMINISTRATION OF SYSTEM SOFTWARE
2] USER INTERFACE
3] BATCH SUBMITTAL SYSTEM
4] DISTRIBUTION PROCESSING SYSTEM
5] TAPE MANAGEMENT SYSTEM
6] OPERATION INTERFACE SYSTEM
7] BACK-UP SYSTEM
8] REMOTE LOGIN CAPABILITY
9] NETWORK FILE ACCESS
10] SYSTEM UTILITIES
11] USER ACCESS SYSTEM
12] DOCUMENTATION
13] NETWORK MANAGEMENT SYSTEM
14] LIGHT WEIGHT PROTOCOL

INSTALLATION & DEVELOPMENT PHYSICS SOFTWARE

1] DEFINE STRUCTURE
2] IMPLEMENT STRUCTURE
3] TEST ACCESS METHODS
4] INSTALL PRODUCTS
- CLHEP - CMZ - HYDRA
- ISAJET - LUND - PATCHY
- SSCL - SSCANA - MAD
- OTHER PHYSICS
- OTHER ACCELERATORS

5] TEST

ANALYSIS & DESIGN
SUBSYSTEM PROCUREMENT
INTEGRATION & TEST

MAJOR MILESTONES

- EVENT LIST ACCEPTANCE
- DESIGN ACCEPTANCE
- COMPLETION OF HARWARE ACCEPTANCE TEST
- INTEGRATION TEST REPORT
- SYSTEM OPERATION
- OPERATION ASSESSMENT REPORT

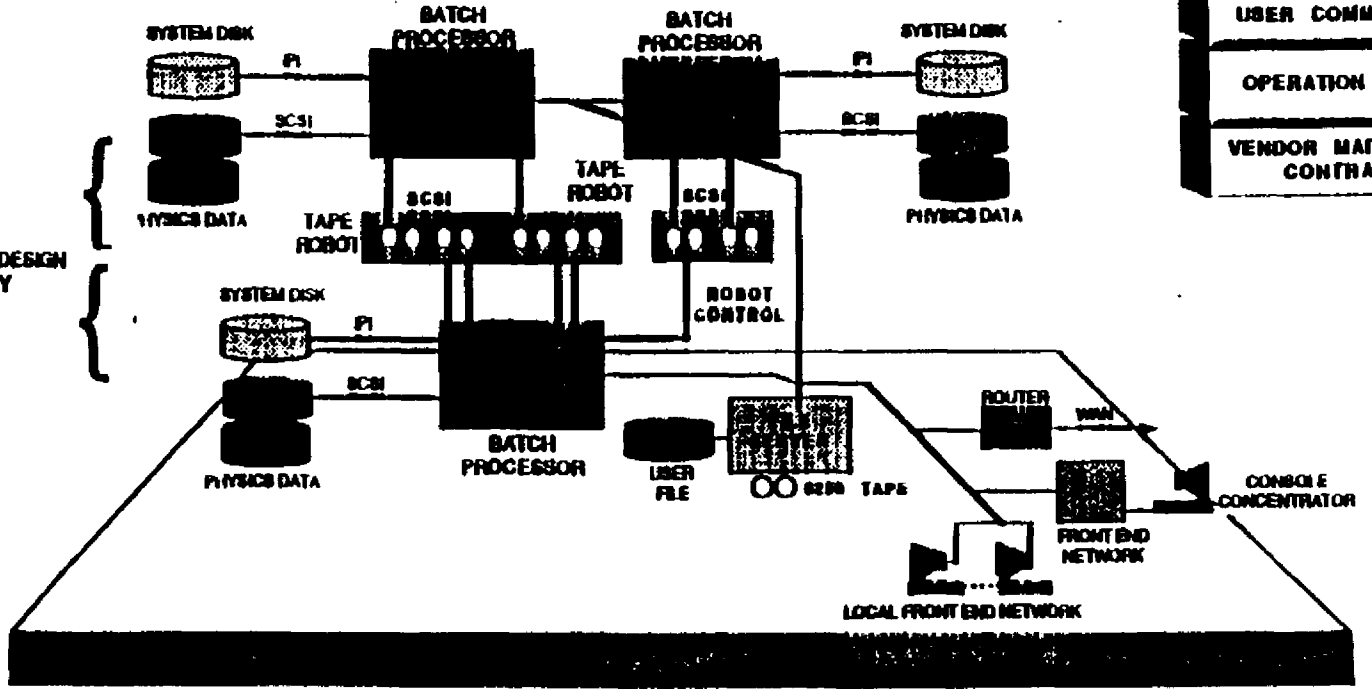
OPERATION SUPPORT

TRAINING
SYSTEM MANAGEMENT & OPERATION TOOLS
OPERATION SYSTEM MAINTENANCE
RELATIONSHIPS USER COMMUNITY
OPERATION GUIDE
VENDOR MAITENANCE CONTRACTS

PROJECT MANAGEMENT & ADMINISTRATION

SYSTEM HARDWARE

1] SCOPE REQUIREMENTS/ DESIGN
2] PROCUREMENT/ DELIVERY
3] INSTALLATION
4] COMPONENT TEST
5] SYSTEM TEST



FACILITY

1] PLAN LAYOUT OF EQUIPMENT
2] POWER REQUIREMENTS

reality, computing resources will be used as tools for basic design as well as simulation and data analysis.

Data reduction/analysis requirements are dependent on the ability to provide computing which will support event reconstruction and event simulation which are CPU intensive. The solution to this effort may be the development of parallel processor ranches which are a collection of large numbers of identical processors running identical programs on different events. In the early stages of the detector development program, where data analysis is not a prevalent requirement, simulation efforts will be supported with conventional computing resources; that is, the integrated use of the distributed computing environment which will have a capability in excess of 4000 MIPS by 1992. After the implementation of the simulation facility, additional data reduction and analysis computing resources can be developed using the latest technology to increase the total CPU power by an additional 6000 MIPS by 1998, approaching 10,000 MIPS total at that time.

About one-third of the Experimental Systems/Detector R&D funding is expected to be designated for ADP equipment to provide tools for the researchers to accomplish the designated tasks.

The Experimental Physics groups will require some equipment that is of general use as well as items specifically associated with particular experiments. The experimental physics program will consist of research conducted at sites other than the SSCL including participants in collaboration for SSC experiments. As experimental groups are established, their needs for equipment and for laboratory space will grow. The laboratory and shop requirements will expand as the participation in outside experiments develops and the supply of software tools and ADP equipment must grow as their function or size changes. The support of groups involved in SSC detector collaborations will also require ADP equipment in both FY91 and FY92 as they engage in work to develop proposals. This includes the building of prototypes for various components and subsystems.

The Experimental Facilities Group will procure ADP equipment to develop computing capability for engineering support and for the work of the SSC collaborative and liaison efforts. Equipment will be used to develop the beam detector lab as well as the labs supporting the engineering and SSC detector groups. The development of a beam instrumentation laboratory has involved starting on the production of modules for silicon microstrip detectors for use as momentum taggers in calibration beams. Other work has been done to build a transition radiation detector (TRD) to tag electrons in calibration beams. Some of this work involved using beam time at FNAL or BNL to test these modules. Computing engines will be required for analysis and documentation of facility requirements associated with detectors in FY91. Software, like the IDEAS systems used for EOIs, will be needed as the data acquisition work gets underway. In FY91 and FY92, the group will continue work on beam-line instrumentation which involves work on silicon microstrip detectors and TRDs. The construction of synchrotron radiation detectors will also begin in FY91. In FY92, the design and construction of special ring-imaging Cerenkov counters for calibration beams will begin. Experimental Facilities will continue to purchase computing engines for analysis and documentation of facility requirements associated with detectors in FY92. In addition, the laboratory will support R&D efforts that will lead to the construction of large detectors.

PRD is also working with the SSC detector collaborations to design and construct large scale data acquisition systems. These on-line systems will include embedded microprocessors, processor ranches, parallel event builders, data storage devices, and monitoring and calibration systems. The details of these systems will depend upon the detectors that are approved. It is likely that as much as one Tera-FLOP of computing may be required from on-line processor ranches.

Off-line reconstruction and reduction of the data collected by the SSC detectors will require massive amounts of CPU power, I/O bandwidth, and data storage. No detailed model has yet been developed for SSCL off-line computing, but the CPU power required is estimated to be at least 100 Giga-FLOPS with a requirement for the storage of penta-bytes of data.

Physics analysis of the data summary tapes will require the use of high-speed servers, high-resolution and high-speed graphics, modern data base systems and servers, high-speed nets, and large volumes of on-line or near-line storage.

2.2 Automated Office Support Systems (AOSS)

AOSS CURRENT ENVIRONMENT

Workstations are desktop units used for small local applications, such as a front end for larger systems, as office systems for more compute-intensive tasks, and applications or file servers shared among several systems. The lower cost per MIP workstations are ideal as front-end systems to more powerful application servers via network applications (X Windows). The Macintosh desktop system provides word processing, spreadsheet and graphics applications. Terminal emulation programs provide access to the VAX while centralized Mac services, such as file servers and network modems, provide services to both local and wide area network resources. IBM and IBM compatible PCs are used to support special scientific and engineering functions such as fluid dynamics modeling, project management and inventory control. PC system central services are provided via an Ethernet LAN linked to a dedicated server.

AOSS PLANNED ENVIRONMENT

PRD will adhere to the SSCL computing strategy to implement a distributed environment of computers supported by local and wide area networks. The emphasis will remain on personal computers and workstations which offer a wide range of desktop capabilities.

2.3 Computer Aided Design/Manufacturing (CAD/CAM)

CAD/CAM/CAE CURRENT ENVIRONMENT

The plan developed for acquiring the resources to meet the short and long term Computer-Aided Design requirements for the Physics Research Experimental Facilities Group considers the work that will be performed to support the SSCL. These engineering support activities include detector design, collision hall and physics specifications, and detector assembly and maintenance.

The PRD, in order to meet these assignments, has implemented a CAD system using Intergraph hardware and software. CAD/CAM/CAE hardware currently in use includes the following:

Qty	Item	Description	Software
1	Intergraph 6080-413	UNIX Workstation	EMS, FEA, DP/Publish, Modelview
3	Intergraph 6240-413	UNIX Workstation	EMS,DP/Publish, Microstation 32, Modelview
5	Intergraph 2000	UNIX Workstation	Microstation 32, Modelview
1	Intergraph 3060	UNIX Workstation	EMS, DP/Publish, Microstation 32
2	FlexCache 25386DT	386 PC (DOS)	Algor, Microstation
2	Mac IIcx	16 MHz Macintosh	Microstation

Currently, three of the Intergraph workstations are in place within the division. Eight additional workstations have been requisitioned for delivery by the beginning of FY91. Laboratory Technical Services provides and maintains the file server and plotting network for these workstations.

CAD/CAM/CAE PLANNED ENVIRONMENT

The planned environment will continue to build on the system already in place. As the work grows and becomes more complex, more powerful workstations will be required to allow the designer to

be more proficient. Likewise, more powerful software will be required for these workstations. This software will consist of items such as simulation software to model and run simulated assembly and maintenance scenarios and modules that are built on current software allowing the user to input and retrieve more information into a design.

As the division starts working more closely with outside collaborations transferring larger numbers of files and generating more files internally, a dedicated file server will be required with upkeep still provided by LTS.

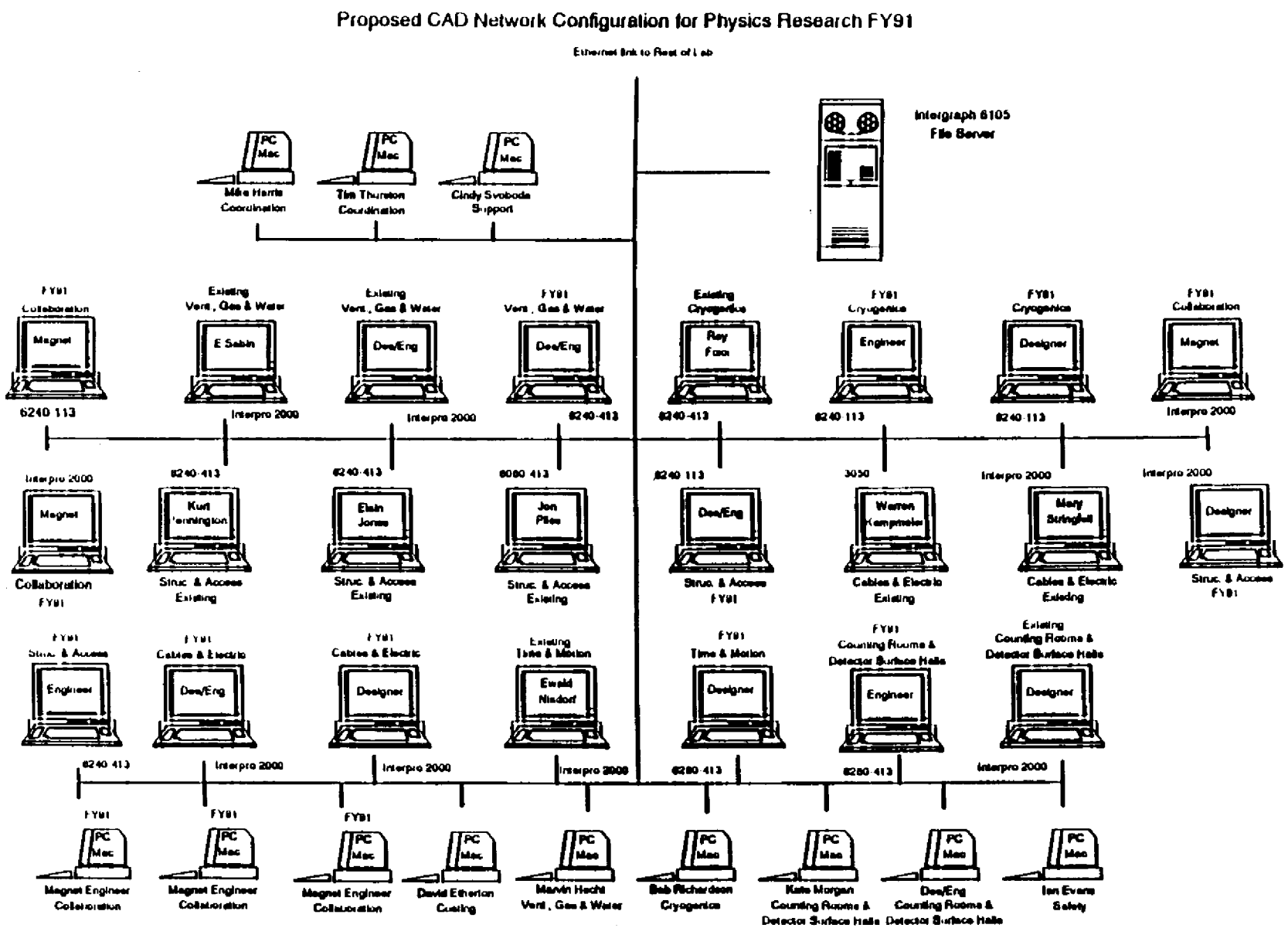
PRD engineers and designers will have to interface very closely with the Architectural Engineering/Construction Management (AE/CM) and the Conventional Construction Division. Both organizations use the Microstation software environment from Intergraph Corporation. One of the companies involved very heavily with the Solenoidal Detector Collaboration also uses the Microstation environment. Therefore, with PRD using this software, the interface between all groups will be easy and transparent to the users. Attached is a proposed network configuration for CAD/CAM/CAE equipment (Figure 3).

3. Telecommunications (TC)

TELECOMMUNICATIONS STRATEGY

PRD is supported by LTS in telecommunications resources planning. The aforementioned hardware and software, whether existing or planned for future acquisition, will be integrated into the general Laboratory-wide system supported by LTS. Contents of this plan will provide input to LTS for planning future telecommunications resources.

Figure 3


Proposed CAD Network Configuration for Physics Research FY91
Ethernet link to Rest of Lab
Intergraph 6105
File Server
PC Mac
Mike Harris
Coordination
Tim Thurston
Coordination
Cindy Svoboda
Support
FY91
Collaboration
Magnet
6240 113
Existing
Vent., Gas & Water
E Sabin
Interpro 2000
Existing
Vent., Gas & Water
Dee/Eng
Interpro 2000
FY91
Vent., Gas & Water
Dee/Eng
6240-413
Existing
Cryogenics
Ray
Fiore
6240-413
FY91
Cryogenics
Engineer
6240 113
FY91
Cryogenics
Designer
6240 113
FY91
Collaboration
Magnet
Interpro 2000
Interpro 2000
Magnet
Collaboration
FY91
6240-413
Kurt
Struc. & Access
Existing
6240-413
Elain
Jones
Struc. & Access
Existing
6080 413
Jon
Pilon
Struc. & Access
Existing
6240 113
Dee/Eng
Struc. & Access
FY91
3050
Warren
Kampmeier
Cables & Electric
Existing
Interpro 2000
Mary
Stringfellow
Cables & Electric
Existing
Interpro 2000
Designer
Struc. & Access
FY91
FY91
Struc. & Access
Engineer
6240 413
FY91
Cables & Electric
Dee/Eng
Interpro 2000
FY91
Cables & Electric
Designer
Interpro 2000
Existing
Time & Motion
Ewald
Nisdorf
Interpro 2000
FY91
Time & Motion
Designer
6280 413
FY91
Counting Rooms &
Detector Surface Halls
Engineer
6280 413
Existing
Counting Rooms &
Detector Surface Halls
Designer
Interpro 2000
FY91
Magnet Engineer
Collaboration
FY91
Magnet Engineer
Collaboration
FY91
Magnet Engineer
Collaboration
David Etherton
Cooling
Marvin Hecht
Vent., Gas & Water
Bob Richardson
Cryogenics
Kate Morgan
Counting Rooms &
Detector Surface Halls
Dee/Eng
Counting Rooms &
Detector Surface Halls
Ian Evans
Safety

B. FY91/92 Short-Range Plan for PRD

SHORT-RANGE PLAN

Organizational Function: Physics Research Division

I. TABULATION OF REQUIREMENTS

1. IS

FUNDING	FY91	FY92
Operating	$75K	$100K

2. CR

	FUNDING	FY91	FY92
ADP	Capital	4100K	9180K
	Operating	2570K	1970K
AOSS	Capital	150K	100K
	Operating	15K	20K
CAD/CAE	Capital	900K	550K
	Operating	100K	100K
COMM	Capital	N/A	N/A
	Operating	N/A	N/A

CAPITAL= High Value Capital (over $5K not including sales tax)
OPERATING= M&S (hardware under $5k and software)

II. MINI-ACQUISITION PLAN

Operational Function: Physics Research Division

1. ITR NEED

IS

An Information Handling System is needed to store and track engineering drawings and documents related to the development and implementation of the detectors in conjunction with the collaborations.

ADP

A computing facility will be implemented to perform the physics and detector simulations for the design of SSC detectors, as well as other computations in support of physics and detector needs. Monte Carlo simulations will be performed at the facility to simulate the physics of the interactions that will occur at the SSC and to simulate the response of the detectors that will study these interactions. The calculations to be performed in each simulation are lengthy and could require many months per run on a VAX 11/780. They may also produce several Gbyte of data per run.

A distributed computing environment of networked high-speed computing engines, symmetric multi-processors, and storage elements will be required to meet these needs. These networked computers will form the basis of a centralized facility for SSC physics/detector simulation work.

The facility will be developed and installed in several phases over a several-year period and will adopt the SSCL policy that encourages the use of open environments for computing.

Physics Requirements: Several Monte Carlo programs such as ISAJET and PYTHIA have been written to simulate complete events at the SSC. These programs use known physics to generate lists of particles, including their energies, directions and types, both for potential signals and for their known backgrounds. Other more specialized detector simulations will also be performed.

GEANT, for example, includes utilities for modeling the detector geometry and for simulating how each of the produced particles will interact with the various parts of the detector and what response it will produce. This data can then be used to analyze the signal and background events as in the real experiment. GEANT detector simulations are more demanding than the physics event generation and may require several hours per event on a VAX 11/780.

Event Generation: In a typical SSC interaction several hundred primary particles may be produced. Only a few of these particles may be of interest to the physicist, but as many as possible must be simulated in the detector. In order to study the response of the detector to the signal of interest, about 10^3-10^4 events must be generated. Background events must be studied since they can potentially produce signatures in the detectors that are misinterpreted as signal events. Typically, about 10^5-10^6 background events must be generated and studied for each physics signal. Each event generated by ISAJET, for example, takes about 5-10 sec. on a VAX 11/780 and generates about 10 KB-30KB of data.

Detector Simulation: Several levels of detector simulation computations varying from simple compilation and debugging test runs to detailed runs which may require as much as 10^4 MIPS-seconds per event and produce on the order of an Mbyte of data are envisioned. The short test runs are likely to require 10 minutes of CPU time in compilation and another 10 minutes of execution on a VAX 11/780 equivalent. A minimal detector simulation based on GEANT with a small number of volumes and parameterized showers may require 50-100 sec. on a VAX 11/780. Full samples of up to 10^6 events will be generated for detailed studies while some number of smaller samples of order 10^5 events will be needed to test ideas quickly. While the minimal simulation is not very detailed, it may still produce a record as long as a fully simulated event , or about 0.5-1 MB. For some purposes, detailed tracking and shower simulations must be run using the full power of GEANT. A typical SSC event requires of order 10^4 sec. on a VAX 11/780 for full shower simulation with a low cutoff energy. Samples of order 10^4 events will be needed to answer many questions. The output of each event will again be about 0.5-1 MB in length.

Data Reduction and Analysis: While much of the data reduction and analysis of the events will be done during the generation of the simulation, additional analysis passes may be done on the generated data. This analysis may consist of applying a different set of cuts to the data, or applying a different reconstruction or pattern recognition algorithm. These jobs may run very quickly in some cases when only a few calculations are performed to produce a new set of histograms, for example. Nevertheless, this type of job is likely to require access to large simulation output files and will therefore place some stringent demands on the network I/O capability. A job of this type might require less than a second per event on a VAX 11/780 but could require the transfer of 0.5-1 MB of data per event.

User Requirements: Approximately 250 users, including 100 full time equivalent scientists, will be involved in the physics/detector simulation effort for the SSC. The needs and working environments of these users will vary considerably. Some of the users will access the facility from terminals on their local computer while others will login directly from their local work-stations. Some users may require short interactive sessions while others will be involved in code development and debugging. Some will submit long batch jobs while others will require large

amounts of bit-mapped data to be transferred. Some will require a windowing environment while others will only transfer small files of ASCII data or UNIX command lines.

External Users: Initially the SSC computer simulation facility will be used primarily by outside users who will log on remotely through a wide area network (WAN). Good access is essential if this is to be possible. While some of the physicists and software engineers involved with the simulation work will be located at the the SSCL, most of the users will be resident at institutions throughout the world. They will require high-speed communication with the computing facility at the SSCL. Remote users will gain access to the facility via the ESNET WAN. The facility will provide DECnet and TCP/IP interfaces over Ethernet to the WAN.

Local Users: These include Laboratory employees and visitors who use the facility while in residence at the SSCL. The local users' needs will not differ significantly from the external users with just a few exceptions. The local users will gain access to the facility by a local area network (LAN) which is likely to permit them a much larger bandwidth for the transfer of data from the facility to the individual user's workstation or display terminal. Consequently these users will make larger demands on the data transfer and graphics capabilities of the facility. Fully interactive detector visualization will require bandwidths that are currently obtainable only through dedicated processors in a graphics workstation located at the user's desk.

Functional Model: The facility requirements can be broken into three major functional subsystems: 1) a networked front-end for interactive usage, 2) a file server, and 3) a ranch of parallel batch processing compute servers. Each of the distributed subsystems is networked by one or more high-speed network links to the other subsystems.

Front End Network: This will provide the user the interactive computing that he needs to gain access to the facility, to retrieve and edit files, to compile and run small jobs, and to submit batch jobs. The front-end shall be comprised of a network of three types of workstations: some of these workstations will not have monitors, some fraction will be mid-range graphics workstations, and a small number will be high-end high-resolution graphics workstations. Each workstation, ideally one per user, shall provide a host unit for the users logged into the facility. The front-end workstation shall provide the system files for the user. The workstations shall permit usage of the system utilities, shall permit usage of the batch system, and shall permit usage of disk and tape storage on the file server.

File Server: This will provide centralized data storage for the facility. The file server will provide storage of the users' source, object, input, and output files. Data produced on the front-end or the batch ranch will be transferred to the file server disks. Longer term archival of files shall be provided by file server tape drives and storage. Standard protocols shall be employed to pass data from the file server to the front-end or the batch ranch. Migration of files and their mounting should be transparent to the user.

Batch Processing Ranch: This will accommodate a major portion of the computing horsepower of the facility. This network of symmetric multi-processors will perform the large simulation jobs described previously in this section. The ranch shall be directly connected to high-speed disks and tape drives in order to achieve the I/O speeds required. File backups and archives of the ranch disks will be done by the file server. Job submission and output data will be transferred over the network directly from the front-end workstations to the batch ranch.

Operational Model: The operational concept of the facility calls for interactive users to log on to the system either remotely or locally. A process resident on a file server will assign an idle front-end workstation to that user. With one workstation per user, each is provided with a completely dedicated resource. Initially there will be approximately 30 front-end machines subnetted into two groups of 15 and connected via a bridge. Most of the front-end units will not have monitors and

will be rack-mounted. Each subgroup will have a separate interface to the file server. The system is intended to be scalable by adding additional file server/front end/Ethernet groups separated by bridges but accessing the same batch and archival services as the other front end groups.

It is intended that interactive and batch processing be separated with a batch ranch of compute servers will be accessible through Network Queueing System (NQS) software. Tools will be made available to assist in the porting of code developed on the front-end system to the batch ranch which may have a different architecture. A fast batch queue will be implemented to facilitate testing of code to be ported.

The eventual goal is that the front end/file server systems be able to access both disk and tape resources containing batch job output independently of the batch processors. Access to disk by dual/multi-ported drives and tape by multi-headed robot-based systems will accomplish this, and is therefore, reflected in the system design. However, for the first phase of development, 8-mm tape carousels will be used by the batch processors for tape storage. This is intended only as a temporary solution to the tertiary storage problem. Longer term, high-volume storage solutions will be developed during Phase II and III.

Graphics: Graphics applications in HEP software include the following: Detector design and physics simulation in order to optimize detector performance; Detector modeling and display of reconstructed events; Monte Carlo and experiment analysis; Event and detector viewing; Physics parameter representation; 2-D and 3-D statistical analysis; Graphics displays with graphics editor for producing of figures for output onto high-quality hard copy devices; Graphics control systems; and Graphics for software engineering applications, display of computer models and integration.

Graphics standards include GKS, GKS-3D, CORE, PHIGS and PHIGS+ applications for use in the computing facility. Applications may need to capture images on graphics metafiles. The Computer Graphics Meta-file standard (CGM) recognized by HEP applications will be supported. CGM allows the transmission of pictures between different graphics standards. CGM will be used in text processing systems to incorporate pictures within documents. CGM currently supports 2-D graphics, though future extensions to 3-D primitives and picture segmentation may be required.

The standardization of workstation windowing systems is becoming recognized in HEP software. Networked graphics will be of increasing importance for SSCL HEP software applications. With X Window being adopted by the Open Software Foundation (OSF), graphics applications will require X Window environments in the near future. An application using the X Window system may reside and run on a client processor, such as a multi-processor computer engine. The user will interact with a local workstation acting as an X Window server or an X terminal. X Window support for graphics may be required to run with PEX graphics software and support both GKS and PHIGS+ via the X Window protocol. The overhead imposed on LAN and WAN traffic by the X Window applications is an important concern for the facility's integration efforts.

Higher-level graphics application tools, such as Physics Analysis Workstation (PAW), are used heavily in Monte Carlo and experiment analysis in HEP computing. PAW is based on the High level Interactive Graphics and Zebra (HIGZ) FORTRAN subroutine library which must be available on all local workstation platforms, as well as all host computers at the SSC Central Computing Facility. The performance of HIGZ is a crucial benchmark and acceptance test. HIGZ is primarily layered on top of GKS, but will also be required to run with PHIGS, PHIGS+, X11.3 or higher, and PEX. HIGZ includes dedicated HEP graphic macro-primitives, as well as features such as histogram production, helix drawings and jet interaction drawings.

Implementation Software: Implementation of the distributed computing environment at the SSCL will require the development of sophisticated systems software and physics software. This effort will require the use of modern techniques such as structured analysis and structured design.

Hardware and software tools that support these methods, such as CASE tools, system simulation software, database and software development packages, will be used to provide a proper environment for development and implementation.

Research: Two types of ADP support will be required to handle Research needs: engineering support and direct support of ongoing Research & Development. Engineering requires a few large workstations for the planned engineering population, with each of these workstations having several large and complex design software products. Both digital and analog software will be used for activities as diverse as electrical computer-aided design and R&D electrical engineering. Some of the planned data analysis tasks for R&D will require additional specialized workstations, again with numerous software packages. Simulation work requirements with the collaborations calls for a multi-platform environment to maintain compatibility with resources available at other laboratories, such as DEC, H-P, Apollo and Sun workstations.

AOSS

Visitors to the PRD require some number of PCs or terminals to support scientific computing and gain access to more powerful computing facilities on the network. The Technical Information and Publications group needs are also limited to PCs. One of the main goals of the Technical Library is to provide state-of-the-art electronic library services to all laboratory staff from their desk computers. A variety of on-line services will be implemented, some of which will be purchased or rented from outside vendors and others which will be developed fully or partially in-house. An interim integrated library system will be installed to facilitate the ordering and processing of library materials and to provide a catalog of the holdings accessible to patrons. An optical on-line system will be installed for the laboratory's archives. A more sophisticated, integrated library system will be installed later to provide users with on-line access to SSCL collections and databases from their own workstations. The archive record management and retrieval system will be enhanced.

CAD/CAM/CAE

The proposed hardware and software will be used to support the Experimental Facilities (EF) group of Physics Research Division. Within EF there are nine engineering groups each working on a specific part of facilities. Each group will have different requirements for computer power and software capabilities. The work performed by each will be used by other groups as well as other divisions within the Lab. The requested hardware and software not only meets these requirements but also integrates with the workstations already in place within the division.

The procurement of these workstations and related software will coincide with the additional 24 engineers and designers who are scheduled to join the Experimental Facilities (EF) Group. They will require the following Intergraph workstations to supplement what is in place: Two 6280-413; two 6240-413; four 6240-113; four 2000's; and one Intergraph Server 6105. The procurement of the items required for FY92 will coincide with the addition of 20 designers and engineers to the EF area of PRD. Fifteen of these designers will require the capabilities of a CAD workstation.

It is anticipated that approximately 19 workstations will be required in FY91 to meet the projected workload for electronic CAD design. For FY92, it is projected that an additional 20 workstations will be needed. Software will be needed to perform electronic CAD functions such as digital layout, analog, full fabrication, pc board and dracula designs.

2. ITR Solution

Following is a list of the ADP, AOSS, and CAD/CAE hardware and software in excess of $25K that will be acquired in FY91 and FY92:

Physics Research Division (PR) Requirements	Acq. Cost ($K)	Maint. Cost ($K)	Procurement Strategy	Funding FY 1991	WBS No.	Control No.
IS						
Sun Sparc 1+ (2)	30K	3K	PR, FC	CP	4.6.3	PR91001
Optical Storage	40K	4K	PR, FC	CP	4.6.3	PR91002
Scanner	60K	6K	PR, FC	CP	4.6.3	PR91003
Scanner Software	15K	2K	PR, FC	MS	4.6.3	PR91004
Sub Total	145K					
ADP						
(8) General Purpose W/S	200K	5K	PR, FC	CP	5.3.1	PR91005
Server Upgrade	50K	5K	PR, FC	CP	5.3.1	PR91006
Miscellaneous Peripherals	25K	3K	PR, FC	CP	5.3.1	PR91007
R&D Workstations & Tools	215K	21K	PR, SS	CP	6.1.3	PR91008
R&D Software	100K	10K	PR, SS	MS	6.1.3	PR91009
Simulation Facility (Phase I)						
Workstations, SMPs	950K	45K	PR, FC	CP	5.3.1	PR91010
Communications	25K	3K	PR, FC	CP	5.3.1	PR91011
Network	50K	5K	PR, FC	CP	5.3.1	PR91012
Software	150K	10K	PR, FC	CP	5.3.1	PR91013
Simulation Facility (Phase II)						
Workstations, Servers, SMPs	950K	75K	PR, FC	CP	5.3.1	PR91014
Additional Front Ends & Servers	500K	75K	PR, FC	CP	5.3.1	PR91015
Communications	25K	2K	PR, FC	CP	5.3.1	PR91016
Mass Storage/Archival (Phase I)	900K	25K	PR, FC	CP	5.3.1	PR91017
Archival Software	250K	12K	PR, FC	CP	5.3.1	PR91018
Software Development Tools	360K	15K	PR, FC	MS	5.3.1	PR91019
	4750K					
AOSS						
Library System	150K	15K	PR, FC	CP, MS	4.6.1	PR91020
CAD/CAM/CAE						
Engineering Workstations & Tools	60K	6K	PR, SS	CP	4.6.3	PR91021
Engineering Workstations & Tools	120K	12K	PR, FC	CP	5.2.0	PR91022
Engineering Software	380K	38K	PR, SS	MS	5.2.0	PR91023
Engineering Software	760K	62K	PR, FC	MS	5.2.0	PR91024
(4) Intergraph 6240-113	129K	13K	PR, SS	CP	4.6.3	PR91025
(2) Intergraph 6240-413	88K	9K	PR, SS	CP	4.6.3	PR91026
(2) Intergraph 6280-413	106K	11K	PR, SS	CP	4.6.3	PR91027
(5) Intergraph 2000	80K	8K	PR, SS	CP	4.6.3	PR91028
Interserve 6105	55K	5K	PR, SS	CP	4.6.3	PR91029
(3) Intergraph EMS	25K	9K	PR, SS	MS	4.6.3	PR91030
(9) Intergraph Mstation 32	16K	1K	PR, SS	MS	4.6.3	PR91031
(2) Intergraph PDS	0	35K	PR, SS	MS	4.6.3	PR91032
Automod II	65K	7K	PR, SS	MS	4.6.3	PR91033
Sub Total	1884K					

KEY: See Following Page.

Physics Research Division (PR) Requirements	Acq. Cost ($K)	Maint. Cost ($K)	Procurement Strategy	Funding FY 1992	Control No.
IS					
Information Handling System	100K	10K	PR, FC	CP	PR92034
ADP					
Workstations	200K	20K	PR, FC	CP	PR92035
Peripherals	50K	5K	PR, FC	CP	PR92036
Network	100K	10K	PR, FC	CP	PR92037
R&D Workstations & Tools	305K	30K	PR, SS	CP	PR92038
R&D Software	150K	15K	PR, SS	MS	PR92039
Simulation Facility (Phase III)					
Workstations, Servers, SMPs	3000K	30K	PR, FC	CP	PR92040
Communications	50K	5K	PR, FC	CP	PR92041
Mass storage/Archival (Phase I)	5000K	100K	PR, FC	CP	PR92042
Software	400K	5K	PR, FC	CP	PR92043
Archival Software	300K	15K	PR, FC	CP	PR92044
Software Development Tools	200K	10K	PR, FC	MS	PR92045
Sub Total	9755K				
AOSS					
Library System	100K	10K	PR, FC	CP, MS	PR92046
CAD/CAM/CAE					
Engineering Workstations & Tools	90K	9K	PR, SS	CP	PR92047
Engineering Workstations & Tools	180K	18K	PR, FC	CP	PR92048
Engineering Software	475K	50K	PR, SS	MS	PR92049
Engineering Software	950K	100K	PR, FC	MS	PR92050
(5) Intergraph 6240-113	162K	16K	PR, SS	CP	PR92051
(3) Intergraph 6240-413	132K	13K	PR, SS	CP	PR92052
Intergraph 6280-413	53K	5K	PR, SS	CP	PR92053
(6) Intergraph 2000	95K	10K	PR, SS	CP	PR92054
(5) Intergraph EMS	83K	8K	PR, SS	MS	PR92055
(10) Intergraph Mstation32	18K	2K	PR, SS	MS	PR92056
(2) Intergraph PDS	0	35K	PR, SS	MS	PR92057
Sub Total	2238K				

KEY: PR = Purchase SS = Sole Source CP = Capital
L = Lease FC = Competition MS = Operational

3. Excessed ITR

None.

III. LEASE AND SERVICE MAINTENANCE CONTRACTS

Lease and/or service maintenance agreement costs are as follows:	FY91	FY92
Intergraph CAD/CAM/CAE hardware and software	$90K	$300K

APPENDIX A

STATEMENT OF STRATEGY FOR PC/MACINTOSH WORKSTATIONS AND ASSOCIATED APPLICATIONS

Prepared in Accodance with
DOE 1360.1A

SUPERCONDUCTING SUPER COLLIDER LABORATORY

STATEMENT OF STRATEGY FOR PC/MACINTOSH WORKSTATIONS AND ASSOCIATED APPLICATIONS

Revised
10/1/90

Prepared in Accordance with
DOE 1360.1A

Prepared by:

9/24/90

Robert Hahn, Manager
Computer Protection Program

Approved by:

Phil Leibold, Deputy Associate Director
Laboratory Technical Services Division

SSC LABORATORY STRATEGIC PLAN
FOR
PERSONAL COMPUTERS AND WORKSTATIONS

SSC LABORATORY AND ADP BACKGROUND

This Statement of Strategy describes the procedure and policy for defining, acquiring, using and evaluating microcomputer equipment and software at the Laboratory.

The SSC Laboratory came into reality late December of 1988. In January of 1989 the contractor for the Laboratory, Universities Research Association (URA), was selected by the Department of Energy (DOE). Later in January, a small advance group of persons established offices in DeSoto, Southwest Dallas County, to assess the problems of establishing the SSCL in Texas. These persons were URA and EG&G employees. EG&G is one of two sub-contractors who work in conjunction with the URA.

In FY90 the SSCL has grown to approximately 800 personnel and is located in several buildings at the Dallas Beckleymeade address. The establishment of both a network and ADP environment, started in FY89, was further expanded in FY90. Two minimal VAX systems were expanded along with the installation of an extensive LAN, a multitude of wide-area networking connections, and the purchase of PC/compatibles, Macintoshes, and workstations for new personnel.

The SSC Laboratory entered an exceedingly rapid growth period which necessitated extraordinary measures to proceed with the accelerator and component design work.

INTRODUCTION TO MICROCOMPUTING AT THE SSC LABORATORY

SSC Laboratory personnel have used Macintoshes, IBM PCs/compatibles, and SUN/DEC workstations for about five years in the Central Design Group at LBL and other laboratories. Many important applications were developed and/or supported on specific system types to optimize performance and effort necessary to support these applications. The SSC Laboratory intends to continue to use different types of systems to optimize the productivity of work to be performed and minimize support and conversion efforts. Many of the productivity intensive applications which are in use exist only in the PC/Macintosh or workstation environment.

The SSC Laboratory has not established the traditional timesharing computer system which will be used by all but has established a distributed environment. Distributed computing provides the responsiveness necessary for optimum productivity of our personnel and begins on the desk of the individual scientist, engineer, or administrator. Thus, the Laboratory places emphasis on PCs and workstations.

From a data processing management perspective, part our business becomes one of supplying the resources necessary to allow for the interchange of data between like and unlike systems. This is accomplished by maintaining a rich networking environment, defining standards for networked applications, and providing effective applications' gateways.

Some shared computer systems and resources will always be needed. We will select and maintain these systems so that the PC/workstation on the desk can directly use and access

these resources and systems. This is accomplished by exploiting our local and wide area networks, and utilizing appropriate software. By having a processor on each desk (as opposed to a terminal), we have the flexibility of emulating any vendor specific terminal device by running corresponding software emulators. This allows us to consider a wider range of computer systems for our more compute-intensive tasks.

PERSONAL COMPUTERS AND WORKSTATIONS

The Strategic Plan addresses the personal computers and workstations that are used at the SSC Laboratory to provide support for applications best suited to the PC/Macintosh or workstation environment. Three types of personal computers and/or workstations are being used.

MACINTOSH SYSTEMS

The Macintosh system has become the current primary desktop system for most SSCL personnel. It provides many functions across the wide range of users at the Lab. Of principal importance is word processing (Microsoft Word) where Macintosh systems are being exclusively used Lab-wide for shared tasks. The Macintosh has become the ideal system for integrating elements from several or all divisions of the Laboratory for reports and documents. Other applications such as spread sheets and graphics programs are also used on the Macintosh because they can transparently integrate information into the Macintosh word processing applications. Terminal emulator programs are used to allow access to the VAX and other mainframe computer systems on the wide-area network. Many other office and desktop management applications are used as well.

Macintosh centralized services which we provide and maintain include file and E-mail servers, network modems, and Fax capability. An Appletalk network is used to access printers and other shared resources. The Appletalk network is bridged to the Ethernet LAN (using appropriate gateway hardware), thus providing an effective means of distributing LAN services.

IBM PC/COMPATIBLES

IBM and PC compatibles are being used to support several special engineering and scientific functions such as fluid dynamics modeling, low-end CAD/CAE, some project management, and inventory control. Terminal emulators are used to access our VAX and other computer systems.

PC and PC compatible system central services are provided by a dedicated server. This server supplies file service, modem pooling, and shared printing facilities. The server and PC systems use our Ethernet LAN and a Novell network as the medium for communications.

WORKSTATIONS

There are three categories of workstations as follows:

(1) Desktop systems used mostly to provide a minimal amount of performance. Used for small local applications and as a front-end to larger systems.

(2) Desktop or office systems with some local compute capability. This class system is also used as a front-end to other systems.

(3) Application and/or file server which is a shared resource among several desktop systems.

Workstations support many specialized applications related to the design of the accelerator and magnets. These applications include the storage of magnet test and cable data, cryogenics simulation, some CAD/CAE, and finite element modeling. Most of the desktop workstations are utilized as front-end systems to more powerful application servers. This is accomplished by using network applications such as X-windows and NFS/LAVC. Many radiation transport and detector/physics simulations codes can run on a UNIX platform. Several of these codes will reside on a UNIX platform to take advantage of the lower cost per MIP these systems currently can provide.

LOCAL AREA NETWORK ENVIRONMENT

It is the SSCL goal to maintain seamless computer network communications to all SSCL facilities in all phases of design, construction, and operation of the Laboratory. The effectiveness of using distributed computing is dependent upon having a high performance and flexible computer networking infrastructure. Every office cubicle is wired with two duplex RJ-11 jacks for data, and one for telephone. Both wiring plants are geographically distributed within the building to local wiring closets. These closets are then wired with trunk cable to a central wiring room.

Thick-wire Ethernet cable is installed between wiring closets and the central wiring room. The wiring closets also contain Ethernet bridges/routers for LAN isolation. Terminal servers, which provide local access to our VAX systems, are located in each geographic area of the Laboratory. Appletalk gateways connect the Appletalk zones to the Ethernet. This LAN/telephone wiring arrangement is extended into all new buildings, The extensions of our LAN is accomplished using a variety of media including twisted-pair wire, coax, fiber-optic cable and microwave. The over-all communications scheme contains components which will allow the extension of our LAN to buildings at the Ellis County campus as well. It is anticipated that some buildings will exist by the end of FY91. With this scheme, distributed computing elements and all PC/Macintosh and workstation services will be accessible from any SSCL facility independent of geography.

WIDE AREA NETWORK ENVIRONMENT

All PC/Macintosh and workstations have access to wide area networks (WANs). The WAN services are provided by the Energy Sciences Network (ESnet) which support the TCP/IP and DECnet protocols. The OSI protocol suite will be used by the SSC Laboratory when supported by ESnet. Currently, the SSCL is using ESnet for HEPnet access, and a T1 circuit to UT Dallas for NSFnet and BITnet access. Mid FY90 ESnet provided service to the SSCL through four T1 lines from FNAL, ORNL, FSU and UT Austin.

TRAINING

An in-house training program has been developed by the Computing Services Group. Computer Training, of the CS Group, provides support for the various dynamic needs of computer users throughout the SSCL by structured training classes and one-on-one attention. Support is available to all Lab divisions as well as to DOE, Texas National Research Laboratory Commission and some educators. Classes include Mac orientation (desk top and application), Hypercard, Microsoft Word, Wingz, Excel, VMS utilities, QuickMail and Filemaker. Classes will be added as the need arises. A state-of-the-art Training Room has been equipped with Macintosh computers to provide hands-on experience.

On-site and remote training is provided by vendors supplying the various systems. Application-related classes involving highly specific instruction for new products will be held as necessary.

Information Services Group will sponsor training in such highly specialized software courses such as PowerHouse and for applications like Relational Data Base Management Systems (RDBMS).

SYSTEM SECURITY

Each PC/Macintosh or workstation, not kept in a controlled access environment during normal working hours, has a locking device to discourage removal of the system from its designated location. In many cases, the system's enclosure will be securely attached to a desk or table. Combination lock information for the security devices will be kept by the Security Manager or his designate as well as by the Staff Services Facilities Support Section Head.

DATA CONTROL

The integrity and access to data residing on PC/Macintosh systems will be the responsibility of the division associated with its use and the individual. All of the data at the Laboratory is unclassified, however, good data processing techniques are applied to all data, particularly that which is considered sensitive or critical.

BACK UP AND RESTORE

Each PC/Macintosh and workstation owner is made aware of the proper procedures for backing up files. Each system installed will have appropriate software and hardware access to back up software and hardware.

SENSITIVE/CRITICAL DATA HANDLING

Individuals who maintain and control sensitive data files on a PC/Macintosh or workstation are instructed on properly securing and maintaining the data to control access. In many cases, the sensitive data will be kept on diskette and the diskette will be kept in a safe locked location. Sensitive files will not be kept on a widely distributed file server, nor transmitted through a non-private LAN or WAN.

FILE/APPLICATION SERVERS

In our distributed architecture, several different file and application servers are used. Each server will be independently maintained. Backups for these servers will be performed on a periodic basis. Typically, full backups will be done weekly with incremental backups occurring as required. For an additional level of redundancy, each PC/Macintosh or workstation has sufficient local disk capacity to allow for local storage of important data files independent of the file server. The latest weekly image backup tapes will be stored in a different building from the server.

PROCUREMENT STRATEGY

The SSCL will bid competitively whenever possible for integrated purchasing arrangements for all workstations system types and classes. This integration will include anticipated system configurations, applications software, maintenance and training. The SSCL will bid each purchasing arrangement separately to encourage competition among

suppliers. All purchasing arrangements will be term arrangements (typically one year) which will be rebid on expiration. The term should open competition and allow the revision of specifications periodically. During FY90, a competitive blanket order for all Macintosh systems was completed. This purchase order will be rebid for FY91 in order to maintain the most cost effective method for acquiring equipment and software.

PROCUREMENT CONTROL

Each system purchased must be requested first through the division head and then approved by the CPPM before a system can be delivered to the end user. The procedure provides assurance that the system purchased is appropriate for the application. The requirements are kept consistent with global computing strategy, as determined by the Directorate, in conjunction with the Associate Directors and the Deputy Associate Director of Laboratory Technical Services Division. Additionally, each procurement is reviewed as necessary by the Computing and Communications Group before procurement begins. See Attachment A, ADP Request Form (for procurements under $25K).

LICENSING AND WARRANTY

All software and hardware licensing and warranty matters are handled by a PC support person. This individual assures that all of the systems are appropriately registered with the manufacturers. Software licensing is handled through this individual as well as the coordination of all upgrades.

FUNDING

Funding for the purchase of PC/Macintoshes and workstations is planned by each division and is contained within the Laboratory's annual fiscal budget.

STANDARDIZATION

The Computing and Communications Group provides the leadership to define standards for application use, systems, training, and support. They also critique all acquisitions of ADP hardware and software to determine the suitability of proposed solutions and configurations. Most often the group is intimately involved in the planning processes and provides effective consultation in applying ADP to a wide range of work.

MAINTENANCE

The Computing and Communications Group will provide maintenance for PCs/compatibles and Macintosh systems. Spare equipment is maintained and the group interfaces between the end-users and appropriate repair facilities.

TECHNOLOGY REVIEW AND EVALUATION

An independent group will review and evaluate new ADP technologies. Currently, the Computing and Communications Group provides this function with existing personnel, but solicits other Laboratory individuals for this task. The SSCL encourages testing of new commercial products and systems within our environment and expects to benefit by keeping in touch with rapidly evolving technologies through this means along with participation in vendor provided seminars and presentations.

ATTACHMENT A

SSC Laboratory ADP Request

DATE: _____1990

TO: Bob Hahn, **ADP/CPP** Manager, LTS Div., Bldg. 2, **MS 1014**

FROM: _____ **(Name)** _____ **(Extension)**

_____ **(Div.)** _____**(Purchase Req. #)**

SUBJECT: Procurements under $25K-- Individual Systems/Equipment/PC/Software & Communications

Hardware Requirements: (Need) _____

_____

_____

_____

_____ Date Required

Justification for systems request: (Include the basis for ***hardware*** selection: i.e., why that particular model?)

_____

_____

_____

_____

_____

_____

_____

Software Required:_____

_____

_____

Procurement

Sole Source? _____Yes _____No

Jusufication for Sole Source Procurement:

_____

_____

_____

_____

_____

_____

(Turn Over)

Sensitive-Unclassified Data

(Often personnel or payroll related but contact Bob Hahn for further information.)

Sensitive data will be processed on this system. ❑ Yes ❑ No

If sensitive data will be processed, the security plan is as follows:

_____

_____

_____

_____

_____

_____

Communications Needs

_____

_____

_____

_____

_____

_____

(Do not write below this line)

Configuration Review

By: _____
Bruce Dix, Project Leader
Computing Services Group

_____ Date

Statement of Strategy Review

By: _____
Bob Hahn
Computer Protection Program Mgr.

_____ Date

Software Review

By: _____
Sherry Dinkins
Computing Services Group

_____ Date

Form #XYZ
Rev. 9/18/90 BH/bac