AIIM
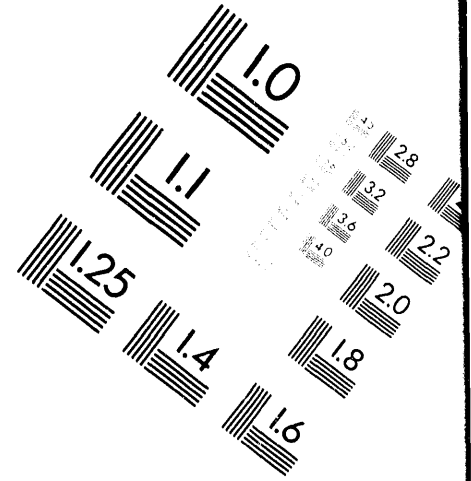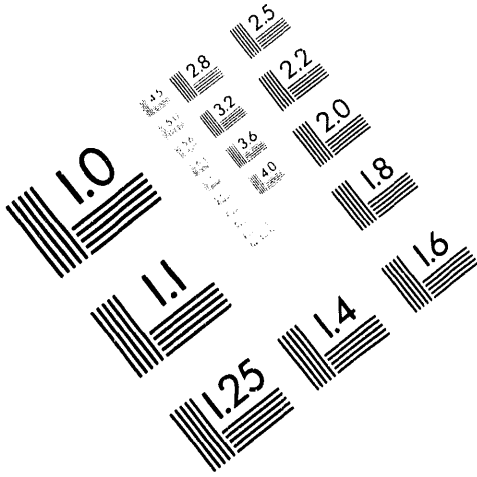
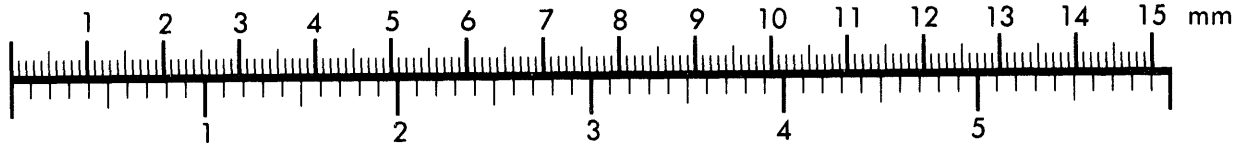**Association for Information and Image Management**

1100 Wayne Avenue, Suite 1100
Silver Spring, Maryland 20910

301/587-8202

Centimeter

1　2　3　4　5　6　7　8　9　10　11　12　13　14　15　mm

1　　　2　　　3　　　4　　　5

Inches

1.0	2.8	2.5
	3.2	2.2
	3.6	2.0
1.1	4.0	1.8
1.25	1.4	1.6

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1 of 3

Integrated Engineering Information Technology

FY93 Accomplishments

R. N. Harris, D. K. Miller, G. L. Neugebauer,
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Integrated Engineering Information Technology

FY93 Accomplishments

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IEIT

Abstract

The Integrated Engineering Information Technology (IEIT) project is providing a comprehensive, easy-to-use computer network solution for communicating with coworkers both inside and outside Sandia National Laboratories. IEIT capabilities include computer networking, electronic mail, mechanical design, and data management. These network-based tools have one fundamental purpose: to help create a concurrent engineering environment that will enable Sandia organizations to excel in today's increasingly competitive business environment.

MASTER

Acknowledgements

Contents

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Nomenclature

Acronyms, including initialisms

AS/KCD	Allied Signal/Kansas City Division (also KCD)
BNC	Biconductor network connector - a cable-TV type of connector
BREP	Boundary representation - a precursor of feature-based solid modeling in CAE design
CAD	Computer-aided design
CAE	Computer-aided engineering
CAM	Computer-aided manufacturing
CD	Control documents
CE	Concurrent Engineering
CLNS	Connectionless Network Services - an Open System Interconnect communication protocol, based on communicating without first establishing a connection
CM	Configuration Management
CSG	Constructive Solid Geometry - a precursor of feature-based solid modeling in CAE design
DAT	Digital Audio Tape - a format in wide use for computer backup because of storage density
DCM	Data Configuration Management - software general type used for CE configuration management
DMCS	Data Management Control Systems - software by Structural Dynamics Research Corporation (SDRC), a Data Configuration Management software for SNL and AS/KCD
DNS	Domain Name System - Unix distributed addressing convention, mapping names to 32-bit numeric addresses of host computers, and giving control of directories to local networks, or "domains"
DTER	Drawing Transfer Engineering Release - the transfer of ownership of engineering drawings between organizations so that a drawing is locked out of the prior organization in the design cycle

(Nomenclature, cont.)

DXF	Drawing eXchange Format - Autodesk standard format for AutoCAD files
ECAD	Electrical or Electronic CAD
ECAE	Electrical computer-aided engineering
EEIS	Electronic Engineering Information Systems
EI	Engineering Information
EMEN	Electro-mechanical engineering network
EPS	Encapsulated PostScript - file transfer standard for PostScript
FM	FrameMaker - platform-independent document publishing software
FTP	File transfer protocol - allows transfer of files between different operating systems
GUI	Graphical user interface - operating a computer by manipulation of graphical objects on screen, developed by Xerox Palo Alto Research Center, pioneered by Apple Computer
ICE	Interactive Concurrent Engineering - software for viewing and interacting with the same display at remote locations
IEIT	Integrated Engineering Information Technology
IMDI	Integrated Manufacturing and Design Initiative
IMS	Image Management System (film bank)
IPX	Internetwork Packet eXchange - Novell PC network protocol; usually found as IPX/SPX
IRIX	SGI workstation operating system, Unix based
IRN	Internal Restricted Network
IRQ	Interrupt Request - hardware interrupt designation for PCs
ISDN	Integrated Services Data Network, a standard for videoconferencing and data communications, requiring as many dedicated communication lines as there are anticipated concurrent users
KCD	Kansas City Division of Allied Signal (also AS/KCD)
LAN	Local Area Network
LIS	Laboratory Information System - a Sandia online library

(Nomenclature, cont.)

LWP	LAN WorkPlace for DOS, a Novell product using TCP/IP rather than Novell's own IPX/SPX protocol
MAN	Metropolitan Area Network
MAST	Multiple Application Surety Technology
MCAD	Mechanical CAD
MCAE	Mechanical Computer-Aided Engineering
MDI	Multi-Document Interface - a Microsoft standard supported by cc:Mail
MS	Microsoft
NFS	Network File System - a Unix distributed file system originally developed by Sun Microsystems, allowing transparent file access among host computers
ODI	Open Data-link Interface - Novell support for multiple protocols and drivers, allows LAN WorkPlace for DOS to communicate with SOMNET and Internet
OSI	Open System Interconnect - networking standard from International Standards Organization (ISO), proposing a 7-layer conceptual model for networking
PBX	Private Branch Exchange - a local telephone switchboard
PC	Personal Computer (IBM compatible) and also printed circuit, as in "PC routing"
PENET	Plant Engineering Network - Sandia Organization 7300 network
PEX	Paste-extrudable explosives - the Focal Point project connected through IEIT
PM	Project Manager
PMATS	Property Management and Tracking System - SNL inventory methodology
PS	Project Specifications (also PostScript page-description language for printers)
PTC	Parametric Technology Corporation - manufacturer of CE software used in IEIT
QFD	Quality Function Deployment (American Supplier Institute)
SDRC	Structural Dynamics Research Corporation - makers of DMCS software
SGI	Silicon Graphics, Inc. - manufacturers of INDIGO, INDY, and IRIS Unix (IRIX) workstations
SLIP	Serial Line Internet Protocol - a Unix standard for networking through serial lines

(Nomenclature, cont.)

SMTP   Simple Message Transfer Protocol - a Unix standard

SQL   Structured Query Language - a relational database programming language standard

TCP/IP   Transmission Control Protocol/Internet Protocol - a Unix non-proprietary standard for the Internet, that can connect computers with differing hardware and software

TQM   Total Quality Management

UPS   Uninterruptible Power Supplies

UUCP   Unix-to-Unix Copy Program - a file transfer method common to all Unix systems

WAN   Wide Area Network - one with links between metropolitan areas

Other Terminology

3COM   Manufacturer of a quality network software and adapter card for PCs

10 Base T   Refers to network transmission lines, breaks down into transmission rate in Mbits/sec, Base(band) signaling, and twisted pair wiring. "10 Base 2" would be thin-wire coaxial cable

ACCORD   Joint Sandia and Allied-Signal project to procure and deploy common tools for mechanical engineering, including CAE/CAD/CAM.

ADLAN   Sandia National Laboratories, Livermore LAN

Agile Manufacturing Initiative

               IMDI support is pledged for this project involved in the manufacture of "discriminators," complex arming devices designed to be resistant to weather and intrusion.

American Industrial Partners

               The remote contractor sites being networked for concurrent engineering by the IEIT team
Speedring - Cullman, AL (beryllium machining for MAST)
Pacific Scientific - Phoenix, AZ (rheology for MAST Focal Point PEX)
Allied-Signal Kansas City Division - Kansas City, KS (PEX manufacturer for Focal Point)
EG&G - Salem, MA (Agile Manufacturing Initiative)

(**Nomenclature**, cont.)

AppleTalk	Apple Computer communications protocol
baseband	A network technology using a single-carrier frequency, and requiring all stations attached to the network to participate in each transmission. As opposed to "broadband" where multiple transmissions take place at different frequencies over the same medium, or "sideband," where transmissions use harmonic farequencies.
bridge	Dumb routers of data packets in networks, only capable of forwarding and limited filtering, that is, forwarding only certain traffic (see router)
CADSI-DADS	Dynamic Motion & Simulation for CAD drawings or solid models of machined parts, made by CADSI company
cc:Mail	Lotus e-mail for PCs
concentrator	Multiple Ethernet connections can be fed into a concentrator for better network throughput, as opposed to a number of connections made to a cable at random
e-mail	Electronic mail - sending messages over a network to another user
Ethernet	A widely used hierarchical topology for linking PCs in LANs, similar to AppleTalk or token ring
Focal Point	Project name for PEX project, part of MAST
gateway	A machine on a network that translates from one format to another (see mail gateway)
hardware address filtering	Filters data packets sent over a network so that only authorized nodes receive packets
Internet	The former DARPA/ARPA Unix network linking universities and other government research sites, now the largest "online community," with commercial and international sites, and millions of users
IP filtering	Internet packet filtering, routing according to the addresses of Internet or TCP/IP packets
IP22	Architecture for new Indigo-2 microprocessor from SGI
mail gateway	A machine that connects two or more e-mail systems and translates between them
Metaphase	New software from Structural Dynamics Research Corporation, makers of DMCS
modem	"Modulator/demodulator" for asynchronous serial communications over telephone wire
NetBlazer	Remote router for networks
NIRVANA	Joint Sandia and Allied-Signal project to procure and deploy ECAE/CAD tools

(**Nomenclature**, cont.)

Novell	Manufacturer of Netware and LAN Workplace for DOS (PCs), IPX protocol.
PostScript	Page description language - a standard for printers and phototypesetters (Adobe Systems, Inc.)
Pro	(Each of the following terms beginning with a slash is a software product of Parametric Technology Corporation, and is prefixed with "Pro")
/DEVELOP	PTC library of C language routines allowing the user to build functions, add attributes to solid models, and create interfaces to the program
/ENGINEER	PTC feature-based solid modeling package, intended to be used with other "Pro/" software to allow Data Configuration Management and concurrent engineering
/PDM	PTC Parametric Data Manager, the database of solid models for Pro/ENGINEER. This software manages drawings so that only one person at a time can check out a drawing and alter it (others can use read-only copies)
/PROJECT	PTC project management software, intended to integrate the capabilities of its other project-related software
/Userguide	An online guide for using Pro/ENGINEER
PTC Exploder	(and PTC Pro/User Group Conference) PTC problem resolution newsgroups on the Internet
RAN	Local Area Network at SNL, Livermore
router	A router transfers data packets between networks, routing them through the most efficient path by using a routing protocol to get information about the network, and algorithms to choose the best route.
SATURN	A KCD network
Synoptics	Manufacturer of concentrators for IMDI IEIT network
T1	Dedicated telephone leased-line connection for data communications, capacity 1.44 Mbit/s; can be "fractional T1" with part of the bandwidth leased, as Sandia does for AS/KCD link
telnet	Unix login to remote host program, not supported by all Unix hosts
X.400	A CCITT network protocol for E-mail endorsed as an OSI standard, consisting of an addressing scheme different from Unix SMTP addressing

I. Introduction

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Integrated Engineering Information Technology Tools for Enabling Concurrent Engineering

by
Rick Harris, IEIT Project Leader

What IEIT can offer you

Your office is in Tech Area I at Sandia's Albuquerque facility and you're working on a report that requires input from design engineers two miles away in Tech Area II, scientists at Sandia's Livermore facility (over 800 miles west), and production engineers at Allied-Signal's facility in Kansas City (over 700 miles east). If you want to get input from these people, you may think that you are limited to two choices:

- Fax, mail, or hand-carry a hard copy. This means waiting hours, perhaps days for a response. After the response is received, their input still has to be keyed into the electronic file on your computer.

- Mail or hand-carry a disk containing the electronic file for the report. This choice saves you the effort of keying in reviewer's input, but what if the addressee has an incompatible computer, disk drive, or version of the application program? If so, he or she may not find out until the disk is received, and you may have to modify your electronic file and mail or hand-carry it to them again.

There is a better way. Sandia's Integrated Engineering Information Technology (IEIT)* project, led by Organization 2604, can provide you a comprehensive, easy-to-use network solution for communicating with coworkers. This solution is available to anyone at Sandia who can access a local area network (LAN).

The IEIT alternative transparently links remote networks, making it possible for you to electronically mail and receive computer-generated documents and drawings attached to network mail

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messages, regardless of how distant the remote LAN is, regardless of whether you're sending the message to a Macintosh LC III or a 80386SX machine or a Silicon Graphics Workstation. The reviewers, when they receive your mail message, can open your attached electronic file, make the necessary modifications, and electronically mail it back to you in minutes instead of days!

Electronic mail across networks is just one example of the tools IEIT provides. IEIT also

- supports feature-based parametric modeling tools for mechanical design that can be shared over networks.

- is actively involved in building a network-based configuration management system for mechanical designers that will interface with Sandia's corporate configuration management system.

Why is IEIT a valuable design tool? How does the IEIT electronic mail work? How will you benefit from feature-based parametric modeling and network-based configuration management? Answers to these questions follow.

The IEIT alternative transparently links remote networks, making it possible for you to electronically mail and receive computer-generated documents and drawings attached to network mail messages, regardless of how distant the remote LAN is, regardless of whether you're sending the message to a Macintosh LC III or a 80386SX machine or a Silicon Graphics Workstation.

The shift from serial to concurrent design

A few years ago, designs were usually developed in a serial fashion. The general approach usually went something like this: Engineers *first* developed the specifications, *then* designers designed a system that fulfilled the requirements, *then* analysis engineers refined the design, and *finally* the manufacturing people made the parts in conformance to the design.

This process was like a relay race in which at any given moment the final outcome depended entirely on the performance of the runner sprinting with the baton, and "interfacing" was limited to a few crucial tenths of seconds when one runner handed the baton off to the runner designated for the next leg of the race. Specialized functional groups in the serial design world acted like these relay runners. Each functional group worked mostly alone in a compartmentalized environment, and once the work was finished, the functional group handed off its work to the next group. This approach slowed product development. The constraints on communication and interaction that serial product development imposed also usually guaranteed a poor or inadequate design that would have to be redone—often after beginning production.

Today's approach to design is concurrent instead of serial. It more closely resembles a high-performance pit crew at an auto race instead of foot runners in a relay race. From the beginning to the end of a product cycle, design input is provided by participants involved in all aspects of the product — from researchers, to design engineers, to sponsors, to stakeholders, to analysis engineers, to managers, to technicians, to production engineers, to operators on the production line, to the customers for whom the product is being made. The success of concurrent engineering depends strongly on the integration of all product development resources (information, people, tools) in the development of a product. In the same way, winning an auto race depends strongly on how well the pit crew works together to maintain the car throughout the race.

IEIT enables concurrent engineering by facilitating communication between all participants of a project; it provides an electronic forum through which the design "pit crew" can collaborate whenever and wherever the need arises. The portfolio of network-based engineering design tools that IEIT is developing all have one fundamental purpose: to make it possible for you and your organization to excel in today's increasingly competitive economic and industrial environment.

IEIT philosophy: use available resources whenever possible

The beauty of IEIT is that it uses existing technology whenever possible. IEIT's network solution uses off-the-shelf hardware and software, existing wiring, and commercial phone lines to communicate with users internal and external to Sandia. Such an approach saves money; it also saves time. It's based on seeking out the quickest, most straightforward solution.

We seek to provide you the capability to link up with IEIT—not to choose between IEIT and the LAN you may now be using. IEIT offers the best of both worlds: all the services of your existing LAN *plus* IEIT's remote connectivity, mechanical engineering tools, and configuration management.

The portfolio of network-based engineering design tools that IEIT is developing all have one fundamental purpose: to make it possible for you and your organization to excel in today's increasingly competitive economic and industrial environment.

Who is using IEIT

Many groups at Sandia are already benefiting from IEIT's services. Through the Integrated Manufacturing and Design Initiative (IMDI) program, IEIT is bringing network-based concurrent engineering tools to people at Sandia working on the design and fabrication of

- batteries
- electronic interconnections
- firing sets
- surety components
- sensors.

IEIT is also being used by Sandians developing environmentally conscious manufacturing processes and total quality management training.

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And the IEIT customer base continues to grow. Why? The answer is simple: customer satisfaction. "The IEIT team has provided outstanding customer support and technical responsiveness to the IMDI community," says IMDI manager Gary Ferguson. "Creation of a communications network that links Sandia engineers at both Sandia sites, Allied-Signal's Kansas City Division, and private industry is pivotal to Sandia's transition to a concurrent engineering mode of operation."

"Even in these times of Total Quality Management and the concept of 'delighting the customer,' I sense that what the IEIT team has done is a cut above the rest," adds Randy Watkins, an IEIT customer.

Many of IEIT's capabilities Ferguson mentions are being developed and tested through two IMDI pilot projects:

- the Multiple Application Surety Technology (MAST) project, which is developing common components (e.g., programmers, firesets, and stronglinks) for many different weapons applications

- the Focal Point project, which is developing paste-extrudable explosives (PEX).

The Focal Point project is using the network services provided by IEIT to collaborate with private industries belonging to a group known as the American Industrial Partners (Figure 1). Participating companies include:

- Speedring, located in Cullman, Alabama, which provides manufacturing expertise in beryllium machining.

- Pacific Scientific, located in Phoenix, Arizona, which offers consulting services in rheology—the behavior of materials in their plastic state. Focal Point is using this information to develop their extrusion process.

- Allied-Signal Kansas City Division, which is the PEX manufacturer and provider of manufacturing process planning and inspection expertise.

"The IEIT team has provided outstanding customer support and technical responsiveness to the IMDI community," says IMDI manager Gary Ferguson. "Creation of a communications network that links Sandia engineers at both Sandia sites, Allied-Signal's Kansas City Division, and private industry is pivotal to Sandia's transition to a concurrent engineering mode of operation."
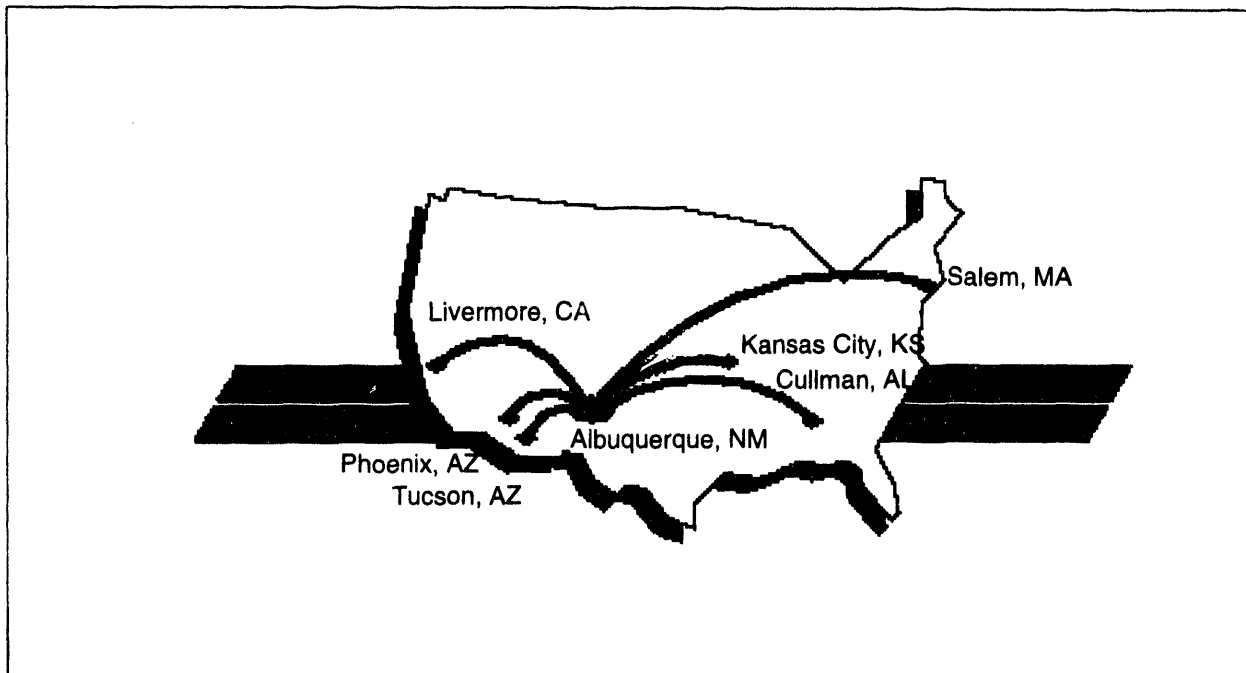
Figure 1.   IMDI IEIT's American Industrial Partners project has enabled network communications between Sandia New Mexico/ California and private industry across the United States.

IEIT services

The remainder of this IMDI IEIT overview briefly explains what IEIT offers. IEIT services belong to three different categories:

- computer networks and electronic mail
- mechanical design
- configuration management.

Computer networks and electronic mail

IMDI IEIT currently provides users access to two networks:

- IMDI Restricted Network (Figure 2)—an unclassified but restricted environment commonly known as Internal Restricted Network (IRN).

- IMDI Red Network (Figure 3)—a secure environment for unclassified computing.

Sandia has been responding to the increased demand for unclassified computing resources by converting many of its red local area networks to black. At the beginning of 1992, approximately 80% of Sandia's local area networks were red and about 20% were black; today the split is approaching 35% red and 65% black.

NetBlazer

In order to communicate by computer network with private industry, we can no longer afford to depend solely on dedicated lines, which, though they can easily be protected from unauthorized access, are costly and difficult to install. IEIT has answered this need by establishing computer communications with private industry partners using inexpensive commercial telephone lines without sacrificing needed security. IEIT has accomplished this by using a NetBlazer remote router to verify that network access is limited to authorized users.

NetBlazer has been used to extend IRN communications to Speedring, in Cullman, Alabama, and Pacific Scientific in Phoenix, Arizona. As Figures 3 and 4 show, NetBlazer remote routers are used to encrypt handshaking signals going onto the commercial telephone lines and decrypt handshaking signals coming from the commercial telephone lines. In addition, the local Ethernet bridge at the IMDI network hub provides hardware address filtering. These two measures

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make it impossible for unauthorized computers to masquerade as belonging to the network.

Hook-up services

IEIT provides a complete installation service. After installing the necessary network interface hardware, your IEIT service representative will configure your system so that network access is completely automated. Once your computer is configured, all you have to do to access the network is turn your computer on. Upon power-up, your computer will request a password for network access. After you enter your password, your computer will open its customary applications. If, for example, you are accustomed to going right into Microsoft Windows, we configure your computer so that Windows will open up after you enter your password. After configuring your computer to your satisfaction, the IEIT service representative will send an electronic mail (E-mail) message with a document or spreadsheet file attached to it through the network and back to your computer to confirm that the system is operational. Your IMDI IEIT service representative is always ready to answer your calls and will periodically call you to see if you have any questions or concerns regarding IEIT network access. Should you ever have any problems, you can reach us at the IEIT hotline number: (505) 844-0753.

In order to communicate by computer network with private industry, we can no longer afford to depend solely on dedicated lines, which, though they can easily be protected from unauthorized access, are costly and difficult to install. IEIT has answered this need by establishing computer communications with private industry partners using inexpensive commercial telephone lines without sacrificing needed security.

IMDI "RED" NETWORK
(Secure - Unclassified - Nonsensitive)

SNL,A Building 82?

────── 10 Base T Lines

Synoptics Concentrator
(IMDI Network Control Center)
Room 2055

PBX
LAN 68

Synoptics Concentrator
(ACCORD Network Control Center)

External Secure Environment

SNL,A

ACCORD NETWORK
SNL,A

T-1 IXL Link

PBX
LAN 68

S
N
L
L

External Secure Environment

External Secure Environment

Synoptics Concentrator
(EI Network Control Center)
Building T-27

SNL,L

PBX
LAN 31

ENGINEERING INFORMATION
NETWORK
SNL,A

Security Router

External Secure Environment

Synoptics Concentrator
(NIRVANA Network Control Center)
Building 859

NIRVANA NETWORK
SNL,A

Internal Secure Environment

- Electro-Mechanical Engineering Network

August 21, 1992

Figure 2.   The IMDI IEIT Red Network provides a secure environment for unclassified computing and networking.

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IEIT "BLACK" NETWORK
(Restricted - Unclassified - Nonsensitive)

Synoptics Concentrator
(IMDI Network Control Center)
Room 2055

NetBlazer Remote Router
nbrouter35
(Encryption, password,
and IP filtering enabled)

NetBlazer Remote Router
nbrouter52
(Encryption, password,
and IP filtering enabled)

Local Ethernet Bridge
(Hardware Address
filtering enabled)

NetBlazer Remote Router
nbrouter53
(Encryption, password,
and IP filtering enabled)

Telebit High Speed Modem
(57.6 kb/s)

Telebit High Speed Modem
(57.6 kb/s)

Router
eroute

Router
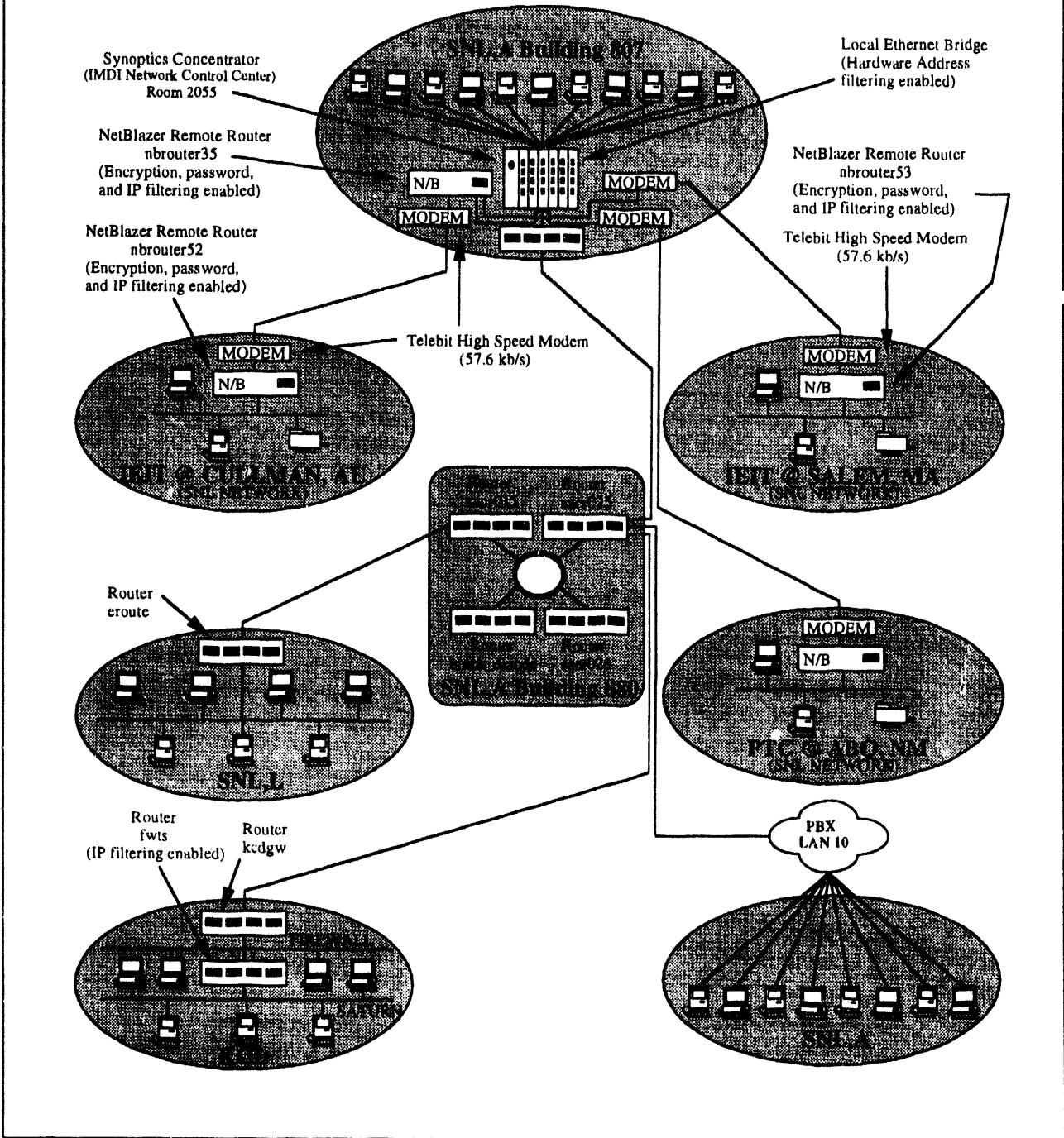fwts
(IP filtering enabled)

Router
kcdgw

PBX
LAN 10

Figure 3.   The IMDI IEIT Black Network provides a restricted environment for unclassified, nonsensitive computing and
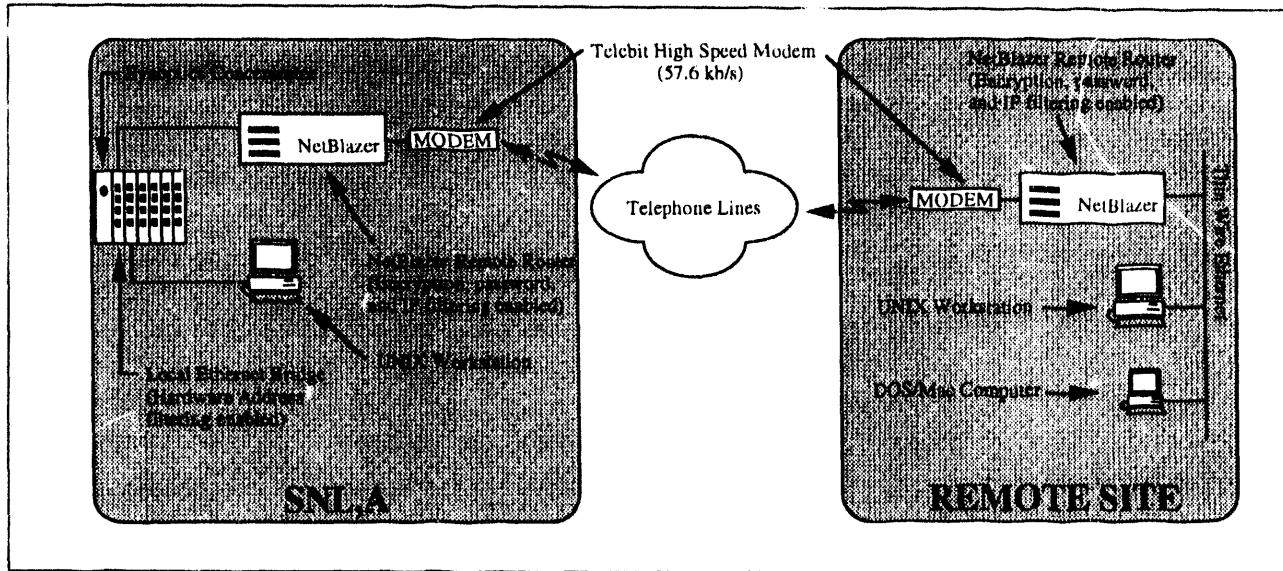networking.

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Figure 4. *NetBlazer uses remote routers to encrypt handshaking signals transmitted over commercial phone lines, which is coupled with Ethernet hardware address filtering at the bridge. This system is being used for communicating by computer with Speedring in Cullman, Alabama, and Pacific Scientific in Phoenix, Arizona.*

E-mail connectivity

Electronic mail, which makes it possible for people to send electronic messages via networks between computers, has revolutionized the workplace. However, the proliferation of E-mail products has also created a "Tower of Babel" syndrome, as Figure 5 shows. Network users have been at the mercy of individual point-to-point translators provided by E-mail suppliers, making communication with someone with a different E-mail protocol difficult at best.

IEIT has a solution to this problem: a unified electronic mail system that uses the X.400 messaging standard, which belongs to the Open System Interconnect (OSI) protocol. X.400 makes possible user-transparent communication between hosts, regardless of the computer they are using or the local area network they belong to. With X.400, all E-mail, regardless of the product brand or protocol, is translated into X.400 by gateways and into OSI protocols by open servers before it is sent to another local area network (Figure 6). This approach eliminates the need for point-to-point connectivity and makes E-mail routing so simple that, from the users' perspective, they are both located on the same local area network and use the same E-mail software.

A description of an example X.400 connection follows. A cc:Mail message originating at a

personal computer is converted to X.400 mail by a cc:Mail gateway, then to OSI protocol by the open server. The message, now in the generic X.400/OSI protocol, is converted to the MS Mail/IPX protocol required by the destination personal computer by the open server and gateway on the destination local area network. All these conversions are completely transparent to the user.

X.400 mail provides additional benefits. Examples include:

- automatic delivery notifications
- binary file attachments such as Excel spreadsheets and Microsoft Word documents.

Mechanical design

When you join IEIT, you will have access to Pro/ENGINEER, a powerful solid modeling program for concurrent mechanical design that can run on standard engineering workstations. (A sample Pro/ENGINEER drawing is shown in Figure 7.) Pro/ENGINEER native files can be shared over IEIT-accessible networks to generate drawings and provide valuable design information throughout the entire life-cycle design of the component you're developing.

The solid-model-definition approach that Pro/ENGINEER uses has a fundamental advantage over earlier computer-aided design (CAD) systems.

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The World without X.400

Internal Restricted Network
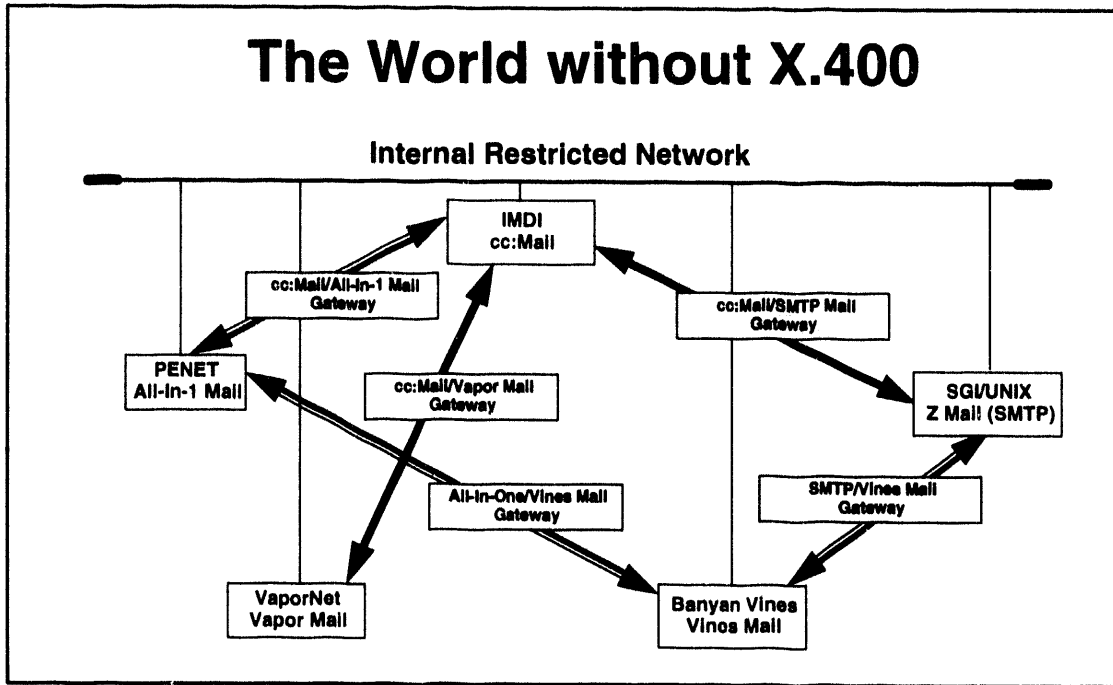
Figure 5. *The world without X.400. Without a standard OSI protocol such as X.400, network users are at the mercy of mail translation packages provided by individual vendors. The result: a confusing array of point-to-point E-mail communication paths.*

IMDI X.400 Implementation

Internal Restricted Network
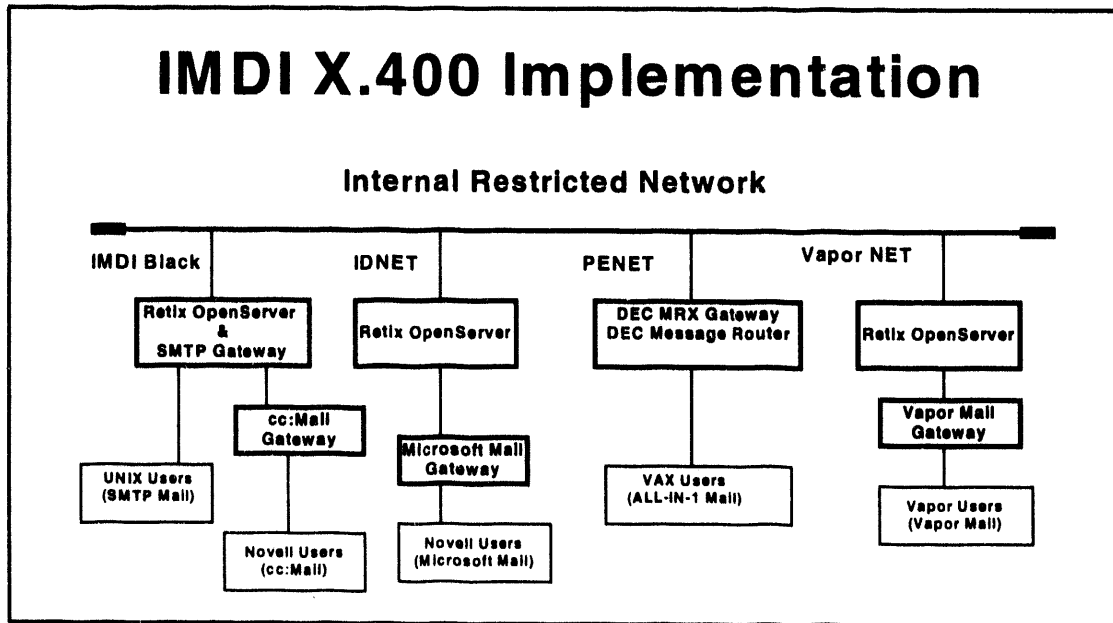
Figure 6. *The world with X.400. With X.400, all E-mail messages are translated to a common X.400, OSI protocol before being sent to another local area network. As a result, E-mail routing is streamlined.*

Solid modelers provide a complete, unambiguous geometric description of the solid model using three-dimensional geometric surfaces, insteadof two- and three-dimensional CAD wireframe representations. A solid model database provides engineering applications a complete geometric part description, which is elusive using conventional wireframe CAD systems.

The solid model databases contain all the information necessary to drive applications that require geometric information, providing the basis for engineering solutions. Solid model databases also support analysis needs. For example, analysts can use solid models to quickly and accurately calculate mass properties, moments of inertia, and interference between mating parts. Solid models also serve as a "front end" to understand thermal or structural behavior.
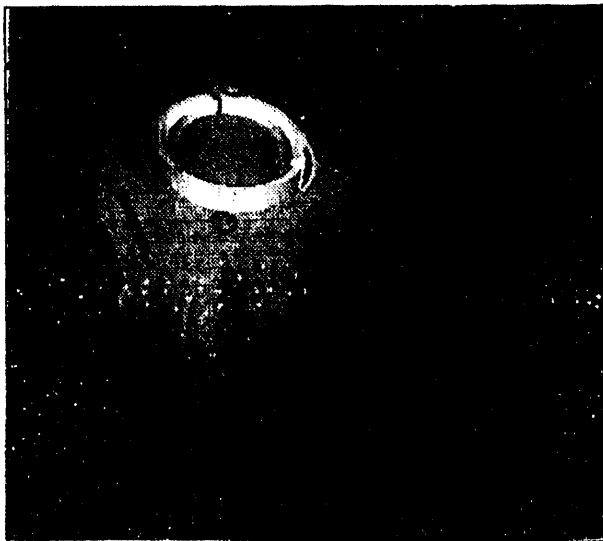
Figure 7. Top portion of Pro/ENGINEER drawing showing interface unit being developed by MAST pilot program. The same native file used to generate this drawing can be used to generate mechanical drawings and generate files that facilitate evaluation of assembly options and numerical toolpaths for fabrication.

Manufacturers also benefit. They can use the same solid model database used at the design stage to evaluate assembly options and generate numerical toolpaths. One IEIT customer is integrating Pro/ENGINEER to their stereolithography process to produce scalable prototypes of Pro/ENGINEER solid model databases. The stereolithographically produced parts can then be used as system components or as patterns for investment cast parts.

Whether used for stereolithography or more conventional approaches such as numerically controlled machining, solid-modeling is a valuable concurrent engineering tool. Using Pro/ENGINEER, IMDI users can cut design time, promote interaction during design, and thus build better parts.

Configuration management

IEIT is also developing a network-based configuration management system to make mechanical and electrical project information readily available to engineers and designers. Our goal is to make it possible for you to submit drawings and specifications for electronic "release" to the configuration management system. These controlled documents could then undergo electronic signoff and then be permanently archived for all to view and retrieve. Should the document need changes, an approved person could "check out" the latest version, make the necessary changes, and "check in" the modified version. If signoff were required, the signoff authority could be automatically included in the check-in process. We are working closely with Sandia's corporate configuration management system to assure that the IEIT configuration management system both meets corporation standards and minimizes what you need to learn about Sandia's corporate configuration management system.

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II. FY93 Accomplishments

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Background for the FY93

The IEIT project was initiated in February 1992 by the IMDI program. Throughout fiscal year '93 (FY93), IEIT has grown to support IMDI program participants as well as the IEIT/Energy, Org. 2500, and IEIT/ID, Org. 2609 computer networks.

In meeting the needs of the clients, the Integrated Engineering Information Technology (IEIT) team connected and trained organizational users inside and outside Sandia to IEIT-designed networks, bringing them the tools to implement concurrent engineering (CE) goals, and the tools for widespread connectivity, ranging from e-mail to Pro/ENGINEER file transfer from internal Sandia to nationwide sites. This report describes the diversity of efforts involved in FY93 accomplishments, and includes some of the results of that effort.

FY93 Accomplishments Summary

The Integrated Engineering Information Technology (IEIT) project, Department 2604, in support of the Integrated Manufacturing and Design Initiative (IMDI) program, has built electronic bridges between organizations and geographic locations. Engineering information is being shared electronically across Albuquerque and across the United States. This information takes the form of electronic mail and application files, including Pro/ENGINEER solid models. Computer networks were built, including leased lines and low cost custom IEIT links to American industrial partners. These custom links operate at an intermediate but very usable speed of 56kbit/s between Sandia, Albuquerque, NM and Speedring, Cullman, AL; Pacific Scientific, Phoenix, AZ; and Parametric Technologies Corporation (PTC), Albuquerque, NM. All systems (PC, Macintosh & Unix) are integrated, providing IEIT clients with seamless file sharing and electronic mail.

Significant Events for the IEIT Team

Internet contact for all network members was established. Aliasing of people's names for Internet addressability made this possible, even after the link to the Internet was established through somnet.sandia.gov.

American Industrial Partners formed a WAN with SNL IEIT networks. The Allied-Signal Kansas City Division in Kansas City, KS, is linked by Sandia corporate resources, using a Department of Energy intranet T1 line. This link was built by Sandia Organization 1900, under the direction and funding of IEIT. Custom IEIT WAN connections include EG&G at Salem, MA; Speedring at Cullman, AL; and Pacific Scientific at Phoenix, AZ. A metropolitan area network (MAN) is formed by the link to the offices of Parametric Technologies Corporation in Albuquerque, NM. All of these networks are linked together, and with the IEIT/Energy and IEIT/ID LANs.

During the year, a mass exodus occurred from the secure "red" network to the restricted "black" networks. As of October 18, 1993 the IMDI secure network was eliminated. Following this date, the attention of the IEIT team can be focussed on restricted access networking.

The dual use effort between the IEIT project and MIDAK International (Tucson, AZ), was initiated to productize conceptual labor regarding the "Lessons Learned" database and PC Data Management. The first version of the Office Advisor product was received in September of the FY93 from MIDAK

International. Features of the Office Advisor include: allowing the user to check in documents from Excel or Word, and allowing the building of queries called "monitors" that stay resident in the system and look for all incoming occurrences of certain topics. These live queries create an environment of proactive dissemination of information within the user's defined interest area. The database is organized as a topic-based structure, and is based on Saros Mezzanine, a text processing engine that works on top of Microsoft SQL server.

In support of EEIS activities with Organization 2604, the IEIT team built two networks totaling over one hundred users within the two months from September through October. IEIT/ID (Instrumentation Development, formerly "IDNET") network (65 people) was added, by moving the network from Banyan Vines to Novell Netware. The IEIT/Energy (formerly "Firecracker") LAN includes over 40 people. The IEIT/ID network was given access to the Laboratory Information System (LIS), which eventually will be available to all network participants. In both cases, these networks were implemented using IEIT standards, and also possess significant connectivity with other IEIT LANs.

Multimedia e-mail: the FIRST multimedia e-mail message to be created on an SGI system was created by Greg Neugebauer, Karl Kottkamp of SGI, and Fred Oppel of SNL, Livermore. The two-minute message portrayed the design of a robotic vertical pipe-cutting tool to be used at Hanford, Washington, in slurry waste beds. Fred Oppel designed the tool, and Karl and Greg created the message. The graphics were done in Pro/ENGINEER, and live video was included, with audio samples from various participants.

Support for IMDI Agility projects: IEIT will support the concurrent engineering of "discriminators," smart and impervious arming devices with complex mechanical interactions; and possibly the "Reservoir" project for development of improved gas storage bottles.

Scheduling implementation on the IEIT networks adds the On Time software to the list of IEIT-supported software. On Time is a scheduling program for MS Windows environment, including an informal "Conference Room" for participants.

The PTC Mail Exploder service on the Internet (located at Pennsylvania State University Erie campus) was linked up with IEIT Pro/ENGINEER users for problem resolution.

The Parametric Technologies Corporation office in Albuquerque was linked to Sandia Pro/ENGINEER seats for problem resolution.

In response to requests from Harry Saxton, Organization 5400, and Bob Rieden, Organization 2604, a study of ISDN functionality and integration with IEIT networks was performed. ISDN was tested by Bob Partridge and found to be expensive, requiring as many lines to be installed as the anticipated concurrent number of users, to avoid a traffic jam between any two users. Thus, if five hundred users were on the network, with a maximum of 250 active at any one time, there would have to be 250 lines installed for there to be no collisions between users, a prohibitively expensive and time-consuming installation operation.

IEIT and Connectivity

A purpose not conceived when the IEIT team began, was to implement communications in general across Sandia, from the planned corporate hub to the connection with the Internet. The IEIT team, focussed on the job of connecting and training users in the mysteries and advantages of networking, has accumulated

intensive problem resolution information, and a position of experience from which they can recommend the use of software and hardware of all types.

IEIT Software Standards to Promote Connectivity

In general, PC software at Sandia is being brought toward three industry standards, Microsoft, Novell, and Lotus. These products cross many of the barriers between PCs and Macintosh. Microsoft sets the standards for applications software, Novell for networking products, and Lotus for PC (and Mac) electronic mail. Retix OpenServer runs on PCs and creates gateways between otherwise conflicting network mail standards. Retix OpenServer, cc:Mail, and Microsoft Mail all support the X.400 Open System Interconnect (OSI) standard that is being implemented for e-mail to remote network sites, such as those connecting Sandia with the American Industrial Partners. (OSI is a suite of standards from the International Standards Organization.) Additionally, all these software packages are widely available, relatively inexpensive, and supported by third party vendors as well as by their manufacturers.

Microsoft's Windows NT is being evaluated for wider use. Other software that the IEIT team has found useful includes FrameMaker (Frame Technology Corporation), a platform-independent document publications software. The PC-Xview package (NCD Software, Inc.) allows the linking of PCs to the Unix X Windows System standard. The Norton PC Anywhere (Symantec) is the fabled "Wal-Mart ICE" allowing remote viewing of the same screen from two widely separate PCs used by engineering teams.

IEIT Hardware Standards to Promote Connectivity

PCs and Macs are connected to the network's hub in Sandia Building 807 using 3COM Ethernet adapter cards installed in each computer. Thin wire cables lead from the cards at the back of each machine to ceilings, floors, or whatever is the best route to get to the hub.

Ethernet is a topology (or shape) of network, a hierarchical structure with a server or network-managing computer at the top, and subsidiary computers connected to a "backbone" of cable at the lowest level (in a comb-type structure, with computers at the ends of the comb's teeth). Other shapes can be combined with it, as the "star" configuration used by the IEIT team. The advantage of Ethernet, as used by the IEIT team, is that one server going down does not take any other servers down. In this case, for example, three Novell servers handle over 200 clients on the IEIT networks, with an average load of around 70 clients per server, so this is an important consideration .

The software that ties together the hardware of this network is Novell Netware. There are four machines acting as Novell servers, three of them tied together, and the fourth acting as an SMTP gateway to a Unix machine. (Similarly, the one Unix machine is designated to talk to the Novell servers.) Novell LAN WorkPlace for DOS communicates with the Unix server in the TCP/IP standard for Internet communication.

Choice of wiring for the connection depends on what is already in place, or can be installed in a timely manner by Organization 1900, the technical organization that controls routers and cabling among Sandia buildings. When there is a choice of what to install, fiber optic cable is preferred between buildings, and "10 Base T" between the hub and client workstations.

The "10" in "10 Base T" stands for the number of mega-bits per second (Mbit/s) transmission rate, which is called "bandwidth," and is a measure of how much data can be put through the network connection at one time. "Base" stands for "baseband," which is the type of signalling in use. "Baseband" means that the

signalling utilizes one transmission rate and frequency of the particular medium, and all the machines on the network participate in a transmission (it is used to distinguish the transmission type from "broadband," which transmits through a medium using multiple messages at multiple frequencies). "T" stands for "twisted pair," or ordinary telephone wire. Some connections at Sandia are "10 Base 2" or thin-wire coaxial cable.

In the future, 10 Base T or fiber optic cable will be preferred for all new installations, and the type of connectors used will be the telephone "RJ-45" connectors and fiber "ST" connectors.

The "hub" refers to the central connection for a network, whether it is a local hub for a Local Area Network (LAN), or the corporate hub for all Sandia. "Hub" usually implies a "star" configuration for the network, where all the machines are connected to a central server, or to a less intelligent machine such as a concentrator.

The hubs for IEIT are in a star Ethernet topology in Building 807, meaning that fiber and 10 Base T connections to the network radiate outward from the central server in a star-like pattern. The hub for the IEIT networks is a Synoptics concentrator, which is a device to reinforce the signal strength and speed the throughput of the network.

Intelligent bridges, termed routers," in use by IEIT are able to choose the most efficient routes, within limits. A example of a remote router is one such as the NetBlazer used by IEIT, which performs routing for long-distance transmission to remote LANs, for example over the Wide-Area Network, or WAN, that now exists between Sandia and Salem, MA. (The NetBlazer also performs tasks such as encryption, password protection, and Internet address packet filtering.)

The Story of "Fred," a Typical Data Packet

Let us suppose a PC user sends a text file, an e-mail letter in the form of ASCII characters, to someone else on the network. For the sake of example, one packet of data, named "Fred," will be followed to its destination in Salem, MA.

Within the computer, the user creates the text file in a network-aware software such as Lotus cc:Mail, which breaks the file down into packets according to the Novell IPX protocol (this is where Fred is born), which are all sent to the 3COM card in the PC, which addresses them according to the e-mail address in use by the file, then beams them over the 10 Base T line to the nearest hub of the Ethernet LAN's "star" configuration at Sandia's Building 807.

If the recipient were another PC, the Novell file server (a computer dedicated to running the network), would read Fred the packet's address, and then he would be sent on his way to the closest connection for that PC's address, as determined by the table of addresses in the server's configuration file. If the server were sending to a Macintosh on the network, say one that was not yet logged on, the packets would be stored in an ASCII database on the Novell server, a database that is shared by both PCs and Macs.

But since the recipient is a Synoptics concentrator, Fred is concentrated until his ears are buzzing with concentration, and he is sent to the big Novell server, which says in a gruff but not unkindly voice, "Go on over to the bridge, Fred." The local Ethernet bridge is dumb, and it looks at the address and says, "Uh - Fred, sorry, but this address of yours is long distance. I gotta send you to the NetBlazer, or I'm in big trouble." Fred is terrified, but he has no choice. He goes to the NetBlazer, which encrypts him (disguises

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him as a nonsense packet, as if he were wearing a harlequin suit), gives him a SLIP address (pasted over his original one) and routes him to the Telebit high-speed modem.

The modem compresses Fred with a number of other packets (Fred says "Oof!") and shoots them all over the telephone lines to EG&G, Salem (whooosh!). If Fred were being sent to Allied-Signal's Kansas City Division, he would travel over T1 phone lines, which are leased or dedicated data transmission lines. (For the AS/KCD case, the IEIT team has "fractional T1," meaning that only part of the bandwidth of the lines is leased for Sandia use.)

The arrival at Salem is at another Telebit modem, which decompresses Fred ("Uh!"), and sends him to a NetBlazer which takes off his SLIP address label, decrypts him (gives him decent clothes to wear), then sends him on the Salem network, where he will be routed one last time, to the user for whom he is intended. At last, with a sigh, he is home.

IEIT USER CONCERNS ABOUT CONNECTIVITY

WHY IS E-MAIL IMPORTANT?

E-mail allows users to communicate with each other from diverse platforms, in this case DOS/Windows on the PC, System 7 on the Macintosh, and Unix on SGI, Sun, and other workstations. In the course of communicating, files containing all kinds of data (as opposed to words alone) can be shared by attaching them to the mailed message. This capability becomes extremely important to any two people working on the same project at remote locations. The e-mail method is time-independent, allowing the user to communicate at will, rather than on the schedule of a remote location that may be in another time zone, on a different shift-structure, or otherwise at odds with the user's "home" time. Finally, the e-mail method is accessible everywhere, as long as there is one computer on the prospective network that can communicate using any of the protocols or software methods mentioned above, cc:Mail, Unix SMTP, X.400, or others.

WHY THE IEIT TEAM?

The team of IEIT members is dedicated to solving unique network problems of connectivity and throughput. Because of their accumulated expertise, problems that hamper other organizational LANs and connected sites, but have gone unrecognized or unsolved due to lack of time, budget, or a dedicated team, have been solved by the IEIT team. Among the team members, expertise is shared, and there is both time and budget for research and development of solutions to networking problems, which are often lacking in the organizations where networking is a secondary concern.

In addition, by identifying off the shelf software standards, the team can spread connectivity among organizations, platforms, and LANs, as these join the larger network typified by the Sandia corporate hub. Other organizations are at least aware ahead of time of the software requirements for connectivity and communication with IEIT networks, the software in use for various applications, and the costs, training, and routines necessary to the connection.

Figure 8. The IEIT Wide Area Network (by Joe Orona)

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IEIT "BLACK" NETWORK
(Restricted - Unclassified - Nonsensitive)

SNL-A Building 907

Local Ethernet Bridge
(Hardware Address
filtering enabled)

10 Base T and Fiber Optic
Lines

Synoptics Concentrator
(IMDI Network Control Center)
Room 2055

NetBlazer Remote Router
nbrouter35
(Encryption, password,
and IP filtering enabled)

NetBlazer Remote Router
nbrouter53
(Encryption, password,
and IP filtering enabled)

NetBlazer Remote Router
nbrouter52
(Encryption, password,
and IP filtering enabled)

Telebit High Speed Modem
(57.6 kb/s)

N/B

MODEM

MODEM

Telebit High Speed Modem
(57.6 kb/s)

MODEM

N/B

MODEM

N/B

PBX
LAN 10

Router
eroute

Router
kcdgw

Router
fwts
(IP filtering enabled)

Figure 9. The IEIT "Black" Network (by Joe Orona)

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III. IEIT Capabilities

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Division 2000 Directs the IEIT Program
to Implement Concurrent Engineering Technologies

- Integrated Electronic Mail

- Nationwide Networking on Demand

- Engineering Applications

- Virtual Co-Location

- Modern Tool Integration

- Business Practice Development

IMDI Pilot Project
Team Members

Industrial Partners

NWC
Production Agencies

Product Designers

Design Analysis
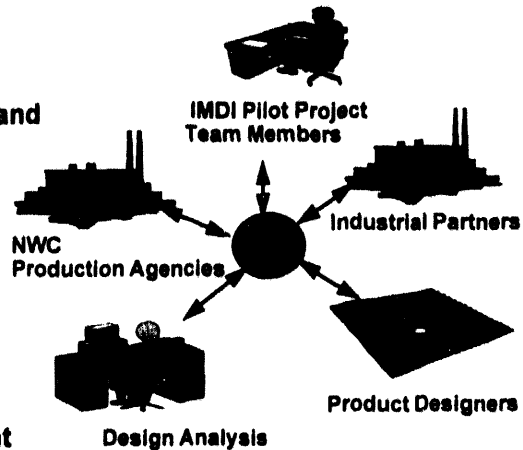
mh 11/9/93 1

IEIT Capabilities

and Planned Enhancements

"Implementing Enabling Technology for Concurrent Engineering"

mh 11/9/93 2

Electronic Mail

An Integrated Approach to PC, Mac, UNIX, IRN, EON

rnh 11/9/93 3

IEIT Mail System

Somnet.Sandia.Gov Main Sandia Domain Name Server	Sandia.gov Main Sandia SMTP Node		Internet Mail X.400 Mail cc:Mail

To the Internet

External Open Network

File Server CC:Mail Postoffice	File Server CC:Mail Postoffice	File Server CC:Mail Postoffice MS Mail Postoffice	File Server CC:Mail Postoffice	Retix cc:Mail/X.400 Gateway	Retix cc:Mail/X.400 Gateway

To an X.400 Host

Domain Name Server	cc:Mail/SMTP Gateway	ccMail Router	WorkStation using cc:Mail	WorkStation using MS Mail	Retix X.400 Open Server

rnh 11/9/93 4

cc:Mail:
PC & Macintosh Mail

cc:Mail:
Logging In

cc:Mail Login	
Log-in Name:	Partridge, Bob
Password:	
P.O. Path:	M:\CCDATA

☐ Add Name to the Log in List

[OK] [Cancel] [ ]

cc:Mail:
Creating A Message

cc:Mail - [New Message # 1]

File   Edit   View   Text   Message   Attach   Rules   Tools   Window   Help

TO   Harris, Rick

Normal

View Graphs
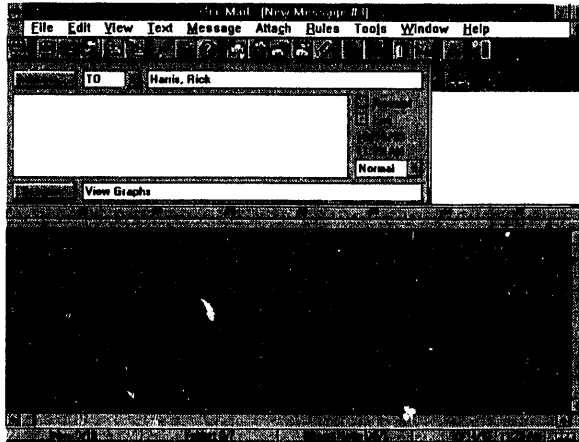
cc:Mail:
Addressing a Message

Address Message

TO

Mail Lists	Abrams, Douglas G. r
Private Mail Lists	Administrator-ENERGY r
Folders	Administrator-ID r
Bulletin Boards	Aguilar, Chris A. r
	Alexander, Jeff A r
	Allard, T J. r
	Allen, Mike r
	Anderson, Fred H r
	Andreas, Ron D. r
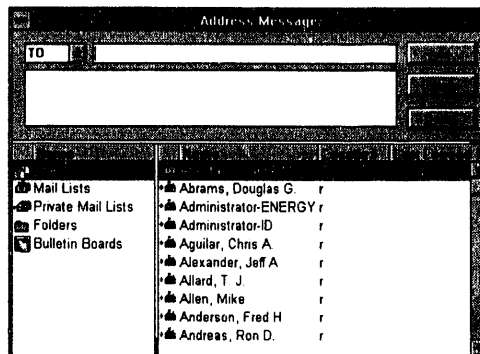
cc:Mail:
File Attachments
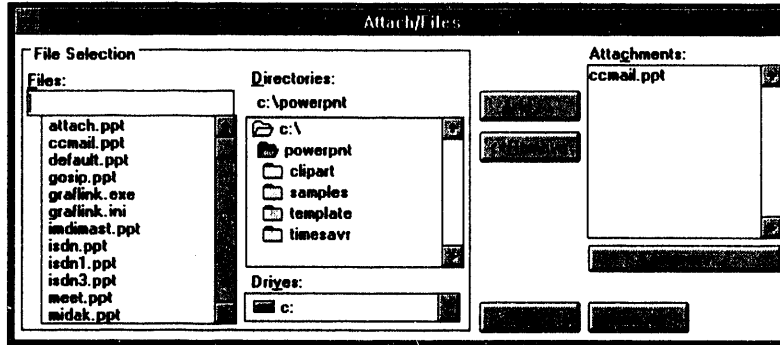
cc:Mail:
Internet Mail Addressing

Z-Mail:
UNIX SMTP Mail GUI

Using IEIT to ...

Access other Sandia Resources

LAN Workplace:
Access to LIS, Midas, JIT ...

LAN WorkPlace

Host Presenter | Rapid Filer | Help!

LIS Lab Information System | Commtel | Penet
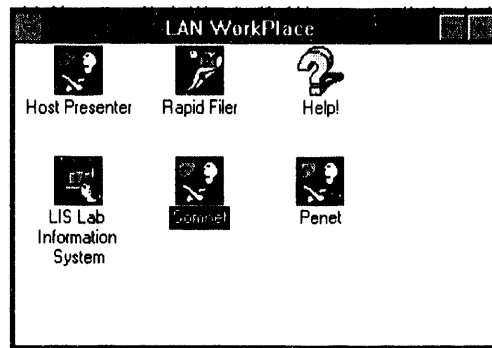
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LAN Workplace:
Telnet Sessions

Open Session

Hostname

Session Name

General Unix Profile

Open | Cancel | Help

Load Profile

Name of Host to log onto

rnh 11/9/93 14

LAN Workplace & UNIX telnet:
LIS Access

```
                        [01] Lab Information System
 File   Edit   Setup   Transfer   Utilities   Help

                                                      Date  . .:  10/15/93
                                                      Time  . .:  09:45:27
                                                      Terminal:  TO6SA10
                        Sandia National Laboratories  IBM 9021-500

                       ***        **********      *********
   Laboratory         ***        **********       *********
   Information        ***             ***         ***
   System            ***             ***        ********
                    ***             ***        ********
                   ***             ***             ***
                  *********    **********      *********
                 *********    **********      *********

              Enter Logon information:
                 User       ==>   -
                 Password   ==>

                 Application ==>
                 Group       ==>
                 Location    ==>
 PF  1=Help  2=Language
```

Note: Connection to LIS will be detailed in the December Program Meeting

LAN Workplace & UNIX telnet:
PENET Access

```
                        General Unix Profile
 File   Edit   Transmit   VT-FuncKeys   VT-ShiftFuncKeys   Setup...   Help
                 Facilities  VAXCluster Computing Network   Mode  ZEUS

 Username:
```

LAN Workplace:
Internet File Transfers

```
┌─────────────────────────────────────────────────────────┐
│                Rapid Filer - [c:||novell.com]            │
│ File  Edit  View  Options  Profile  Help                 │
├─────────────────────────────────────────────────────────┤
│ c:\windows                                               │
│ ▢ fonts       ▢ calendar.exe  ▢ emm386.exe  ▢ opsetupt.exe│
│ ▢ msapps      ▢ cardfile.exe  ▢ expand.exe  ▢ packager.exe│
│ ▢ system      ▢ charmap.exe   ▢ mouse.com   ▢ pbrush.exe  │
│ ▢ twain       ▢ clipbrd.exe   ▢ mplayer.exe ▢ pifedit.exe │
│ ▢ ~cln1703.exe ▢ clock.exe    ▢ msd.exe     ▢ printman.exe│
│ ▢ atmcntrl.exe ▢ control.exe  ▢ msdos.exe   ▢ progman.exe │
│ ▢ calc.exe    ▢ drwatson.exe  ▢ notepad.exe ▢ recorder.exe│
├─────────────────────────────────────────────────────────┤
│ novell.com: /netwire/novfiles                            │
│ ▢ nlcd410      ▢ novfil.idx                               │
│ ▢ 311ptd.exe                                             │
│ ▢ dosup7.exe                                             │
│ ▢ landr2.exe                                             │
│ ▢ upd311.exe                                             │
│ ▢ vimup1.exe                                             │
│ ▢ winup7.exe                                             │
└─────────────────────────────────────────────────────────┘
```

Mechanical
Engineering

Conceptual Design

Pro/ENGINEER

- ACCORD integration (Files, Mail, Plotting ...)
- Pro/Project for PEX: SNL NM & CA, KCD, UD, SP
- Operating system and application s/w installation & consulting
- Pro/PDM national council representation
- Connection to PTC (Dave Rackstraw)
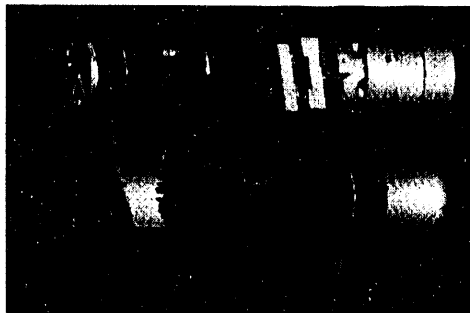
Pro/Engineer
MAST

Dual Use

PC Configuration
Management

Office Advisor

Rick Harris
Sandia National Laboratories
Integrated Engineering Information Technology

"At Sandia National Laboratories, vast amounts of technical
information is captured in the minds of the technical staff. Staff
reassignments and retirements threaten the accessibility of this
knowledge. We are looking for a method of capturing, organizing
and presenting this information to others. The Office Advisor
paradym of user interest, registration and proactive distribution
of knowledge fits perfectly."

Office Advisor:
Data Repository
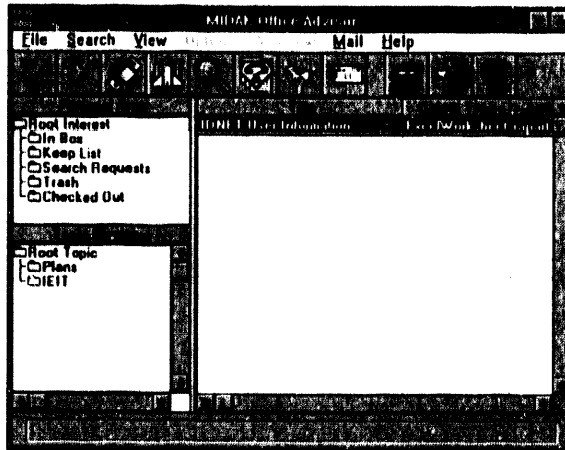
Office Advisor:
Search by Attribute
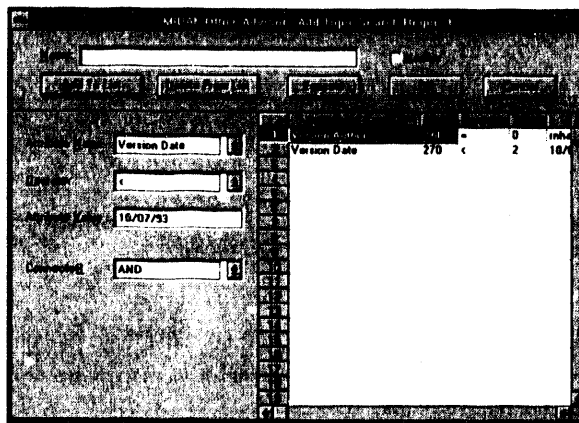
Office Advisor:
Search by Topic
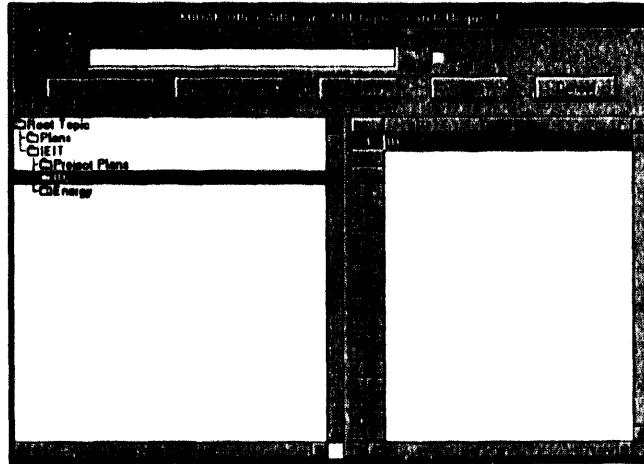
Office Advisor:
Proactive Notification when new topics of interest are entered
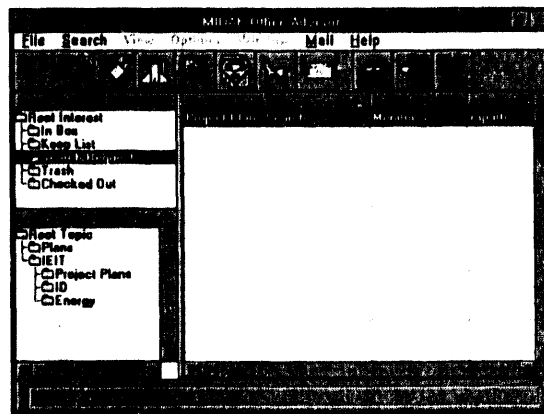
Office Advisor:
Automatic E-Mail Notifications when documents of interest are entered

Monitor Name   Title
Bob's Project Search   IF IT Mail System Diagram
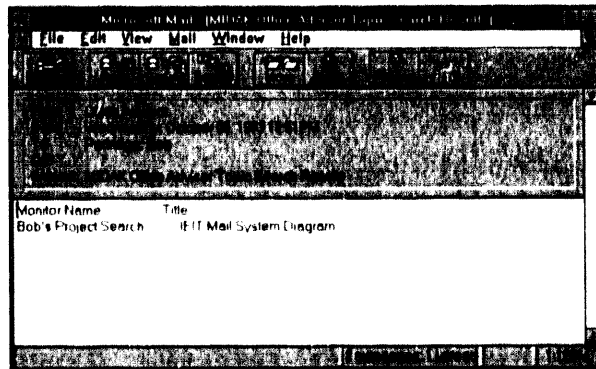
On Time:
Owner's Calendar--Day View
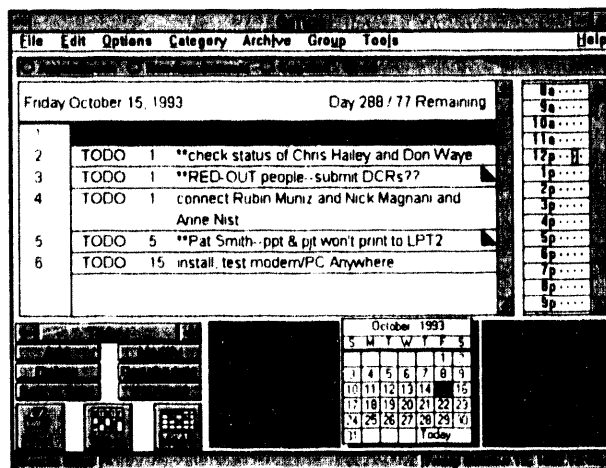
On Time:
Owner's Calendar--Week View

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On Time:
Owner's Calendar--Month View

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On Time:
Group Calendar

File	Edit	Options	Category	Archive	Group	Tools			Help

October 10, 1993 to October 16, 1993

Sun 10	Mon 11	Tue 12	Wed 13	Thu 14	Fri 15	Sat 16
8a	8a	8a	8a	8a	8a	8a
9a	9a	9a	9a	9a	9a	9a
10a	10a	10a	10a	10a	10a	10a
11a	11a	11a	11a	11a	11a	11a
12p	12p	12p	12p	12p	12p	12p
1p	1p	1p	1p	1p	1p	1p
2p	2p	2p	2p	2p	2p	2p
3p	3p	3p	3p	3p	3p	3p
4p	4p	4p	4p	4p	4p	4p
5p	5p	5p	5p	5p	5p	5p
6p	6p	6p	6p	6p	6p	6p
7p	7p	7p	7p	7p	7p	7p
8p	8p	8p	8p	8p	8p	8p

October 1993

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31			Today			

On Time:
Group RSVP Status Page

Attendees	RSVP Status			
Bob Partridge				✓
Dennis Miller	✓			
Greg L. Neugebauer				✓
Joe R. Orona				✓
Rick Harris				✓

Realtime Communication

"ICE Lite"

SGI Multimedia: Value added E-Mail component
  - E-Mail messages with voice and video file attachments
  - Sender and receiver need not coordinate schedules
  - "Played" and "re-played" at leasure.
  - Low bandwidth network requirment i.e. Link to Industry

"Wal-Mart ICE"
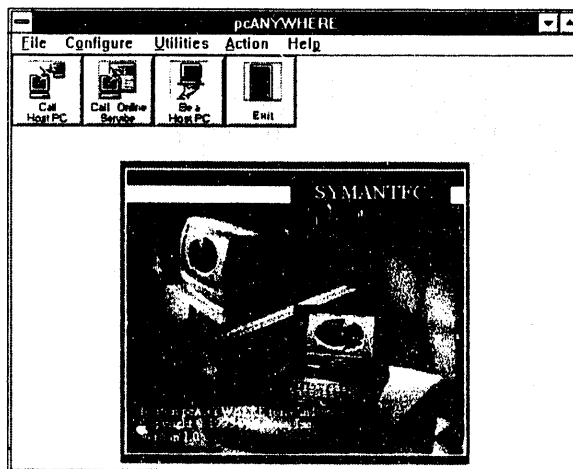
PCAnywhere:
Realtime connection PC to PC
over the network
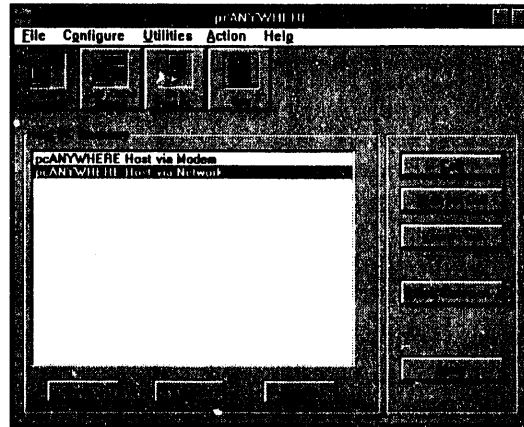
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PCAnywhere:
Share the same screen from
two remote locations
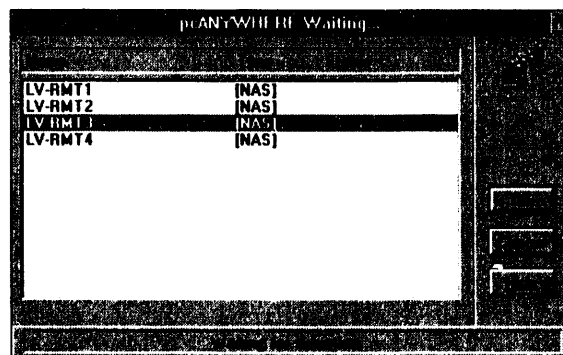
mh 11/9/93 38

Computer Networks

Information Highway

IEIT Networks

- **Network Connectivity on Demand**
  - IRN Fiber, PBX, 10bT ...
  - Netblazer to Remote locations via commercial Phone Lines

- **IRN Network with access to EON functionality**
  - » Internet Mail send and receive
  - » IPX IRN EON Solutions being studied
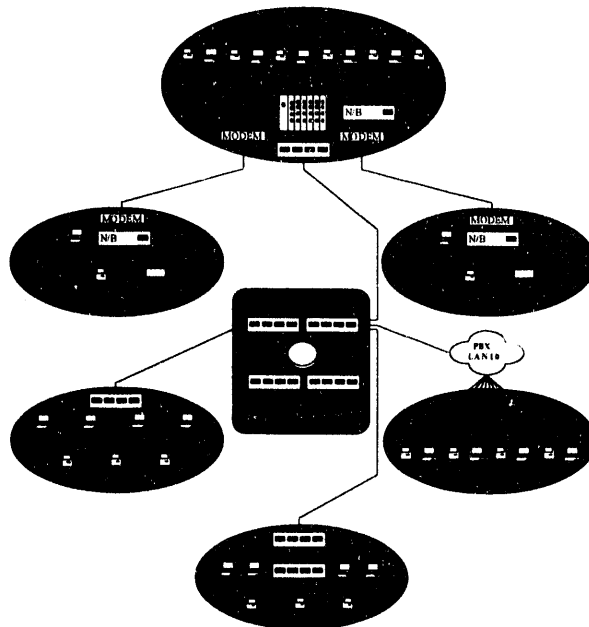
Network Access to Remote Locations
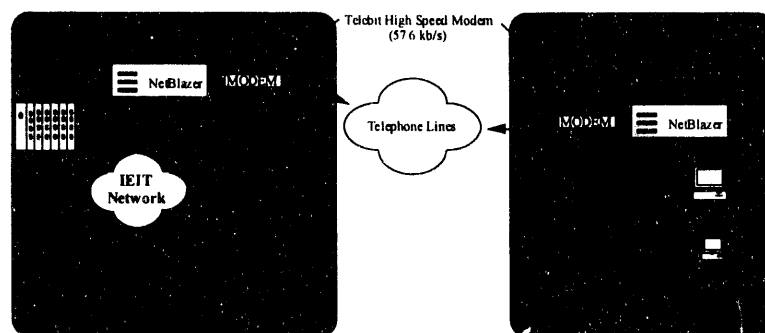
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IV. Mechanical Engineering Design

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Conventions and Guidelines for the IMDI MCAE Environment

Greg Neugebauer, 2604

1.0 Introduction

The ability to share information throughout all phases of product development with design, engineering and manufacturing teams is a fundamental principle of concurrent engineering and is consistent with the objectives of IMDI. To effectively use electronic data, the information must be readily available on the network and never impose restrictive translations, standards, or methods of delivery and retrieval.

This document is written for IMDI Pro/ENGINEER designers participating on various pilots. The intent is to build a framework that will assist users by recommending a consistent database structure which promotes sharing of data. This document intentionally dodges conventions for many elements of Pro/ENGINEER. This decision is based on limited experience with all of the modules and our intent to generate a non-restrictive modeling environment that welcomes full use of all the software's capabilities.

Several sections is this guide deal with related topics such as disk structure, backup, and electronic mail. An underlying knowledge of these capabilities will improve the concurrent engineering process and allow our customers to make accurate decisions.

2.0 Pro/USERGUIDE

Pro/ENGINEER provides on-line documentation that is installed on many of the systems. This product offers users the ability to scan volumes quickly and easily. A command string search capability also exists. To initiate this utility type proguide from the command line or launch the application from the WorkSpace or ToolChest. Available volumes include:

Administration Guide

Basic Library

Cabling Users Guide

Composites Users Guide

CONNECTOR Library

Drawing Users Guide

FEM Users Guide

Fundamentals of Pro/ENGINEER

Manufacturing Users Guide

Modeling Users Guide

Mold Design Users Guide

Pro/DEVELOP Examples

Pro/DEVELOP Users Guide

Pro/DEVELOP Installation Guide

Project Users Guide

Pro/VIEWONLY

Sheet Metal Users Guide

TOOLING Library

UNIX/ULTRIX Installation Guide

VAX/VMS Installation Guide

Due to disk space requirements (a total of 240 MB for all the volumes), not all of these modules are installed. To list the modules available on a system launch the Pro/USER-GUIDE application and review the list provided under "Available volumes". Additional volumes can be quickly installed by the application specialist upon request.
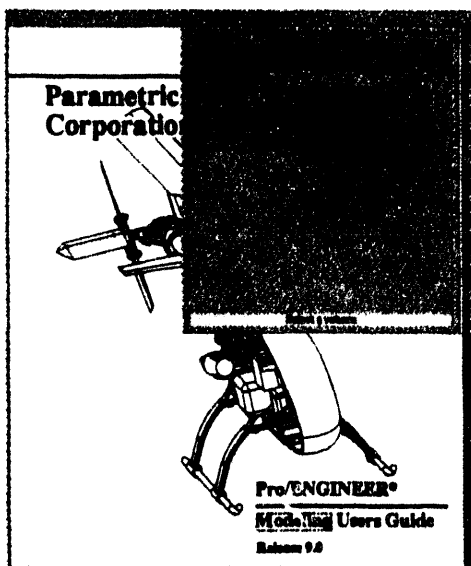
3.0 CONFIG.PRO Setup File

Each designer has the option to control the Pro/ENGI-NEER environment by building a 'config.pro' file in the home or working directory. The online documentation contains information pertaining to the dozens of setting available. The following settings establish a consistent look and feel to Pro/ENGINEER and are used extensively in Sandia's design group.

Bell	No
Cascading_Menus	No
Forced_Cascading_Level	0
Menu_Horizontal_Hint	Right
Thermo_Position_Hint	No_Window_Overlap
Windows_Scale	.93
Wind_Mgr_Decorate	True
Wind_Mgr_Decorate_Menus	False
Auto_Regen_Views	No
Drawing_File_Editor	Editor
Part_Table_Editor	Editor
Relation_File_Editor	Editor
Pro_Editor_Command	Jot -d
Sketcher_Dec_Places	3
Default_Dec_Places	3

4.0 Modeling Conventions

IEIT sponsored an activity to develop and complete a feature based solid modeling guide. The effort resulted in completion of A Feature Based Modeling Guide for Concurrent Engineering at Sandia National Laboratories[1]. The document is 35 pages in length and presents techniques for using feature-based solid modeling in a production environment to model and manufacture parts which represent both the geometric definition and the design function. Chapter 4 from this guide addresses feature based modeling techniques and should be of particular interest to the reader. Contact Ross Burchard at 844-2295 for the latest copy of the paper.

As a general practice users should avoid the following extremes:

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1. A Feature Based Modeling Guide for Concurrent Engineering at Sandia National Laboratories, Ross L. Burchard, 2884 and Richard H. Robison, 2861

A base feature that is too complex

A base feature that represents the billet stock or shape of the base material.

A base feature that is too complex can usually be described as one that carries more than 10 dimensions to constrain it. Models that begin with a base feature beyond this complexity are prone to attaching subsequent features to a parent surface, that later through a design change, is removed. When this occurs significant rework, reordering of features, and perhaps a fresh start may be necessary.

A base feature constructed on the belief that the modeler is starting with a piece of raw stock has potential drawbacks. This methodology is prone to frequent use of the 'cut' feature. When this occurs, the number of cut operations needed to define the part can become excessive and drive the size of the database to large proportions. Additionally, feature modification is compounded because the profile representing the cut is normally not part of the model itself and may be difficult to select. Another disadvantage to this method is that the automatic drawing generation utility will show the dimensions used to define the cut. Significant cleanup and dimensioning may be necessary in the drawing / detail mode.

All PTC training instructors recommend a genuine effort to evaluate several modeling techniques and select the most appropriate strategy before the base feature is constructed. A modest amount of planning in the early modeling stages will insure that the model is easy to maintain and modify.

5.0 Stereolithography Process

An interface to SLA machines is supported by the Pro/ENGINEER application. The prefered file format is ASCII when specifying output file. A document [1]prepared for the IEIT project provides a useful overview and a description of the process to generate slice files and the design and construction of support structures. A copy of this document is available thru the IEIT support team or dirctly from Frank Whiston, 2483.

6.0 Conventions and Level Guidelines

Prior to starting a new part, a trail file[2] is available which can be called by a map key to set the modeling environment. To establish a map key include the following entries in your config.pro:

mapkey /prtl #part;#create;#misc;#trail;/depot1/pro90/formats/
startpart_l.txt

mapkey /prtr #part;#create;#misc;#trail;/depot1/pro90/formats/
startpart_r.txt

Select the script which is most appropriate for the model. The 'startpart_l' is for protusions, 'startpart_r' for revolutions. Three default datum planes labeled -A- -B- -C-, 3 default datum axis and a default coordinate system will be constructed. Subsequently, the script removes all numbered layers and assigns the datum features to the following named layers:

DEFDATUMS

DEFAXIS

DEFCOORDSYS

In addition, the script defines two other layer designations:

CONSTDATUMS to isolate construction datums planes,
THRDGROUPS to organize threaded features on a layer.

In addition, the following level structures are recommended to insure consistency throughout IMDI databases.

POINTS, CONNECTORS, FASTENERS, REFDIMS, ASSYDATUMS, ASSYCOORD.

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1. A Guide for Stereolithography at Sandia National Laboratories, Frank Whiston, 2483,

2. Trail file contributed by Mark Platzbecker, 2664

7.0 Datums

Datums are geometric entities used for constructing a model. They are necessary for referencing features and assembling parts. Datum controls include level, name, and state (on & off). The color of datums cannot be changed. Due to their frequent use the following guidelines apply:

Datums may be named to aid in construction and selection of references. There is no formal method recommended for the naming of datums. System defaults are acceptable.

There are many types of datums including coordinate systems, points, planes, curves, surfaces, axis, and graphs. Each of these can be automatically placed on different levels using entries in the LAYERSETUP.PRO file. A configuration file is available from the /depot1/pro90/utilities resource directory that includes these defaults and may be copied to the users home directory and modified as necessary.

Pro/ENGINEER software can distinguish part and assembly datums. Assembly datums are used to define assembly operations such as match/mate hole drilling. Part datums can be used as references during creation of the assembly

model. Assembly datums should be placed on a level different than part datums.

Datums can be toggled to fit the feature. This option will make them much smaller and serves as a method to clean up the display. The default is to allow datum planes to pierce the entire part and extend slightly beyond.

Datums can be built "on the fly". When using this option the datums are visible only when the feature that references them is selected for modification. This capability should be used often in all but simple parts to reduce the complexity of the display.

Manufacturing datums are tightly tied to the associated tool path. There is no need to designate a special set of layers for manufacturing datums.

8.0 Family Tables

Family tables provide a catalog of parts that share a common shape and function. The tables provide an easy method to generate these parts and are an effective alternative to building and storing each of these as separate geometric entities.

- PTC provides 6 libraries containing over 35K parts. Version 10 libraries include the original connector, mold, standard, and tooling libraries as well as a piping and electrical symbol library.

- The Pro/LIBRARY module is necessary to access the parts in the standard PTC libraries.

- Family tables developed by customers do not require the Pro/LIBRARY module for access to custom tables.

- The PTC supplied standard library contains commercially available fasteners. Military hardware is not included.

- Family tables can also be used to construct frequently used features and are not limited to parts. All members of a family table should closely resemble one another.

- System managers can add and delete table entries. The files should be located on a server or at the workstation of the library administrator. The files can be set for read only

access. An entry in the CONFIG.PRO file sets the path to these libraries.

- New parts and tables should be documented. A decision must be made to extend the existing libraries or create new ones. Each has it's disadvantages. Extending the existing libraries will require all users to install the Pro/LIBRARY option. Building new tables will require the administrator to reconstruct all the parent parts or features.

- There are two basic types of tables, custom and standard. Custom tables allow users the liberty of setting specific dimensions of an instance. Standard tables prohibit this capability and force the instance to conform to the dimensions listed in the table entry.

9.0 Assembly Layer Usage[1]

In order to establish layer control and speed up design and assembly manipulation designers should consider removing all numbered layers and create new layers corresponding to the part which exists on each layer. Pro/ENGI-NEER does not impose a limit on the number of named levels that can exist within a database. The '/prt' mapkey described earlier will assist with the first stages of this task by removing all numeric references to layers.

10.0 Thread Construction Techniques

10.1 Threads on Planar Surfaces

- Internal Threads:

Model minor diameter and then use CREATE COSMETIC THREAD to show major diameter. The thread will appear
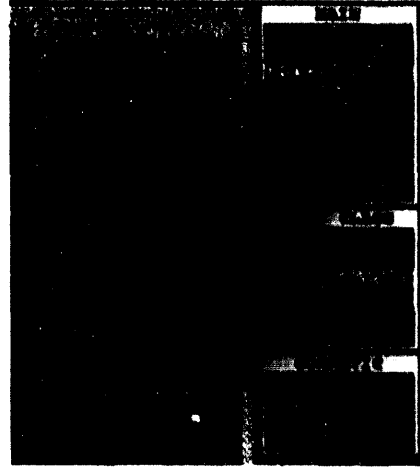
in wireframe mode and drawing mode only. The shaded image will only show a hole representing the minor diameter.

- External Threads:

Use major diameter and then use CREATE COSMETIC THREAD to show minor diameter. As described with
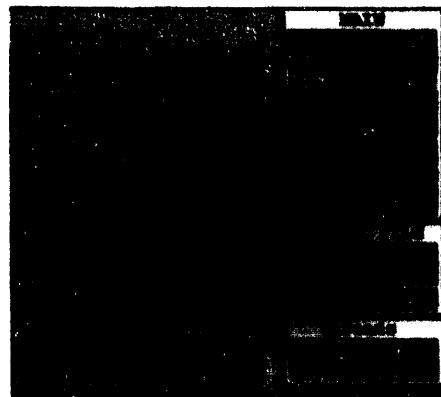
internal threads, the cosmetic feature will only appear in wireframe and drawing views. The shaded image will show the major diameter

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1. Conventions proposed by M. Platzbecker, 2664, and adopted by IEIT.

10.2 Threads on Non-Planar Surfaces

Use the following construction technique when building a threaded hole between non-planar surfaces such as thru the sides of a cone or irregular surface.

Internal Threads:

Use minor diameter and then use CREATE COSMETIC THREAD created from a planer datum perpendicular to minor diameter. CREATE DATUM QUILT OFFSET of "0" on the non-planer surface and then CREATE DATUM QUILT PATCH INTERSECT to intersect the cosmetic thread and the non-planer quilt.

In the drawing mode cosmetic features can be turned off and on in individual views by using VIEW REPRESENT.

11.0 Fillet Modeling

Manufacturing engineers would like to see all corner fillets and chamfers modeled on our parts. Fillets built as features can be suppressed. A suggested technique is to put the fillets in last. Fillets can be important features when it comes to stress relief, mass properties, and interference analysis. Avoid using fillets as parent features. At this point, an official range of fillet levels is not deemed necessary at this time. As our experience with the product grows, a convention may be established.

12.0 Mass Property Data Resource File

A list of material properties is available on IMDI workstations that contains specific densities in a number of units. Rick Harris, 2604, submitted the information to org. 1500 for review and approval. The files can be viewed with the following command:

% density

13.0 Pro/PROJECT

The Pro/PROJECT module has been installed on all IMDI nodes. Each node can act as a project server or client.

14.0 Description of Disk Partitions and Sizes

Each SGI Indigo workstation is equipped with a 1.2 GB disk drive. This drive is the source location for the operating system, application software and active user files. The disks are configured at the factory with three primary partitions (root, swap, and usr). Default partition sizes and the necessity to use the usr partition for active databases and applications resulted in a decision to employ a different disk partitioning strategy. Fundamental to this decision is the availability of only 40 MB of swap space as factory configured in partition 1. Systems with 32 MB of memory and application software packages such as Pro/ENGINEER require additional swap resources.

The first partition (0), root, remains as a 16 MB partition. The second partition (1), swap, has been extended to 100 MB. This resulted in allocating blocks previously reserved for the usr partition. A new partition (5), is available on each disk and is mounted from the /depot1 directory. This partition provides 733 MB of disk storage for application programs and user files. The usr partition (6) is trimmed back to 300 MB and is used for operating system utilities normally found in this section.

A primary advantage to this strategy is that the /depot1 partition is reserved solely for user files and applications. By having a single partition set aside for this function, backup and restore operations are greatly simplified and the danger of overwriting user data during a system upgrade is significantly diminished. The /depot1 partition

may also be easily NFS mounted across the network to enable file sharing.

15.0 Location of Files

The Pro/ENGINEER files are located in the /depot1/ pro90 directory on IMDI nodes. This application can be invoked by entering pro90 from the command line or launched from the WorkSpace or ToolChest utilities by double clicking the appropriate icon. Pro/USERGUIDE volumes, the on-line documentation associated with Pro/ENGINEER, reside in the /depot1/proguide directory. This

application is invoked with the proguide command or methods similar to those above.

Network licensing is configured on all nodes. Each node is setup as a client and server of 1 license. The nodes only look at themselves for available licenses. Licensing administration information is found in the /depot1/pronlo directory. The proflush command is available to recover checked-out licenses. When invoked from a user account, only licenses checked out by the active user are recovered. Root has permission to recover any and all licenses.

User files are found under the /depot1/people directory. The names of user directories are identical to conventions used to establish each account. Each account is assigned a different default directory. The accounts and directories follow the standard convention of first initial, middle initial, first five characters of last name. Example: Dwight David Eisenhower ----> ddeisen

16.0 Policies on Disk Usage

Disk quotas have not been established on the IMDI systems. Each user is responsible for cleaning up obsolete files and purging trail and design files. Plot files, particularly PostScript output from Pro/ENGINEER become extremely large. With common sense and minor attention, limitations on disk space limits should be rare. The DMCS server can be used as a repository for released and archived designs. Consult with an application specialist to determine the process for elevating stable designs to this level of control.

17.0 Accounts and Passwords

Accounts were establish for each user with the System Manager GUI tool. This tool prompts the system administrator for relevant information such as user ID, Name, Office, Phone, and home directory. The tool builds the account and places skeleton .login and .cshrc files in the users directory. WorkSpace, a graphical user interface can be turned on or off. As a rule, WorkSpace is turned on for new users. Passwords are not centrally administered. Users that require access to data on another node will need to request that an account be built for them on the target system.

Each user must set a password of at least 7 characters in length that includes one special character or number. Avoid passwords that are first or last names, addresses, or pet names. An example of a valid password might be

"letsg0bucs".

18.0 Root Access

Root access to each IEIT node is password controlled. Users requiring operations performed in super-user mode or by root must contact their system administrator.

19.0 Privacy - Group / User IDs and Masks

All work performed on IEIT nodes is subject to Sandia computing security and auditing policies. Fraudulent use of this equipment is subject to disciplinary actions outlined in the SLI's. User accounts share a common group number. These group numbers are different for each network (red and black). The default UNIX user mask of 022 remains unchanged.

20.0 Motif as Standard Windowing System

The SGI Indigo is preconfigured by the factory to invoke the 4DWM window manager. Pro/ENGINEER is not supported on this windowing system. The Motif windowing system has been installed on all systems from CDROM. The /usr/lib/X11/xdm/Xsession file on all systems has been edited to invoke the mwm window manager at login. A simple way to determine if Motif is running as the default on a SGI is to move a window. If the coordinates relating to position are displayed while the window is be being moved, then the Motif window manager is probably running. To check the default, list the Xsession file and look near the bottom for the following line

/usr/bin/X11/mwm >/dev/console 2>&1 & #/usr/bin/X11/ wait4wm

The "mwm" in this case designates the Motif window manager as the default. "4Dwm" is present in the unaltered state. If it is necessary to change this file, the system administrator can modify it using any editor. It is not necessary to reboot the system to change the default window manager.

21.0 Backup Responsibilities

Backup of the operating system and application software is the responsibility of the IEIT support team. A master disk will be kept current at all times and will be available for cloning additional systems on demand. All nodes on the network will periodically be backed up in full. These backup tapes will be labeled and stored in 807/2055.

4 mm DAT tape drives are available. These devices can be quickly inserted into one of the internal SCSI slots on any SGI Indigo workstation. Cartridge tapes are also available. Designers are expected to backup their own data using utilities found in the ToolChest under "System Manager" and "Backup & Restore" icons.

The graphical utility (built on UNIX bru) is very user friendly and self explanatory. Select the tape drive location (click on a local tape drive or the remote button and specify the tape location) and indicate the tape operation

(Backup or Restore). Insert a tape and enter the directory to backup. Ex: /depot1/people/elvis Click the Start Backup button. Files will be listed as they are placed onto tape. When the backup is complete the End Backup button will be illuminated. Shells and other windows can be activated while the backup is running. The window can be minimized to an icon while other active work goes on. Click on the Quit button to close windows after the backup is complete.
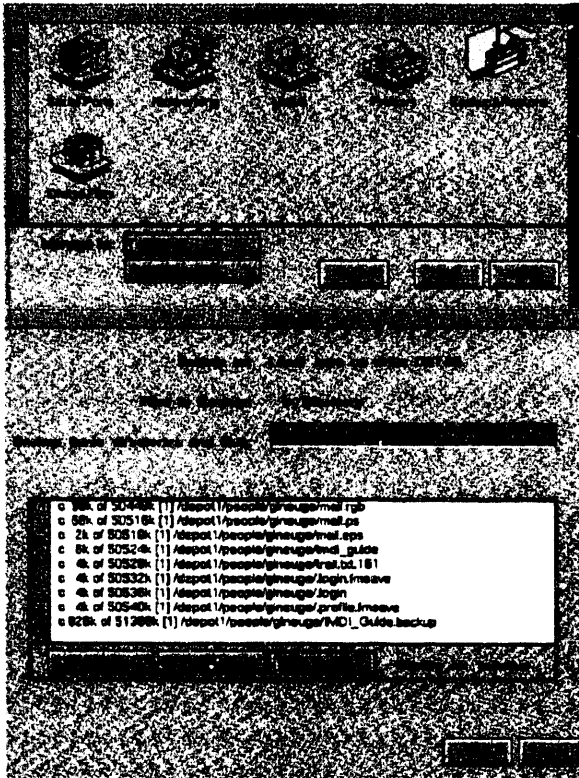
The restore process is very similar. Users should list the contents of the tape they wish to recover data from and select the files they need to restore with the mouse. Files may alternatively be restored to a directory other than the one listed on tape.

For more information, refer to the SGI Personal System Administration Guide - Chapter 9.

22.0 Electronic Mail

Z-Mail is an electronic mail utility available on all IMDI SGI workstations. The application can be launched from the ToolChest / Tools desktop accessory. A link to the

mailbox icon is established. Users will notice that the flag will be in the upright position when new, unread mail is delivered. Double clicking on this icon will automatically invoke the Z-Mail application and highlight the latest unread message.
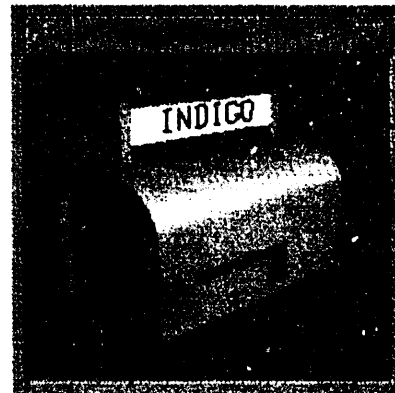
Effective use of aliasing is enabled. To enhance the mail environment, Z-Mail users may address mail using our adopted natural naming convention and rely on the system to deliver the message to the appropriate machine. Example: To send mail to Greg Neugebauer on machine labeled 'emerald' simply address the message to gregneugebauer. Z-Mail supplies a simple means to attach and detach Pro/ENGINEER files.
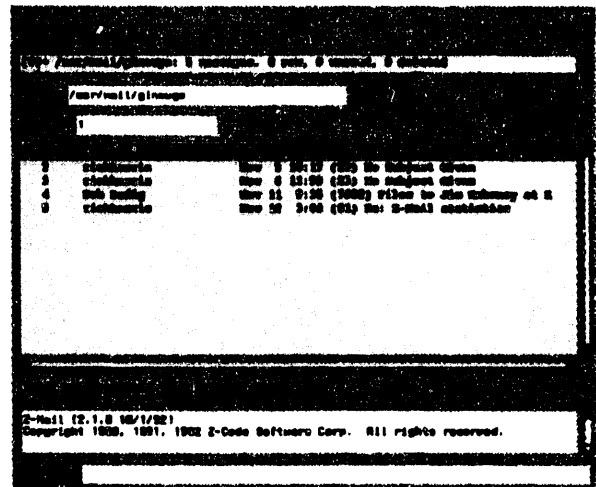
Using mail to transfer CAD files has several advantages. First, the mail transport system does not require users to have accounts on machines that they need to exchange files with. Mail messages are merely delivered to the destination machine where the recipient can detach the messages to any directory they own or have write permission. Secondly, the destination machine does not have to be online when the transfer takes place as required by the UNIX 'cp' command. The mail transport system attempts to deliver the mail every 15 minutes until the machine eventually comes on-line.

The Z-Mail system has also been linked to a PC SMTP gateway and router. These machines allow SGI users to send electronic mail messages to PC or Macintosh users over our network. The same aliasing and addressing scheme described for UNIX users can also be applied to PC destinations. Example: To send mail to Rick Harris' Macintosh named 'silver' address the message to rickharris.

Parameterized Family Tables
of Pressed Pins and 'D'
Subminiature Connectors

**Prepared by Carlos Lopez - Science and
Technology Alliance Program**

August 2, 1993

Abstract:

This report documents the work completed as outlined in the statement of work for the IEIT project.

1.0 Introduction

The Integrated Manufacturing and Design Initiative (IMDI) will define and implement Concurrent Engineering processes for the realization of weapon products. The Concurrent Engineering process will integrate all facets of weapons engineering throughout the life cycle of continuous improvements . On going weapon projects will pilot these processes to demonstrate improvements. These processes will be propagated throughout the DOE weapon community and beyond. The Integrated Engineering Information Technology (IEIT) project sponsored this assigment during the summer. The IEIT project will prototype implementation of a modern approach to engineering design, manufacturing,design definition and information management within two IMDI pilot projects. The objective of the IEIT project is to enhance engineering effectiv-ness . The emphasis of the IEIT project will be to apply commercially routine technology to enhance engineering practices in the area of information management, mechanical design and electrical design. It is anticipated that through implementation of these tools , we will realize the benefits of concurrent engineering i.e. improved quality,- shorter development schedules and reduced cost. Throughout this plan references to mechanical computer aided engineering (MCAE) tools will be referred to as MCAE. Likewise, electrical computer aided tools (ECAE) will be referred to as ECAE.

The IEIT project will develop and implement practices and computer tools to enhance concurrent communication infrastructure of IMDI,design a prototype information system to implement Configuration Management (CM) and integrate Mechanical Computer Aided Engineering (MCAE) and Electrical Computer Aided Engineering (ECAE) within the two pilots projects.

This project will enhance engineering design, prototyping and reduce design cycles and information management. These pilots will benefit from solid modeling visualization, quick drawing creation, mass property availabilty, rapid prototyping and integrated structural and thermal analysis.[1]

Now that we have to deal with restrictions in budget (funding) and time(development schedules) there is a need to have a tool that helps the users to select the parts or components that he or she may need. Some vendors have a good variety of parts for the users to select from, but sometimes the users need some parts that require special characteristics. Often the manufacturers are able to supply the desired parts for a minimum charge. The problem is that those changes can cost a lot of money and can delay the project more than is expected. This is one of the reasons that makes the use of standard parts and family tables a need.

My assignment for this summer was to learn Pro/ENGI-NEER solid modeling techniques and the UNIX environment provided on the Silicon Graphics workstations. Pro/ENGINEER, a feature based parametric solid modeling system from Parametric Technology Corporation, provides the ability to define families of parts for functionally related items such as mechanical fasteners and electrical connectors. The IMDI project at Sandia requires military specifications in several circumstances. The libraries supplied by the vendor provide many commercial parts but, must be extended to include these other commonly used piece parts. A survey of user needs will prioritize the generation of the base model and the family table.

2.0 Original Statement of Work

Pro/ENGINEER, a feature based parametric solid modeling system from PTC, provides the ability to define families of parts for functionally related items such as mechanical fasteners and electrical connectors. The libraries provided by the vendor include many commercial parts. The IMDI project at Sandia requires military specifications in several circumstances. The libraries supplied by the vendor must be extended to include these commonly used piece parts. The candidate will be expected to learn Pro/ENGINEER solid modeling techniques and the UNIX environment provided on the Silicon Graphics worksta-tions. A survey of user needs, conducted by the candidate will prioritize the generation of the base model and family tables. A workstation with the MCAE software will be fur-nished as well as a system administrator to facilitate distri-bution of the libraries. Documentation of the family table by the candidate in report form will be an intermediate

1. IMDI / IEIT Project Plan, Rick Harris, 2604

requirement before progressing to the next library. A DOE "Q" clearance is mandatory as well as an interest in advanced solid modeling.

3.0 Tools Used

The main tool used for this project was a Silicon Graph-ics workstation. This workstation operates in a UNIX environment. The software used to perform the work was Pro/ENGINEER. Pro/ENGINEER is the only mechanical design automation (MDA) tool that integrates the entire design-through-manufacturing process. Pro/ENGINEER is a parametric featured-based solid modeling system. The software gives full associativity throughout the entire design-through-manufacturing process allowing the user to reconfigure parts design "on-the-fly" without incuring time and cost penalties in downstream application such as manufacturing.

First, the user has to learn how to use the software applica-tion. Most mechanical design software that we know of today, the creation of parts that are wanted to design are with lines, arcs and circles. Once the user starts to work with Pro/ENGINEER, a significant difference will be noticed on how to build a part in comparison with other mechanical design software. The approach to follow when working with Pro/ENGINEER is to make sure that the geometry of the component is clear and easy to under-stand. This means that all the dimensions of the design has to be known and clearly defined. It takes some time to understand and learn what dimensions are needed to pre-vent error with the dimensioning of the component. The Family Table is one of the options that Pro/ENGINEER provides and is used for this project. This capability lets the user build a database of dimensions, features or other important characteristics that can define the part or compo-nent. With this information, the program can build differ-ent instances from one generic part. This will minimize time when creating the part and also will save memory in the computer because there is no need to have a lot of parts that have the same shape but differ in size. Meetings with Dave Rakestraw provided an opportunity to learn and understand Pro/ENGINEER. Dave Rakestraw is the local technical support representative from Parametric Technol-ogy Corporation (PTC). PTC is the company that supplies Pro/ENGINEER.
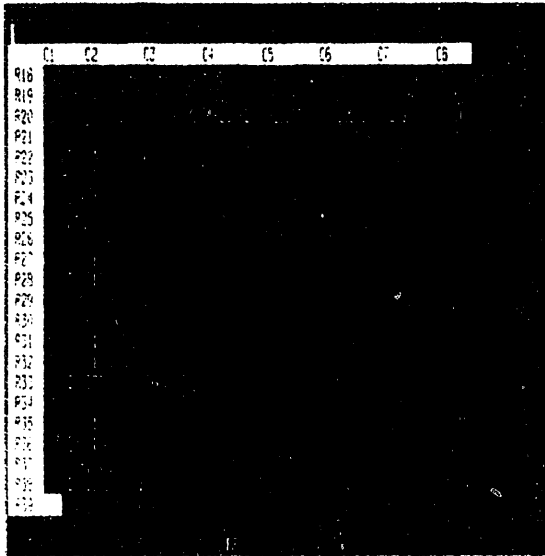
FIGURE 3

For simplicity, sometimes the parts are named having in mind one particular dimension or a characteristic. If the user wants a specific part, the only thing needed to be known is the name that represents the desired part. Once the desired instance is recalled, the program will create a part that corresponds to the name that the user gives. Using the information that is on the family table, the program will modify the generic part with the dimensions and information that describes the instance that is been recalled.

FIGURE 4

Sometimes the user will not be able to remember the names of all the parts in the family table. When this happens the user has a choice to recall the part that is wanted in a different form. When the user recalls a part that has a family table, the program will ask for some information that describes the instance in order to build the part. This will depend on how the family table had been defined.
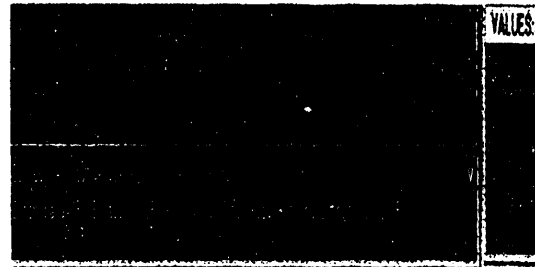
FIGURE 5

This option helps the user to define the part wanted. The program uses the information that the user gives to build the part, but the program has the advantage that it can control the users input. This means that the user will not be able to create a part that does not exist in the family table. This will reduce cost and production time because the user is not able to create a part with special characteristics.

6.0 DISCUSSION OF RESULTS

One problem that had been found when defining the parts was the lack of information in relation to the dimensioning scheme of the part. Sometimes the dimensions found in some of the vendor's catalog correspond only to the internal shape of the part or are overall dimensions. (See appendix 1) Sometimes when the user is trying to build a part using the vendor's catalog and after a long time when the part is finish, it does not look the same as the part on the catalog.

4.0 WORK PERFORMED

Once the user had spent some time familiarizing with the workstation and Pro/ENGINEER, direct work can be started with the construction of the Family Table. The parts that were assigned to build were a Micro-D Metal connector (MDM), a Jackpost Bushing for the MDM connector, a Straight Headless Pin, a Commercial D Subminiature connector, a Plastic Potting Cup and a Double Density D connector. All the family tables were built based on dimensions from one vendors catalog, adding those parts that had special characteristics. A remaining item was needed to be performed, it was to calculate the mass properties for some of the parts.

The first family needed to be built were the Straight Headless Pin. This pin consists of a variety of features, including the following: one long cylinder and one short cylinder with a rounded edge. The next step was to define the family table that would have all the information concerned with the straight pin. It would include the features that describe the pin itself and the dimensions that describe the different sizes of each pin. A challedge with this particular pin is that it has two different ends.
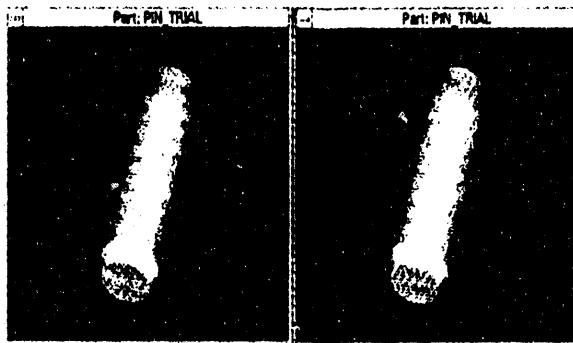
FIGURE 1

To resolve this, the user could take advantage of the supression feature. This option gives the user the liberty to supress the part's features instead of having to build a generic part to accomodate minor feature changes. Once the user supresses the desired feature, there is the ablity to display a different feature. Another advantage that the user has is to be able to control dimensions that are related between each other. The user was able to write ecuations that can control the behavior of one or more dimensions, of the part, all at the same time. This saves user's time, because there is no need to change all the dimensions one by one everytime that there was a need to change the size or shape of the part.
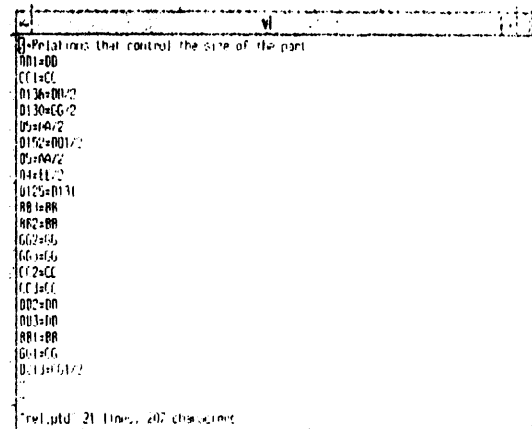
FIGURE 2

When the part was completed and all the dimensions and relations that would control the part, the user was ready to build the family table. To build a family table the user has to define what features of the part defines it. Also the user has to include the dimensions that govern those feature if it is necessary.

5.0 RESULTS OBTAINED

Once the user has all the family tables, selection of the part is needed. There are two different ways to do this: One way is to select a part from a family table, asking directly the specific part. This will depend on how the family table has been organized.

7.0 CONCLUSION

The use of Pro/ENGINEER promotes design optimization, delivering higher quality products faster at lower cost. The use of Pro/ENGINEER is a great tool for the user when a mechanical design software is needed. The use of this software application was a great experience because it gives the user the opportunity to improve designing techniques. It helps the user to understand the importance of spend some time doing a good dimensionig scheme of the parts. Now these family tables will save time and money to the user, because now it is possible to create parts without having to depend vendor's capabilities to supply the parts that are needed. Another application of the family table is that this can be used as a catalog of standard parts for the design of components.

FIGURE 6

To resolve this the user had to made a guess in some of the dimensions that were missing on the vendor's catalog. This technique might work if accuracy and presicion are not important or maybe are not needed. But one goal that was clearly stated since the beginnig of the project was to have as more information as possible from the family tables. The user has to be very concern with the dimensions of the parts because if the part is built out of the wrong dimensions it would cause the program to calculate mass properties that do not correspond to the original part. One alternative that have been used is to get the necessary dimensions using a vernier caliper. The use of this presicion instrument was an aid to find the dimensions that were needed. Once the dimensions that were missing had been found, the user was able to build the part with the correct size and also was able to get a part that looks the same as the one on the catalog. Now the user is able to create build a part whenever is needed thanks to the family tables. The use of family tables help the user to save time and money.

APPENDIX 1

Part Number by Shell Size	Y +.020 (0.51) −.000 (0.00)	Part Number by Shell Size	Y +.020 (0.51) −.000 (0.00)
2DE19P	.250 (6.35)	2DB52S	.236 (5.99)
2DE19S	.250 (6.35)	2DC79P	.236 (5.99)
2DA31P	.250 (6.35)	2DC79S	.236 (5.99)
2DA31S	.250 (6.35)	2DD100P	.236 (5.99)
2DB52P	.236 (5.99)	2DD100S	.236 (5.99)

A ±.015 (0.38)	B ±.010 (0.25)	C ±.010 (0.25)	D ±.010 (0.25)	E ±.015 (0.38)	G ±.010 (0.25)	H ±.010 (0.25)	J ±.010 (.025)	K ±.010 (0.25)	L ±.010 (0.25)	M ±.010 (0.25)	N ±.010 (0.25)	V MAX
1.213 (30.81)	.697 (17.70)	.984 (24.99)	.360 (9.14)	.494 (12.55)	.759 (19.28)	.422 (10.72)	.030 (.762)	.236 (5.99)	.045 (1.14)	.422 (10.72)	.120 (3.05)	.555 (14.10)
1.213 (30.81)	.640 (16.26)	.984 (24.99)	.308 (7.82)	.494 (12.55)	.759 (19.28)	.422 (10.72)	.030 (.762)	.243 (6.17)	.045 (1.14)	.429 (10.90)	.120 (3.05)	.555 (14.10)
1.541 (39.14)	1.025 (26.03)	1.312 (33.32)	.360 (9.14)	.494 (12.55)	1.083 (27.51)	.422 (10.72)	.030 (.762)	.236 (5.99)	.045 (1.14)	.422 (10.72)	.120 (3.05)	.555 (14.10)
1.541 (39.14)	.968 (24.58)	1.312 (33.32)	.308 (7.82)	.494 (12.55)	1.083 (27.51)	.422 (10.72)	.030 (.762)	.243 (6.17)	.045 (1.14)	.429 (10.90)	.120 (3.05)	.555 (14.10)
2.088 (53.03)	1.583 (40.21)	1.852 (47.04)	.378 (9.60)	.494 (12.55)	1.625 (41.27)	.422 (10.72)	.039 (.990)	.231 (5.87)	.060 (1.52)	.426 (10.82)	.129 (3.28)	.555 (14.10)
2.088 (53.03)	1.508 (38.30)	1.852 (47.04)	.308 (7.82)	.494 (12.55)	1.625 (41.27)	.422 (10.72)	.030 (.762)	.243 (6.17)	.045 (1.14)	.429 (10.90)	.120 (3.05)	.555 (14.10)
2.729 (69.31)	2.231 (56.67)	2.500 (63.50)	.378 (9.60)	.494 (12.55)	2.272 (57.71)	.422 (10.72)	.039 (.990)	.231 (5.87)	.060 (1.52)	.426 (10.82)	.129 (3.28)	.555 (14.10)
2.729 (69.31)	2.156 (54.76)	2.500 (63.50)	.308 (7.82)	.494 (12.55)	2.272 (57.71)	.422 (10.72)	.030 (.762)	.243 (6.17)	.045 (1.14)	.429 (10.90)	.120 (3.05)	.555 (14.10)
2.635 (66.92)	2.127 (54.02)	2.406 (61.11)	.484 (12.29)	.605 (15.37)	2.178 (55.32)	.534 (13.56)	.039 (.990)	.231 (5.87)	.060 (1.52)	.426 (10.82)	.129 (3.28)	.555 (14.10)
2.635 (66.92)	2.062 (52.37)	2.406 (61.11)	.420 (10.67)	.605 (15.37)	2.178 (55.32)	.534 (13.56)	.030 (.762)	.243 (6.17)	.045 (1.14)	.429 (10.90)	.120 (3.05)	.555 (14.10)

For float mounts, add letter F after shell size, e.g., 2DEF19P.

Screw/Jackpost Assembly
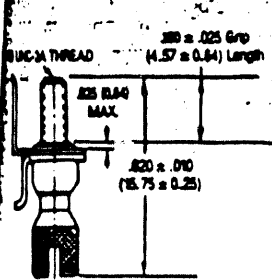
Standard (F172) Jackscrew (factory installed)
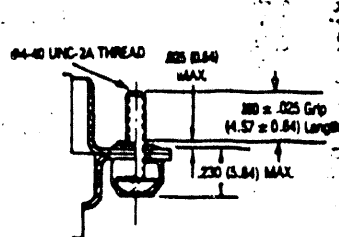
Low Profile (F173) Jackscrew (factory installed)
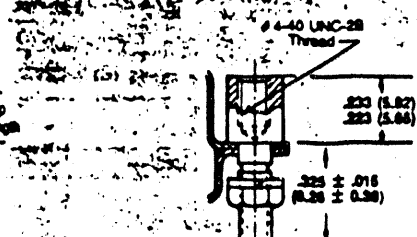
Jackpost (F171) Front Panel Connector Mounting Only

MILITARY STANDARD

MS16555

PIN, STRAIGHT, HEADLESS
(DOWEL)
(0002 OVER NOMINAL SIZE)

MILITARY STANDARD

MS15795

WASHER, FLAT-METAL, ROUND,
GENERAL PURPOSE (IN/MM)

TABLE II

FED. SUP CLASS 5315

CARBON OR ALLOY STEEL - PLAIN

DECIMAL SIZE

BRINELL SIZE

* INACTIVE FOR NEW DESIGN AFTER 6 APR 1974.

Mounting Hardware Views (for sizes 9 – 51)

Hardware supplied unassembled.
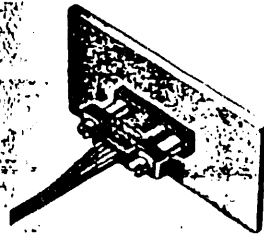
Screw Lock Assembly

90° Angle Mounting Bracket

LOCK SCREW

RETAINING CLIP

.408 (10.36) MAX

.182 (4.62) MAX

.688 (17.48) MAX

BUSHING

.093 (2.36) RECOMMENDED PANEL THICKNESS

Screw Lock Assembly
NOTE: Torque value is 4.0 in/lbs max.

.096 ± .005 (2.44 ± 0.13) DIA

.170 (4.32) MAX

90° Angle Mounting Bracket

MATING FACE

CONNECTOR SHOWN FOR REF ONLY

#2-56 UNC-2B

.185 (4.70) MAX

PANEL REF .500 (12.7) MAX

.225 (5.89) MAX

#2-56 UNC-2A

Jackpost – (P)

#2-56 UNC-2B THD
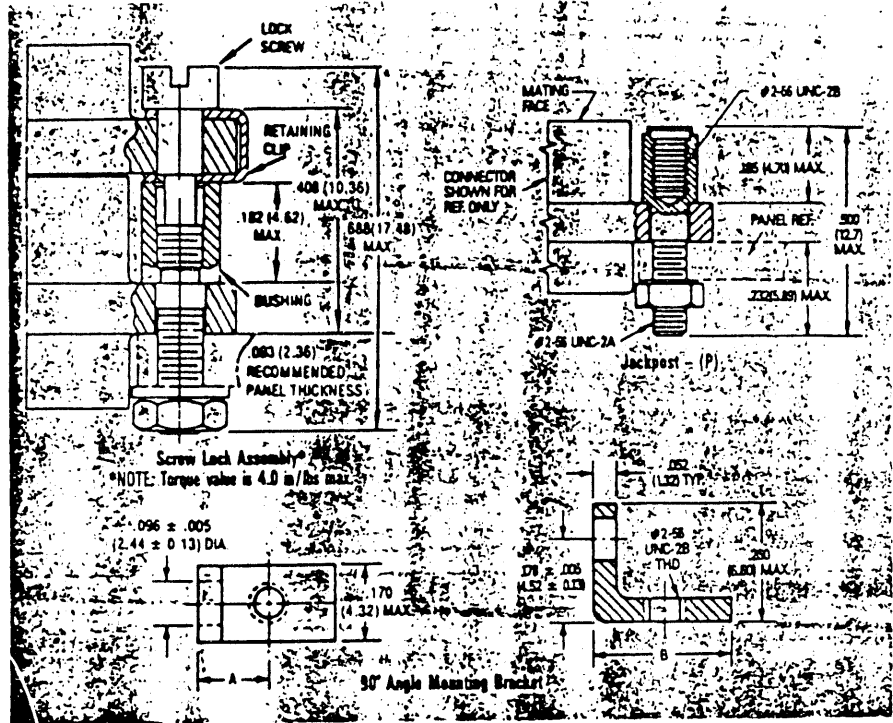
Description	Part Number	A ±.005 (±0.13)	B Max.
Screw Lock Assembly	322-9500-000	N/A	
Jackpost Kit	320-9505-000	N/A	
Mounting Bracket 90° MDM for 9 thru 37 Shell Sizes	015-9516-002	.147 (3.73)	.308 (7.82)
Mounting Bracket 90° MDM for 51 Shell Size	015-9516-003	.169 (4.29)	.350 (8.89)

NOTES: Screw lock assembly (322-9500-000) can be used for front mounting only. Jackpost kit (320-9505-000) consists of two assemblies, shipped unassembled.

Jackpost Bushing (for rear panel mounting-for sizes 9 – 51)

HEX IS .135 (3.43)/.115 (2.92) ACROSS FLATS
.170 (4.32)
.185 (4.70)
#2-56 UNC-2B THD
MATING FACE

.500 (12.7)
.480 (12.19)

#2-56 UNC 2A THD

.126 (3.20)
.125 (3.18)
DIA. TYP.

.105 (2.67)
.100 (2.54)
TYP

27° TYP
26°

Panel A Thickness	A +.005 (0.13) -.000 (0.00)	Jackpost Kit Number*
3/32 (2.4)	.087 (2.21)	320-9505-007
1/16 (1.6)	.056 (1.42)	320-9505-006
3/64 (1.2)	.042 (1.07)	320-9505-005
1/32 (0.8)	.025 (0.64)	320-9505-004

*2 jackposts, 2 nuts, 2 washers
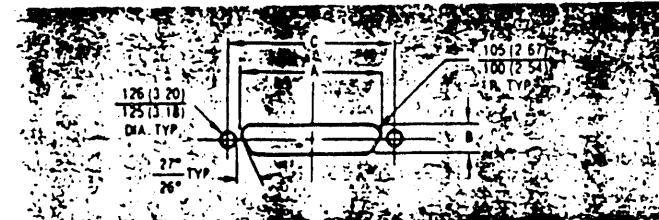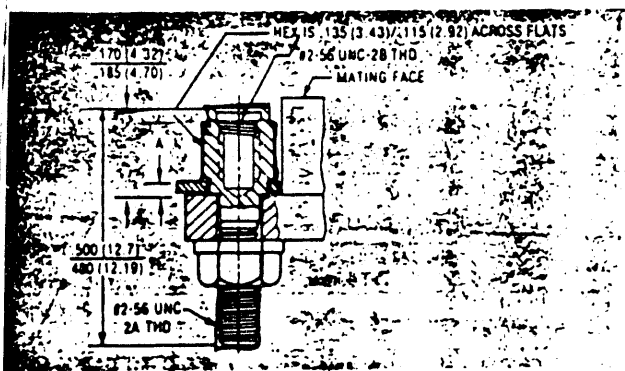
Plug and Receptacle Dimensions

Shell Size	A +.004 (0.10) -.000 (0.00)	B +.004 (0.10) -.000 (0.00)	C ±.005 (0.13)
9	.401 (10.19)	.252 (6.40)	.565 (14.35)
15	.551 (14.00)	.252 (6.40)	.715 (18.16)
21	.701 (17.81)	.252 (6.40)	.865 (21.97)
25	.801 (20.34)	.252 (6.40)	.965 (24.51)
31	.951 (24.16)	.252 (6.40)	1.115 (28.34)
37	1.101 (27.97)	.252 (6.40)	1.265 (32.13)
51	1.051 (26.70)	.295 (7.49)	1.215 (30.86)

nting Hardware Views (for size 100)

hardware supplied unassembled.

90° Angle Mounting Bracket
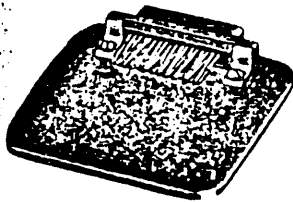
Jackpost – (P)

90° Angle Mounting Bracket
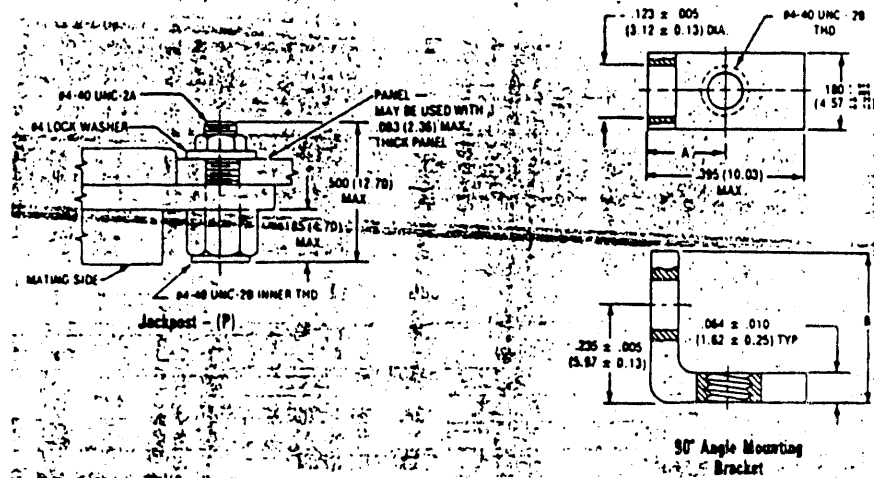
Description	Part Number	A ±.005 (0.13)	B Max
Jackpost Kit	320-9505-015	N/A	
Mounting Bracket 90° MDM	015-9528-000	.191 (4.85)	.370 (9.40)

is hardware is factory installed.

Float Mounting – (F) Std.   Jackscrew – (K) Slotted Head   Jackscrew – (L) (Low Profile)
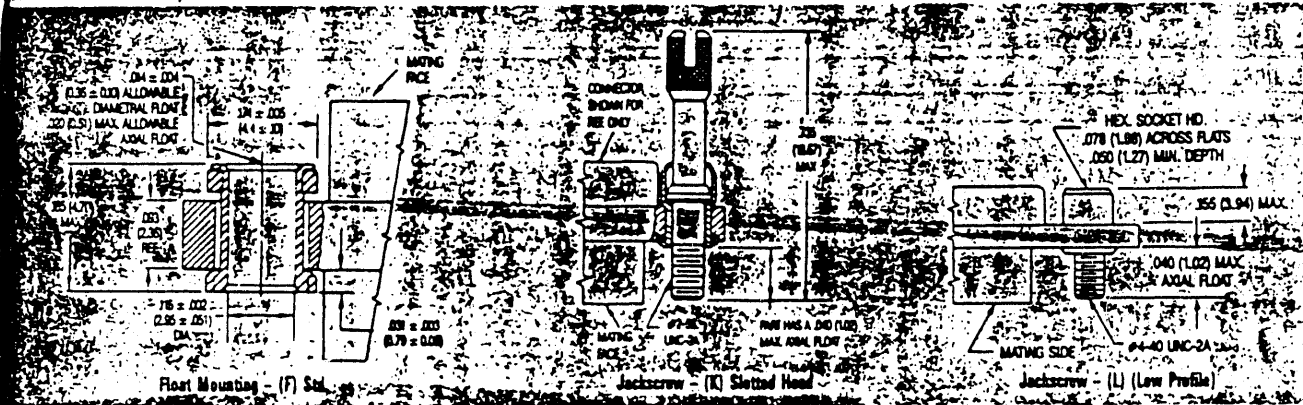
Jackpost Bushing (for Rear Panel Mounting) FOR SIZE 100

Panel Thickness	A +.005 (0.13) −.000 (0.00)	Jackpost Kit Number*
3/32 (2.4)	.087 (2.21)	320-9505-013
1/16 (1.6)	.058 (1.42)	320-9505-012
1/32 (0.8)	.025 (0.64)	320-9505-010
3/64 (1.2)	.042 (1.07)	320-9505-011

*2 jackposts, 2 nuts, 2 washers

Dimensions for Rear Panel Mounting

ITT Cannon
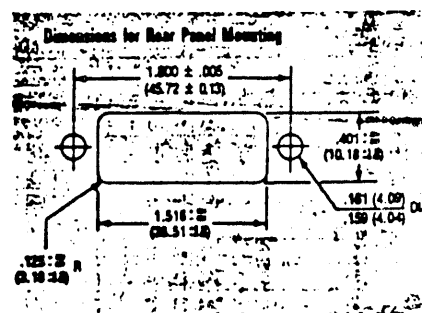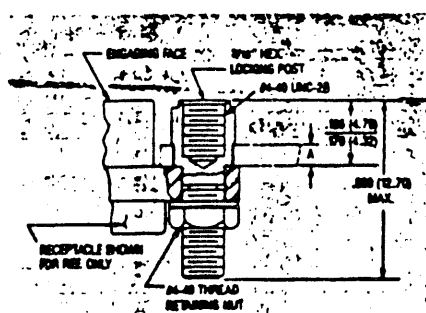
Shell Dimensions (Conforms to MIL-C-83513)

Plug
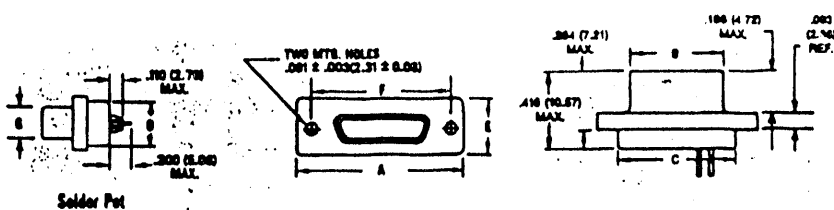
Solder Pot

Receptacle
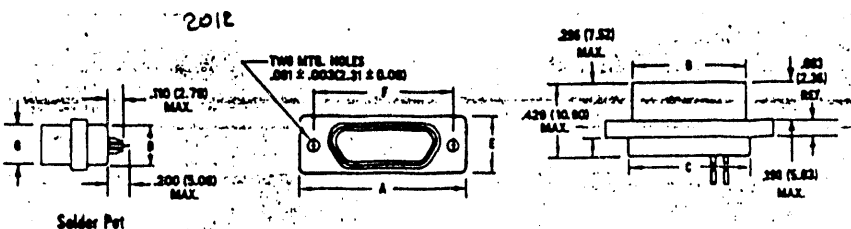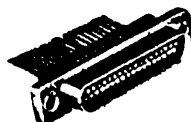
Solder Pot

Receptacle (MDM-100 only)
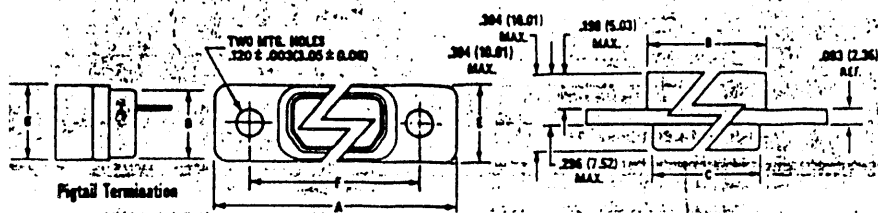
Pigtail Termination

Part Number By Shell Size	A Max.	B Max.	C Max.	D Max.	E Max.	F ±.005 (0.13)	G Max.	Average Weights** oz. (gm.) ±5%
MDM-9P*	.785 (19.94)	.334 (8.48)	.400 (10.16)	.270 (6.86)	.308 (7.82)	.565 (14.35)	.185 (4.70)	.063 (1.79)
MDM-9S*	.785 (19.94)	.402 (10.21)	.400 (10.16)	.270 (6.86)	.308 (7.82)	.565 (14.35)	.253 (6.43)	.063 (1.79)
MDM-15P*	.935 (23.75)	.484 (12.29)	.550 (13.97)	.270 (6.86)	.308 (7.82)	.715 (18.16)	.185 (4.70)	.084 (2.39)
MDM-15S*	.935 (23.75)	.552 (13.97)	.550 (14.02)	.270 (6.86)	.308 (7.82)	.715 (18.16)	.253 (6.43)	.083 (2.37)
MDM-21P*	1.085 (27.56)	.634 (16.10)	.700 (17.78)	.270 (6.86)	.308 (7.82)	.865 (21.97)	.185 (4.70)	.105 (2.99)
MDM-21S*	1.085 (27.56)	.702 (17.83)	.700 (17.78)	.270 (6.86)	.308 (7.82)	.865 (21.97)	.253 (6.43)	.104 (2.97)
MDM-25P*	1.185 (30.10)	.734 (18.64)	.800 (20.32)	.270 (6.86)	.308 (7.82)	.965 (24.51)	.185 (4.70)	.119 (3.39)
MDM-25S*	1.185 (30.10)	.802 (20.37)	.800 (20.32)	.270 (6.86)	.308 (7.82)	.965 (24.51)	.253 (6.43)	.118 (3.36)
MDM-31P*	1.335 (33.91)	.884 (22.45)	.950 (24.13)	.270 (6.86)	.308 (7.83)	1.115 (28.32)	.185 (4.70)	.140 (3.99)
MDM-31S*	1.335 (33.91)	.952 (24.18)	.950 (24.13)	.270 (6.86)	.308 (7.83)	1.115 (28.32)	.253 (6.43)	.139 (3.96)
MDM-37P*	1.485 (37.72)	1.034 (26.26)	1.100 (27.94)	.270 (6.86)	.308 (7.82)	1.265 (32.13)	.185 (4.70)	.161 (4.59)
MDM-37S*	1.485 (37.72)	1.102 (27.99)	1.100 (27.94)	.270 (6.86)	.308 (7.82)	1.265 (32.13)	.253 (6.43)	.160 (4.56)
MDM-51P*	1.435 (36.45)	.984 (24.99)	1.050 (26.67)	.310 (7.87)	.351 (8.92)	1.215 (30.86)	.228 (5.79)	.193 (5.50)
MDM-51S*	1.435 (36.45)	1.052 (26.72)	1.050 (26.67)	.310 (7.87)	.351 (8.92)	1.215 (30.86)	.296 (7.52)	.188 (5.35)
MDM-100P*	2.170 (55.12)	1.384 (35.15)	1.442 (36.63)	.360 (9.14)	.394 (10.01)	1.800 (45.72)	.271 (6.88)	.500 (14.3)
MDM-100S*	2.170 (55.12)	1.508 (38.10)	1.442 (36.63)	.360 (9.14)	.394 (10.01)	1.800 (45.72)	.394 (10.01)	1.040 (29.5)

*Add lead type and length, see How To Order   **Weight given is 1/2", uninsulated, solid, #25 AWG gold plated copper pigtails

Panel Mounting Dimensions (Sizes 9 – 100)

.200 ±.005
(5.08 ± 0.13)
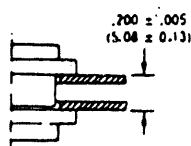
Plug and Receptacle
Rear Mounted

.395 ±.005
(10.03 ± 0.13)
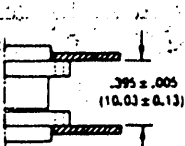
Plug and Receptacle
Front Mounted

.300 ± .005
(7.62 ± 0.13)
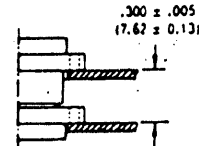
Plug Front Mounted
Receptacle Rear Mounted

Jackscrew/Jackpost Assemblies

Jackpost — P/N D110551

Consists of 2 posts, 2 nuts, 2 lockwashers.
Order one per connector.

FEMALE
POST

#4-40 UNC-2B THD

#4-40 UNC-2B THD

120 (3.05) DIA

#4 LOCK WASHER

#4 HEX NUT

JACKPOST ASSEMBLY

187 (4.75) HEX
(ACROSS FLATS)

CONNECTOR
ASSY

#4-40 UNC THREAD

.230 (5.84) ± .005 (.130)

555 (14.10)
± .005 (.130)

.045 (1.14)
± .005 (.130)

PANEL .125 (3.18) MAX

.220 (5.59) MIN
PERFECT THD.

LOCK WASHER

HEX NUT

#4-40 UNC THREAD

Material: Stainless Steel per QQ-S-763
Finish: Passivated per QQ-P-35
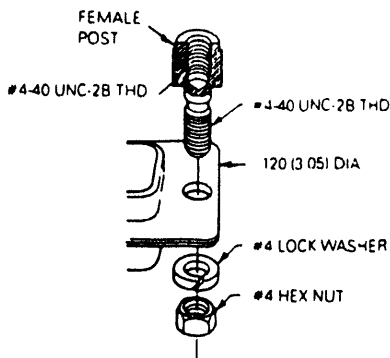
Jackpost is not compatible with rear-panel mounted connectors.

Jackscrew — P/N D110550

Consists of 2 studs, 2 heads, and 1 tube retaining compound.
Order one per connector.

HEAD, JACKSCREW

RETAINING
COMPOUND

120 (3.05) DIA

#2-56 UNC THD

STUD, JACKSCREW

#4-40 UNC THD

JACKSCREW ASSEMBLY

.035 (0.89)
± .005 (.130)

.220 (5.59)
DIA MAX

.370 (9.40)
MAX

.068 (1.73)
MAX

.640 (16.26)
MAX

.180 (4.57)
MAX.

.025 (.064)
± .005 (.130)

#4-40 UNC
THREAD

.220 (5.59) DIA.
MAX
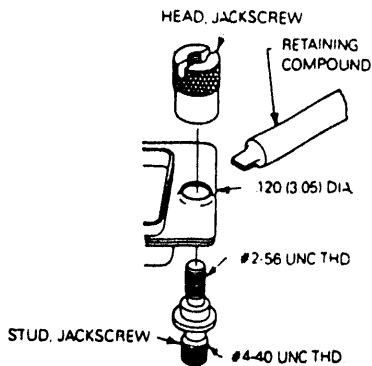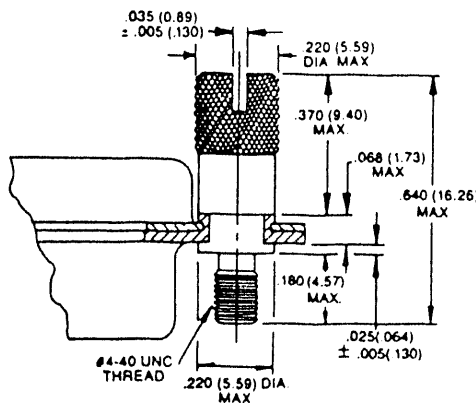
Material: Stainless Steel per QQ-S-763
Retaining Compound: per MIL-S-46163
Finish: None

Plastic Potting Cups

D*50904

.128 (3.25) DIA.

10°

.600
(15.20)

.185 (.470)
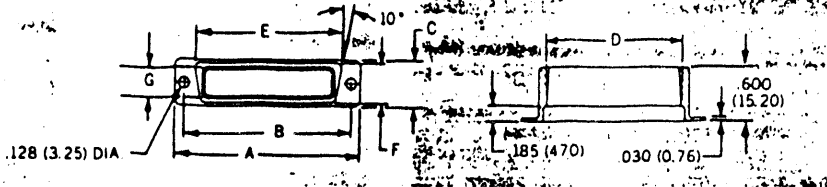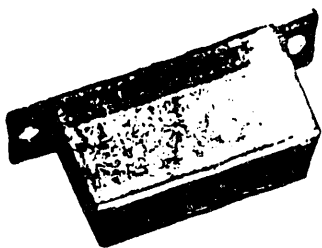
.030 (0.76)

Material: Nylon
Color: Natural (white)

Note: Nylon potting shells are molded with a thin flange .030 (0.76) to permit the use of D Subminiature locking devices.

Layout	Part Number	A ±.015 (0.38)	B ±.005 (0.13)	C ±.010 (0.25)	D ±.015 (0.38)	E ±.020 (0.51)	F ±.010 (0.25)	G ±.020 (0.51)
DE-9	DE 50904-1	1.208 (30.68)	.984 (24.99)	.495 (12.57)	.641 (16.28)	.769 (19.53)	.430 (10.99)	.345 (8.76)
DA-15	DA 50905-1	1.536 (39.01)	1.312 (33.32)	.495 (12.57)	.973 (24.71)	1.104 (28.04)	.430 (10.99)	.345 (8.76)
DB-25	DB 50906-1	2.083 (52.91)	1.852 (47.04)	.495 (12.57)	1.516 (38.50)	1.639 (41.63)	.430 (10.99)	.345 (8.76)
DC-37	DC 50907-1	2.723 (69.16)	2.500 (63.50)	.495 (12.57)	2.154 (54.71)	2.289 (58.14)	.430 (10.99)	.345 (8.76)
DD-50	DD 50908-1	2.630 (66.80)	2.406 (61.11)	.606 (15.39)	1.938 (49.23)	2.189 (55.60)	.545 (13.84)	.445 (11.30)

ITT Cannon

Dimensions are shown in inches (millimeters)
Dimensions subject to change.   317

D Subminiature Products • 1851 E. Deere Ave. P.O. Box 35000, Santa Ana, CA 92705-6500 • (714) 261-5300 • FAX (714) 757-8324

Machined Contacts, Solder Cup – Original Style

Standard Data

MATERIALS AND FINISHES

	Material	Finish
Shell	Steel	Yellow chromate over cadmium or zinc
Insulator	Two piece white nylon	—
Contacts	Copper alloy	Gold over nickel
Float Mount Hardware	Stainless steel	Passivated

MECHANICAL FEATURES

Coupling — Friction and lock accessories

Polarization — Keystone-shaped shells

PERFORMANCE SPECIFICATIONS

Temperature Rating — −55°C to +125°C

Dielectric Withstanding Voltage — 1250 VAC sea level

Wire/Contact Size — #20 AWG

Current Rating — #20 contact 5 Amps

Contact Arrangements

Face View, Pin Insert

Shell Size	E	A	B
Contact Arrangement	9	15	25
Contact Size	#20	#20	#20
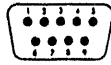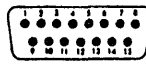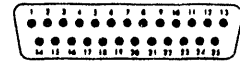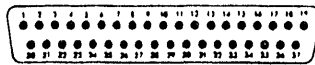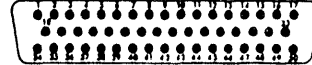
Shell Size	C	D
Contact Arrangement	37	50
Contact Size	#20	#20

Dimensions / Part Numbers
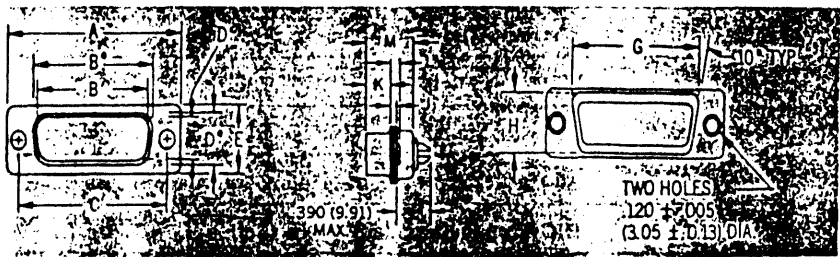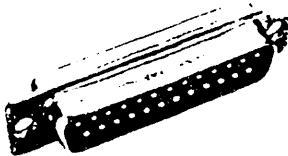
Clinch Nut and Float Mounting Options Available:

Add: E = 4-40 Clinch Nut
      Y = Float Mounting

Example: DBE25S
          DBY25S

See page 211 for Mounting Method detail.

Number of Contacts (Shell Size)	Part Number*	A ±.015 (0.38)	B• ±.010 (0.25)	B' ±.010 (0.25)	C ±.005 (0.12)	D• ±.010 (0.25)	D' ±.007 (0.18)	E ±.007 (0.18)	G ±.010 (0.25)	H ±.010 (0.25)	J ±.010 (0.25)	K ±.010 (0.25)	L	M ±.015 (0.38)
9(E)	DE9P	1.213 (30.81)	—	.666 (16.91)	.984 (24.99)	—	.329 (8.36)	.494 (12.55)	.759 (19.28)	.422 (10.72)	.030 (0.76)	.236 (5.99)	.060 (1.53) .035 (0.89)	.422 (10.72)
	DE9S	1.213 (30.81)	.640 (16.25)	—	.984 (24.99)	.308 (7.82)	—	.494 (12.55)	.759 (19.28)	.422 (10.72)	.030 (0.76)	.243 (6.17)	.060 (1.53) .035 (0.89)	.429 (10.90)
15(A)	DA15P	1.541 (39.14)	—	.994 (25.24)	1.312 (33.32)	—	.329 (8.36)	.494 (12.55)	1.083 (27.51)	.422 (10.72)	.030 (0.76)	.236 (5.99)	.060 (1.53) .035 (0.89)	.422 (10.72)
	DA15S	1.541 (39.14)	.968 (24.58)	—	1.312 (33.32)	.308 (7.82)	—	.494 (12.55)	1.083 (27.51)	.422 (10.72)	.030 (0.76)	.243 (6.17)	.060 (1.53) .035 (0.89)	.429 (10.90)
25(B)	DB25P	2.088 (53.03)	—	1.534 (38.96)	1.852 (47.04)	—	.329 (8.36)	.494 (12.55)	1.625 (41.27)	.422 (10.72)	.039 (0.99)	.231 (5.87)	.070 (1.78) .050 (1.27)	.426 (10.82)
	DB25S	2.088 (53.03)	1.508 (38.30)	—	1.852 (47.04)	.308 (7.82)	—	.494 (12.55)	1.625 (41.27)	.422 (10.72)	.030 (0.76)	.243 (6.17)	.060 (1.53) .035 (0.89)	.429 (10.90)
37(C)	DC37P	2.729 (69.31)	—	2.182 (55.42)	2.500 (63.50)	—	.329 (8.36)	.494 (12.55)	2.272 (57.71)	.422 (10.72)	.039 (0.99)	.231 (5.87)	.070 (1.78) .050 (1.27)	.426 (10.82)
	DC37S	2.729 (69.31)	2.156 (54.76)	—	2.500 (63.50)	.308 (7.82)	—	.494 (12.55)	2.272 (57.71)	.422 (10.72)	.030 (0.76)	.243 (6.17)	.060 (1.53) .035 (0.89)	.429 (10.90)
50(D)	DD50P	2.635 (66.92)	—	2.079 (52.81)	2.406 (61.11)	—	.436 (11.07)	.605 (15.37)	2.178 (55.32)	.534 (13.56)	.039 (0.99)	.231 (5.87)	.070 (1.78) .050 (1.27)	.426 (10.82)
	DD50S	2.635 (66.92)	2.062 (52.37)	—	2.406 (61.11)	.420 (10.67)	—	.605 (15.37)	2.178 (55.32)	.534 (13.56)	.030 (0.76)	.243 (6.17)	.060 (1.53) .035 (0.89)	.429 (10.90)

•Dimensions B, D, G, and H are measured as outside dimensions at the bottom of draw

NOTE: B• and D• are the O.D dims for socket side; B' and D' are the I.D dims for pin side

* For tin plated shells add K87 to end of part number and A197 to end of part number for receptacle.

Dimensions are shown in inches (millimeters)
Dimensions subject to change

V. IEIT Network User's Guide

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IEIT NETWORK USER'S GUIDE

Introduction to the IEIT Networks

The Integrated Engineering Information Technology project, Organization 2604, builds and supports concurrent engineering environments for a variety of Organizations and Programs. These environments include electronic mail, Pro/ENGINEER modeling and data management. All IEIT networks are integrated and are built upon the Internal Restricted Network (IRN) corporate resources. Over time, we will have electronic mail access to all employees and contractors working at Sandia, many employees at Allied-Signal KCD, and anyone with an Internet account.

The instructions in this document are intended to assist users with PC & Macintosh electronic mail and Novell server functionality. Should you need further assistance, help is available through the **IEIT Hotline at 4-0753.**

Getting Started

How to Login from your PC

During boot, your PC will ask if you wish to load the network. Type "Y" to load the network drivers, no carriage return is required. You will be asked for your password. (You will be provided with a sheet with your login name and password.) If you lose your password the system administrator can change your password, but cannot look up your old password. You will be asked to change your password every 6 months by the system, and passwords are required to be unique. To change your password type **SETPASS** at the DOS prompt.

To logout of the network Novell uses the **LOGOUT** command, but you can also type **LO**. To log back into the network you can either reboot your machine or simply type **NET** at the DOS prompt. You do not have to logout before logging back in. If you share a machine or use one of the lab machines when you login, Novell will automatically logout the previous user.

What files are loaded to connect to Novell server

The following files and drivers are loaded by means of a batch file called NET.BAT:

1. LSL.COM   Link Support Layer
2. 3C503.COM   Network card driver (Other files for different cards)
3. IPXODI   Protocol drivers for IPX and TCP/IP Stacks
4. NETX   Client network shell which names connection to Novell server

WINDOWS TIP: Do not login or out of the network while running Windows or shelling out to DOS from Windows. Drive and printer mappings can get mixed up and it can sometimes cause your local machine to crash. You should also not turn your machine off while running Windows. Though this method will log you off the network, any files that were open while Windows was running may become corrupted. Quit Windows and then logout from the network.

Services Available

Electronic Mail

The electronic mail system for PC and Macintosh is cc:Mail. cc:Mail is auto-started by WNOTIFY.EXE when you load Windows.

To enter data into cc:Mail, use the standard Windows tab key or the mouse to move from field to field. But you can also just press the Enter key and you will be moved to the next field. This makes it very easy to enter information as your hands don't have to leave the keyboard.

The cc:Mail login name conforms to telephone book syntax and Sandia standards. Your mail name is your last name followed by your first name and middle initial, not your network login name. cc:Mail on your workstation has already been configured for your name. For example, Al Newman's login name is AENEWMA but his cc:Mail name is "Newman, Al E.". This makes it easy to select names in cc:Mail. When you are in the list box for user names just begin typing the user's last name and cc:Mail will automatically position the highlight bar to the user name. When you have the name highlighted press the Enter key. To select another name just begin typing the second name, remember last name first (you can also use the arrow keys), and once cc:Mail has identified that unique name press the enter key.

To manually address a user not listed in the mail directory, double-click on the post office where that user receives mail. You will then be prompted to enter the mail name of the recipient in the format described above. When manually addressing to the SMTP post office (UNIX users), the user name format is the first initial, middle initial and first 5 characters of the last name followed by the "@" sign

and fully qualified domain hostname. For example, Al E. Newman's SMTP address might be aenewma@sandia.gov. Since manually addressing a mail message is not as simple as selecting a user from the directory, you may require some assistance from the administrator to determine the recipient's mail address.

People who are not on the IEIT networks should address mail to you using your SMTP address. Your SMTP address is your seven-character Novell login ID, followed by "@sandia.gov". For example, people can send electronic mail to IEIT user John P. Smith using jpsmith@sandia.gov.

File Transfer

You can transfer files from your computer by simply attaching them to a cc:Mail message. This is accomplished by clicking the paper clip icon. All files selected will be attached to your message. When you receive a message with an attachment, you can either view it or save it to disk. To view the attachment, simply double-click on the attachment icon. To save the attachment to your disk drive, detach it from the electronic mail message. This is done by highlighting the attachment and selecting SAVE AS from the file menu bar.

Creating Archive Folders

Archives are like folders but instead of being stored on the network they are stored on your local drive. You can still access them from within cc:Mail, just as you do folders, but only from your workstation.

PLEASE USE ARCHIVES. Archiving saves network disk space and improves the overall performance of cc:Mail if your messages are not stored on the network. To create an archive press the Archive button on the toolbar in cc:Mail. Then select File Create Archive and type in a name for the archive. Users oftentimes create a personal archive, as well as several archives for different projects they are working on.

How do I move messages to Archives or Folders?

cc:Mail supports Microsoft's Multi-Document Interface (MDI) and drag-and-drop. Therefore, it is possible to have several folder or archive windows open at the same time in cc:Mail. To move messages from the "New in" folder to other folders or archives, select the messages you want to move using either a single mouse click, Shift-click, or Ctrl-click, and hold the mouse button down and drag the messages over to the folder or archive. cc:Mail will not allow you to copy messages from one folder to another, they can only be moved.

If you have a Message Log folder defined, it is a good idea to go through your Message Log once a week. Delete unwanted messages and move messages you want to save to an Archive.

Saving a Copy of All Sent Messages

It is possible to save a copy of all messages that you send into a cc:Mail folder. To do this, open the Folder window by clicking on the Folder button on the toolbar. Then select File, Create Folder from the menu pull-down. Name the folder Message Log, and then press Create, followed by Done. Now every message you send will be copied into the Message Log folder. This folder resides on the cc:Mail system so it can take up quite a bit of space, especially if you attach files to your messages. For long-term storage, move the messages you want to keep to an Archive. Message Log cannot be automatically stored in Archives.

How To Reply To The Original Sender Of A Message

When replying to a message, if that message has been sent to multiple recipients it is very easy to reply inadvertently to the entire list. Often, you just want to reply to the original sender. Using cc:Mail for Windows version 1.11, when you reply to a message you see the following dialog box:
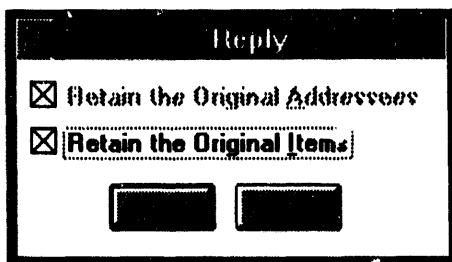
To reply to everyone on the list, just press the OK button. To reply to the original sender only, deselect or uncheck the Retain the Original Addressees check box. If you don't want the original message to appear in your reply, uncheck the Retain the Original Items check box.

Printing

There are several network printers available on the IEIT networks. To access them, open the Jet Print group under Windows. Execute Jet Print, and on the left you will see the available network printers. To choose one of these printers, double-click on the printer name in the list box. This will automatically set the default printer in Windows. To print, simply go to the Windows application and select File, Print. To access local printers there is a pull-down list on the left called **Printer Type:** where you can choose to display network printers, local printers, or both.

You can also attach to other Novell servers and print to those printers. If you have an account and password on another server, you can use Jet Print to attach to that server and then select the printer. Jet Print can be used with any HP printer equipped with a Jet Print card, any printer queue on a Novell file server, or any local printer. The following is a list of printers on the IEIT-IDNET network:

HP LaserJet 4si MX
HP PaintJet XL300
Tektronix Phaser III
Epson LQ2500   Not to be used except by Purchase Requisition program

All of the available printers are currently located in the CAE lab building 890 room 3081.

DOS Printing

If you are using a DOS application, you will need to run a batch file to select the network printer before starting your DOS application. The program to run is called **NETPRINT**. Choose which printer you want to use, and your choice will set LPT3: to that printer. Set your DOS application to print to LPT3: and make sure that the correct printer driver is defined in your application for whatever printer you select. If you are unsure what printer is selected, you can type **SHOW** at a DOS prompt and it will display the current printers defined for each parallel port. If your DOS application will not print to LPT3:, or you need special assistance setting up a printer, please call the IEIT Support Hotline.

AIIM

Association for Information and Image Management

1100 Wayne Avenue, Suite 1100
Silver Spring, Maryland 20910

301/587-8202

Centimeter

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 mm

1 2 3 4 5

Inches

1.0

1.1

1.25 1.4 1.6

2.5 2.8 3.2 3.6 4.0 4.5 5.0 5.6

1.8 2.0 2.2
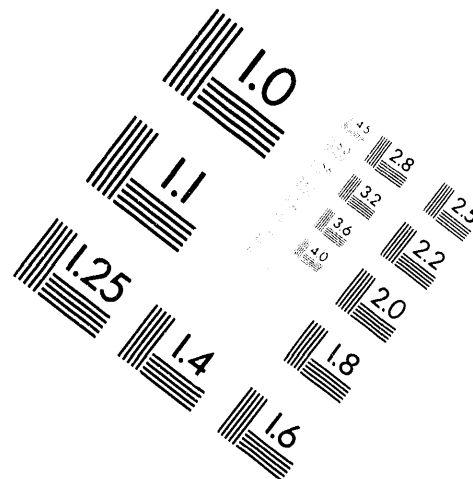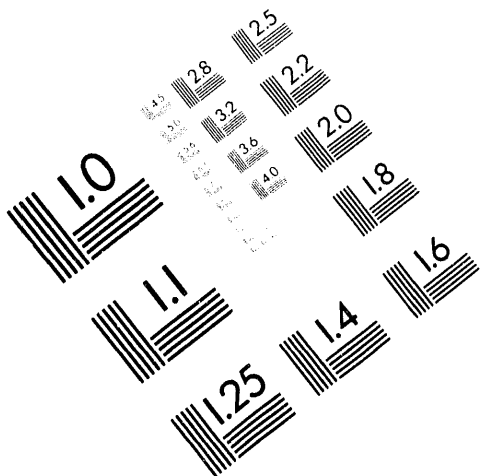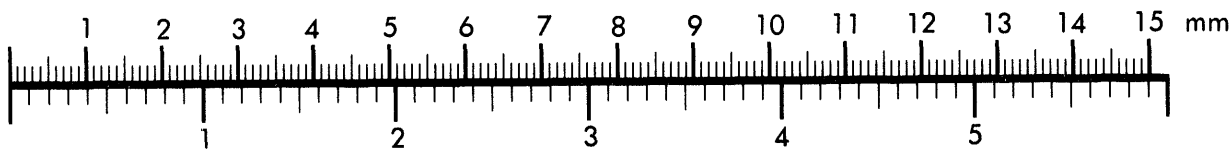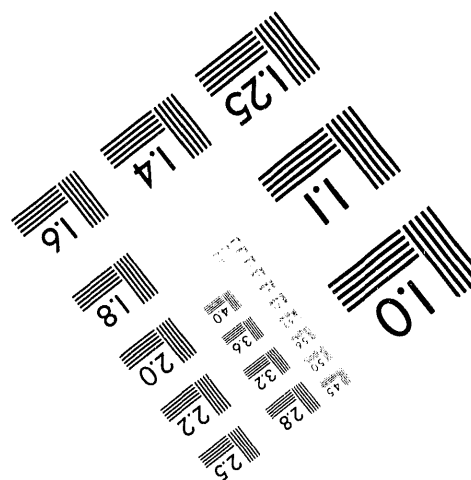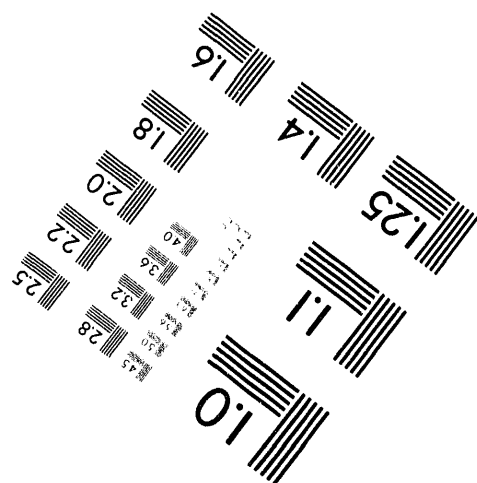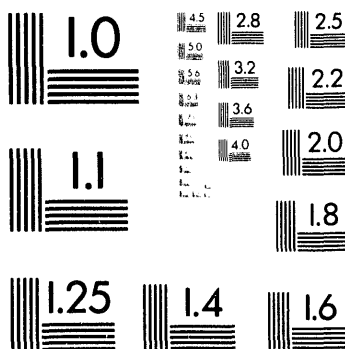
MANUFACTURED TO AIIM STANDARDS
BY APPLIED IMAGE, INC.

Host Services and Telnet

To get access to host services, and to Telnet to UNIX machines on the IRN, we use Novell's LAN WorkPlace for DOS or Macintosh. This Windows application provides remote host access and file transfer management. The host access program is called Host Presenter and the file transfer program is Rapid Filer. Host Presenter allows you to attach to other host services such as SOMNET, PENET, LIS and others, and provides terminal services. The default terminal is VT220 and may have to be changed depending on the terminal emulation supported on the system that you are connecting to. Here are some of the addresses you will need, to connect to Sandia hosts:

Host	Domain Name	Preferred Emulation	Function
SOMNET	somnet.sandia.gov	vt220	Ability to connect to other UNIX hosts outside of Sandia and outside access to Internet services
LIS	lisgate.sandia.gov	3270	Laboratory Information System (LIS) IBM 3090, services include JIT, MIDAS, DOBIS, Financial Services, Human Resources
PENET	hera.penet.sandia.gov	vt220	Facilities VAX cluster including conference room scheduling

Rapid Filer allows you to connect to a host system and manage files on the host system. Instead of using arcane commands such as FTP get or put, Rapid Filer shows you the directory of the host system and your network or local drives. It is very easy to copy files to and from either system. You can also delete files from either system. When you start Rapid Filer, you are presented with a dialog box where you enter the name of the system you want to attach to, example: somnet.sandia.gov, your user name and your password. Rapid Filer logs you in and reads the directory structure. Select the files you want to copy and press the copy button. You can have a Rapid Filer session and a Host Presenter session to the same host at the same time. Even though this FTP functionality is available, we recommend using mail attachments for file transfer.

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Because not everyone needs host and Telnet access, LAN WorkPlace is an additional product installed on your computer as needed. To get LAN WorkPlace installed on your computer, please call the IEIT Support Hotline.

File Sharing and Network Disk Storage

The Novell file server disk space is separated three volumes. They are:

Drive K:	Novell System files	SYS:
Drive L:	User Files	NET_USER:
Drive M:	Network applications	NET_APPS:

Drive L: is where shared data files will be stored. Also on Drive L: is each user's home directory. For example, user Jack Nicholson's login name is JRNICHO. On the L: drive is a subdirectory L:\JRNICHO. When Jack logs in and changes to the L:\ directory, he will only see his directory. The subdirectory name corresponds to your network login name. This home directory is your private directory, where you can create your own subdirectories and store files. The main benefit in using this directory is that you can store files there. These can then be accessed by you, from any workstation you login to, and these files will get backed up regularly.

After browsing the server file structure, you can quickly return to your home directory by typing **HOME**. Should Jack type "home," he will be moved to L:\JRNICHO.

LIS

(LABORATORY INFORMATION SYSTEM)

What is a LIS?

LIS, Laboratory Information System, is an IBM 3090 host accessed from your PC or Macintosh using Novell LAN WorkPlace (LP). LIS gives you access to DOBIS, JIT, MIDAS, Office Vision, and other laboratory information systems. Icons for each platform have been created to aid you through connection to LIS. Simply click on the LIS ICON to initiate your connection.

LIS

An alternate method of connecting to LIS is shown below. The purpose for this information is to inform you of what the ICON is doing thus giving you the knowledge to customize LAN WorkPlace for other connections, should you need them

To connect to LIS, start LWP Host Presenter. You will see by the following login screen:
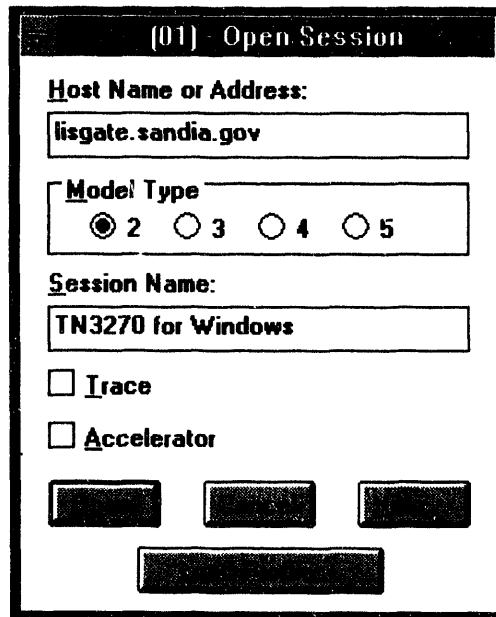
Figure 1. LWP Login Screen

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You will then be connected to the LIS gateway, which is called McData. You will see the following screen:

```
┌─────────────────────────────────────────────────────────────────────────┐
│                        [U1] - TN3270 for Windows                    ▨ ▨  │
├─────────────────────────────────────────────────────────────────────────┤
│  File   Edit   Setup   Transfer   Utilities   Help                      │
│                           Sandia National Labs                          │
│                                                                          │
│                                                                          │
│                                                                          │
│                                                                          │
│                                                                          │
│                                                                          │
│                                                                          │
│                                                                          │
│                                                                          │
│ IBM 3090                  Building 880        Computer Annex-3           │
│ Enter application request (L or TSO for TSO, NETACC for NetView)         │
│                                                                          │
│ _                                                                        │
│                                                                          │
│                                            ☐—☐PC  LINE  23  COL  1       │
└─────────────────────────────────────────────────────────────────────────┘
```
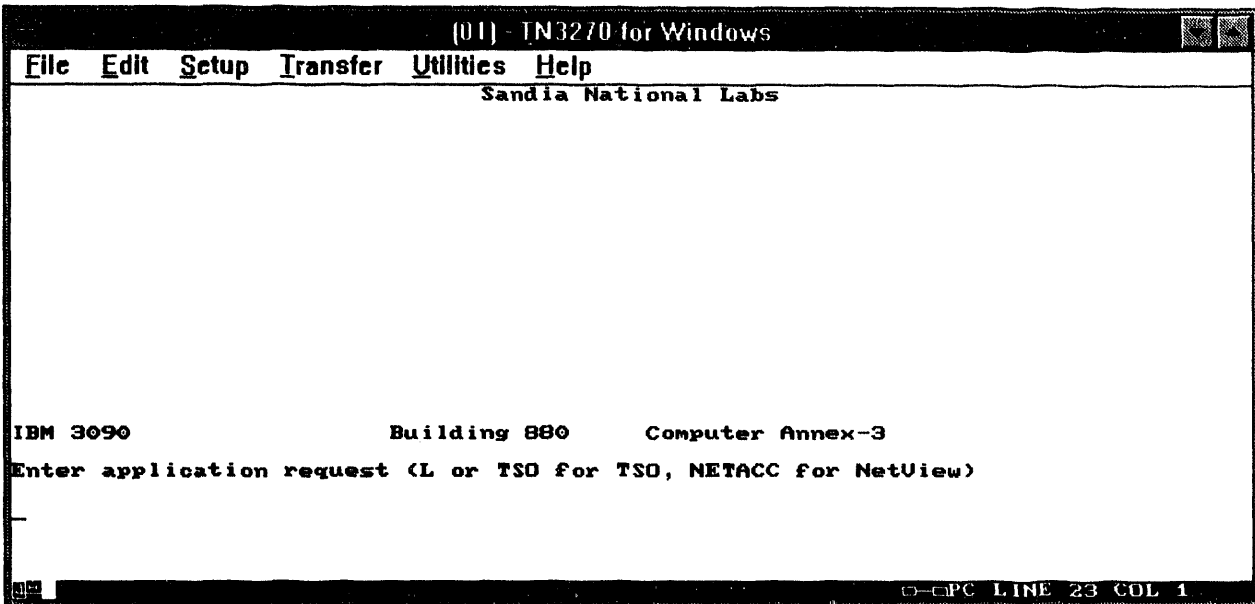
Figure 2. The LIS Gateway

Enter **NETACC,** and press the CTRL key, which is the equivalent of "enter" on the 3270 terminal keyboard.

The following screen will appear:

```
┌─────────────────────────────────────────────────────────────────────────┐
│                        [U1]  TN3270 for Windows                     ▨ ▨  │
├─────────────────────────────────────────────────────────────────────────┤
│  File   Edit   Setup   Transfer   Utilities   Help                      │
│                                              Date . .: 09/03/93          │
│                                              Time . .: 09:08:49          │
│                                              Terminal: T06SA10           │
│                                              IBM 9021-500               │
│                                                                          │
│  Laboratory                                                              │
│  Information                                                             │
│  System                                                                  │
│                                                                          │
│                                                                          │
│            Enter Logon information:                                     │
│                             _                                            │
│                                                                          │
│               Application  ==>                                          │
│               Group        ==>                                          │
│               Location     ==>                                          │
│ PF 1=Help  2=Language                                                    │
│                                                                          │
│                                            ☐—☐PC  LINE  18  COL  35      │
└─────────────────────────────────────────────────────────────────────────┘
```
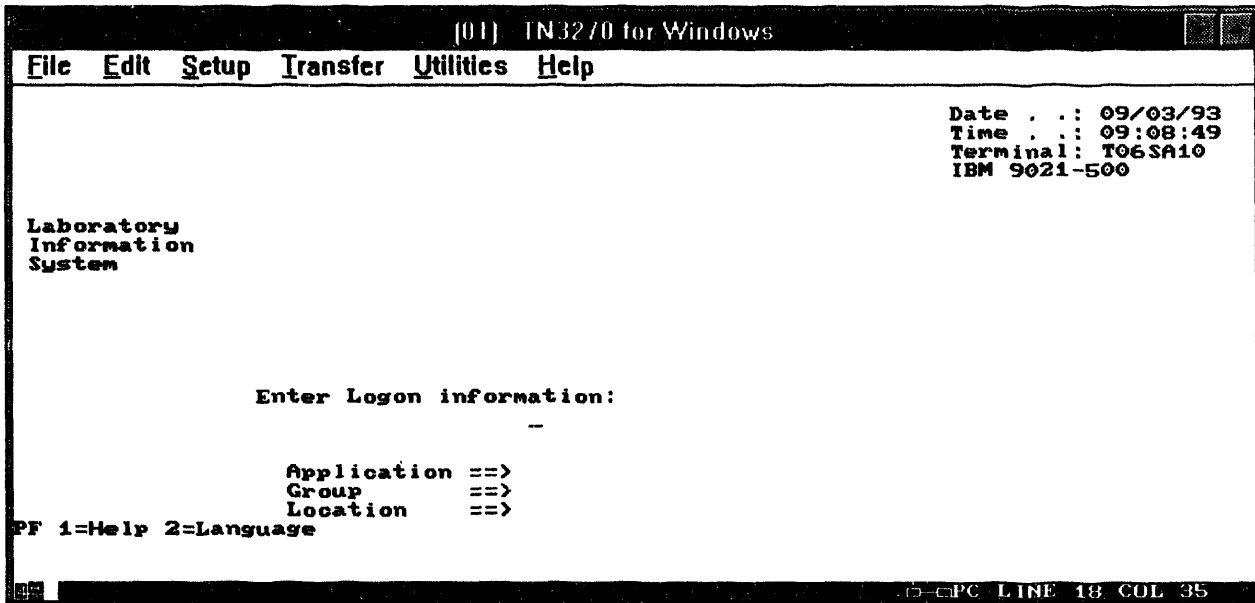
Figure 3. LIS Login screen

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Type in your user name and press the TAB key, then type your password and press Enter. The next screen will display the different options available. This screen will vary, based on what systems you access. Figure 4 is a typical menu screen.

```
┌─────────────────────────────────────────────────────────────────────────────────┐
│ Application Selection                          Term: T06SA1Q                      │
│                                                                                   │
│                                                Date: 08/26/93 Time: 16:04:52      │
│                                                                                   │
│                                                Broadcast:                         │
│                                                                                   │
│ Select application or enter command. Return to this panel using Escape key PF24   │
│                                                                                   │
│ Issue commands in applications using Command key ENTER and Prefix @@              │
│                                                                                   │
│                                                                                   │
│    ID   Name       Status M  B Jump Key Application Description                   │
│                                                                                   │
│     1   ADNETOV            PA2     Office Vision                                   │
│                                                                                   │
│     2   DOBIS              PA2     Technical Library - DOBIS                       │
│                                                                                   │
│     3   IPS                PA2     Production IPS system                           │
│                                                                                   │
│     4   JIT6               PA2     JIT remote orders                              │
│                                                                                   │
│     5   MIDAS              PA2     VM Reporting machine                            │
│                                                                                   │
│                                                                                   │
│                                                                                   │
│                                                                                   │
│                                                                                   │
│                                                                                   │
│ To terminate all sessions use the LOGOFF command.                                 │
│                                                                                   │
│                                                                                   │
│ COMMAND ==> _____  _____  _____  _____               │
│                                                                                   │
│ PF 1=Help   2=Language   3=Disconnect   4=Redefine Keys   7=Backward   8=Forward  │
└─────────────────────────────────────────────────────────────────────────────────┘
```

Figure 4. LIS Menu choices

To logoff LIS type **LOGOFF**. To return to the McData gateway, type **CTRL-W**, and to disconnect from the gateway, choose option **d** and then answer yes.

More information

You can get more information from the LIS Help Desk: 845-9880 or from Sandia Line at 845-6789. Enter **9** for Quick Dial and **1222#** for quick dial code. There are several documents of interest:

1501	Welcome Aboard	brief description of each LIS application
1502	What's Cooking	how to use LIS once you have a password
1503	NASty sheet	how to use NAS (NEtview Access Server) on LIS
1504	New Office Vision features	new features of Office Vision e-mail
1505	Office Vision quick guide	how to use Office Vision for read/send mail
1506	BookManager quick guide	how to use BookManager for online search and retrieval from Sandia documents
1507	LIS/OV password request form	

DOBIS

What is a DOBIS?

DOBIS is an online library catalog that contains materials owned by both the Albuquerque and Livermore libraries. DOBIS is accessed through the LIS (Laboratory Information System).

To start DOBIS select the option from the LIS option screen. The list of options available will vary, depending on your access to LIS. Figure 1 is a sample screen.

```
Application Selection                    Term: T06SA1Q

                                         Date: 08/26/93 Time: 17:18:30

                                         Broadcast:

Select application or enter command. Return to this panel using Escape key PF24

Issue commands in applications using Command key ENTR and Prefix @@

                      Application Description

   1  ADNETOV           PA2    Office Vision

   2  DOBIS             PA2    Technical Library - DOBIS

   3  IPS               PA2    Production IPS system

   4  JIT6              PA2    JIT remote orders

   5  MIDAS             PA2    VM Reporting machine

To terminate all sessions use the LOGOFF command.

COMMAND ==> _____   _____   _____   _____

PF 1=Help   2=Language   3=Disconnect   4=Redefine Keys   7=Backward   8=Forward
```

Figure 1. LIS menu choices

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Select the number for DOBIS, and the following screen will appear:

```
                            WELCOME TO DOBIS!

CLEAR YOUR SCREEN AND THEN ENTER TRANSACTION CODE, FOR EXAMPLE, LIB3.

NOTE: ON IBM-PC AND CLONES THE "+" ON THE NUMERIC KEYPAD WILL CLEAR THE SCREEN.

17:17:26




              DDDDD          OOOO         BBBBBB      IIIII     SSSSSS

            DDDDDDD        OOOOOOO        BB    BB     IIIII    SSSSSSS

          DD      DD     OO      OO      BB    BB      III     SSSS  SS

          DD      DD     OO      OO      BBBBBBB       III     SSSS

          DD      DD     OO      OO      BB    BB      III       SSSS

          DD      DD     OO      OO      BB    BB      III    SS  SSSS

          DD     DDD     OOOOOOO         BB    BB     IIIII    SSSSSSSS

        DDDDDDDDD          OOOO         BBBBBBBB      IIIII     SSSSSS
```

Figure 2. DOBIS opening screen.

```



                           NEED HELP?

              In Albuquerque, call Pager 142-1725.

        In Livermore, call 8-846-5841 and key in Pager ID 1725.
```

Figure 3. DOBIS logon screen

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The screen must say, "Enter your E-number". If it doesn't, you did not type **LIB3** correctly. To return to the main LIS screen, press the ESC key, and then the Shift and the equals key together: **ESC SHIFT-=** and reselect DOBIS. Contractors: use your social security number, with no dashes for your E-number.

The next screen is the password screen. Use the same password that was provided for LIS access. For more information on DOBIS there is a very detailed User's Guide, with sample sessions, available directly from the Technical Library (7142).

VT220 EMULATION

What is a VT220?

VT220 is one of the standard emulation definitions for computer terminals. The keyboard map can sometimes be confusing, so we have outlined some of the more important key sequences. There are several key definitions; a key may be pressed by itself (example: **F1**), multiple keys pressed together (example: **SHIFT-BACKSPACE**), or multiple keys pressed sequentially (example: **ESC TAB**). Function keys may also be called "PF" keys.

Commonly used functions:

Function	Key Press
F1 through F10	**ESC 1** through **ESC 0**
F11 or F12	**ESC -** or **ESC =**
F13 through F22	**ESC SHIFT-1** through **ESC SHIFT-0**
F23 or F23	**ESC SHIFT--** or **ESC SHIFT-=**
Page up (scroll up)	**ESC 7**
Page Down	**ESC 8**
IBM Clear	**CTRL-C**
First field on screen	**ESC H**
Next field	**TAB**
Previous field	**BACKSPACE**
Next line (first field)	**LF** (if available, generally isn't)
Other movements or directions	**ARROW** keys
Erase to end of field	**CTRL-E**
Insert mode ON	**ESC DELETE** (or **ESC keypad .**)
Insert mode OFF	**CTRL-R** (reset)
Delete forward	**DELETE** (or **keypad .**)
RESET (if keyboard locked)	**CTRL-R** (reset)
Print Screen	(not available)
Exit the emulator	(not applicable)
PA1	**ESC ,**
PA2	**ESC .**

PENET

What is a PENET?

PENET is the plant engineering VAX cluster for conference room scheduling and facilities management.

How to access PENET?

PENET is available using LAN WorkPlace. To access PENET click on the PENET icon in the Windows Group LAN Workplace.

You will be connected to the VAX cluster and will see the following screen:
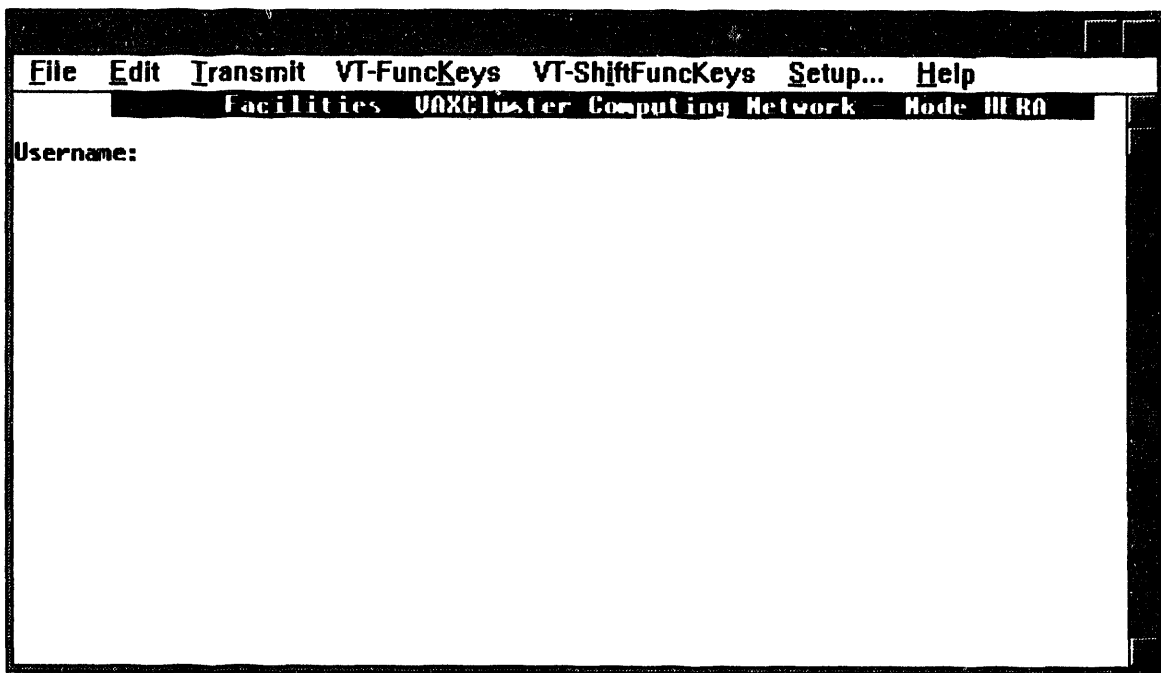
Figure 2. PENET Logon screen

Login with your user name and password to get to the PENET prompt. To start All-in-One type **ALLIN1** at the prompt and you will see the main menu.

```
 File   Edit   Transmit   VT-FuncKeys   VT-ShiftFuncKeys   Setup...   Help
Tim Vargo                          STA                          Thu 02-Sep-1993

        S a n d i a
          N a t i o n a l            Facilities Computing Center
          L a b o r a t o r i e s
          EM          Electronic messaging
          IM          Information management
          TM          Time management
          PERMITS     Plant Engineering Mgmt Info. & Tracking Sys.
          ENGR        Engineering applications
          ESR         Engineering Standards Requests
          COM         Communications
          DM          Desk management
          OS          Office Support

          TR          Training
          EX          Exit workstation

          -

        Enter Selection and press RETURN.                     (More...)
```

Figure 3. PENET All-in-One Main Menu

You can access other services by entering the command at the prompt. To logoff PENET, return to the prompt and type **LO**.

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VI. ISDN Study

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ISDN Study

Robert A. Partridge

Productive Data Systems

Dept. 2604

Objective   Determine if it is feasible to connect multiple remote users to the IRN for purposes of performing simple LAN functions. Simple LAN functions for purposes of this study are considered to be Electronic Mail and simple file transfers.

Considerations   Performance must be fairly close to what it would be if the user was connected directly to the network using traditional means (PBX, 10-BASE-T, etc.).

Once installed, the user should not have to perform special functions other than what they would normally perform to logon to the network.

Performance must be reliable. We cannot afford to have a director, vice-president, or their secretaries receiving an "Unable to read device Network" error message.

IMDI - ISDN Test Bed

Building 880

99
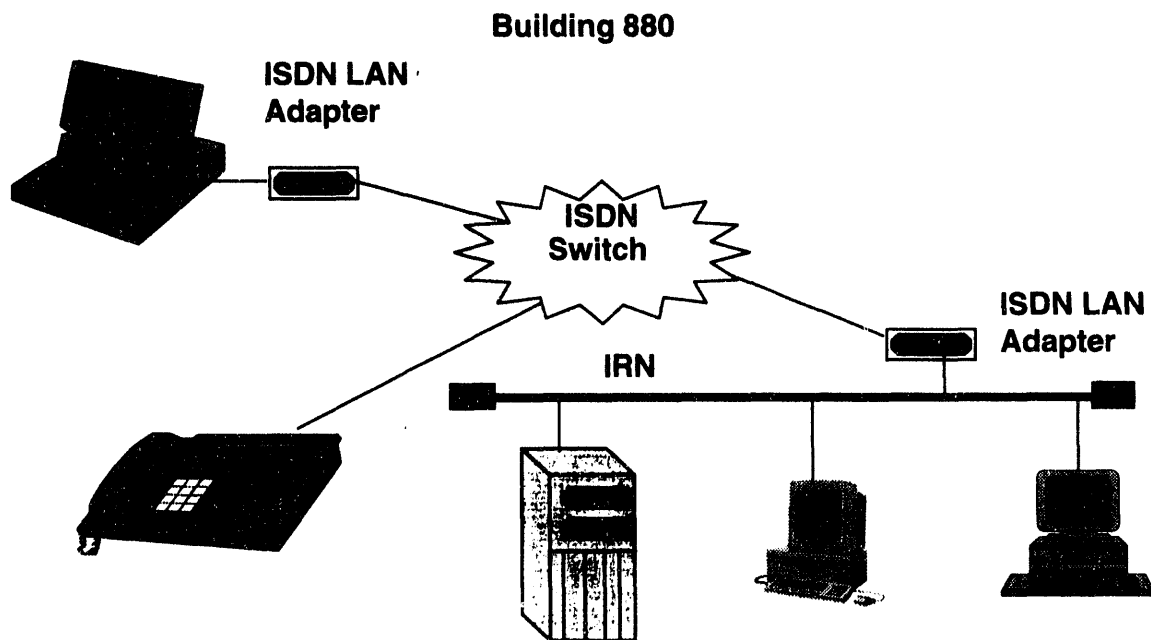
Test Bed

John Eldridge in Dept. 1955 has three ISDN lines available for testing. One line was connected to the IRN, one was used for an ISDN telephone, and the third was used for LAN connections. It would be helpful to be able to test multiple workstations trying to share the same connection into the IRN at different times, but that is not possible given the current number of lines available. All tests were performed using the IMDI file server TOPAZ as the target file server.

ISDN LAN Adapter

Ethernet BNC Ethernet Twisted Pair Config. Port Termination Switch ISDN Line Power Connection Power Switch
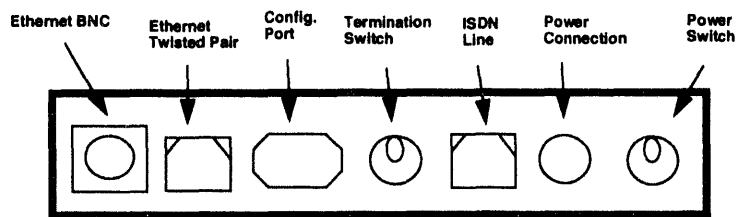
Back Panel

Features
•Operational Transparency
•Transparent bridge operation
•Manages Demand
•Multiple levels of filtering
•No special desktop software
•Authorization, caller ID
•Data Compression
•Efficient channel usage

INTERCHANGE
COMBNET
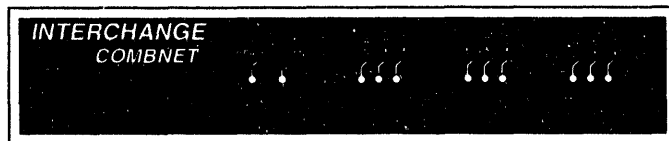
Front Panel

Observations

I first attempted to log on to the IRN using a Gateway Laptop PC. The attempt failed, probably due to the line speed and number of routers between the test bed and the IMDI file server. We analyzed the network traffic, and found that all the Novell file servers on the IRN were acknowledging the PC's broadcast for the nearest file server, but for some reason the PC would not acknowledge the messages from the Novell file servers. I tried logging on using a Macintosh successfully. Performance was good and I successfully sent a mail message. I was also able to read my mail.

I next tried inserting a command into the PC's NET.CFG file to direct its broadcasts straight at TOPAZ. This worked and I was able to login. I also successfully sent and received mail. Performance was very slow, since the application (cc:Mail) is located on the file server. Logging in is also very slow, for the same reason, the Login command is located on the file server. It took

approximately 23 seconds to login to the file server and approximately 90 seconds to login to cc:Mail.

I copied the cc:Mail application from the file server to the local hard disk and the login program to the hard disk also. This improved the performance considerably. In fact I don't think the average user would notice any difference between logging in over ISDN lines as opposed to direct IRN connections.

Next, I ran tests to see what happens when a connection is dropped due to no transmit or receive activity over the ISDN line, and determine how easy it is to reestablish the connection. These tests were harder to do since we only had three ISDN lines to work with. Before implementing this solution, more testing should take place, using more lines and a variety of real life scenarios.

For our purposes, we were able to test a phone and computer attempting to use the same line on the other end. First we logged on to the network and sent e-mail as before. We then waited for the connection to be dropped. The connection was reestablished without any problem by performing a normal operation which would generate network traffic. It did not matter if another user used the connection to the IRN or not, the connection was easily reestablished. This was true for both the Macintosh and PC.

However, if there were no available connections to the IRN when the PC tried to reconnect, performance would slow to a crawl and eventually a message would appear, saying: "**ERROR: reading from device Network**". At this point, we had to reboot the PC to continue working. It was very difficult to connect to the file server again after this happened.

When the same test was tried using the Macintosh, the worst that would happen was that we would have to connect to the network again via "chooser." The Macintosh did not have to be rebooted. This is probably because of the built in networking capability of the Macintosh operating system.

Conclusions

It is feasible, from a performance standpoint, to connect users to the IRN using ISDN lines.

It is imperative that enough connections exist from the ISDN switch to the IRN to accommodate the maximum potential users.

It would also be feasible to connect a LAN to the IRN via ISDN lines. This method would allow multiple users on the LAN to share the same ISDN line without having to purchase an ISDN Ethernet Adapter for each remote user.

It would be better to connect users directly to the IRN if possible.

The Windows users are severely affected by network problems. This is more because of problems with Windows and networking than because of problems with ISDN. Those people who use DOS applications, and Macintosh users, are not affected by network problems nearly as much as Windows users.

**Future
Considerations**

What happens when the file server sends a message to a user whose connection has been dropped?

What happens when a mail server attempts to deliver a message to a computer whose connection has been dropped?

The next few pages show potential configurations.

ISDN Configuration
Multiple Remote Users

ISDN
Switch

Power Supply

NT1 Network Terminator

ISDN LAN Adapter

Remote LAN Back Bone
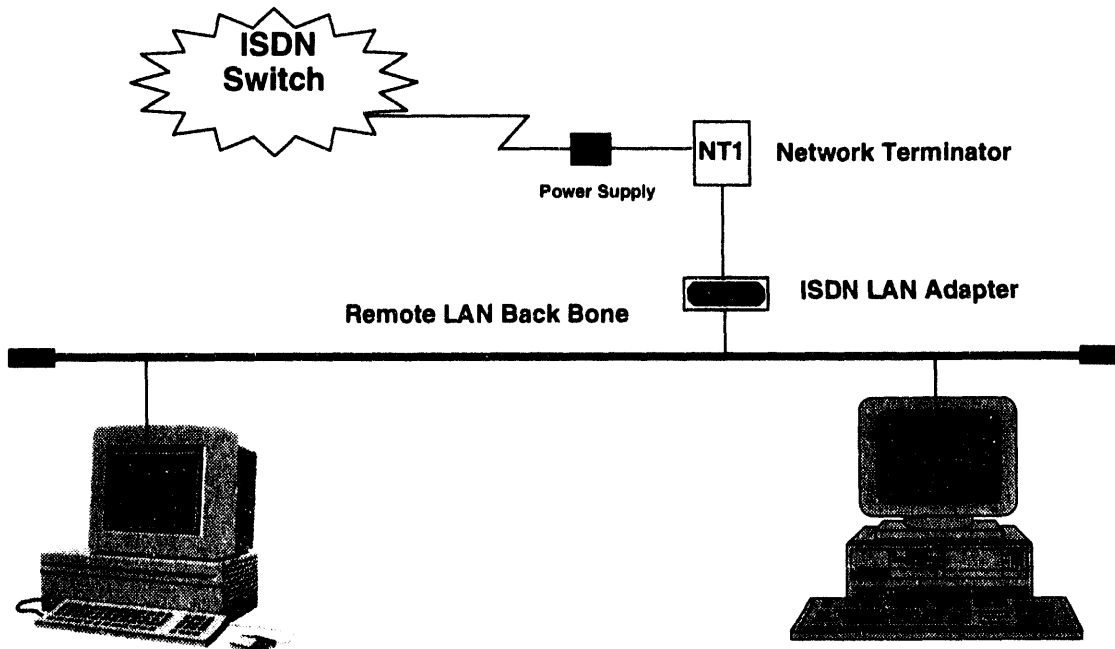
ISDN Configuration
Remote Single User

ISDN Switch

Power Supply

NT1 Network Terminator

Signal Splitter

ISDN LAN Adapter
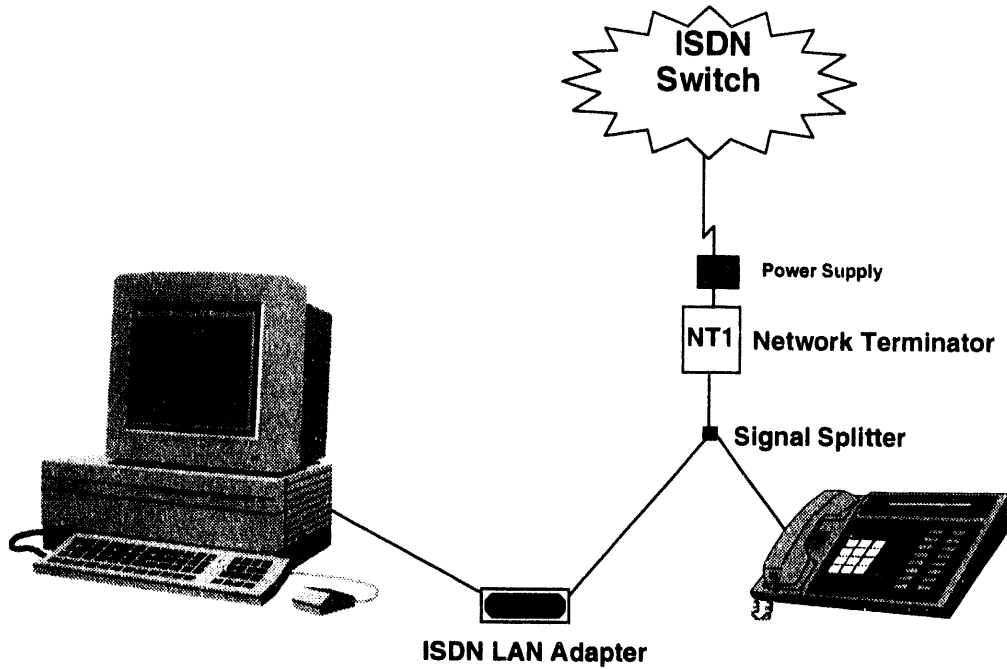
ISDN Configuration
IMDI Network Side

It is essential that enough ISDN connections
to the IMDI Network are available to handle
the maximum number of concurrent users.

ISDN Switch

Power Supply   Power Supply

ISDN LAN Adapter   NT1   NT1   ISDN LAN Adapter

Network Terminators

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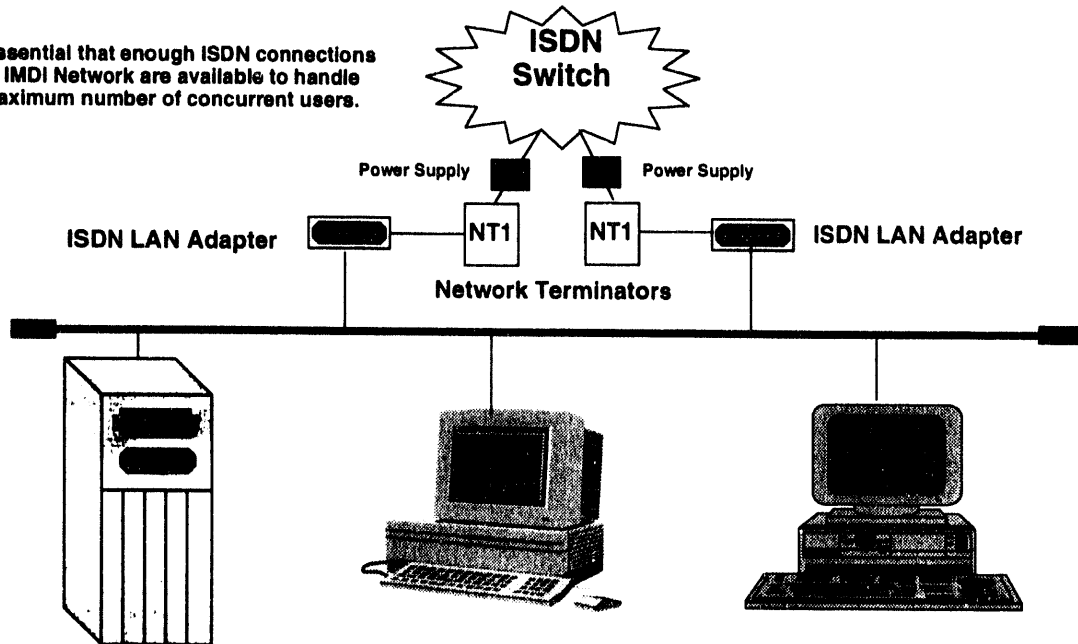
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VII. X.400 Implementation Plan

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IMDI X.400 Implementation Plan

To provide expanded electronic mail capability, the IMDI network will soon support X.400 messaging. X.400 is a common messaging standard which many organizations throughout the world are either currently using or migrating toward. Providing X.400 messaging service to our IMDI customers will remove limits of proprietary mail programs, while allowing continued use of mail programs they have become accustomed to.

To accomplish this implementation the following tasks need to be accomplished.

Task	Date Started	Date Completed	Comments
Purchase 2 copies of Retix OpenServer for DOS.	February 1993	April 1993	Initially the Unix versions were ordered
Purchase Microsoft Mail X.400 Gateway	February 1993	March 1993	
Purchase cc:Mail X.400 Gateway	February 1993	March 1993	
Obtain PC from 5100	February 1993		Evidently 5100 gave us their spare parts which they were no longer using
Install Retix OpenServer	4/16/93	4/22/93	
Configure Retix OpenServer	4/23/93	4/24/93	
Install cc:Mail X.400 Gateway	4/26/93	4/26/93	
Configure cc:Mail X.400 Gateway	4/26/93	4/27/93	
Install Microsoft Mail X.400 Gateway	4/28/93	5/6/93	
Configure Routers to Route OSI	4/29/93	5/25/93	

(Task implementations, cont.)

Task	Date Started	Date Completed	Comments
Configure Microsoft Mail X.400 Gateway	5/6/93	5/7/93	
Populate cc:Mail Directory with Test X.400 Users	5/6/93	5/7/93	
Populate Microsoft Mail Directory with Test X.400 Users	5/7/93	5/10/93	
Begin Testing mail between the two systems	5/10/93	5/14/93	
Begin Testing with Mike Hoy's System	6/2/93	6/20/93	Have exchanged mail with Mike. Waiting for address list. 7/26/93
Begin Testing with Allied Signal in Kansas City	6/9/93	6/22/93	Still working on addressing issues. 7/26/93
Populate Directories with all Users and their X.400 Addresses	7/1/93	7/15/93	
Reconfigure Microsoft Mail X.400 Gateway to run on 5100 Network	August 1993	August 1993	Start date will be after completion of Black wiring in Building 836
Test X.400 mail between IMDI Network and 5100 LAN	August 1993	August 1993	Start date will be after completion of Black wiring in Building 836

Configuration Information

IMDI OpenServer

MTA Name   IMDI_OPS

System Directory   M:/OSI_PROD/IMDI_OPS

Submission Queue   M:/OSI_PROD/IMDI_OPS/MTASQ

Input Queue   M:/OSI_PROD/IMDI_OPS/MTAIQ

cc:Mail Output Queue   M:/OSI_PROD/IMDI_OPS/MTAOQ002

MS Mail Output Queue   M:/OSI_PROD/IMDI_OPS/MTAOQ003   (Temporary)

Undeliverable Queue   M:/OSI_PROD/IMDI_OPS/MTAUQ

Network Interface Cards   (3C507)

	NIC #1	NIC #2
Protocol	IPX	OSI
Base I/O Address	300h	380h
IRQ	5	12
Ethernet Address	00 60 8C 5C F8 35	00 60 8C B0 CC AD
RAM Address	D0000	D8000
RAM Size	16	32

O/R Address Information

Country   US

Administrative Domain   ' '

Private Domain   USDOE+SNL

Organization   SNL

TRANSPORT_STACK

STACK ID   LAN

NSAP   47.0005.80.000400.0000.001a.0035.0060.8cb0.ccad.01

NETWORK TYPE   CLNS

TRANSPORT CLASS   4

Node	AFI	IDI	DFI	Adm. Auth.	Reserved	Rtg. Domain	Area	End System	NSel
imdi_ops	47	00 05	80	00 04 00	00 00	00 1a	00 35	00 60 8c b0 cc ad	01
IRNOS400	47	00 05	80	00 04 00	00 00	00 1a	00 48	00 60 8c b1 13 b7	01
X400ML	47	00 05	80	00 04 00	00 00	00 1a	00 10	aa 00 04 00 0f 28	21
RETIX	47	00 05	80	00 04 00	00 00	00 1a	00 10	10 00 24 10 c7 09	01
KCD	47	00 05	80	00 04 00	00 00	00 10	00 01	00 00 c0 d7 16 1a	01
GOVX400	47	00 05	80	00 04 00	00 00	00 1a	00 10	08 00 2b 17 95 b8	21

Gateway Configurations

cc:Mail Gateway Name   CCXIMDI

Gateway Input Queue   M:/osi_prod/imdi_ops/mtaoq002

Gateway Output Queue   M:/osi_prod/imdi_ops/MTAlQ

Gateway System Directory   M:/osi_prod/imdi_ops

Gateway Country   US

Gateway ADMD   ' '

Gateway PRMD   USDOE+SNL

Gateway Organization   SNL

Gateway Organizational Unit 1   IMDI

Gateway Organizational Unit 2   CC

cc:Mail Import/Export Path   M:/OSI_PROD/IMDI_OPS

cc:Mail Post Office Name   TOPAZ-SNLA

cc:Mail Post Office Password   XXXXXXXX

cc:Mail Gateway Name   CCX400

cc:Mail Gateway Password   XXXXXXXX

cc:Mail Data File Path   M:/CCDATA

cc:Mail Naming Convention   Surname, Given

Activity Log Path   C:/X400GATE

Error Log Path   C:/X400GATE

Microsoft Mail Gateway Name   MSXIMDI

Gateway Input Queue   M:/OSI_PROD/IMDI_OPS/MTAOQ003

Gateway Output Queue	M:/OSI_PROD/IMDI_OPS/MTAIQ
Gateway System Directory	M:/OSI_PROD/IMDI_OPS
Domains data filename	domain
Names data filename	name
Gateway Country	US
Gateway ADMD	' '
Gateway PRMD	USDOE+SNL
Gateway Organization	SNL
Gateway Organization Unit 1	IEIT
Gateway Organization Unit 2	MS
MS Mail Get/Put Path	G:/MMGW
MS Mail Post Office Name	DEV5000
MS Mail Network Name	5000NET
MS Mail Administrator Mailbox	ADMIN
MS Mail Admin's Password	XXXXXXXX
MS Mail Data File Path	M:/MSDATA
MS Mail Version Number	3.0b
Activity Log Path	G:/MMGW
Error Log Path	G:/MMGW
Outgoing Dump File	M:/MMGW/OUT.DMP
Incoming Dump File	M:/MMGW/IN.DMP
Report Dump File	M:/MMGW/REPORT.DMP

**When 5100 Open Server is configured all references to IMDI will be changed to 5100

IMDI Microsoft Mail Network
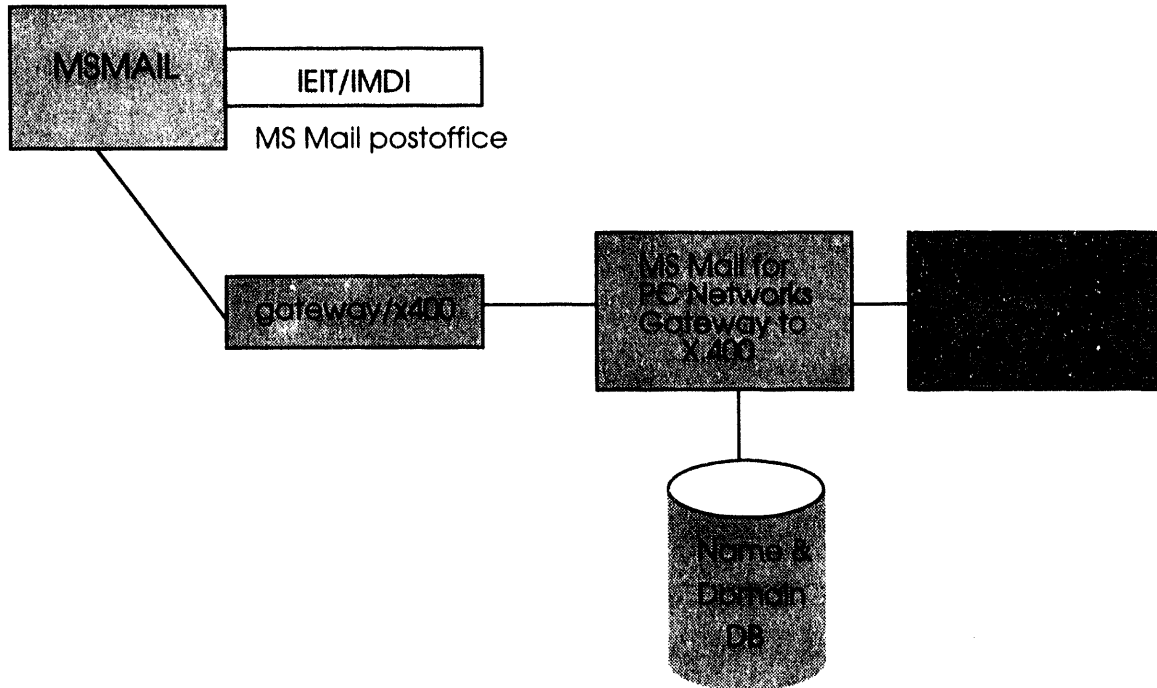
Router Configurations

To successfully implement X.400 messaging, all routers between organizations wishing to exchange X.400 mail must be configured to route ISO CLNS protocols. This will be no small task, considering the number of routers involved.

To route from the IMDI Network room to Kansas City requires that sacr031, sacr025, and kcdgw all be configured as OSI IS nodes. The ideal situation would be to configure all routers at Sandia as ISO CLNS intermediate nodes.

OSI Nodes and Addresses

Node	Type	Network Service Access Point Address
imdi_ops	ES	47.0005.80.000400.0000.001a.0035.0060.8cb0.ccad.01
5100_ops	ES	
sacr031	IS	47.0005.80.000400.0000.001a.0028.0000.0c01.3fa 2.00
sacr025	IS	47.0005.80.000400.0000.001a.0048.0000.0000.00 01.00
kcdgw	IS	
sacr015	IS	47.0005.80.000400.0000.001a.0010.0000.0000.00 01.00

IMDI X.400 Network
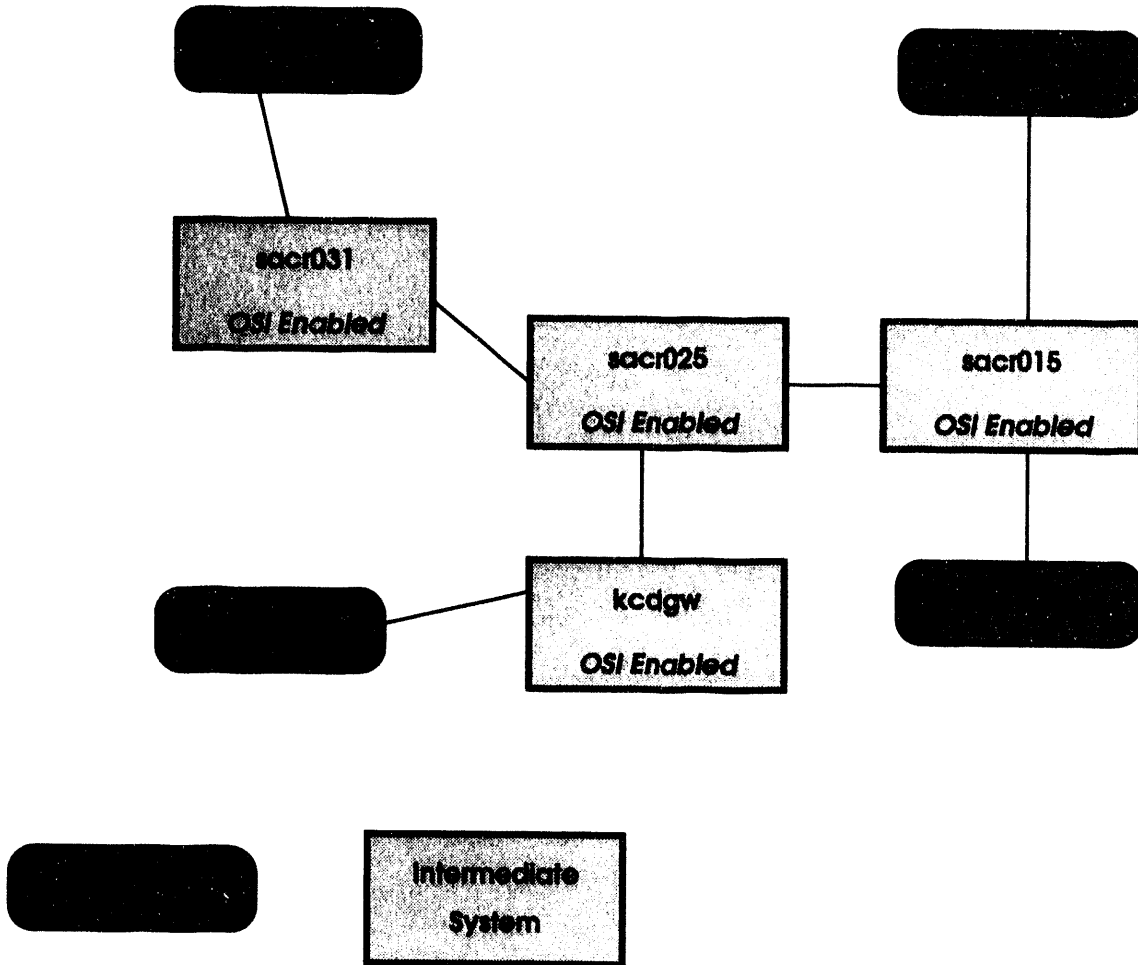
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VIII. Configuration Management

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IMDI

Configuration Management Status Report

Judd Herman 2863

June 14, 1993

Here is what we did:

1. *Install Software.*

The DMCS and Oracle software were loaded on both red and black servers. An upgrade release was distributed soon after DMCS was installed. This upgrade proved to be very difficult to install, mainly because of poor upgrade documentation.

As delivered, DMCS is a considered a "TOOL KIT" and not a software "package" that can be unwrapped and used. Therefore, DMCS must be "customized" extensively if it is to be used in a manner that varies from the as-delivered product. DMCS provides various ways to customize the software, such as PCI, the GUI and transaction modeling. None of these are easy to implement.

DMCS client software was installed on several machines in building 807 in Sandia Albuquerque and at one machine at Sandia Livermore.

2. *Customize Knowledge Base.*

The following is a list of all IMDI projects, which are legal values for projects within the DMCS knowledge base. This is a high level outline of the knowledge base implementation:

   MAST Fireset

   Mast System

   MAST Programmer

   Focal Point PEX

   Focal Point System

   Focal Point Simple Fireset

   IMDI Program

   Design Guides

For each IMDI project defined within DMCS, there would be five controlled entities:

Budget

Project Plan

Control Document

Product Specification

Mechanical Design

Electrical Design

These were fairly simplistic models. However, it was difficult to get agreement on how to use DMCS to implement these models. The main problem was finding a customer to provide input for the implementation specifics of the system.

3. *Implement Pro/Engineer to DMCS Interface.*

An interface was developed to transfer Pro/ENGINEER files to and from DMCS without using the DMCS Graphical User Interface. Jerry Riuggieri from PTC and Louis Boydstun from SDRC jointly developed code to "export" tar files from Pro/ENGINEER to DMCS and "import" tar files from DMCS back to Pro.

4. *Modifications to the Pro/DMCS interface.*

Some modifications to the interface were required to accommodate version changes made to Pro/ENGINEER. One change dealt with string manipulation problems and allowing the import function to create new UNIX directories in the event one with the same name already exists.

Other modifications dealt with making the interface work in a client - server mode. As delivered, the interface would only operate on the server and communicate to Pro/ENGINEER on the server. The first step to resolve this issue was by changing DMCS protocol from "mailbox" to TCP/IP. This allowed DMCS clients and the interface program to be placed on other machines in the network. The second step was to make the interface program compatible with the DMCS knowledge base. Several attributes in the interface program were changed to reflect those in the knowledge base and various modifications to string functions were required to make the program work correctly.

5. *Modifications to DMCS GUI.*

Modifications were made to the DMCS Graphical User Interface to display on small screens such as the ones on laptop computers.

Other modifications were made to the DMCS GUI so that the screens would appear less congested; field defaults were added along with various other changes.

The DMCS GUI was tested on a remote NetBlazer system from the black DMCS server(Jasper). Although slow, it was able to transfer files between machines and perform all of the other standard DMCS functions.

6. *Demonstrate DMCS check-in and check-out.*

Check in and Check out of files was demonstrated between a Macintosh computer and an IBM Personal Computer. To accomplish this task, DMCS has a Graphical User Interface for displaying messages to the user, and software to perform a UNIX FTP transfer of the file. MacX software was used to display the DMCS screens on the MAC and PC-Xview to display the DMCS screens on an IBM PC. During the demonstration, a file written in Microsoft word on the Macintosh was checked in to the DMCS control space on the DMCS server and then checked out to an IBM personal computer. The file was finally translated from the Macintosh version of Microsoft Word to the IBM PC version.

7. *Demonstrate Pro/ENGINEER-DMCS interface.*

The interface as demonstrated showed check-in of a tarred Pro/ENGINEER directory to DMCS. To accomplish this, a part was selected from Pro/PROJECT from the customized Pro/DEVELOP menu. The interface created a tar file of the part directory and sent the tar file to a pre-defined control space within DMCS. Information that was maintained for the file was userid, time and date checked in, and file status history, etc. Once in DMCS the file is protected and encrypted so that it can only be accessed through DMCS.

8. *PEX.*

A meeting was held in Albuquerque with PEX representatives to outline DMCS requirements from the PEX project on February 4, 1993. In reality, this meeting showed that there was not much interest in DMCS from the PEX users.

Here is what we wanted to do:

It was intended to use DMCS to maintain product data for all IMDI related projects.

If the PEX users had shown more interest in DMCS, the plan of action would have been to:

☐ Develop a data model from data requirements provided by the Focal Point PEX Project team.

☐ Develop a proposed process model(s) outlining and clarifying requirements and business rules.

☐ Customized Screens would be developed from the standard DMCS graphical user interface.

☐ Determine what changes would be needed to the Pro/DMCS interface and implement these.

☐ Install DMCS clients at all remote PEX vendor sites.

☐ Provide training to all IMDI DMCS users.

☐ Schedule and attend PEX meetings.

(The following are the C-language files documenting the changes to the interface between DMCS and Pro/ENGINEER.)

```c
/* BEGIN PROPI.C */
/*   added function gethost, called in login_to_dmcs Judd Herman
     12/7/92   */
#define globalref
#include <stdio.h>
#include <status.h>
#include <pcidef.h>
#if 1
#define DEBUG
#endif
#define BOOLEAN int
#define CE_TYPE    "M_DESIGN"
#define DATABASE   "IMDI"
#define KEYFIELD   "Proj Name M_Design"
#define PROJID     "IMDI"
#define DATACLASS  "IMDIDOC"
/*  #define APPSPACE    "Emerald" */
#define ACCREASON  "READ"
static char message[80];
static int init = FALSE;
static char userid[256];
static char hostnode[25];
int gethost()
{
  gethostname ( hostnode, 25 );
 /* printf("hostname = %s\n", hostnode ); */
}
int put_error(mod, str)
char *mod;
char *str;
{
    sprintf(message, "%s: %s", mod, str);
#ifdef DEBUG
    printf("%s\n", message);
#endif
  return NOT_OKAY;
}
int stdexit(dstat, msg)
status dstat;
char *msg;
{
    int rt;
    if (dstat == OKAY)
    {
        strcpy(msg, "");
        rt = TRUE;
    }
    else
    {
        strcpy(msg, message);
        rt = FALSE;
    }
    return rt;
}
#define PUT_ERROR(s) put_error(mod_name, s)
static RCID rcid = RCID_IVAL;
static RTID rtid = RTID_IVAL;
status read_label(project, a_num)
char *project;
int  *a_num;
{
    status dstat = OKAY;
```

```c
    char *mod_name = "read_label";
    UFLS_PTR ufls = NULL;
    UFCB_PTR ufcb = NULL;
    UFCB_PTR label_ufcb = NULL;
    int num;
    if (project == NULL) dstat = PUT_ERROR("project is NULL");
    if (dstat == OKAY) dstat = ufls_append_field(&ufls,  "fcn id",  "system");
    if (dstat == OKAY) dstat = ufls_append_field(&ufls,  KEYFIELD,  project);
    if (dstat == OKAY) dstat = ufls_append_field(&ufls, "ce type",  CE_TYPE);
    if (dstat == OKAY) dstat = ufcb_build(ufls, "dummy", &ufcb);
    if (dstat == OKAY)
    {
        dstat = dci_exec_cl_trans(rtid, "", "S.LA.QY.INIT", ufcb);
        if (dstat != OKAY) PUT_ERROR("cannot query labels");
    }
    if (dstat == OKAY) dstat = dci_cltn_get_size(rtid, &num);
    if (dstat == OKAY && num == 1)
    {
        ufcb = NULL;
        if (dstat == OKAY) dstat = dci_exec_cltn_fetch(rtid, 1, &ufcb);
    }
    else if (dstat == OKAY && num == 0)
        ;
    else
        dstat = PUT_ERROR("duplicate project names in DMCS");
    if (dstat == OKAY) *a_num  = num;
    return dstat;
}
status add_label(project)
char *project;
{
    char *mod_name = "add_label";
    status dstat = OKAY;
    UFLS_PTR ufls = NULL;
    UFCB_PTR ufcb = NULL;
    if (project == NULL) dstat = PUT_ERROR("project name is NULL");
    if (dstat == OKAY) dstat = ufls_append_field(&ufls,  "fcn id",  "system");
    if (dstat == OKAY) dstat = ufls_append_field(&ufls,  "project id", PROJID);
    if (dstat == OKAY) dstat = ufls_append_field(&ufls,  KEYFIELD,  project);
    if (dstat == OKAY) dstat = ufls_append_field(&ufls, "ce type",  CE_TYPE);
#if 1
    if (dstat == OKAY) dstat = ufls_append_field(&ufls, "Project", "IMDI");
#endif
    if (dstat == OKAY) dstat = ufcb_build(ufls, "dummy", &ufcb);
    if (dstat == OKAY)
    {
        dstat = dci_exec_ad_trans(rtid, "", "S.LA.AD.INIT", ufcb);
        if (dstat != OKAY) PUT_ERROR("cannot create project in DMCS");
    }
    return dstat;
}
int project_isin_dmcs(project, msg, a_sw)
char *project;
char *msg;
BOOLEAN *a_sw;
{
    status dstat = OKAY;
    char *mod_name = "project_isin_dmcs";
    int       num = 0;
    BOOLEAN   sw  = FALSE;
    strcpy(message, "propci failure");
    if (project == NULL) dstat = PUT_ERROR("project name is NULL");
    if (msg     == NULL) dstat = PUT_ERROR("message buffer is NULL");
    if (dstat == OKAY) dstat = read_label(project, &num);
    if (dstat == OKAY)
    {
```

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```c
        /* create new label */
        if (num == 0)
        {
            sw = FALSE;
            dstat = add_label(project);
        }
        /* label exists, verify with user */
        else if (num == 1)
            sw = TRUE;
        /* error */
        else
            dstat = PUT_ERROR("too many labels found in database");
    }
    if (dstat == OKAY) *a_sw = sw;
    return stdexit(dstat, msg);
}
status login_to_dmcs(argc, argv, user, password, msg)
int argc;
char *argv[];
char *user;
char *password;
char *msg;
{
    status dstat = OKAY;
    char *mod_name = "login_to_dmcs";
    UFLS_PTR ufls = NULL;
    strcpy(message, "propci failure");
    gethost();
    if (argv     == NULL) dstat = PUT_ERROR("argv is NULL");
    if (user     == NULL) dstat = PUT_ERROR("user is NULL");
    if (password == NULL) dstat = PUT_ERROR("password is NULL");
    if (msg      == NULL) dstat = PUT_ERROR("path is NULL");
    if (init) dstat = !logout_of_dmcs();
    /* login to DMCS */
    if (dstat == OKAY)
    {
        dstat = dci_proc_command_line(argc, argv);
        if (dstat != OKAY) PUT_ERROR("cannot process command line");
    }
    if (dstat == OKAY) strcpy(userid, user);
    if (dstat == OKAY) dstat = ufls_append_field(&ufls, "userid", user);
    if (dstat == OKAY) dstat = ufls_append_field(&ufls, "password", password);
    if (dstat == OKAY) dstat = ufls_append_field(&ufls, "database", DATABASE);
    if (dstat == OKAY)
    {
        dstat = dci_ufls_login(ufls, &rcid);
        if (dstat != OKAY) PUT_ERROR("cannot log in to database");
    }
    if (dstat == OKAY)
    {
        dstat = dci_open_trans(mod_name, rcid, &rtid);
        if (dstat != OKAY) PUT_ERROR("cannot open transaction");
    }
    if (dstat == OKAY) dstat = dci_dflt_disable_reset(rtid);
    if (dstat == OKAY) init = TRUE;
    return stdexit(dstat, msg);
}
status read_items(project, a_all_items, a_num)
char *project;
UFCB_PTR **a_all_items;
int *a_num;
{
    static UFCB_PTR *all_items = NULL;
    status dstat = OKAY;
    char *mod_name = "read_items";
    int       indx = 0;
```

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```c
    int        num   = 0;
    UFCB_PTR ufcb = NULL;
    UFLS_PTR ufls = NULL;
    if (project      == NULL) dstat = PUT_ERROR("project name is NULL");
    if (a_all_items == NULL) dstat = PUT_ERROR("project name is NULL");
    if (dstat == OKAY) dstat = ufls_append_field(&ufls,   "fcn id",   "system");
    if (dstat == OKAY) dstat = ufls_append_field(&ufls,   "project id", PROJID);
    if (dstat == OKAY) dstat = ufls_append_field(&ufls,   KEYFIELD,   project);
    if (dstat == OKAY) dstat = ufls_append_field(&ufls, "ce type",   CE_TYPE);
    if (dstat == OKAY) dstat = ufcb_build(ufls, "dummy", &ufcb);
    if (dstat == OKAY)
    {
        dstat = dci_exec_cl_trans(rtid, "MAIN.LA.MF", "S.LA.FO.QY.INIT", ufcb);
        if (dstat != OKAY) PUT_ERROR("cannot query folder items in DMCS");
    }
    if (dstat == OKAY) dstat = dci_cltn_get_size(rtid, &num);
    if (dstat == OKAY && num > 0)
    {
        if (all_items != NULL) /* free(all_items) */;
        all_items = (UFCB_PTR *) malloc(sizeof(UFCB_PTR) * num);
    }
    for (indx = 0; dstat == OKAY && indx < num; indx++)
    {
        ufcb = NULL;
        dstat = dci_exec_cltn_fetch(rtid, indx + 1, &ufcb);
        if (dstat == OKAY) all_items[indx] = ufcb;
    }
    if (dstat == OKAY) *a_all_items = all_items;
    if (dstat == OKAY) *a_num        = num;
    return dstat;
}
status add_file_to_folder(project, path, msg)
char *project;
char *path;
char *msg;
{
    char *mod_name = "add_file_to_folder";
    status dstat = OKAY;
    int        num        = 0;
    UFCB_PTR *all_items = NULL;
    strcpy(message, "propci failure");
    if (project == NULL) dstat = PUT_ERROR("project name is NULL");
    /* collect folder items in current label */
    if (dstat == OKAY) dstat = read_items(project, &all_items, &num);
    /* add file to folder */
    if (dstat == OKAY && num == 0)
        dstat = add_this_file(project, path);
    else if (dstat == OKAY)
        dstat = replace_this_file(project, path, all_items, num);
    return stdexit(dstat, msg);
}
status replace_this_file(project, path, all_items, num)
char *project;
char *path;
UFCB_PTR *all_items;
{
    char *mod_name = "replace_this_file";
    status dstat = OKAY;
    UFCB_PTR ufcb = NULL;
    UFLS_PTR ufls = NULL;
    int indx;
    int rev;
    char *ptr;
    char *owner;
    char stat[80];
    if (project     == NULL) dstat = PUT_ERROR("project name is NULL");
```

```c
   if (path       == NULL) dstat = PUT_ERROR("path name is NULL");
   if (all_items == NULL) dstat = PUT_ERROR("all_items is NULL");
   if (dstat == OKAY) dstat = most_recent(all_items, num, &indx, &rev, stat);
   if (dstat == OKAY)
   {
       ufcb = all_items[indx];
       ufls = ufcb->ufls;
       dstat = ufls_get_field(ufls, "owner id", &owner);
       if (dstat == OKAY && owner == NULL) owner == "";
   }
   /* set up for add */
   ufls = NULL;
   ufcb = NULL;
   dstat = ufls_append_field(&ufls,  "fcn id",  "system");
   if (dstat == OKAY) dstat = ufls_append_field(&ufls,  KEYFIELD,  project);
   if (dstat == OKAY) dstat = ufls_append_field(&ufls, "ce type",  CE_TYPE);
   if (dstat == OKAY) dstat = ufls_append_field(&ufls, "owner id", userid);
   if (dstat == OKAY) dstat =
       ufls_append_field(&ufls, "location name", hostnode);
   if (dstat == OKAY) dstat =
       ufls_append_field(&ufls, "data class", DATACLASS);
   if (dstat == OKAY) dstat =
       ufls_append_field(&ufls, "file description", project);
   if (dstat == OKAY) dstat =
       ufls_append_field(&ufls, "foreground flag", "+");
   if (dstat == OKAY)
   {
       ptr = path + strlen(path) - 1;
       while (ptr > path)
       {
        if (*ptr == '/')
        {
           *ptr = (char) 0;
           break;
        }
        ptr--;
       }
       ptr++;
   }
   if (dstat == OKAY) dstat =
       ufls_append_field(&ufls, "from application file", ptr);
   if (dstat == OKAY) dstat = ufcb_build(ufls, "dummy", &ufcb);
   /* if we're not the owner, assign owner and replace it */
   if (dstat == OKAY && !strcmp(owner, ""))
   {
       if (dstat == OKAY)
           dstat = dci_exec_xx_trans(rtid, "", "S.LA.FO.AO.INIT", indx + 1,
ufcb);
       if (dstat == OKAY)
           dstat = dci_exec_xx_trans(rtid, "", "S.LA.EF.RF.INIT", indx + 1,
ufcb);
    }
   /* if we are the owner, just replace it */
   else if (dstat == OKAY && !strcmp(userid, owner))
   {
           dstat = dci_exec_xx_trans(rtid, "", "S.LA.EF.RF.INIT", indx + 1,
ufcb);
    }
   /* else checked out by someone else */
   else
       dstat = PUT_ERROR("file is already checked out");
   return OKAY;
}
status add_this_file(project, path)
char *project;
char *path;
```

```
{
    char *mod_name = "add_this_file";
    status dstat    = OKAY;
    UFCB_PTR ufcb = NULL;
    UFLS_PTR ufls = NULL;
    char *ptr;
    if (project == NULL) dstat = PUT_ERROR("project name is NULL");
    if (path    == NULL) dstat = PUT_ERROR("path name is NULL");
    if (dstat == OKAY) dstat = ufls_append_field(&ufls,  "fcn id",  "system");
    if (dstat == OKAY) dstat = ufls_append_field(&ufls,  KEYFIELD,  project);
    if (dstat == OKAY) dstat = ufls_append_field(&ufls, "ce type",  CE_TYPE);
    if (dstat == OKAY) dstat =
        ufls_append_field(&ufls, "location name",  hostnode);
    if (dstat == OKAY) dstat =
        ufls_append_field(&ufls, "data class",  DATACLASS);
    if (dstat == OKAY) dstat =
        ufls_append_field(&ufls, "file description",  project);
    if (dstat == OKAY) dstat =
        ufls_append_field(&ufls, "foreground flag",  "+");
    if (dstat == OKAY)
    {
        ptr = path + strlen(path) - 1;
        while (ptr > path)
        {
            if (*ptr == '/')
            {
                *ptr = (char) 0;
                break;
            }
            ptr--;
        }
        ptr++;
    }
    if (dstat == OKAY) dstat =
        ufls_append_field(&ufls, "from application file",  ptr);
    if (dstat == OKAY) dstat = ufcb_build(ufls, "dummy", &ufcb);
    if (dstat == OKAY)
    {
        dstat = dci_exec_ad_trans(rtid, "", "S.LA.EF.AF.INIT", ufcb);
        if (dstat != OKAY) PUT_ERROR("cannot transfer file into DMCS");
    }
    return OKAY;
}
logout_of_dmcs()
{
    char *mod_name = "logout_of_dmcs";
    status dstat = OKAY;
    if (init)
    {
        init  = FALSE;
        dstat = dci_logout(rcid);
    }
    return dstat;
}
status most_recent(all_items, num, a_indx, a_rev, stat)
UFCB_PTR *all_items;
int num;
int *a_indx;
int *a_rev;
char *stat;
{
    status dstat = OKAY;
    char *mod_name = "most_recent";
    UFLS_PTR ufls;
    int indx;
    char *val;
```

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```
        int max       = -1;
        int max_indx = 0;
        if (all_items == NULL) dstat = PUT_ERROR("all_items is NULL");
        if (num        ==     0) dstat = PUT_ERROR("num is zero");
        if (a_indx     == NULL) dstat = PUT_ERROR("a_indx is NULL");
        if (a_rev      == NULL) dstat = PUT_ERROR("a_rev is NULL");
        if (stat       == NULL) dstat = PUT_ERROR("a_stsat is NULL");
        for (indx = 0; dstat == OKAY && indx < num; indx++)
        {
            ufls = all_items[indx]->ufls;
            dstat = ufls_get_field(ufls, "item revision", &val);
            if (atoi(val) > max)
            {
                max       = atoi(val);
                max_indx = indx;
                dstat = ufls_get_field(ufls, "status", &val);
            }
        }
        if (dstat == OKAY) *a_indx = max_indx;
        if (dstat == OKAY) *a_rev  = max;
        if (dstat == OKAY) strcpy(stat, val);
        return dstat;
}
int get_most_recent_revision(project, path, msg)
char *project;
char *path;
char *msg;
{
        char *mod_name = "get_most_recent_revision";
        status dstat    = OKAY;
        UFCB_PTR *all_items  = NULL;
        int       num        = 0;
        int       indx       = 0;
        int       rev        = 0;
        char      *ptr       = NULL;
        char       stat[80];
        UFCB_PTR ufcb       = NULL;
        UFLS_PTR ufls       = NULL;
        UFLS_PTR this_ufls  = NULL;
        char revision[80];
        char appspace[512];
        char file[512];
        strcpy(message, "propci failure");
        if (project == NULL) dstat = PUT_ERROR("project name is NULL");
        if (path    == NULL) dstat = PUT_ERROR("path name is NULL");
        if (msg     == NULL) dstat = PUT_ERROR("msg is NULL");
        if (dstat == OKAY) dstat = read_items(project, &all_items, &num);
        if (dstat == OKAY) dstat = most_recent(all_items, num, &indx, &rev, stat);
        if (dstat == OKAY && strcmp(stat, "A"))
            dstat = PUT_ERROR("folder item status is not 'A' (accepted)");
        /* setup attributes for file transfer */
        if (dstat == OKAY) dstat = ufls_append_field(&ufls,  "fcn id",   "system");
        if (dstat == OKAY) dstat = ufls_append_field(&ufls,  KEYFIELD,   project);
        if (dstat == OKAY) dstat = ufls_append_field(&ufls, "ce type",   CE_TYPE);
        if (dstat == OKAY)
        {
            sprintf(revision, "%d", rev);
            dstat = ufls_append_field(&ufls, "item revision",  revision);
        }
        if (dstat == OKAY)
            dstat = ufls_append_field(&ufls, "file description", project);
        if (dstat == OKAY)
            dstat = ufls_append_field(&ufls, "appl space data class", DATACLASS);
        if (dstat == OKAY)
            dstat = ufls_append_field(&ufls, "access reason", ACCREASON);
        if (dstat == OKAY)
```

```c
        dstat = ufls_append_field(&ufls, "foreground flag", "+");
    /* parse out app space and file name from path */
    if (dstat == OKAY)
    {
        strcpy(appspace, path);
        for (ptr = appspace + strlen(appspace) - 1; ptr > appspace; ptr--)
        {
            if (*ptr == '/')
            {
                *ptr = (char) 0;
                strcpy(file, ptr+1);
                break;
            }
        }
    }
    if (dstat == OKAY)
        dstat = ufls_append_field(&ufls, "location name", hostnode);
    if (dstat == OKAY)
        dstat = ufls_append_field(&ufls, "to application file", file);
#if 1
    if (dstat == OKAY)
    {
        if (dstat == OKAY) dstat = ufcb_build(ufls, "dummy", &ufcb);
        if (dstat == OKAY)
            dstat = dci_exec_xx_trans(rtid, "", "S.LA.EF.CF.INIT", indx + 1,
ufcb);
        if (dstat != OKAY) PUT_ERROR("cannot check file out");
    }
#endif
    return stdexit(dstat, msg);
}
int get_dmcs_projects(a_list, a_num, msg)
char ***a_list;
int  *a_num;
char *msg;
{
    static char **list = NULL;
    static int   num    = 0;
    char *mod_name = "get_dmcs_projects";
    status dstat   = OKAY;
    UFLS_PTR ufls = NULL;
    UFCB_PTR ufcb = NULL;
    int      indx = 0;
    char     *val = NULL;
    strcpy(message, "propci failure");
    if (a_list == NULL) dstat = PUT_ERROR("a_list is NULL");
    if (a_num  == NULL) dstat = PUT_ERROR("a_num is NULL");
    if (msg    == NULL) dstat = PUT_ERROR("a_msg is NULL");
    if (dstat == OKAY && num > 0)
    {
        for (indx = 0; indx < num; indx++)
            /* free((void *) list[indx]) */;
        /* free(list) */;
    }
    list = NULL;
    if (dstat == OKAY) dstat = ufls_append_field(&ufls, "fcn id", "system");
    if (dstat == OKAY) dstat = ufls_append_field(&ufls, "ce type", CE_TYPE);
    if (dstat == OKAY) dstat = ufcb_build(ufls, "dummy", &ufcb);
    if (dstat == OKAY)
    {
        dstat = dci_exec_cl_trans(rtid, "", "S.LA.QY.INIT", ufcb);
        if (dstat != OKAY) PUT_ERROR("cannot query labels");
    }
    if (dstat == OKAY) dstat = dci_cltn_get_size(rtid, &num);
    if (dstat == OKAY && num > 0)
    {
```

```
            list = (char **) malloc(sizeof(char *) * num);
            for (indx = 0; dstat == OKAY && indx < num; indx++)
            {
                ufcb = NULL;
                dstat = dci_exec_cltn_fetch(rtid, indx + 1, &ufcb);
                if (dstat == OKAY) dstat = ufls_get_field(ufcb->ufls, KEYFIELD,
&val);
                if (dstat == OKAY) list[indx] = (char *) strdup(val);
            }
        }
        if (dstat == OKAY) *a_num  = num;
        if (dstat == OKAY) *a_list = list;
        return stdexit(dstat, msg);
    }
/* check in */
#if 0
main(argc, argv)
int argc;
char *argv[];
{
    char message[80];
    int rt;
    int sw;
    rt = login_to_dmcs(argc, argv, "SUPER_USER", "SDRC", message);
    /* verify with user */
    rt = project_isin_dmcs("MAST_FIRESET", message, &sw);
    if (sw == TRUE)
        ;
    rt = add_file_to_folder("MAST_FIRESET", "usr1/dmcs/cd", message);
    logout_of_dmcs();
}
#endif
/* get list of dmcs projects */
#if 0
main(argc, argv)
int argc;
char *argv[];
{
    char message[80];
    int rt;
    char **list;
    int num;
    int indx;
    rt = login_to_dmcs(argc, argv, "SUPER_USER", "SDRC", message);
    rt = get_dmcs_projects(&list, &num, message);
    for (indx = 0; rt = TRUE && indx < num; indx++)
        printf("<%s>\n", list[indx]);
    logout_of_dmcs();
}
#endif
/* check out */
#if 0
main(argc, argv)
int argc;
char *argv[];
{
    char message[80];
    int rt;
    int sw;
    rt = login_to_dmcs(argc, argv, "SUPER_USER", "SDRC", message);
    /* verify with user */
    rt = project_isin_dmcs("MAST_FIRESET", message, &sw);
    if (sw == FALSE)
        printf("cannot find project\n");
    rt = get_most_recent_revision("MAST_FIRESET",
                    "usr1/dmcs/WorkSpace/test2", message);
```

```c
    logout_of_dmcs();
}
#endif
/* dummy login */
#if 0
main()
{
    int argc;
    char **argv;
    char message[80];
    int rt;
    argc = 1;
    argv = (char **) malloc(sizeof (char *) * 4);
    argv[0] = "propci";
    argv[1] = NULL;
    rt = login_to_dmcs(argc, argv, "super_user", "SDRC", message);
    logout_of_dmcs();
}
#endif
/* END PROPI.C */


/* BEGIN UDCM_MNU.C */

/*-------------------------------------------------------------------*\
File:              udcm_mnu.c
                   Contains functions for interface between
                   Pro/PROJECT and DMCS at Sandia National Labs
                   Albuquerque New Mexico

                   Modified by Richard Robison, 2815 and
                   Jerry Riugierri of PTC from original example
                   code provided by PTC for DCM interface

           Modified to remove host name from proj_name
           for version 10 of Pro/E, will be compatible
           with older versions. Judd Herman 3/10/93

           Modified to change proj_name to lower case.
           Judd Herman 3/10/93

           Modified import function to create new directories
           Judd Herman 6/8/93

\*-------------------------------------------------------------------*/

#include <stdio.h>
#include <malloc.h>
#include <unistd.h>
#include <sys/types.h>
#include <string.h>
#include "user_wchar_t.h"          /* wchar_t defs */
#include "pro_project.h"           /* For Pro/PROJECT options */
/*-------------------------------------------------------------------*\
| File:              udcm_mnu.c                                       |
| Function:          user_dcm_menu                                    |
| Purpose:           Bind meta functions to Pro/E actions             |
\*-------------------------------------------------------------------*/
user_dcm_menu()
{
char target[80], source[80], fname[80], full_name[80], tstring[180];
/* Declare external functions */
extern int user_dcm_to_pro_objects();
extern int user_dcm_to_pro_attributes();
extern int user_dcm_from_pro();
/*  Bind these meta functions  */
```

```
prodev_bind("dcm_to_pro_objects", user_dcm_to_pro_objects);
prodev_bind("dcm_to_pro_attributes", user_dcm_to_pro_attributes);
prodev_bind("dcm_from_pro", user_dcm_from_pro);
}
extern char *getenv();
/*-------------------------------------------------------------*\
 | File:          udcm_mnu.c                                     |
 | Function:      user_dcm_to_pro_objects                        |
 | Purpose:       Import from the DCM to the Pro/E workspace     |
\*-------------------------------------------------------------*/
user_dcm_to_pro_objects(w_target)
wchar_t w_target[];
{  /*  Start of Function  */
wchar_t w_source[80], w_file[80];
int ierr;
char dmcs_path[80], proj_name[80];
char *p, target[80], output[420], errmsg[120];
int i, argc;            /*  Substitute for command line args  */
char **argv;
char **list;
char message[80], tfile[80], fpath[80], tdir1[40], newdir[40];
int num, rt, indx;
int irt, isw;
static int count = 0;
/*  Command line arguments  */
argc = 1;
argv = (char **) malloc(sizeof (char *) * 5);
argv[0] = "prodms1";
argv[1] = NULL;
/*  Establish connection to DMCS  */
if (!user_connect_to_dmcs(argc, argv, errmsg))
                                    return(0);
/*  Pro/E identifies the target  (CWD)  directory  */
pro_wstr_to_str(target, w_target);
/*  Get the DMCS Project List  */
if (!get_dmcs_projects(&list, &num, message))  {
   promsg_print(MSGFIL, "USER %0s", "Cannot get project list");
   printf("Cannot get project list\n");
   return(0);
}
/*  DMCS Path Dir  */
if ( (p = getenv("DMCS_PATH") ) != NULL)
   strcpy(dmcs_path, p );
else  {
   promsg_print(MSGFIL, "USER %0s",
                "DMCS_PATH environment variable must be set");
   return(0);
}
/*  List of Projects from DMCS  */
if (!user_string_menu(num, list, proj_name))  {
   promsg_print(MSGFIL, "USER %0s", "No projects were selected");
   return(0);
}
else  {
   sprintf(output, "Project selection: %s", proj_name);
   promsg_print(MSGFIL, "USER %0s", output);
   printf("%s\n", output);
}
/*  Define a unique directory to expand dmcs tar file  */
sprintf(tfile, "%s.%d%d", proj_name,getpid(), count++);
sprintf(fpath,"%s/%s", dmcs_path,tfile);
/*  Check to ensure the directory doesn't already exist  */
/*  If it does, make new directory name  */
 if ( !access(proj_name, F_OK))
 {
    sprintf(output, "Warning: Project directory %s already exists",
```
-133-

```c
            proj_name);
   sprintf(newdir,"%s%d",proj_name,++count);
   while ( !access(newdir, F_OK))
       sprintf(newdir,"%s%d",proj_name,++count);
   promsg_print(MSGFIL, "USER %0s", output);
}
/*  Get the tarfile from DMCS  */
irt = project_isin_dmcs(proj_name, message, &isw);
if (!isw)  {
   promsg_print(MSGFIL, "USER %0s",
                "Project doesn't exist");
   return(0);
}
if (!get_most_recent_revision(proj_name, fpath, errmsg))  {
   promsg_print(MSGFIL, "USER %0s",
                "No projects obtained from DMCS");
   printf("No projects obtained from DMCS\n");
   return(0);
}
/*  Make temporary directories  */
sprintf(tdir1,"%s%d%d",  "tmpdir", getpid(), count);
/* Create temporary directory to place extract tar file into  */
sprintf(output,
   "mkdir %s; chmod 777 %s; cd %s; tar xf %s; cd ..;",
   tdir1, tdir1, tdir1, fpath );
system(output);
/* Create newdir and move extract files in tdir1 to newdir */
sprintf(output,
   "mkdir %s; chmod 777 %s; cd %s/%s; mv * ../../%s; cd ../../; rm -r %s;",
   newdir, newdir, tdir1, proj_name, newdir, tdir1);
system(output);
/*  Report back to the user  */
sprintf(output, "Project successfully retrieved to %s", newdir);
promsg_print(MSGFIL, "USER %0s", output);
return(1);
}  /*  End of Function  */
/*-------------------------------------------------------------------*\
| File:          udcm_mnu.c                                           |
| Function:      user_dcm_to_pro_attributes                           |
| Purpose:       Take attrs from the DCM into Pro/E                   |
\*-------------------------------------------------------------------*/
int    user_dcm_to_pro_attributes(project_name,     object_name,     out_attrs,
num_attrs)
wchar_t project_name[];      /* input, supplied by Pro/ENGINEER */
wchar_t object_name[];       /* input, supplied by Pro/ENGINEER */
Obj_attr **out_attrs;        /* output, returned from DCM */
int     *num_attrs;          /* output, returned from DCM */
{
FILE *fp;
char output[420];
char obj_name[90], attr_name[40], attr_val[40];
int status, i, maxi;
char fname[90], pname[80], oname[80];
wchar_t w_file[40], w_name[40], w_value[40];
Obj_attr set_attr;
/*  This function not implemented for IMDI  */
sprintf(output, "This option is not available for IMDI");
promsg_print(MSGFIL, "USER %0s", output);
        return(1);
}
extern char *getenv();
/*-------------------------------------------------------------------*\
| File:          udcm_mnu.c                                           |
| Function:      user_dcm_from_pro                                    |
| Purpose:       Export an object from Pro/E to the DCM               |
\*-------------------------------------------------------------------*/
```

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```
int user_dcm_from_pro(w_proj_name, object_name, deps, ndeps)
wchar_t w_proj_name[];
wchar_t object_name[];
Proj_dep *deps;
int ndeps;
{
FILE *fp;
Obj_attr *get_attr;
char fname[80], proj_name[80], oname[80], prev_depend[80], sname[80],*b;
char dependent[80], dependee[80], dep_type[80], source[80];
char attr_name[80], attr_value[80], full_name[180], tstring[256];
int idep, iattr, nattr, nbls;
wchar_t w_proj_host[180], w_base_path[180];
wchar_t proj_host[180], base_path[180], w_source[80];
wchar_t w_obj_path[280];
char obj_path[280];
int direct;
char *loc;
/*   Variables for DMCS Purposes   */
char dmcs_path[80];
char *p, ans[40], target[40], output[120], errmsg[120];
/*   Substitute for command line args   */
int i, argc;
char **argv;
/*   Ask whether to export object or project   */
promsg_print(MSGFIL,
             "USER Export the object or project <project>: ");
if (promsg_getstring(wstr1, 40))   strcpy(ans, "p");
else
    pro_wstr_to_str(ans, wstr1);
/*   Get Project name   */
pro_wstr_to_str(proj_name, w_proj_name);
user_string_to_lower(proj_name,proj_name);
/*Remove host name from proj_name */
loc = strchr(proj_name,':');
if (loc != NULL)
      strcpy(proj_name, loc + 1);
/*   Object or Project   */
switch(ans[0])   {
/*   Object option   */
case 'O':   case 'o':
/*   This function not implemented for IMDI   */
sprintf(output, "This option is not available for IMDI");
promsg_print(MSGFIL, "USER %0s", output);
    break;
    /*   Object name   */
    pro_wstr_to_str(oname, object_name);
    user_string_to_lower(oname,oname);
    printf("object_name: %s  \n", oname);
    /*   Strip the version number   */
    user_strip_vsn_number (oname, sname);
    /*   Write the file here   */
    if ( (b = strchr(sname,'.')) != 0) strncpy(fname, sname, strlen(b));
    else        strcpy(fname, sname);
    strcat(fname, ".txt");
    printf("fname = %s\n", fname);
    fp = fopen(fname, "w");
    if (fp == 0)   {
        promsg_print(MSGFIL,"USER Could not open file %0s", fname);
        return(0);
    }
    /*   Write out project heading info   */
    printf("Project: %s\n", proj_name);
    fprintf(fp, "\nProject: %s\n", proj_name);
    proj_get_project_path(w_proj_name, w_proj_host, w_base_path, &direct);
    pro_wstr_to_str(proj_host, w_proj_host);
```

```
    pro_wstr_to_str(base_path, w_base_path);
    printf("    %s:%s/%s\n", proj_host, base_path, oname);
    fprintf(fp, "    %s:%s/%s", proj_host, base_path, oname);
    /*  Dependency list  */
    if ( ndeps > 0 )  {
        fprintf(fp,"\n\n");
        fprintf(fp,"        dependent                                    dependee\
dep type\n");
        fprintf(fp,"        ---------                                    --------
--------\n");
        for(idep=0; idep<ndeps; idep++ )  {
            pro_wstr_to_str(dependent,deps[idep].dependent.object_name);
            pro_wstr_to_str(dependee,  deps[idep].dependee.file_name);
            fprintf(fp, "      %-30s %-30s %-30s\n",
                    dependent, dependee, deps[idep].dep_type);
            /*  Now obtain the path of each dependee  */
            proj_get_object_path(w_proj_name, deps[idep].dependee.file_name,
                                 0, 0, w_obj_path);
            pro_wstr_to_str(obj_path, w_obj_path);
            printf("dependee = %s\n", obj_path);
        }  /* end of for */
    }  /* end of if */
    /*  Strip the version number  */
    pro_wstr_to_str(oname, object_name);
    user_strip_vsn_number (oname, sname);
    pro_str_to_wstr(object_name,sname);
    /*  Get the objects attributes   */
    nattr = proj_get_object_attributes(w_proj_name, object_name,
                                       0, 0, &get_attr);
    /*  Attribute list  */
    if ( nattr > 0  )  {
        fprintf(fp,"\n");
        fprintf(fp,"      attr_name                       value\n");
        fprintf(fp,"      ---------                       -----\n");
        for(iattr=0; iattr<nattr; iattr++)  {
            pro_wstr_to_str(attr_name, get_attr[iattr].name);
            pro_wstr_to_str(attr_value, get_attr[iattr].value.val);
            fprintf(fp, "      %-32s %-30s\n", attr_name, attr_value);
        }  /* end of for */
    }  /* end of if */
    fclose(fp);
    /*  Now show the file  */
    pro_show_file(pro_str_to_wstr(wstr1,fname));
    /*  Ask where the file is being exported to  */
    promsg_print(MSGFIL,"USER Enter the source directory: ");
    if (promsg_getstring(w_source,80))    return(0);
    pro_wstr_to_str(source,w_source);
    /*  Build the command string  */
    user_string_to_lower(oname,oname);
    sprintf(full_name,"%s/%s", base_path, oname);
    sprintf(tstring,"rcp %s:%s %s", proj_host, full_name, source);
    /*  Report back to the user  */
    if (!system(tstring))
        promsg_print(MSGFIL,"USER Object successfuly copied %0s DCM: ", "to");
    else
        promsg_print(MSGFIL,"USER Could not open file %0s", full_name);
    break;
/*  Project option  */
case 'P':  case 'p':
default :
    /*  Command line arguments for DMCS calls  */
    argc = 1;
    argv = (char **) malloc(sizeof (char *) * 4);
    argv[0] = "propci";
    argv[1] = NULL;
    /*  DMCS Path Dir  */
```

```c
    if ( (p = getenv("DMCS_PATH") ) != NULL)
        strcpy(dmcs_path, p );
    else  {
        promsg_print(MSGFIL, "USER %0s",
                        "DMCS_PATH environment variable must be set");
        break;
    }
    /*  Obtain the base_path of the project file  */
    proj_get_project_path(w_proj_name, w_proj_host, w_base_path, &direct);
    pro_wstr_to_str(proj_host, w_proj_host);
    pro_wstr_to_str(base_path, w_base_path);
    /*  Change the mode of the Pro/PROJECT directories so they can be copied */
/*  sprintf(output, "find %s -type d -exec chmod 777 {} \\;",  base_path); */
    sprintf(output, "find %s -exec chmod 777 {} \\;",  base_path);
    system(output);
    /*  Develop the system tar command  */
    sprintf(target, "%s/%s.tar.%d", dmcs_path, proj_name, getpid());
    sprintf(output, "cd %s/..; tar cf %s %s",
            base_path, target, proj_name );
    system(output);
    /*  Establish connection to DMCS  */
    if (!user_connect_to_dmcs(argc, argv, errmsg))
                                            break;
    else  {
        promsg_print(MSGFIL, "USER %0s","Successful login to DMCS");
        printf("Successful login to DMCS\n");
    }
    /*  Interface to dmcs program for export  */
    if (!user_interface_to_dmcs(proj_name, target, errmsg))
                                            break;
    break;
}  /*  End of switch statement */
return(1);
}
/*-----------------------------------------------------------------*\
| File:          udcm_mnu.c                                         |
| Function:      user_dcm_call_dcm_program                          |
| Purpose:       Interface to dmcs program for export       |
\*-----------------------------------------------------------------*/
int user_interface_to_dmcs(proj_name, target, message)
char proj_name[], target[], message[];
{
        char output[120];
        int irt, isw;
                    /*  Verify Project Name  */
        sprintf(output, "Project name <%s> ", proj_name);
        promsg_print(MSGFIL,"USER %0s", output);
            /* Create a new folder iff needed */
        irt = project_isin_dmcs(proj_name, message, &isw);
        if (!isw)
            {
            promsg_print(MSGFIL, "USER %0s",
                "A new project has been created");
            }
/*      else
            {
            promsg_print(MSGFIL, "USER %0s",
                "Project already exists in dmcs");
            printf("Project already exists in dmcs\n");
                    return(0);
            } */
            /*  Okay to add the file to the folder  */
        if(!add_file_to_folder(proj_name, target, message))
            {
                    printf("%s\n", message);
                    promsg_print(MSGFIL, "USER %0s", message);
```

```
                                return(0);
                }
        else
            {
                promsg_print(MSGFIL,  "USER %0s",
                        "Successfully added to folder");
                printf("Successfully added to folder\n");
            }
                /*  All is okay  */
        return(1);
}
/*------------------------------------------------------------*\
 | File:          udcm_mnu.c                                  |
 | Function:      user_connect_to_dmcs                        |
 | Purpose:       Login/Logout of dmcs iff necessary          |
\*------------------------------------------------------------*/
int user_connect_to_dmcs(argc, argv, errmsg)
int argc;
char *argv[], errmsg[];
{
        int i, irt;
        static int login = 0;    /*  Check for login to dmcs  */
        char user_name[40], password[40];
        switch(argc)
            {
        case 0:                       /*  Logout of dmcs iff necessary  */
            if(login)
                {
                    logout_of_dmcs();
                    printf("Logged out of DMCS\n");
                }
            break;
        case 1:                       /*  Login to dmcs iff necessary  */
        default:             /*  Login to dmcs iff necessary  */
            if(!login)
                {
                    /*  Ask for User  */
                promsg_print(MSGFIL,"USER %0s", "Enter DMCS user name: ");
                if (promsg_getstring(wstr1, 40))  return(0);
                pro_wstr_to_str(user_name, wstr1);
                    /*  Ask for Passwd */
                promsg_print(MSGFIL,"USER %0s", "Enter DMCS password: ");
                if (promsg_getstring(wstr1, 40))  return(0);
                pro_wstr_to_str(password, wstr1);
                    /*  Now login to DMCS  */
                if(!login_to_dmcs(argc, argv, user_name, password, errmsg))
                    {
                        printf("%s  %s\n", user_name, password);
                        i = 0;
                        while( argv[i] != NULL)
                        {
                                printf("argv[%d] = %s\n", i, argv[i]);
                                i++;
                        }
                        promsg_print(MSGFIL,  "USER %0s", errmsg);
                        return(0);
                    }
                else  login = 1;
                }
            break;
            }
            /*  All is okay  */
            return(1);
}
/*------------------------------------------------------------*\
 | File:          udcm_mnu.c                                  |
                                -138-
```

```
|  Function:      user_dcm_call_dcm_program                              |
|  Purpose:       Invoke a call to the DCM program                       |
\*--------------------------------------------------------------------*/
int user_dcm_call_dcm_program()
{
        printf("Invoke a call to the DCM program\n");
}
/*--------------------------------------------------------------------*\
|  File:     udcm_mnu.c                                                   |
|  Function:        user_strip_vsn_number                                 |
|  Purpose:  Strip the version number from the name                       |
\*--------------------------------------------------------------------*/
int user_strip_vsn_number (string1, stripped)
char string1[];
char stripped[];
{
      int length, lena, lenb, ver;
      char  *b, tbuff[40];
/*    printf("user_strip_vsn_number: string1: %s\n", string1);  */
      length = strlen(string1);
      b = strrchr(string1,'.');
      if(b != 0)    lenb = strlen(b);
      lena = length - lenb;
      strcpy(tbuff, &string1[lena+1]);
      ver = atoi(tbuff);
      if(ver > 0)
         {
            strncpy(stripped, string1, length-lenb);
            stripped[length-lenb] = '\0';
         }
         else
         {
            strcpy(stripped, string1);
         }
/*    printf("user_strip_vsn_number: stripped: %s\n", stripped);  */
      return(lena);
}
/* END UDCM_MNU.C*/
```

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IX. Tape Exchange Methods for SGI and Sun Systems Using 4mm DAT

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Tape Exchange Methods for SGI and Sun Systems using 4mm DAT

Greg L. Neugebauer, 2604

A report prepared for the IMDI/ IEIT Project

This report documents the procedures needed to write data to electronic media as a method of transferring information between workstations on separate networks. The IMDI/IEIT project has settled on 4mm Digital Audio Tape (DAT) as the technology best suited to accomplish this task. 4 mm tapes hold over 1.3giga-bytes of information. This capacity is normally enough for an entire system disk with user files. Because of their small size, handling or mailing the cartridges is further simplified. Since the tar formats are not completely compatible between SGI and Sun systems, byte swapping of the tape will be the responsibility of the recipient.

Tape Unit Installation and Preparation - Sun Systems

The Artecon tape systems supplied by the IEIT project have been previously configured to disable compression. Sun OS supports a version of DCLZ compression algorithms that writes data to tape which is unreadable by SGI IRIX. The first two switches on the bottom of the tape unit have been set to the 'off' position to disable compression. The enclosure and internal mounting brackets must be removed to modify these settings.

SCSI cables, terminators, and power cords are included in the kits. The SCSI device plugs into the buss as any other peripheral. Either of the ports can be used for the import or export function. The device reference has been set to '4'. Remember that no two devices may share the reference. This value can be increased or decreased using the panel on the back of the unit.

To install the tape unit, power down the system and connect the SCSI cable to the appropriate ports. If no external devices are present, simply connect one end to the worksta-tion port and the opposite to the tape unit. Systems with peripherals merely daisy chain

the unit into the SCSI buss. Be sure that the buss is properly terminated using the connector supplied or in the case of multiple peripherals, somewhere else on the buss.

Always power the peripherals on before rebooting the system to insure that the workstation recognizes the devices during startup.

During startup the system should display a message that a tape unit (st1) has been located.

Writing Files to Tape - Sun

The UNIX 'tar' command is recommended for writing information to tape that will be read by another system.

Insert the cartridge into the unit as indicated by the arrow. The unit will accept the cartridge mechanically and emit a series of green flashing signals on the front panel.

DO NOT ATTEMPT TO WRITE TO THE TAPE UNTIL THE CARTRIDGE HAS BEEN PROPERLY MOUNTED BY THE SYSTEM.

Failure to comply will result in a tar IO error.

The cartridge is ready for reading or writing when the lights on the front panel are steady green.

Several examples of the tar command follow. Note that a blocking factor is used to insure that the media is readable at the target system.

To write a single file to tape:

EXAMPLE: %tar cvfb /dev/rst1 1 filename

Where 'filename' is the name of the file to be written. In the above example we assume that the user has set his default to the directory containing the file. Full pathnames can also be used although they should be avoided in most case to simplify the reading of the tape. This example indicates that the system should display files as they are written to tape and to build the archive on /dev/rst1 with a blocking factor of 1. Other blocking factors can be used but must be noted on a written label included with the tape.

EXAMPLE: %tar cvfb /dev/rst1 1 directory_name

Where 'directory_name' is the name of the directory to be written along with any files below it.

Reading Files from Tape - Sun

Methods for reading tapes are similar to the write methods described above.

Insert the cartridge into the unit with the arrow pointing inward. The unit will accept the cartridge mechanically and emit a series of green flashing signals on the front panel.

DO NOT ATTEMPT TO READ TO THE TAPE UNTIL THE CARTRIDGE HAS BEEN PROPERLY MOUNTED BY THE SYSTEM.

Failure to comply will result in a tar IO error.

The cartridge is ready for reading or writing when the lights on the front panel are steady green.

Several examples of the tar command follow. Note that a blocking factor is specified based on the methods used to generate the tape.

EXAMPLE: %tar xvfb /dev/rst1 1   for reading Sun tapes

EXAMPLE: %tar xvfb /dev/rst1ns 1   for reading SGI tapes

In the above examples we assume that the user has set his default to the directory where the output should be written and desires to extract all files from tape. Directory structures will be preserved as necessary beginning at the current working directory. This example indicates that the system should display files as they are written to disk and to extract the archive on /dev/rst1 with a blocking factor of 1. Specify other blocking factors based on tape labeling.

EXAMPLE: %tar xvfb /dev/rst1 1 filename   for reading Sun tapes

EXAMPLE: %tar xvfb /dev/rst1ns 1 filename   for reading SGI tapes

Where 'filename' is the name of the file to extract to the current working directory.

Writing Files to Tape - SGI

As previously stated the UNIX 'tar' command is recommended for writing information to tape that will be read by another system.

Insert the cartridge into the unit with the arrow pointing inward. The unit will accept the cartridge mechanically and emit a green and amber signal on the front panel.

The cartridge is ready for reading or writing when the light on the front panel is steady green.

Several examples of the tar command follow. Note that a blocking factor is used to insure that the media is readable at the target system.

To write a single file to tape:

EXAMPLE: %tar cvfb /dev/mt/tps0d# 1 filename

Note: a number of 1-7 should be substituted for the # in the above example correspond-
ing to the slot the internal DAT unit is in (2 or 3) or the external reference.

Where 'filename' is the name of the file to be written. In the above example we assume
that the user has set his default to the directory containing the file. Full pathnames can
also be used although they should be avoided in most case to simplify the reading of the
tape. This example indicates that the system should display files as they are written to
tape and to build the archive on /dev/rst1 with a blocking factor of 1. Other blocking
factors can be used but must be noted on a written label included with the tape.

EXAMPLE: %tar cvfb /dev/mt/tps0d# 1 directory_name

Where 'directory_name' is the name of the directory to be written along with any files
below it.

Reading Files from Tape - SGI

Methods for reading tapes are similar to the write methods described above.

Insert the cartridge into the unit as indicated by the arrow. The unit will accept the car-
tridge mechanically and emit a green and amber signal on the front panel.

The cartridge is ready for reading or writing when the light on the front panel is steady
green.

Several examples of the tar command follow. Note that a blocking factor is specified
based on the methods used to generate the tape.

EXAMPLE: %tar xvfb /dev/mt/tps0d# 1   for reading SGI tapes

EXAMPLE: %tar xvfb /dev/mt/tps0d#ns 1   for reading Sun tapes

Note: a number of 1-7 should be substituted for the # in the above example correspond-
ing to the slot the internal DAT unit is in (2 or 3) or the external reference.

In the above examples we assume that the user has set his default to the directory where
the output should be written and desires to extract all files from tape. Directory struc-
tures will be preserved as necessary begining at the current working directory. This
example indicates that the system should display files as they are written to disk and to
extract the archive on /dev/mt/tps0d3 with a blocking factor of 1. Specify other blocking
factors based on tape labeling.

EXAMPLE: %tar xvfb /dev/mt/tps0d# 1filename   for reading SGI tapes

EXAMPLE: %tar xvfb /dev/mt/tps0d#ns 1 filename   for reading Sun tapes

Where 'filename' is the name of the file to extract to the current working directory.

X. Statement of Work for the Agile Manufacturing Demonstration

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Statement of Work for the Agile Manufacturing Demonstration

Prepared by the IEIT Project - June 16, 1993

For Gary Randall, 2645

This report responds to your request to provide engineering workstations, application software and technical support for the design team of a concurrent engineering environment needed for the discriminator mechanism agile manufacturing demonstration. This support plan addresses the elements of initial setup and ongoing support.

1.0 Workstation

One engineering workstation will be provided complete with Pro/ENGINEER software for design of the discriminator mechanism. The Indigo2 workstation with the R4400 processor, 1 Gb disk drive, 32Mb of memory and 19 inch color monitor will enable your project with the necessary compute and graphics engine required by the application software. The net price of and Indigo2 with Extreme Graphics is $21,550. The upgrade from a R4000 to R4400 processor requires an additional $4,371. Under the terms quoted, our responsibility is to purchase the workstation, configure the system and partition the disk to accommodate your applications.

In the event that capital funding is unavailable, an option to lease a R4000 Indigo workstation with XZ24Z graphics exists. A one year lease agreement of $14,000 in expense dollars will also include a 1.2Gb disk. 19 inch monitor and 32Mb of memory.

The selected site to deploy this workstation will be inspected to insure that adequate power, air conditioning, and safety guidelines are met. You will be advised to any non-conformances with ES&H policies.

2.0 Application Software

The latest version of Pro/ENGINEER application software and the associated on-line documentation will be installed on your workstation. We suggest the 'design' package at a cost of $10,000. Operability of the software and interfaces to supported plotters will be verified.

Z-Mail software will also be procured, installed and licensed on your workstation to provide a graphical user interface to UNIX SMTP mail. We will assist in the building of aliases and distribution lists.

Shell utilities, and desktop accessories developed for IMD1 customers will be shared with your project.

3.0 Network Interconnections

Network configuration, interfaces and participation on our IMDI LAN will be provided. The IMDI LAN is located on the Internal Restricted Network and enables information exchange with a growing number of organizations at the Laboratory. Organizations 2483, 2800, and Allied Signal KCD are reachable from this LAN.

We anticipate completion of all communication requests in FY93. Connectivity to the Internet will also be provided. File transfer to the External Open Network is conducted thru 'telnet' and 'ftp' sessions with a host computer on the open side of the Sandia computing diode.

It is recognized that this plan supports the design team of the agile manufacturing demonstration. In a larger sense, there are many additional agile team members that require network capabilities. Potential members are not limited to those listed in 6.3.8. Addition of these people to the support agreement will be negotiated at a later date.

4.0 Technical Support

The IEIT staff is experienced with network management and are capable of troubleshooting or extending connectivity to other nodes located on the Internal Restricted Network. In addition, recent developments by our team to utilize commercial phone lines will enable communications with industrial partners.

Your workstation will be interfaced to plotters, printers and hardcopy devices existing on our network. Our staff will serve as a consultant for procurement of additional devices.

Your workstation will be covered under the IEIT computer security protection plan. The operating system and application revisions will remain consistent with other nodes on the IMDI network to insure compatibility with application software. Every released version of the operating system will not be installed unless required by the application software.

Vendor hardware, software, and application maintenance fees are not included in the quote. We will assume administrative responsibility for these and amend our contracts to include your workstation. An annual fee will be required to recover the costs associated with your workstation. IEIT will bear these costs if the workstation lease option is selected.

5.0 Schedule

Upon authorization, our group is positioned to immediately build a purchase requisition and order the necessary line items. The workstation will be operational one week after delivery to Sandia. Network connectivity to requested LANS will be accomplished within two weeks of delivery. During this initial start-up phase our staff will be available to diagnose and remedy problems at your workstation or at the participating site(s) where you require communications.

6.0 Summary

The prices quoted include services provided for one full year from your authorization date. These figures include hardware procurement and network administration and troubleshooting costs.

6.1 Workstation

Select one

R4400 Indigo2 .... $25,921

* *R4000 Indigo2 $21,550*

R4000 Indigo Lease Option $14,000

Staging $2,000

6.2 Applications

Software Procurement $10,000

Installation $1,000

6.3 Network Interfaces

The following connection fees are a one-time charge to cover the cost of computer and networking hardware necessary to extend connectivity to your customers. In some cases the higher costs reflect custom wiring and contracted building modifications. Services may include but are not limited to: PC mail, UNIX mail, remote login sessions, Pro/Project - Pro/PDM, simple file transfer, and plotting.

6.3.1 Dept. 1561

Mike Nielsen/ IRN /Network e-mail, Pro/E......$4,000

6.3.2 Dept. 2481

Ron Ward/ IMDI Restricted/UNIX, e-mail, Pro/E

....$3,000

6.3.3 Dept. 2483

Terry Smith/ IMDI Restricted/UNIX, e-mail Pro/E

....$3,000

6.3.4 Organization 2643

Ken Eras/ IMDI Restricted/ UNIX, e-mail $10,000

6.3.5 Organization 2645

Gary Randall/ IMDI Restricted/ UNIX e-mail,

Pro/E...$3,000

6.3.6 Dept. 2850

Name/ACCORD Black/UNIX e-mail, Pro/E... $3,000

6.3.7 Dept. 2863

Rodema Ashby/859/e-mail access.....................$3,000

6.3.8 Low Priority (To be negotiated)

Bob Bryan/D811 AS-KCD/MDMA/email,Pro/E

Gerry McCarty/ 878/ UNIX ftp of Pro/E

Brian Pardo / 878 / UNIX ftp of Pro/E

David Strip / 1621EON/ e-mail

Bob Easterling / 880 / e-mail

TBD by B. Easterling / e-mail

Steve Kaufman / 1621 EON / e-mail

Pablo Garcia / 1671/ e-mail

Cliff Loucks / 1611 / e-mail

Ron Jones / 1621 / e-mail

Bob Woods / 1672 / e-mail

Bill Burd / 2483 / e-mail, Pro/E

Arlo Ames / 2861 / e-mail, Pro/E

6.4 Technical Support

One year service agreement...........................$25,000

6.5 TOTAL

IEIT support contract.....................................$57,000

Transfer for software expense........................$10,000

Transfer for capital procurement....................$21,550

7.0 Project Review

In order to measure progress and monitor milestone completion a series of bi monthly project reviews will be held in 807/2055 from 11:00 until 11:30 on the following dates

August 24, October 26, December 14, 1993

February 22, and April 26, 1994

8.0 Approvals

Rick Harris, IEIT Project Manager

....

Gary Randall, Engineering Design Lead - Agile Manufac-
turing Demonstration

....

Dave Strip, Manager - Intelligent Systems Principals
Department

....

Appendices

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Appendix A: MEMOS and NOTE SHEETS

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IMDI Computer User Security Policy

This policy represents compliance to the 1932 Computer Security Requirements. It pertains to all computers used on IMDI projects that are connected to the IMDI networks. Violation of this policy may result in reduction of computer privileges and possibly a security infraction.

POLICY

- No classified or sensitive data can be transmitted on IMDI networks or stored on computers connected to IMDI networks. While computers are processing these types of data they <u>can not</u> be connected to the IMDI networks. If you do classified or sensitive processing on your computer you are required to have security plan filed with Organization 1932. When your computer is processing classified or sensitive information, that computer may not be logged on to the IMDI network. To avoid this, we have installed our network drivers only on your non-classified removable media. These drivers and associated files must not be copied to the classified or sensitive media under any circumstances. In addition, you should physically disconnect your network connection. This is accomplished by unplugging the jack from the PBX drop on the wall.

-All passwords are private information and must not be shared or compromised. If your password is compromised contact the Hotline and you will be issued a new password.

-The secure-side passwords (IMDI Red) are private information. They can be locked in your desk. Secure-side passwords cannot be included in any file or software setup on any other computer (i.e., autologin procedures). UNIX passwords must be a minimum of seven characters (non dictionary word) including one special character i.e. !/#. These passwords should be updated every six months.

-Computers connected to the IMDI networks can not be connected to other networks via communications devices. All internetwork communications is controlled and monitored through the IMDI computer center.

-All node names, Internet Addresses, and Numeric User IDs and Group IDs must be unique and are assigned by IMDI network administrator in accordance with Sandia procedures. These values must <u>not</u> be modified by users.

-All software used should be owned for the computer on which it is used. License contracts and manuals verifying ownership are the responsibility of the users. To avoid viruses, public domain software is discouraged on all personal computers.

-Before moving any equipment that connects to the IMDI Network, please notify the IMDI Hotline.

-When you leave your terminal, you should log off or activate a screen lock utility for short absences.

If you have any questions please contact the IMDI IEIT team through the hotline phone number below.

Integrated Manufacturing and Design Initiative (IMDI)
Integrated Engineering Information Technology (IEIT)

Network Authorization Agreement

Instructions: All IMDI Network users must complete part 1 of this form. Return completed form to: Joe Orona, 2604 (4-5584).

****

To be completed by applicant.

Date: _____

N 1e: _____   Organization: _____
         Last   First   Middle Initial

Phone #: _____Employee #: _____   SSN: _____

Type of Machine   Mac __ PC __ SGI __ SUN __ Other _____

Applicant is Q cleared: Yes __. No

All users of Sandia computers have the responsibility of utilizing the computers in accordance with the established IMDI Computer User Security Policy (see attachment). Your signature indicates that you have read and understand this policy and agree to the terms therein.

Signature of applicant _____ Date: _____

****

Connection Approval: _____
                     Rick Harris, 2604

Notes: _____

                _____

date: September 2, 1993

to: Mike Vahle, 1954

from: Rick Harris, 2604

subject: Communications Infrastructure Support Needed by IMDI

I have discussed communications and routing needs for the IMDI networks with various people in Organizations 1900 and 7300. I want to be as specific as I can regarding our needs; however, our needs may change with time. We must work to build a dynamic process for determining customer needs.

We are committed to providing reliable point-to-point information services to hundreds of customers throughout many organizations within Sandia, with extensions to Allied-Signal and other American Industrial Partners. A part of this service involves electronic mail (cc:Mail, SMTP and X.400) which requires TCP/IP, IPX, AppleTalk and CLNS. All routers in New Mexico are functioning very well at present. The switch from IGRP to RIP appears to have added a significant robustness, both within the New Mexico site and the link to Allied-Signal KCD. We are still waiting on AppleTalk routing between New Mexico and California.

We would like to have an Organization 1900 point of contact whom we can communicate our networking issues and strategies with. In this forum, issues such as whether to use IPX or TCP/IP for Novell networks could be discussed. At the present time, Novell IPX is as equally popular in the U.S. as TCP/IP. Even within institutions like Sandia (and the IMDI project), where TCP/IP is widely used, it wouldn't surprise me if more IPX packets of information are floating through the networks than TCP/IP. There are also significant questions regarding whether Novell's potential support of TCP/IP would be equivalent in both functionality and implementation for LANs like IMDI, i.e., PC computers do not handle memory management as cleanly as UNIX or VMS computers. Consequently, when looking at new network drivers we should be very cautious.

In summary, we think that Sandia should support IPX, AppleTalk and OSI for the time being. Working with LANs such as IMDI Org. 1900 will remain at the cutting edge of protocol routing technology which will lead to a smoother transition should a single "SUPER" protocol emerge.

Copy to:
1900   D. L. Crawford
2604   R. N. Harris
7300   H. M. Witek

date: March 30, 1993

to: Distribution

from: Rick N. Harris, 2604

subject: IMDI Electronic Mail Naming Convention Change for PCs & Macintosh

The electronic mail systems on both the IMDI red and IMDI black networks have rapidly been assimilated into the everyday engineering practices of most IMDI participants. The increase in use has stimulated additional requirements for the e-mail system. Among these requirements, is the desire to connect to the Sandia corporate e-mail system when it becomes a reality. To ensure this connectivity we are working with Organization 7300 as they develop a corporate e-mail hub. This Corporate e-mail system is being implemented following the International x.400 standard. To expand the scope of our existing messaging system to include X.400 mail capability, it has become necessary to change the name convention on our cc:Mail network. This change will give us the flexibility to provide mail service to a wider range of users. The new format will be the last name followed by a comma and a space, then the first name and middle initial. An example is shown below.

Name:	Gary Ferguson
Current e-mail name:	garyferguson
New e-mail name:	Ferguson, Gary F

This change will be implemented on a gradual (one by one) basis starting the week of April 5 and should be completed within three to four weeks. During the transition period, e-mail functionality will not be affected other than a change in the e-mail recipients name. We apologize for the inconvenience this change will cause, initially, but feel the long term benefits merit the change.

Distribution:

302	Merren, George T		2571	Curtis, William C
342	MacDougall, H.R.		2571	Roberts, Roger P
1552	Hailey, Christine E		2571	Wickesberg, Bruce A
2314	Saverino, Everett		2604	Harris, Rick N
2522	Gilbert, Jim A		2604	Neugebauer, Greg L
2522	Guidotti, Ron A		2604	Orona, Joe R

2604	Rieden, Robert
2645	Gallagher, John M.
5104	Alvis, Robert L
5167	Lapetina, Neil A
5167	Ortiz, Keith
5167	Shane, John K
5167	Skaggs, Timothy M.
5167	Thomas, Danny L
5167	Traylor, Leland B
5377	French, Nina E
5402	Clark, Virginia R. (Ginny)
5408	Ferguson, Gary M
5408	Martinez, Martha
6611	Baca, Adra S
6611	Hooper, Paul R
6611	Stiefeld, Robyn E
6611	Watkins, Randy D
6613	Armendariz, Maria
6613	Campbell, James E
6613	Cranwell, Robert M
8111	Flower, William L
D/343	Harnden, Bryan
D/800	Powell, Bob
D/811	Lavelock, Rick
D/811	Reilly, Jim
D/812	VanCleave, Bob
D/837	May, Harrison
D/844	Coombs, Bill
D/848	Schaefer, Mike

Sandia National Laboratories

date: September 30, 1993

Albuquerque, New Mexico 87185

to: Distribution

[signature]

from: Rick Harris, 2604

subject: Termination of the IMDI Secure (Red) Network

The IMDI secure (red) network will be terminated on October 14, 1993. This network currently has 34 users. The IMDI Restricted (black) network current has approximately 200 users, connects to other mail systems and will continue to support IMDI participants.

The secure network was built to complement the restricted network for some people located within the Albuquerque tech area. This network mainly served offices where black wiring was unavailable. Until recently this secure network offered unique services including access to Accord and Nirvana. The following situations have changed.

1) Many people within the Albuquerque tech area now have black wiring. Those who do, have opted to move from the secure to the restricted networks. There are still a few people connected to the red network. However, since these people cannot access the IMDI program office, KCD, the Industrial partners or the bulk of the IMDI participants, their secure network connection provides them very little functionality.

2) Accord and Nirvana have moved their systems to include the restricted environment.

Following the termination of the IMDI secure network, we will devote greater resources toward connecting IMDI participants to the restricted network. Those people who are not IMDI participants and are listed below as members of Org. 5167 should contact Dave, 5167 at 844-7891. Dave will add you to the Org. 5100 LAN. If you have any questions please contact me at 4-4828.

Distribution:

IMDI Secure Network Users:

1552	Hailey, Christine E
1552	Waye, Donald E.
2522	Gilbert, Jim A
2522	Guidotti, Ron A
2604	Rieden, Bob
2604	Harris, Rick
2604	Orona, Joe
2645	Gallagher, John M.
2833	Evans, Chip
5104	Alvis, Robert L
5167	Lapetina, Neil A
5167	Shane, John K
5167	Thomas, Danny L

5167	Traylor, Leland B
5408	Gary Ferguson

Members of Org. 5167

5167	Anderson, Robert C.
5167	Ayers, Ernest D.
5167	Bell, R. Glenn
5167	Decker, Merlin K.
5167	Montoya, Jose M.
5167	Puls, Galen H.
5167	Skaggs, Timothy M.
5102	Dave Geene

date: March 31, 1993

to: Gary Ferguson, 5408

from: Rick Harris, 2604

subject: IMDI IEIT Link to American Industrial Partners

The IMDI Integrated Engineering Information Technology (IEIT) Project has built and implemented a computer network connecting Sandia Albuquerque and Livermore and Allied Signal in Kansas City. In support of IMDI PEX customer requirements, the IEIT project agreed to devise a method for network connectivity between the IMDI network and the PEX American Industrial partners. We are pleased to inform you that a working prototype is in place to Unidynamics in Phoenix, Arizona and Speedring in Cullman, Alabama. This constitutes a significant advancement for IMDI and IEIT in direct support of our mission, "Creating Enabling Technology for Concurrent Engineering."

Functional Capabilities

IMDI users can now share Pro/ENGINEER files and send electronic mail to their industrial partners. Network connectivity to these remote locations was accomplished by using recent technology in serial routers, compression and encryption. This accomplishment represents one more step in enabling our customers for concurrent engineering. The beauty of the link is that it uses no special hardware or software and operates over normal phone lines. In this way, we pay normal phone charges while the link is in use and avoid costly leased line fees. This evolution into new technologies represents a dividend recovered from our unique IMDI network foundation and integrated engineering information technology expertise. We have received preliminary computer security approval for a 45-day trial period. Final approval is expected in May 1993.

This elegant solution represents a new approach to remote connectivity. Our link provides our customers with full TCP/IP and IPX network functionality rather than modem-to-modem serial communication. This added technology means that computers and users alike need not concern themselves with the communications equipment. There is literally no difference in whether they are connecting 30 feet or 3000 miles. When network connectivity is required, the modem dials the IMDI hub automatically, makes the connection and then returns to the network request. Should the link lie idle, the phone connection is dropped automatically. The system works so well that it gives our customers the opportunity to concentrate on concurrent engineering without wasting time with communications technology.

Anticipating Customer Needs

We capitalized on the quality function deployment (QFD) technique to determine the functional requirements "whats" of our PEX customers. We then determined the "hows" to match our customers "whats." The IEIT team also added requirements that went far beyond network connectivity. Understanding Pro/ENGINEER, Pro/PROJECT and DMCS architecture within the IEIT environment were major factors in the technology selection and implementation. With this complete understanding of what the customer needed, we were able to consider a variety of options from a technical, computer security and cost perspective. These options included using Internet connectivity, leased lines from AT&T or MCI, remote IP router, and asynchronous connection using Serial Line Interface Protocol (SLIP).

Following an intense review of "off-the-shelf" technology, we attended several demonstrations to further evaluate the various elements of the system to be implemented. In addition, we continued to interact with our customers regarding such issues as ease of use, bandwidth needs, and supportability. Through this process, we determined that the remote IP router would best serve our collective needs. This effort was lead by Joe Orona, RE/SPEC, who is on contract to the IEIT project. A diagram of the system configuration is shown below.
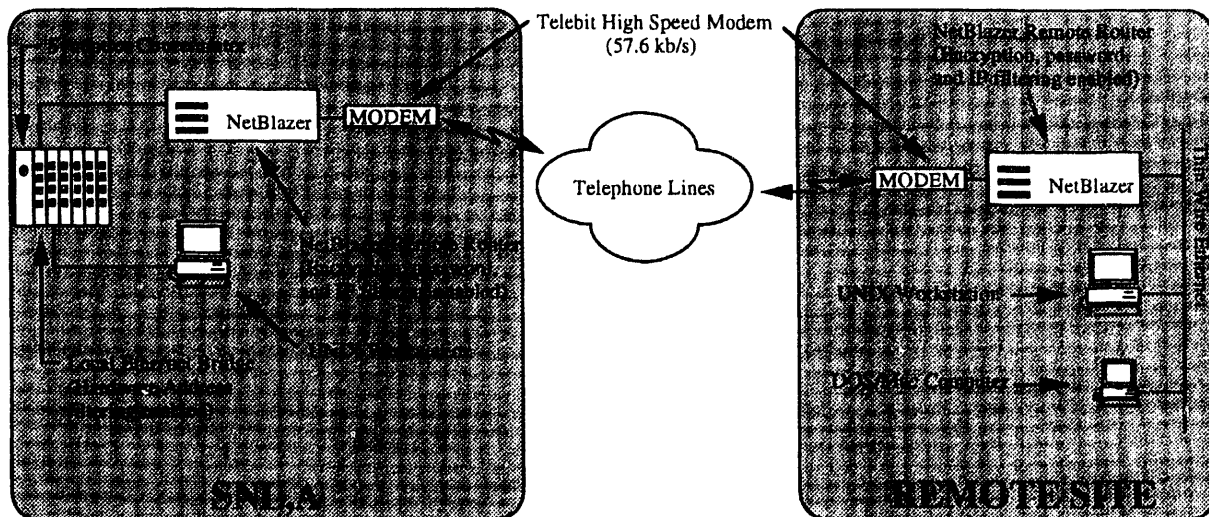
Computer Security

Our wide area networks operate in accordance with all computer security policies and procedures documented in the Sandia Master Network Protection Plan. Our implementation includes user and node authentication via passwords and TCP/IP address and Ethernet packet filtering. Connections from the remote sites enter the IMDI restricted access network via an IP filtering router connected to the Synoptics concentrator. The Synoptics concentrator performs Ethernet filtering, thus providing node authentication.

Distribution:

5400	H. J.	Saxton
5800	J. L.	Wirth
2600	J. H.	Stichman
2604	R. F.	Rieden
2900	W. E.	Alzheimer
8453	P. T.	Larson

date: May 11, 1993

to: Mike Vahle, 1954

Rick Harris

from: Rick   Harris, 2604

subject: Access to IMDI Network Routers

The IMDI networks have certainly grown beyond our initial
expectation in April 1992.   Currently, we have a five-state
network managed by two contractors, Joe Orona and Bob
Partridge.   Each of these people have significant experience with
several network media types (fiber, 10 Base T, 10 Base 2, 10 Base
5); Synoptics network equipment: and Cisco router configuration
and troubleshooting using IPX, TCP/IP, Appletalk, and ISO/CLNS
protocols.

Since the beginning of our network activity, we have had
numerous   network   problems--mainly   concerning   router
configuration and loss of routes.   In all cases, we have logged the
problems with your Network Control Center.   To date, slow and
inefficient diagnostic techniques limited our ability to provide the
production environment our customers deserve.

We request that Joe Orona, 2604, be given training as you deem
necessary, to allow him privileged access to the IRN routers used
by the IMDI networks.   In this way, Joe can assist the Network
Control Center in providing our customers with the timely
response that we need.   Joe will comply with error reporting rules
you deem necessary.
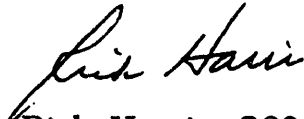
Your consideration is requested.

Distribution:
2604   R. F. Rieden
2604   R. N. Harris
5408   G. F. Ferguson

date: August 31, 1993

to: Gary Fischer, 2565

[signature]

from: Rick Harris, 2604

subject: Concurrent Engineering Enabling Technologies

We are enthusiastic about the prospect of building concurrent engineering connectivity between your organization and EG&G, Salem, Massachusetts. Based on conversations with you, as well as Ron McNeese, Dave O'Brien, Carlton Jones and Trish O'Donnell of EG&G, I thought it would be useful to write down what we intend to accomplish.

Network Connection

We will build an extension to the IMDI/IEIT network from the IMDI computer center to EG&G, Salem, MA. This link will be maintained by the IEIT team. In addition, connectivity will be provided to Gary Fischer in Building 891/Room 1235.

Computer Workstation

In both locations (891/1235 & Salem), we will connect Silicon Graphics Workstations, running Pro/ENGINEER, and IBM PCs, running cc:Mail and Microsoft products. Our goal is to give you the capability to send both CAD information and PC type information. This equipment will be owned by Department 2565 but will be configured and supported by the IEIT team.

Printing/Plotting/Release

Your HP7580B plotter will be connected to your SGI workstation located in Building 891/Room 1235. Color printing is available on the IMDI network. At EG&G, we will configure the SGI and PC to print to an HP Laserjet IV. Their SGI will either plot to their HP7550A or we will find another similar plotter. We have and will continue to work with Organization 2800 to release files from our network per customer requests.

Implementation Details

Several pieces of equipment have been ordered. Once all equipment is received and tested, we will make final plans for implementation. Installation will be done by IEIT team members and Gary Fischer. Some system overview and training will be given by Greg Neugebauer and Joe Orona. Pro/ENGINEER training will be done by Gary Fischer. We intend to install this equipment before Thanksgiving.

Action Required

Gary Fischer should order an HP Laserjet IV printer, per specifications from Greg Neugebauer. As soon as the SGI workstation is received, please contact Greg Neugebauer. As previously discussed, funding for this effort should include budget for 0.3 FTE and 10K DC purchased dollars allocated to Department 2604.
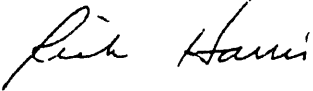
Distribution
2565 P. J. Wilson
2604 R. F. Rieden
2604 R. N. Harris
2604 G. L. Neugebauer

date: February 8, 1993

to: Ruben Urenda, 2643

from: Rick Harris, 2604

subject: IMDI IEIT Consulting
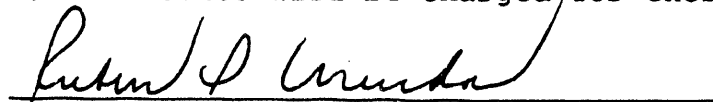
Leveraging the expertise of IEIT staff, we plan to support your needs as shown below. All costs assume the existence of the workstations and Pro/ENGINEER software. Some dates are dependent upon receipt of:

a) Name and location of engineer that will use the system and
b) Receipt of SGI H/W and Pro/E software

Deliverables
- Build initial Pro/ENGINEER model of assembly. This will cost approximately 3K/week. Jim Brown, 2858, will begin work the week of February 8. You will interact with him directly.
- Configure two SGI Indigo workstations including Pro/ENGINEER. This will take two weeks following the arrival of the h/w and s/w ordered by Joe Harris.
- Add the SGI workstations to IMDI secure network; include in security plan. We will begin work on this immediately following your notice of the person's name and their physical location. An estimate of the delivery date will be made once we know this information.
- Identify long-term (3-6 months) designer to work with engineer on the assembly design. This has already been completed. Ron Brown is available part time or full time immediately.
- Attend meeting at Sandia, California February 16 & 17. Jim Brown will attend this meeting.

Case 4870.100 will be charged for these deliverables.

Ruben Urenda, 2643

Rick Harris, 2604

IMDI IEIT

date: July 19, 1993

to: R. S. Urenda, 2643

from: Rick   Harris and Greg Neugebauer, 2604

subject: Completion of commitment for workstation and network configuration

When we negotiated our role regarding the establishment of a Pro/ENGINEER environment for Org. 2643 we agreed that the IEIT team would provide you with a broad range of services. This included workstation and software procurement and configuration, network creation and connectivity to Org. 2800 designers. We were and are capable of all tasks. Since this agreement a number of changes evolved which have reduced our contribution. These changes include:

1) Joe Harris assuming responsibility for the IRIS workstation purchase and coordinated Data Communication Requests
2) Dept. 2643 electing to serve the Pro/ENGINEER license from the IRIS
3) Dept. 2643 electing to network to CASPER rather than IMDI

As we originally agreed, our project team had responsibility for the entire Pro/E system: workstation, operating system, Pro/ENGINEER software and network connection. Given the above changes, the IEIT advantages have been significantly reduced. Since you are being adequately supported by Joe Harris, we envision no further charges to this task.

Distribution:
2604   R. F. Rieden

Sandia National Laboratories

Albuquerque, New Mexico 87185

date: July 23, 1993

to: Pro Padilla, 7612

Rick Harris

from: Rick Harris, 2604 - IMDI / IEIT Project Manager

subject: Silicon Graphics Workstation to PTC - Document #A 04170

The goal of IMDI is to achieve a modern approach to product realization. The IEIT project is developing and deploying technology to improve design quality and flexibility. Parametric Technology Corporation supplies the fundamental mechanical application software to generate solid models. Design data will be transmitted to them as an electronic CAD file to resolve modeling difficulties and to verify software bugs and enhancements.

In order to facilitate concurrent engineering and eliminate the need to reduce the data to paper or a less intelligent electronic form we must share common hardware and software. This memo authorizes the shipment of a Silicon Graphics workstation that will be networked with our existing nodes.

The period of loan is not to exceed three years. Sandia personnel will travel to the local Parametric Technology Corp. office and handcarry the property to insure proper installation and setup. Specific dates for recovery of the equipment are not established. Sandia agrees to pay return shipping costs.

GLN:2815

copy to:
7612 Linda Burkhardt

date: April 13, 1993

to: Fran Current, 2884

Greg Neugebauer

from: Greg Neugebauer, 2604

subject: Request for IRN Communications to 892/115

This memo is written as a follow-up to our 'brown bag' conversation regarding IMDI designer relocation.

We understand that you will coordinate extension of your IRN fiber from the 892 CPU room to cubicles in 892/115 assigned to Gene Arnot and Barry Bronkema. Completion of this work is expected before Gene is required to move from bldg. 836. I will reconfigure the hosts file and routing tables based on information you provide regarding IP addresses on your network. Our project is prepared to cover incidental hardware charges although I expect these to be minimal. System administration will remain the responsibility of the IEIT project.

Thanks for your cooperation in this effort.

Copy to:
2604 Bob Rieden
2604 Rick Harris
2883 Bill Drozdick
2883 Gene Arnot
2884 Larry Grube
2884 Rose Fischbach

date: July 26, 1993

to: Distribution

Greg Neugebauer

from: Greg Neugebauer, 2604

subject: Agile Manufacturing Communications

On July 16, a service agreement covering workstation configuration, application software, network, and e-mail support for the **A' design** team was signed. This event enables the Integrated Engineering Information Technology (IEIT) to begin the task of connecting primary candidates and authorizes effort to establish network communications with auxiliary candidates as resources permit in FY93.

Please provide the information requested on the reverse side of this memo. We will use the data to judge whether a communications link can be established or routed to an existing connection this fiscal year and alert us to any special requirements. Additional information will be used to officially register or verify nodes and user accounts in the 1900 network database.

Distribution
(Primary Connections)

1561	Mike Nielsen	1621	Ron Jones
2481	Ron Ward	1671	Pablo Garcia
2483	Terry Smith	1762	Bob Woods
2643	Ken Eras	2861	Arlo Ames
2645	Gary Randall	2483	Bill Burd
2863	Rodema Ashby	2484-1	Gerry McCarty
		2484-1	Brian Pardo

(Auxiliary Connections)

323	Bob Easterling
323	Laura Halbleib
1611	Cliff Loucks
1621	Dave Strip
1621	Steve Kaufman

Cop to:
2604   Rick Harris

Return to: Greg Neugebauer, 2604

Name

Org

Social Security No.

Bldg   Room

Existing Network Connection - ISN, IRN, or EON

Phone Number

Computer Vendor

Model

OS Version

Property Number

Network Connection Type

IP Address

Node Alias

Serial Number

Hardware (Ethernet) Address

Registered Machine ID (if any ex: SASG063)

Registered User ID (if any ex: 2521)

PBX Circuit ID

PBX Drop Box No.

Special Requirements:

Fold and staple - this side out

date: August 6, 1992

to: Dave Keiss, 7214

from: Greg Neugebauer, 2815

subject: Statement of Work for AD-0591

This memo requests and authorizes the shipment of **2 units** included in **line item 4** of AD-0591 directly to:

> **Allied-Signal Aerospace Company**
> **Kansas City Division**
> **Rick Lavelock D/811, 2A36**
> **2000 East 95th Street**
> **Kansas City, MO 64131-3095**

The units consist of an SGI Indigo XS24Z workstation, 32 MB, 1.2GB SCSI disk, 19 inch color monitor, mouse, keyboard, associated cabling, and manuals.

The contractor must clearly label the outside of the shipping containers with Sandia PR number **AD-0591** and the Allied-Signal requisition number **369960**.

GLN:2815

Copy to:
2604 Rick Harris
PTC Pat Drummond (FAX) 246-9907
SGI Margaret Clifton (FAX) 884-1355

Carmela Gallegos:

Please inform the following individuals that a network file server that serves building 823 is temporarily out of service and that tech control is working on the problem. Until the repair is complete, these people will not be able to connect to the IMDI network. We hope this outage will be repaired quickly and there will be a minimum of inconvenience to each of our valued customers.

Baca, Adra S   6611   505-844-8640 823   2014
Watkins, Randy D   6611   505-844-3387 823   2014
Hooper, Paul R   6611   505-844-3580 823   2099
Stiefeld, Robyn E   6611   505-844-5197 823   2304

Thank you for your assistance.

Dennis K. Miller, 2604
4-2476

Kathy Cash:

Please inform the following individuals that a network file server that serves building 823 is temporarily out of service and that tech control is working on the problem. Until the repair is complete, these people will not be able to connect to the IMDI network. We hope this outage will be repaired quickly and there will be a minimum of inconvenience to each of our valued customers.

```
Armendariz, Maria      6613    505-844-6946 823   3452
Campbell, James E      6613    505-844-5644 823   3482
Cranwell, Robert M     6613    505-844-8368 823  3497D
```

Thank you for your assistance.

Dennis K. Miller, 2604
4-2476

Dear IMDI Lan Network User:

The problem we experienced last week with building 823 has now been corrected. You may once again access the IMDI network.

Some users have chosen to remove the driver routine from their autoexec.bat file. In an effort to make life a little easier for you, I have modified your driver routine. The routine will now prompt you to answer yes or no when it is time to load the network driver files. If you answer no, then the drivers will not be loaded and you cannot connect to the network. If you answer yes, then the drivers will be loaded and your system will automatically attempt to attach to the network and prompt you for your confidential password. Hopefully, the next time the system goes down (and we hope it is a LONG time before it does), you can easily avoid the hassles of trying to login and having to wait for next-to-eternity for the prompt to come back and tell you what you already knew---that the system was down. If you know in advance that the system is down or that you have no need to log on to the network, then just answer no when the system asks you if you want to log on.

We hope that your network experiences with IMDI are all pleasureable, even when they are not ideal.

Please feel free to contact any of us if you have any questions, concerns, problems, slow software/systems, or even if you have words of encouragement and gratitude!

Thank you for letting us serve you.
The IMDI team:

Rick Harris	4-4828
Greg Neugebauer	4-3264
Joe Orona	4-5584
Judd Herman	4-0753
Dennis Miller	4-2476

AIIM

Association for Information and Image Management

1100 Wayne Avenue, Suite 1100
Silver Spring, Maryland 20910

301/587-8202

Centimeter

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 mm

1 2 3 4 5
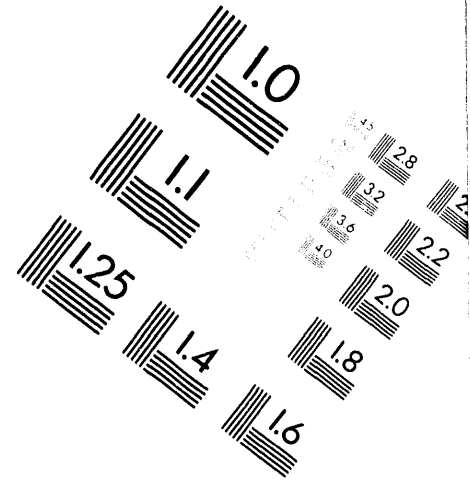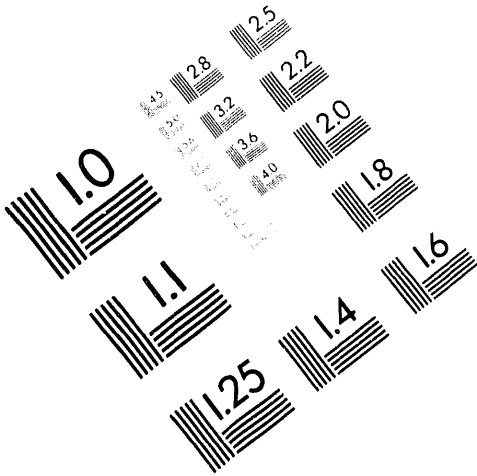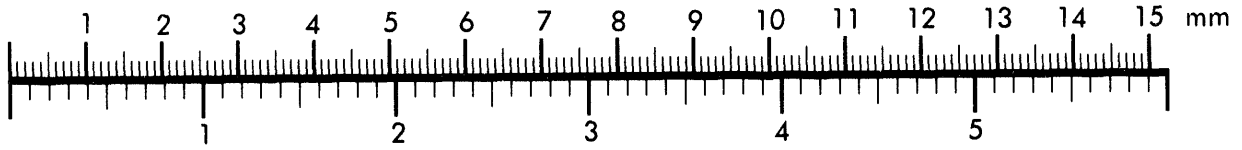
Inches
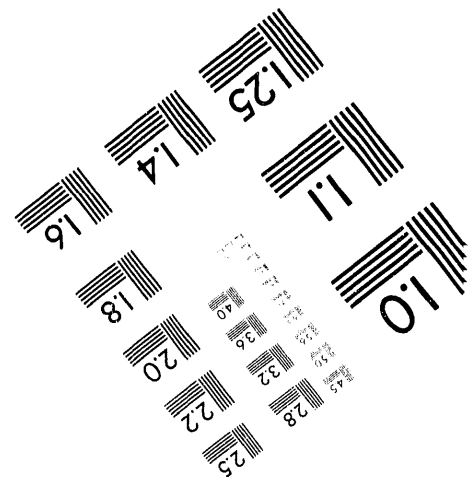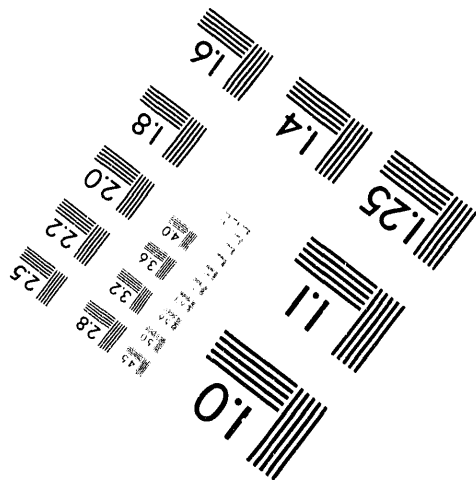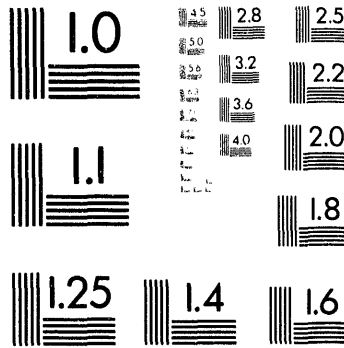
MANUFACTURED TO AIIM STANDARDS
BY APPLIED IMAGE, INC.

Facilities Express
Organization 7911

Date: 8/27/93

To: DENNIS MILLER   Org. 2604

From: ~~June Harrington,~~ FRED GLEICHER 7911   Phone: ~~4-8890~~ 4-7259

Subject: Facilities Express Service Order No. A W 1792

DCR No. 27924

An asbestos survey in Building/Room 892/165 has been done and the results reveal that asbestos abatement is required before your DCR can be completed. The estimated cost for this abatement is not to exceed $ 4800 ᶜᶜ.

Please furnish a case number for these costs and sign below to indicate your authorization to spend up to that amount for asbestos abatement. Only actual costs will be charged.

If you have questions, or if you wish to reconsider your requirements or cancel the service order, please call.

To save time, the signed form may be FAXed to 4-8890.

Thank you.

faxed 8/27/93
@ 9:20

Approval Levels:
MTS/MLS	Up to $ 5,000
Team Supervisor	Up to $ 20,000
Manager	Up to $100,000

Revised authorization approved:

_____ MTS   159-52-7144
Approved by   Social Security No.

2604   8/27/93   4641.540
Org.   Date   Case Number

Appendix B: Software Standards for IEIT

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SOFTWARE STANDARDS

Software standards for IEIT project (Items marked with an asterisk will be replaced.)

Applications

PC and Macintosh

Word Processing	MS Word
	Microsoft Corporation
Spreadsheet	MS Excel
	Microsoft Corporation
Project Planning	MS Project
	Microsoft Corporation
Presentation	MS PowerPoint
	Microsoft Corporation
Scheduling	On Time
Configuration Management	Office Advisor
	MIDAK International
Desktop Publishing	FrameMaker
	Frame Technology Corporation

UNIX

Desktop Publishing	FrameMaker (primarily for UNIX workstations)
	Frame Technology Corporation
Mechanical Design	ProENGINEER family of products

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Parametric Technologies Corporation

Configuration Management   ProENGINEER family of products

Parametric Technologies Corporation

Network & Connectivity

PC and Macintosh

Mail   Lotus cc:Mail

Lotus Development Corporation

MS Mail*

Microsoft Corporation

Networking   Novell Netware

Novell, Inc.

Networking   Novell LAN WorkPlace for DOS

Novell, Inc.

Networking   MacX, PC XView - X Window System

Networking   Norton PC Anywhere

Symantec

UNIX

Mail   Z-Mail - UNIX GUI for SMTP

Z-Code Software Corporation

Mail   X.400 - Standard for e-mail from International
Standards Organization (ISO), Open System
Interconnect standard

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Appendix C. Other

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Name	Org.	SMTP Address		
Abrams, Douglas B.	2574	dgabram	@	sandia.gov
Aguilar, Chris A.	2664	caaguil	@	sandia.gov
Alexander, Jeff A.	2574	jaalexa	@	sandia.gov
Allen, Mike	KCD	mdallen	@	jade.imdi.sandia.gov
Ames, Arlo	2861	alames	@	sandia.gov
Anderson, Fred H.	2571	fhander	@	sandia.ogv
Armendariz, Maria	6613	rearmen	@	sandia.gov
Armistead, David J.	2664	djarmis	@	sandia.gov
Arnot, Robert E.	2852	rearnot	@	sandia.gov
Baca, Adra	6625	asbaca	@	sandia.gov
Barnette, Jon H.	2606	jhbarne	@	sandia.gov
Bast, Terry C.	2664	tcbast	@	sandia.gov
Bello, David J.	2664	djbello	@	sandia.gov
Berry, Dante	2574	dmberry	@	sandia.gov
Berst, David W.	2664	dwberst	@	sandia.gov
Blumberg, Kathryn R. (kitty)	8415	krblumb	@	ca.sandia.gov
Bobbe, M. Kelly	5400	mkbobbe	@	sandia.gov
Bohnhoff, Bill	1425	wjbohnh	@	sandia.gov
Brannan, Brad	SPR	brannan	@	granite.imdi.sandia.gov
Branscombe, Duwayne A.	2612	dabrans	@	sandia.gov
Briner, Clifton F.	2574	cfbrine	@	sandia.gov
Brown, K. Dewayne	KCD	u53973	@	134a.kcp.com
Brown, Ralph L.	2571	rlbrown	@	sandia.gov
Burd, William C.	2483	wcburd	@	sandia.gov
Burket, Donald G.	2571	dgburke	@	sandia.gov
Campbell, James	6613	jecampb	@	sandia.gov
Clark, George E.	2571	geclark	@	sandia.gov
Clark, Ginny	5402	vrclark	@	sandia.gov
Cook, Bryan A.	2664	bacook	@	sandia.gov
Cook, Ellen F.	2663&2665	efcook	@	sandia.gov
Coombs, Bill	KCD	bacoomb	@	jade.imdi.sandia.gov
Coriz, James D.	2663	jdcoriz	@	sandia.gov
Cranwell, Robert	6613	rmcranw	@	sandia.gov
Crawford, John	KCD	u08121	@	arret.kcp.com
Culler, Bryan S.	2665	bsculle	@	sandia.gov
Curtis, Jack E.	2611	jecurti	@	sandia.gov
Curtis, William C.	2571	wccurti	@	sandia.gov
Cusenbary, P. Randy	2663	prcusen	@	sandia.gov
Cusumano, Anthony J.	EG&G	ajcusum	@	catseye.imdi.sandia.gov
DeAguero, James G.	2665	jgdeagu	@	sandia.gov
DeSpain, Mark J.	2574	mjdespa	@	sandia.gov
Diegert, Kathleen	12323	kvdiege	@	sandia.gov
DuBay, Timothy J.	2663	tjdubay	@	sandia.gov
Duke, Holly	6611	khduke	@	sandia.gov
Dunham, Tracy	6625	tmdunha	@	sandia.gov
Dunn, Paul A.	2571	padunn	@	sandia.gov

Easterling, Bob	323	rgeaste	@	sandia.gov
EG&G Desk	EG&G	eggdesk	@	jade.imdi.sandi.gov
Egbom, Charles S.	2665	csegbom	@	sandia.gov
Ehasz, Joseph P.	2664	jpehasz	@	sandia.gov
Elder, Chuck	2631	rcelder	@	sandia.gov
Ellis, Jo A.	2574	jaellis	@	sandia.gov
Ellison, Roy F.	2571	rfellis	@	sandia.gov
Eras, Ken	2643	keras	@	sandia.gov
Ferguson, Gary	5408	gmfergu	@	sandia.gov
Fienning, William C.	2665	wcflenn	@	sandia.gov
Finley, M. Helen	2600	mhfinle	@	sandia.gov
Fischer, Gary J.	2565	gjfisch	@	sandia.gov
Franco, Ronald J.	2664	rjfranc	@	sandia.gov
Godshall, Ned A.	2665	nagodsh	@	sandia.gov
Gonzales, Beth	2574	bgonzal	@	sandia.gov
Granoff, Barry	6608	bgranof	@	sandia.gov
Greene, Libby	2612	lgreene	@	sandia.gov
Greene, Steve N.	2664	sngreen	@	sandia.gov
Groves, Gordon E.	2631	gegrove	@	sandia.gov
Hall, Ron	6904	rchall	@	sandia.gov
Harnden, Bryan	KCD	bnharnd	@	jade.imdi.sandia.gov
Harris, E. Lynn	2641	elharri	@	sandia.gov
Harris, Joseph	2641	jharris	@	sandia.gov
Harris, Richard N.	2604	rnharri	@	sandia.gov
Harstad, David N.	2631	dnharst	@	sandia.gov
Haseman, Greg M.	2631	gmhasem	@	sandia.gov
Hauser, Gene C.	2664	gchause	@	sandia.gov
Help Desk	2604	helpdesk	@	sandia.gov
Henry, Edward A.	2664	eahenry	@	sandia.gov
Herman, Judd A.	2816	jaherma	@	sandia.gov
Hoffa, Larry G	8441	lghoffa	@	ca.sandia.gov
Hole, Jim	2631	jhole	@	sandia.gov
Holswade, Scott C.	2574	scholsw	@	sandia.gov
Hooper, Paul	6611	prhoope	@	sandia.gov
Imbert, Martin H.	2663	mhimber	@	sandia.gov
Ippel, Jeff	KCD	jhippel	@	diamond.kcp.com
James, John B.	2574	jbjames	@	sandia.gov
Jerome, Thisbe D.	2645	tdjerom	@	sandia.gov
Jones, Carlton S.	EG&G	csjones	@	catseye.imdi.sandia.gov
Kadlec, Emil R.	2663	erkadle	@	sandia.gov
Kalb, Jeffrey L.	2664	jlkalb	@	sandia.gov
Kenney, John W.	EG&G	jwkenne	@	catseye.imdi.sandia.gov
Kidner, Ronald E.	2664	rekidne	@	sandia.gov
Kimball, Kenneth B.	2631	kbkimba	@	sandia.gov
Kirkland, John Q.	2665	jqkirkl	@	sandia.gov
Landron, Clinton O.	2631	colandr	@	sandia.gov
Larson, Patricia T	8453	tturner	@	prince.ran.sandia.gov
Lavelock, Rick	KCD	rllavel	@	jade.imdi.sandia.gov
Leland, Douglas K.	2574	dklelan	@	sandia.gov

Leuenberger, William R.	2645	wrleuen	@	sandia.gov
Levin, Victoria A.	6605	valevin	@	sandia.gov
Like, David W.	2663	dwlike	@	sandia.gov
Longoria, Robert J.	2611	rjlongo	@	sandia.gov
Lyons, Gregory R.	2571	grlyons	@	sandia.gov
MacGibbon, Richard P.	2665	rpmacgi	@	sandia.gov
Mahoney, Jim	KCD	mahoney	@	sneezy.kcp.com
Markewicz, Mike J	2571	mjmarke	@	sandia.gov
Markewicz, Mike J	2571	mjmarke	@	sandia.gov
Marks, David B.	2665	dbmarks	@	sandia.gov
Martin, Samuel B.	2641	sbmarti	@	sandia.gov
Martinez, Martha	5408	memarti	@	sandia.gov
MAST Desk	2571	mastdesk	@	sandia.gov
May, Harrison	KCD	hmay	@	materials.kcp.com
McNeece, Robert W.	EG&G	rwmcnee	@	catseye.imdl.sandia.gov
Meacham, Jamie A	8454	jmeacham	@	prince.ran.sandia.gov
Miller, Dennis K.	2604	dkmille	@	sandia.gov
Mittas, Anthony	2574	amittas	@	sandia.gov
Montoya, Anthony C.	2611	acmonto	@	sandia.gov
Montoya, Dominic A.	2611	damonto	@	sandia.gov
Morgan, Jeffrey R.	2664	jrmorga	@	sandia.gov
Mowry, Dennis A.	2665	damowry	@	sandia.gov
Mullendore, Rodney N.	2665	rnmulle	@	sandia.gov
Muniz, Ruben B.	2000	rbmuniz	@	sandia.gov
Neilsen, Mike	7010	mkneils	@	sandia.gov
Nelson, Larry E.	2631	lenelso	@	sandia.gov
Neugebauer, Greg L	2604	glneuge	@	sandia.gov
Nidever, Charles R.	2664	crnidev	@	sandia.gov
Normann, Randy A.	2663	ranorma	@	sandia.gov
O'Donnell, Patricia J.	EG&G	pjodonn	@	catseye.imdl.sandia.gov
Orona, Joe R.	2604	jrorona	@	sandia.gov
Owens, Bob	KCD	rowens	@	jade.imdl.sandia.gov
Parsons, Gwen	KCD	gparson	@	jade.imdl.sandia.gov
Partridge, Michael E.	2665	mepartr	@	sandia.gov
Partridge, Robert A.	2604	rapartr	@	sandia.gov
Paul, David E.	2571	depaul	@	sandia.gov
Perea, Thomas R.	2665	trperea	@	sandia.gov
Perry, Joseph H.	2611	jhperry	@	sandia.gov
Pierce, Dave M.	2571	dmpierc	@	sandia.gov
Pitschke, Michael R.	2571	mrpitsc	@	sandia.gov
Powell, Bob	KCD	bjpowel	@	jade.imdl.sandia.gov
Raines, Lupe E.	6605	leraine	@	sandia.gov
Rakestraw, David U.	PTC	durakes	@	garnet.imdl.sandia.gov
Ramsey, James E.	2571	jeramse	@	sandia.gov
Randall, Gary T.	2645	gtranda	@	sandia.gov
Reif, Lewis C.	2631	lcreif	@	sandia.gov
Reilly, Jim	KCD	jmreill	@	jade.imdl.sandia.gov
Rey, Danny	2663	drey	@	sandia.gov
Rhodes, Peggy S.	2301	psrhode	@	sandia.gov

Rieden, Robert F.	2604	rfriede	@	sandia.gov
Roberts, Roger P	2571	rprober	@	sandia.gov
Rosario, Pat	2600	prosari	@	sandia.gov
Rosborough, John R.	2571	jrrosbo	@	sandia.gov
Russell, Scott D.	KCD	u53643	@	taurus.kcp.com
Ryerson, David E.	2664	deryers	@	sandia.gov
Salazar, Vincent P.	2664	vpsalaz	@	sandia.gov
Saverino, Everett	2314	elsaver	@	sandia.gov
Saxton, Harry	5400	hjsaxto	@	sandia.gov
Schaefer, Mike	KCD	rmschae	@	jade.imdl.sandia.gov
Schroeder, Donald H.	2600	dhschro	@	sandia.gov
Schulz, Kathleen M.	6605	kmschul	@	sandia.gov
Sicking, Carl W.	2631	cwsicki	@	sandia.gov
Silva, Steven A.	2611	sasilva	@	sandia.gov
Siska, Norbert F.	2574	nfsiska	@	sandia.gov
Smiel, Adalbert J.	2571	ajsmiel	@	sandia.gov
Smith, Patrick A.	2574	pasmith	@	sandia.gov
Smith, Terry T.	2483	ttsmith	@	sandia.gov
Snell, James E.	2663	jesnell	@	sandia.gov
Stang, Paul D.	2665	pdstang	@	sandia.gov
Stegmaier, Michael R.	2611	mrstegm	@	sandia.gov
Stevenson, Martin J.	2574	mjsteve	@	sandia.gov
Stichman, John H.	2600	jhstich	@	sandia.gov
Stiefeld, Robyn	6611	restief	@	sandia.gov
Stuckey, Rose	KCD	u52882	@	alpha.kcp.com
Taplin, Richard B.	2665	rbtapli	@	sandia.gov
Terry, M. Dean	2665	mdterry	@	sandia.gov
Thompson, Carmie	2574	cthomps	@	sandia.gov
Thompson, Meredith A.	2571	mathomp	@	sandia.gov
Trujillo, David L.	2664	dltruji	@	sandia.gov
Trujillo, Dianna J.	2611 & 2664	djtruji	@	sandia.gov
Urenda, Daniel N.	2663	dnurend	@	sandia.gov
Urenda, Ruben S.	2643	rsurend	@	sandia.gov
VanCleave, Bob	KCD	bavancl	@	jade.imdl.sandia.gov
Vargo, Timothy D.	2665	tdvargo	@	sandia.gov
Vogel, Roger A.	2611	ravogel	@	sandia.gov
Watkins, Randy D.	6611	rdwatki	@	sandia.gov
Watkins, William A.	2663	wawatki	@	sandia.gov
Weichman, Louis S.	2574	lsweich	@	sandia.gov
Weinbrecht, Edward A.	6625	eaweinb	@	sandia.gov
Weinlein, John H.	2574	jhweinl	@	sandia.gov
Wickesberg, Bruce A	2571	bawicke	@	sandia.gov
Wickesberg, Bruce A.	2571	bawicke	@	sandia.gov
Wickstrom, Greg L.	2631	glwicks	@	sandia.gov
Wilder, Jim A.	2574	jawilde	@	sandia.gov
Williams, T. J.	2571	tjwilli	@	sandia.gov
Wilson, M. Sheila	2301	mswilso	@	sandia.gov

Mail to the Internet from cc:Mail

To send mail out to the internet the following changes have to made to the sendmail.cf file located on the local domain name server.

1.   The machine which will forward mail to the internet must be defined using the F macro.
2.   The names of the relay hosts must be defined using the R macro.

These are the F macro and R macro sections of the sendmail.cf file for Jasper, the IMDI domain name server.

```
#### F macro and class ###################################################
# F macro: Forwarder hostname.
# The F macro must contain the name of the forwarder host.
# If no such host exists this macro should be empty.  If this host is the
# forwarder, this macro should be defined to contain this host's name.
DF sass165.sandia.gov

# F class: Alternate forwarder hostnames.
# The F class should contain all known hostnames for the forwarder host
# defined above.  If the F macro is empty, the F class should be empty as
# well.
CF sass165.sandia.gov

# R macro: Relay hostname.
# This macro defines the hostname (or an alias) used by
# all hosts which act as relay machines.  Relay machines
# are "forwarders" to known internal domains and are themselves
# defined by the use of this relay hostname as their hostname
# or alias.
#
# This macro comes pre-configured as "relay" which is strongly
# suggested.
#
# This macro must not be left blank although it is not necessary
# for any actual relay machines to be configured in the
# network.
#
# Mail relay hosts implement a sort of "poor man's" MX scheme.
# They may also be useful as an emergency "back-up" to the use
# of MX records.
#DRl/usr/etc/configmail get relayname
DRsass165.sandia.gov
CRsass165.sandia.gov
Dmimdi.sandia.gov
```

To receive mail in from the internet, the local domain name server must be configured with MX records for each SMTP gateway on the network. This is the localhost.rev file from Jasper, the main IMDI domain name server.

```
;LOCALHOSTS.REV
;
@         IN        SOA       jasper.imdi.sandia.gov.
root.jasper.imdi.sandia.gov.  (
                              1.1       ; serial
                              3600      ; refresh      3 hours
                              300       ; Retry        1 hour
                              3600000 ; Expire         1000 hours
                              14400 ) ; Minimum        24 hours
;


          IN        NS        jasper.imdi.sandia.gov.
0         IN        PTR       loopback.jasper.imdi.sandia.gov.
1         IN        PTR       localhost.

jade.imdi.sandia.gov.   IN        A               134.253.35.11
                        IN        MX        10      jasper.imdi.sandia.gov.
                        IN        MX        20      sandia.gov.
```
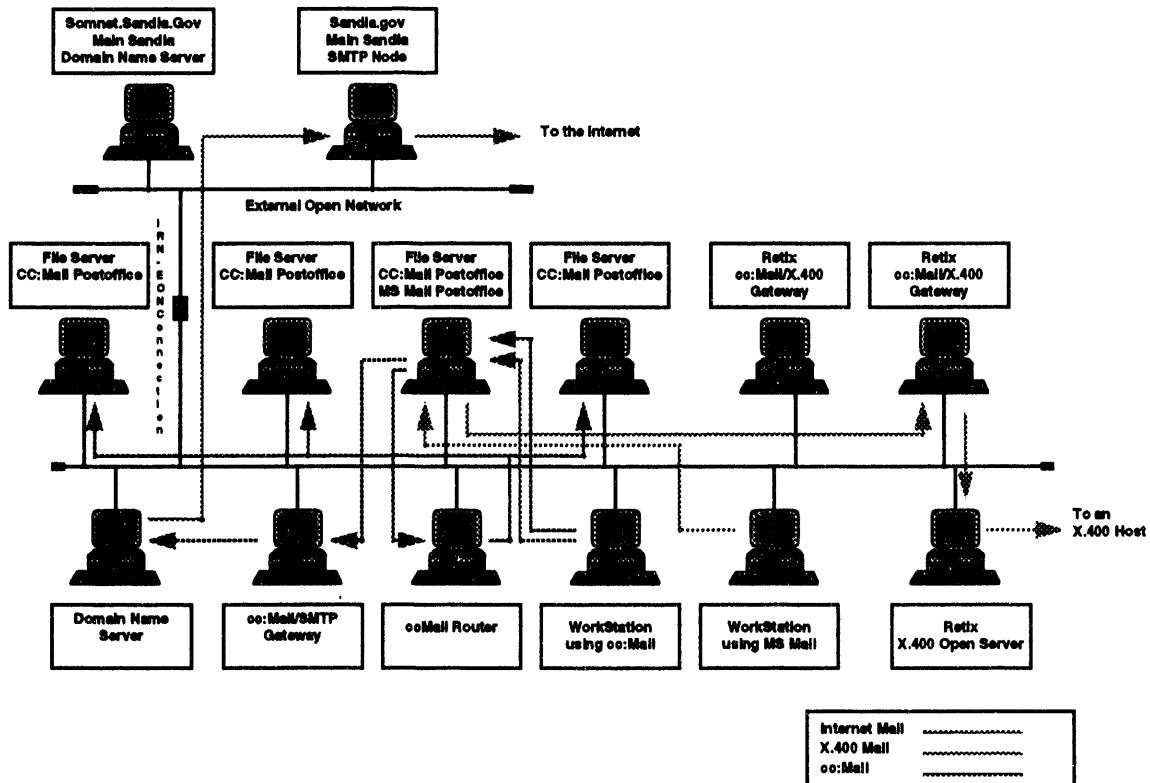
IEIT Mail System

Sandia National Laboratories

FILE MAPPING WITH CC:MAIL ON THE MACINTOSH

When receiving attached files (via cc:Mail) from a DOS-based machine on a MAC, the files cannot be opened using the appropriate application unless a file mapping table has been created in cc:Mail on the MAC. The following is a step-by-step procedure to create this map:

1. Open cc:Mail
2. From the *File* pull-down menu, select *Preferences...*
3. From the bottom of the window select *File mapping...*
4. Create the following table inside the window that opens up (where ^ represents a blank space):

EXTENSION	TYPE	CREATOR
DOC	WDBN	MSWD
PPT	SLD3	PPT3
XLS	XLS^	XCEL
MPP	MPP^	MSPJ

5. Then click on *OK*
6. Then click on *OK* again.

You have now told your MAC (for example) that whenever it receives a file attached to a cc:Mail message with a file extension DOC and you save that file onto your hard disk, etc. and you later wish to open that file, that your MAC must use the Word application to open the file and that the file is not a Teachtext file, but actually a Word document. The same holds true for PPT (PowerPoint) files, etc, etc.

The following is a list of what has just been entered into your file map with the corresponding applications:

EXTENSION	DOS MACHINE APPLICATION
DOC	Word for Windows
PPT	PowerPoint
XLS	Excel
MPP	Project for Windows

If you discover any applications tat we have not listed for you that you need to add to your cc:Mail File mapping table and you need the corresponding type and creator fields, call the IMDI hotline at 4-0753 and we will be glad to assist you.

Thank you,
the IMDI team

Enabling DOS Mouse in Windows

Jerry:

The following instructions are to be executed inside Windows to modify the autoexec.bat file to enable you to use your mouse in DOS applications:

1. from Program Manager, select **File**
2. from this pull-down menu, select **Run...**
3. in the **Command line:** dialog box type *sysedit* and press *enter*
3a. Program Manager will open four files, of which the last will be autoexec.bat
4. move your mouse pointer to the beginning of the line that reads "set mouse=c:\ballpt" and click with the left mouse button
5. as you type the following, the line will open up space for the text you are typing:
   c:\utils\setkey /pm then press *enter*
6. now press the *alt* key, followed by the letter *F*, the letter *X*, and the letter *Y*, to save your editing

These changes will not actually take place until you exit Windows and reboot the computer. It should not be necessary to do this immediately. In fact, since you will be making these changes from inside Windows and your mouse should be working, you can wait until the next time you turn on the machine for these changes to take effect.

Should you find these instructions difficult to follow or encounter any problems, feel free to contact me at (505) 844-2476 (at my desk) or you can leave me a message at the IMDI hotline at (505) 844-0753.

Thanx!
Dennis K. Miller

PC Networking Checklist

1. Inspect office for wiring options
   A. PBX
   B. fiber
   C. thinwire
   D. 10 Base T (from concentrator)

2. Inspect computer for hardware requirements
   A. type of Ethernet card
   B. type of cable required (see section 1. above)
   C. necessity of special adaptor card to install Eet card

3. Survey customer to determine customer's communication needs
   A. Standard
   B. PENET
   C. LIS
   D. Internet
   E. other

4. Install Ethernet card
   A. Insert card
   B. Configure card
   C. Test card
   D. Document hardware address

5. Copy network software to PC (use appropriate copying batch file)
   A. NET.BAT
   B. LO.BAT, LOGIN.EXE, LOGOUT.EXE, UNLDNET.BAT
   C. LSL.COM
   D. IPX.COM or IPXODI.COM
   E. 3c507.COM (or other Ethernet card driver)
   F. Lan Workplace (optional) (request IP address from network administrator)
      1. Determine Router Address (134.253.35.254 for bldg. 807)
      2. Subnet = 255.255.255.0
      3. Domain=imdi.sandia.gov
      4. Domain Name Server address=134.253.35.150
      5. We don't use Bootp and we don't use SLIP.
   G. NETX.EXE
   H. Install Windows network drivers for Novell shell version 3.26 and above (run Windows Setup)

6. Test network connection
   A. Login as supervisor
   B. Create customer's Novell account and cc:Mail account
   C. Login using the customer's login name and password
   D. Launch Windows and check for conflicts

7. Install cc:Mail
   A. Install software
   B. Move cc:Mail icon to appropriate group and change file properties
   C. Copy icon to startup group and change file properties to start cc:Mail Notify
   D. Start notify
   E. Start mail
   F. Set file options
   G. Prepare and send a test message to user using cc:Mail name
   H. Send internet mail from customer to customer using username@sandia.gov

8. Install OnTime (if appropriate)

9. Test!
   A. Exit Windows
   B. Logout
   C. Reboot
   D. Login under customer's name and password
   E. Run Windows
   F. Check for Notify
   G. Run File Manager and look at network drives
   H. Test other software for conflicts

10. Add all data to nodes list

11. Train customer
   A. Login procedures
   B. cc:Mail usage
   C. Provide documentation for login, printing, cc:Mail

IMDI Restricted Access/ Silicon Connectivity

The IMDI and Silicon E-mail system are configured to allow communication between IMDI -Topaz & Silicon for the following people:

IMDI - TOPAZ	SILICON
H. J. Saxton	J. E. Gronager
M. K. Bobbe	S. G. Brantley
G. M. Ferguson	J. B. Woodard
M. Martinez	V. R. Clark
	J. A. Nist
	T. T. Schimke
Org 2604	A. A. Stannish
R. Rieden	K. L. Shanklin
J. Orona	H. M. Witek
R. N. Harris	P. A. Longmire
D. Miller	A. C. Beradino
	G. L. Record

Examples

IMDI to Silicon

If you are connected to IMDI-TOPAZ and wish to send e-mail to someone on Silicon, you simply select their name from the directory. For example John Gronager is entered into the address directory as:

Gronager, John

Silicon to IMDI

If you are connected to Silicon and wish to send e-mail to someone on IMDI-TOPAZ, you enter their SMTP address. For example, to send e-mail to Gary Ferguson you would select his Silicon address as shown below.

gmfergu@jade.imdi.sandia.gov

A complete list is shown below.

Name	Silicon Directory Address
Harry Saxton	hjsaxto@jade.imdi.sandia.gov
Kelly Bobbe	mkbobbe@jade.imdi.sandia.gov
Gary Ferguson	gmfergu@jade.imdi.sandia.gov
Martha Martinez	mjmarti@jade.imdi.sandia.gov

Org 2604

Bob Rieden	rfriede@jade.imdi.sandia.gov
Joe Orona	jrorona@jade.imdi.sandia.gov
Rick Harris	rnharri@jade.imdi.sandia.gov
Dennis Miller	dkmille@jade.imdi.sandia.gov

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