Computer and Network Services (CaNS)

The primary mission of Computer and Network Services (CaNS) is to provide the infrastructure and services within EMSL for an advanced computing environment where staff, visitors, and collaborators can effectively utilize computer and network resources to address scientific research and business requirements. CaNS is responsible for the infrastructure planning, engineering, procurement and installation within EMSL. CaNS is also responsible for distributed computer and networking development/operations, computer support, software services, conference support services, and managing computer maintenance contracts. CaNS is the group collectively responsible for successful operation of the network infrastructure and support of the computing services required to meet EMSL's scientific mission. In supporting EMSL's growing business and research needs pertaining to information sciences, CaNS works to secure global information access to our facilities by providing online remote access to both computing resources and scientific equipment. A large portion of CaNS efforts provides customer support to EMSL researchers and off-site users. With off-site users it is vital to provide secure information access and dissemination among EMSL researchers and a global scientific user community.

Wireless Networking Deployed

Wireless Networking became an improved reality this year in the EMSL. Coverage areas were expanded, equipment was upgraded, and security was improved.

Office Computing Support

In addition to the standard services provided to PNNL by IS&E (Information Systems and Services, provider of general PNNL computer services), EMSL's Office Computer Support team provided primary computer support services to EMSL's 1100+ PC and 220+ Mac computer systems. While the majority of these systems reside on user desktops, some systems are connected to EMSL's specialized electronic instruments and devices in support of the research mission. In addition to satisfying the daily support requests from users for the PC's and Mac's, the team responded to an increasing number of support requests for PDA's (i.e., Personal Digital Assistants, such as Palm Pilots) and remote computers.

There was a significant increase in the number of PC's upgrading from Windows 98 and 2000 to the Windows 2000 and Windows XP operating environments. The new operating system provides the EMSL users with increased capability and reliability. The 220+ Mac's within EMSL consist of G3 & G4 models running MacOS 9.x/OS-X and the Office X suite. Many of these systems were upgraded throughout the year. OS-X was introduced.

License servers provide access to common desktop applications for Macintosh and PC systems throughout the facility at a reduced overall cost. Automated PNNL network installers are available (to staff) for a range of commercial and locally developed software including Word processing, spreadsheets, drawing, and presentation applications; scientific graphics; project management; relational database; equation manipulation and solution; viewers for documents and PNNL databases; user clients for PNNL applications.

Distributed File Services Enhanced

The CaNS strategy for high availability in its distributed file service (Andrew File System or AFS) configuration paid off several times this year as hardware component failures were repaired without disruption of service to users. Besides high availability, the EMSL distributed file system provides uniform access for users to their personal and project areas from any EMSL Unix or PC system, enhanced and secure file sharing capability, consistent file backups, access to shared software (described later), access to maintain web pages, and consistent tools across platforms.

This year, the systems providing AFS services added a terabyte (1,000 gigabytes) of new space. A new type of storage that costs 75% less than the existing AFS storage was purchased and deployed for evaluation of its reliability and performance. So far it is meeting all expectations and will probably be the basis of future upgrades.

In addition, the operating system on servers in the Infrastructure was upgraded to the latest revision and new rack mountable systems were installed to replace five-year-old shelf models. This enabled us to consolidate two rows of cabinets into five cabinets and make room for the new supercomputer.

Software Integration

In 2002, CaNS developed two new software application systems designed to streamline the processing of EMSL users and to track statistics requested by DOE.

EMSL Resource System (ERS). The ERS web-based tools were developed to track usage of EMSL's major instruments and facilities. The design and development of the ERS began in early FY 2002. A beta system was rolled out in March and has been used to track usage of a small number of instruments. We anticipate the tracking of usage of all major instruments on the ERS by the end of FY 2003.

The ERS is composed of two reservation systems. An Internet-based system can be used from a desktop computer, and Web Tablets located near the equipment can be made available for "walk-up" scheduling with a "touch screen" interface. These systems comprise a major milestone in addressing the DOE Inspector General (IG) audit recommendations that EMSL improve accountability for the use of its instruments.

The ERS desktop application allows reservations to be made on any of the EMSL instruments using a drag-and-drop scheduling system. Reservations are displayed in a calendar-like grid and color-coded according to the usage type (such as programmatic, on-site, remote user, etc). Each reservation can be linked to an EMSL User Proposal or a PNNL staff member requesting the usage.

EMSL User System (EUS). The EUS web-based work-flow tracking system facilitates the use of EMSL, starting from the initial request for use of EMSL resources to the tracking of publications resulting from each use. The EUS was designed, developed, and beta tested in FY 2002 and rolled out on October 1, 2002.

The EUS consists of an externally available web application that allows users to submit requests for using the EMSL facility. A second application allows EMSL staff to review and approve or deny these requests, update the request information, track the approval process and receipt of necessary user agreements, and close out the usage once it is complete.

The EUS also interacts with PNNL's Electronic Records & Information Capture Architecture (ERICA) application, used to submit scientific publications to DOE's Office of Scientific and Technical Information. Together, the EUS and ERICA can be used to track publications resulting at least in part from an EMSL use and linking those publications back to the original EMSL use information. This also comprises a major milestone in addressing the IG audit recommendations that EMSL improve the tracking of published reports, papers, and journals that result from an EMSL use.

Automated e-mail letters are sent from the EUS to notify the users and EMSL staff of changes in status as a usage request flows through the proposal, usage, and results stages. These letters confirm receipt of a proposal, request EMSL staff to update and approve proposals prior to their acceptance, identify significant changes to a proposal (such as the addition of new users), and on closing, request usage summaries and citations for publications resulting from the use. A User's Guide was also written to assist in the use of the EUS and to document the work-flow process of EMSL.

Graphical reports in many common formats can be generated on data collected and stored from both the ERS and EUS applications. These include the automatic generation of the EMSL User Data reports requested quarterly by DOE. Other reports include listings of proposals at any stage in the workflow process, listings of users that have or plan to use the EMSL facility, listings of the institutions and counties these users are from, and the instruments they are using.

Support Queue Tool Enhancements

The EMSL Support and Help Queue System is vital to the operations of the EMSL. One of the primary roles of the EMSL CaNS group is to provide computer support to all EMSL users, including scientists, technicians and support staff. Of the many ways that this help is provided, the most commonly used channel to report a problem, is via e-mail and web forms. The EMSL Support and Help Queue system (ESHQ) was developed and deployed by CaNS in 1999 to handle this 24 x 7 response service. This system provides software to handle and store the submitted email requests, and provides the software needed by CaNS members to access these requests, reply to them and record all dialogue surrounding the problem. Users benefit by receiving a more thorough response, faster service, and an improved tracking system to assure their problems are solved in an expeditious manner. CaNS staff benefit from the ability to better organize their work and identify chronic problems.

This year, the EMSL Support and Help Queue system provided continual, mission-critical service to the CaNS team and has continued to be enhanced to meet growing needs. Additionally, the adoption of the ESHQ system by nine other EMSL support groups brought the total to 26 different help and support queues currently being hosted by the CaNS system.

Data from the year 2002 show that these 26 help queues were staffed by over 130 administrators and experts, who together handled an impressive 16,000 requests for help and support from EMSL staff and users.

Conference Room Support

In 2002 the CaNS Computing and Conference Room Management Team provided the setup and configuration for all audiovisual and presentation computing needs in EMSL including the PNNL onsite review. We added a workstation to capture and encode the video and audio from meetings for the purpose of streaming the meetings.

Unix Scientific Computing Support

Unix System Support morphed this past year for CaNS. We still support five operating systems: Redhat Linux, Sun Solaris, SGI IRIX, HP-UX, and IBM AIX (ordered from the most common OS type to the least used). We now support more Linux systems than any other OS. Clustering technologies and methodologies coupled with the adoption of Gigabit-Ethernet as the PNNL network backbone have brought about many opportunities for experimenting with high bandwidth networking and multi-node computational solutions for our customers. We are currently managing 12 Linux clusters that vary in size from 8 to 128 processors each. The Unix Scientific Computer Support team upgraded its test bed cluster to an 8 processor (4 node) cluster with fast Ethernet, gigabit Ethernet and Myrinet network backplanes allowing scientists to experiment and benchmark before they buy their own hardware.

Unix Capabilities Maintained

Unix Software Repositories provide shared access to frequently used software, including freeware and floating license managers for commercial scientific applications. Applications in the repository include computer languages and interpreters, editors and debuggers, configuration management tools, documentation tools and pre-viewers, communication and collaborative tools, visualization, plotting, and graphing tools, numerical tools and libraries, data acquisition tools, data management, structure, and format conversion. Over 150 applications are available via this repository, and have been built/compiled to operate over the various operating system flavors. The repository is made available via our distributed file system (AFS) and provides the benefit of consistent applications without users having to build them themselves.

Upgrades and security patches are continually required in the support model for CaNS to provide capability enhancements, support new hardware, and plug security holes. 250 EMSL Unix desktop, infrastructure, and computational systems were upgraded to the latest operating system, application services, and security patches to meet security operations mandates. This work was done with scripts and automated procedures developed by the team to implement the standard EMSL configuration on all machines remotely. This standard configuration facilitates support of user systems and minimizes unavailability of systems to their users.

Network Infrastructure

Upgrades to the EMSL network infrastructure have become necessary due to the increased bandwidth now required by the users. During the past few years applications have grown in their complexity and the requirements of moving huge amounts of data across the networks have become commonplace.

General Statistics

A dedicated team provides complete computer support for all EMSL computer systems, including PC, Macintosh, and UNIX systems. Computer procurement assistance, setup, delivery, connection, upgrade installation, and 24-hour computer emergency support are all provided. System administration services include configuration management, software upgrades, security standards, account setup, and automated backup. The CaNS group supports EMSL's local computer users and researchers throughout the laboratory as well as EMSL's Front Office.

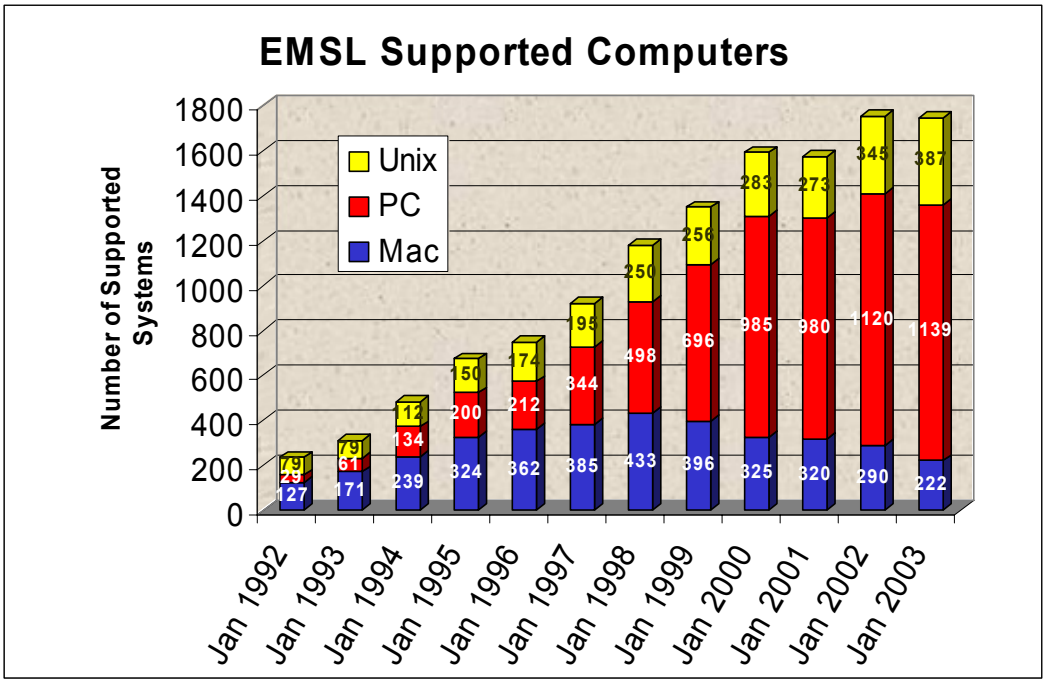

Figure 1. Computer Count History.

In 2002, CaNS added 49 new scientific users to bring its support scope to 596. Of these, 235 are remote.

EMSL has a long history of growth in computer systems. Future growth is anticipated in the area of personal digital assistants (Palm devices), wireless systems, and in the number of computer systems supported by remote users of the facility. The chart in Figure 1 illustrates this historical growth in computer use. In 2002, 411 systems were added to the support scope and 418 were released yielding a net decrease of 7 systems.

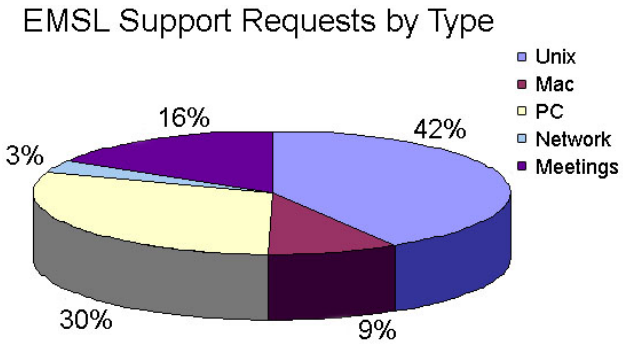

Figure 2. Support Requests by Type.

The EMSL Computer Support Group was founded in 1991 in the early stages of EMSL. Dedicated computer support was an important component of the EMSL project and continues to be so today. The CaNS group responds to approximately 5,000 formal requests per year and an estimated 1,500 informal requests. Conference room support and multimedia services represent another significantly growing area this year. Demonstrating consistency and responsiveness, 50% of the support requests are resolved within a day and 90% with a week. Figure 2 shows the breakout by platform of this year's computer support requests.

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