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Implementation of a Network Intensive Management Information System Major

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Overview

The evolution of Corporate Information Technology has resulted in the intensive use of networked computer systems in U.S. and worldwide business corporations. The demand for network support and training is practically overwhelming. The software services market is predicted by Dataquest to grow from $50 billion in 1995 to $79 billion in 1999. Such growth is driven by the move to advanced computer architectures encompassing Novell Netware, Microsoft Windows NT, groupware, and the Internet.

This evolution has not been overlooked in IS'95, Model Curriculum and Guidelines for Undergraduate Degree Programs in Information Systems(1). Resources necessary for effective IS programs include a specialized laboratory with data communication focus to be used for hands-on experimentation with and evaluation of local and wide area hardware, software, and applications. At least two defined courses in the recommended curriculum, IS'95.4 - Information Technology Hardware and Software and IS'95.6 - Telecommunications deal directly with networked computer systems.

In response to these developments, the Eberly College of Business (ECOB) has implemented a proposed Network Intensive Management Information System (NIMIS) program. (2)

The first undergraduate network class began in the ECOB in January, 1996. Student enthusiasm was quite strong and participation has been eager. A second class is scheduled for the fall along with a tentative offering at the MBA level. Students appear keenly aware of network computing trends and show high interest in the offerings.

In conjunction with the NIMIS program, an intern program aimed at providing network administration experience in a corporate environment is being put in place. Early corporate responses to a request for placement possibilities has been highly favorable. The demand seems much higher than the ECOB program can supply. For instance, one company indicated they were hiring three network specialists each month and had a backlog of 20-25 unfilled positions. Assuming such demand will carry over to the graduates, the NIMIS program promises to be quite a success.

Course Proposals

A key to the adoption of the NIMIS program was adoption of necessary courses by the ECOB and University Senate. New courses, IM352, Network Installation and Administration, and IM354, Network Design and Advanced Administration were proposed for the undergraduate curriculum. A graduate course, IM660, Corporate Network Management was also proposed. The courses were readily adopted by the appropriate ECOB committees. Business faculty from other departments appeared keenly aware of the impact of Information Technology and expressed great support for the department efforts.

Program Goals

Major goals for the program recognize the continuing effort at practitioner certification by both Novell (3) and Microsoft (4). An MIS student pursuing the Network Intensive MIS major should be prepared, at a minimum, to successfully pass a Novell examination for Certified Netware Administrator (CNA). In

addition, the majors can complete 70 % or greater of the requirements for CNE status which will further enhance there employability. The percentage can increase to reach full certification provided ECOB supports follow-on hardware, software, and faculty certification training.

Subsequent to the early NIMIS planning, it became obvious that Microsoft intended to challenge Novell in the field of corporate computer networking. The release of Windows 95 and Windows NT 4.0 beta, each containing a richly expanded set of networking capabilities, portend an increasing role for Microsoft networking. It can be expected that NIMIS majors will benefit greatly from emphasis on training to the requirements for becoming a Microsoft Certified Systems Engineer (MCSE). This effort expands considerably the scope of NIMIS training.

Laboratory Hardware

Hardware support for the Network Intensive MIS (NIMIS) program was readily forthcoming. Equipment purchase approvals responded to the need to provide hands-on training in all aspects of managing computer networks. Desired training includes network hardware assembly and disassembly including major components such as file servers, work stations, laser printers, scanners, network facsimile machines, CD-ROM drives, and LAN gateways.

However, delivery delays were very burdensome. The original schedule called for equipment delivery to coincide with the opening of the new ECOB building, i.e., January 16, 1996. Nine weeks later, the equipment began to arrive. Fortunately, another new computer lab had progressed much further and became the temporary home for the course. Students were able to re-partition four Pentium computers and in four groups were successful in installing Netware 4.1, Windows NT 3.5, and most network services. They were also introduced to the various problems of having four servers on the same cable plant.

Once equipment delivery began, the NIMIS lab quickly reached an adequate level of personal computers. A total of 16 Pentium computers were available to establish four individual networks. Each network had computers from three different vendors to allow working with different designs and setups. Some computers required the installation of CD-ROM drives and all required the addition of common network cards. Changing network cards was essential since the delivery of network hubs was delayed until after term completion. Consequently, all pre-installed 100BaseT cards had to be replaced by those with 10Base2 connectors. Students were able to accomplish minor work with hubless 10BaseT systems by constructing cross-over cables for two-computer communications. By-and-large however, all network construction was carried out using 10Base2 connectivity.

Laser printer deliveries were also a major problem. Early work in the alternate lab permitted little or no printer interfacing as the primary network server was handling all print queues and printers. Follow-on network installations in the NIMIS lab only allowed the installation of printer services because several old dot-matrix printers were located. Fortunately, the printers worked with standard Novell Netware drivers and allowed some experience with printer services.

Deliver delays on other network hardware resources such as scanners and FAX machines effectively precluded work with such installations. Late arrival of high-speed modems and delayed installation of laboratory telephone lines delegated experiments with remote access services to follow-on classes.

Network Software

Server software support was somewhat limited because of the delivery delays. However, local Novell support was able to provide several CD-ROM disks containing the complete Netware 4.1 operating system and documentation. Two-user demo licenses were temporary patches until five-user licenses arrived. Having four CD-ROM disks allowed the student groups to do simultaneous Netware installations. During the semester it became very apparent that the availability of multiple copies of software on CD-ROM was

essential for viable teaching. Floppy-disk based installations, and even CD-ROM based installations that generated backup floppy disks were simply too time consuming for classroom installations. Unfortunately, the absence of CD-ROM drives on several client machines made installations from floppy disks unavoidable. Hindsight clearly demonstrated that CD-ROM drives are essential on all networked personal computers.

Netware server installations required the creation of non-DOS partitions on those personal computers that were designated to become servers. A standard process might be to simply fdisk the hard-drive and proceed with server installation from floppy boot. However, it was desired to preserve the pre-existing DOS software as the servers would also act as clients on peer-to-peer network installations. A key element in avoiding a continuing re-installation of software was the utilization of commercially available dynamic repartitioning software. Such software easily allowed the creation of 300 Mbyte non-DOS partitions for Netware without destroying the approximately 100 Mbyte of pre-installed DOS and Windows software.

Installation of Windows NT servers was more of a problem as only a single installation CD was available. The version was Windows NT 3.5 which had become available through a Microsoft beta testing program. Because the disk had to be shared, installation of network management and application software designed for network use was delayed for some time. Of course, some of the software problems were resolved as deliveries of software continued.

Working with Windows NT had not initially been a major priority, but student interest was very high. As a result, several contacts were initiated with Microsoft to see if Windows NT 3.51 server CD-ROMs could be made available for educational use. Microsoft had earlier granted ECOB an educational license for 50 copies of NT workstation but did not have an official process for making the server available. Late in the term, a Microsoft representative who were visiting the campus to talk about a switch to C++ and review the utilization of educational licenses for Visual Basic, made available a CD-ROM containing Windows NT 4.0 beta. The students installed the software immediately as everyone was anxious to work with the NT40 interface.

Prior to client/server network installations, peer-to-peer network systems were created. Of primary interest was setting-up file sharing, message handling, and printer sharing. Since the personal computers on each four computer network ran a mix of Windows for Workgroups and Windows 95, creating the networks was a bit of a challenge. Student interest was strong as most of them were unfamiliar with modern resource sharing networks.

This experience for NIMIS majors will allow them to manage hardware maintenance technicians and support network users effectively in the business world. They have begun to develop capabilities in network construction, design, and management.

Intern Training

During the conduct of this first networks course, an effort was made to develop corporate contacts for network management interns. The effort started with an analysis of want ads in the Pittsburgh Sunday newspapers for the month of February. Approximately 35 companies advertised for network help over that period. Each company received a letter asking if they could fund internships (see attached sample letter). Responses were generally favorable, e.g.,

"I am very pleased to see that you have recognized the opportunities in this field and the corresponding lack of trained personnel to meet the growing demand in this area. I am interested in learning more about potential candidates you may have for the intern program"

Overall, the interest far exceeded the number of students ECOB can make available for possible internships. At least four companies sought internal funding to support network interns or promised future support.

As it turned out however, the biggest obstacle to establishing networking internships was with the students. Out of 17 students in this first class (most of whom were seniors), 12 were primarily interested in a traditional systems analysis career and only 5 thought that network management might be an attractive possibility. Since 3 of those 5 were seniors, only the remaining 2 were available as student interns. It certainly became clear that several classes would pass before a sufficient pool of students would be available to support a strong internship program. Current plans call for repeat class offerings in the fall and winter terms with a repeat of efforts along the internship line for the summer of 1997.

Conclusions

This first offering in networking provided to be a valuable effort for many reasons. Primarily it provided a good shake-down cruise through the rough waters of hands-on intensive network teaching. In spite of considerable hardware delivery problems, the students were able to accomplish much in the way of successful hardware and software installations. For the first time, dedicated hardware was available to support hands-on training that precluded the shared use of the equipment. The effort also pointed to gaps in student knowledge that hopefully will be addressed in prerequisite classes. Of particular concern are weaknesses dealing with operating system control files such as config.sys, autoexec.bat, win.ini, and system.ini. Most students were not familiar with the problems of software interrupts, i/o base addresses and DMA channels. Installation of CD-ROM hardware and drivers was tedious, to say the least. The advent of Windows 95 and Windows NT 4.0 promise even more concern. It is not at all clear where students will have access to campus computers that do not preclude access to these fundamental control files and concepts.

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(1) IS'95, Model Curriculum and Guidelines for Undergraduate Degree Programs in Information Systems, draft report May 17, 1995

(2) Proposal for a Network Intensive Management Information System Major, Dr. Richard A. Halapin, February 24, 1996, presented at the first AIS conference, Pittsburgh, Pa., August 20, 1995

(3) Novell Education Course Catalog, Novell, Inc., 122 East 1700 South, Provo, Utah, 84601-6194

(4) Microsoft Education and Certification Roadmap, Microsoft Corporation, One Microsoft Way, Redmod, WA 98052-6399