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Building a Gateway for the CD-ROM Network: A Step Toward the Virtual Library with the Virtual Microsystems V-Server

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Establishing a CD-ROM network which is accessible to users outside the library through the campus network is one step toward building the virtual library. Choosing the appropriate method for making the network available to outside users depends on the goals of the library as well as the equipment and networks which may already be in place. Several methods are available for building a gateway from CD-ROM local area networks to wide-area networks.

Software options include the use of PCAnywhere or Carbon Copy by the dial-in user to imitate a similarly configured machine on the network. This option has several drawbacks including the high price of supplying every user with a copy of the necessary software. Everywhere Access software is a very new development and should be seriously studied by those interested in gatewaying to other networks. This particular option was not available at the time St. Mary's was choosing a gateway.

Hardware options for a gateway include those built by Gandalf, Logicraft, and Virtual Microsystems. Virtual Microsystems V-Server gateway was chosen by St. Mary's since it can handle almost any type of hardware logging into the system such as Macintoshes, dumb terminals, or any type of PCs as well as having other advantages for our situation.

INTRODUCTION

Establishing a virtual library has been a prospect for many libraries and other organizations discovering the possibilities opened by local area networks to share access to CD-ROMs. The networking of electronic information empowers the user to find needed information easily and quickly. However, the establishment of a CD-ROM local area network usually still requires the user to visit the

library to gain access to the network so this is only a small step toward the virtual library. St. Mary's University Academic Library in San Antonio has provided a gateway for dial-in access to its CD-ROM network from outside the library.

One of our goals in providing this service was to make library indexes and materials more easily available to St. Mary's nontraditional and off-campus students. Often these students spend little time actually on campus since many classes are taught at local military bases or businesses. Others who do visit campus for classes are evening students with full-time employment who spend only one or two nights a week in class and have little spare time for visits to the library. The Academic Library began purchasing individual CD-ROM workstations and CD-ROM indexes several years ago and these quickly became very popular among the students. We wanted to increase access to automated index searching both inside and outside the library by taking advantage of the popularity of CD-ROM indexes among the students.

ALTERNATIVES

One option for bringing journal indexing to a wide area network is to load journal index tapes (such as those available from Wilson) onto the library computer which handles the online catalog. But we found that we did not have the size or power to do this with our current computer and we were unable to afford to migrate to a larger one at the time. We also considered loading these tapes on our campus mainframe, but found that purchasing a search engine to run the tapes there was out of our price range. In addition, we were hoping to keep as many of our computer resources in-house as possible since we have found that when they leave our direct control, they are often not treated as first priority when problems arise. The possibility of building a local area network for our CD-ROMs with a gateway to our campus network was pursued as an alternative to loading index tapes on the main library computer.

GOALS

Our principal goal was to bring access to the CD-ROM network to the wider university community including students at off-campus sites. Our online catalog was already available for dial-in access through the campus network. Secondly, we wanted control of the CD-ROM network to stay within the library. Some of the options for networking that are available make use of the campus mainframe as the network server and, though we work closely with our campus computer center, they do sometimes have other priorities than the library.

In order to open dial-in access to the gateway to the widest possible community of users on campus, we wanted a network which would accept any sort of hardware, such as terminals, older and newer PC's, or Macintoshes. We also excluded any gateway options which relied on loading expensive software packages on the users' workstation since this would restrict access unnecessar-

ily. The network and gateway had to be reliable, affordable, and easy for the students to use. Also, we wanted the network we purchased to support all calls to the CD through DOS extensions, directly to the CD, or any other variation since different CD-ROM search software has different requirements regarding the installation of DOS extensions.

Next, the network and gateway had to be easy to administer. Since we would be unable to hire a new full-time system administrator, one of the librarians would have to take on this job in addition to other duties. Also, the configuration of the network should be such that one workstation or printer could go offline without affecting the entire network. Printer connections and arrangement should be made so that resetting printers and canceling print jobs could be done manually from the workstation and printer itself. Since this might often have to be done by students or reference librarians, we wanted printer problems to be easily solved, without any high level access to protected parts of the software system.

Another goal which would also ease the administration of the network was to have dial-in access take place through the campus fiber optic network already in place on campus, rather than installing new modems in the library for this purpose. This would enable the network to have an extra level of dial-in security since users on the campus network would need a password assigned by the campus computing center. This would also ease the administration of the network for the library network administrator.

GATEWAY OPTIONS

Since our first goal was to gateway our CD-ROM network to the wider campus network, we looked first for hardware and software which would deliver this facility. Since different departments, faculty, and students favor a variety of different kinds of hardware, we wanted the gateway to work with any kind of hardware. We didn't want to impose unnecessary limits on access. The second of our goals which had a large influence on the choice of gateways was the need to avoid loading expensive software on users' machines. Some gateways require that special software packages costing hundreds of dollars be loaded on users' machines. This limits access by limiting the type of hardware the user must have as well as by pricing it out of the range of most students.

Software Options for the Gateway

- **PCAnywhere or Carbon Copy Plus**

There are different approaches which can be taken with regard to setting up a gateway for dialing into a CD-ROM network. Most of these are reviewed by Au (1992), Cutright and Girrard (1991), and McQueen (1990). One way is to set up a network workstation in-house with a modem and software such as PCAnywhere

or Carbon Copy Plus which allow a remote PC to "imitate" the in-house PC. The drawback to this approach is that the remote machine must also contain the software package and these are somewhat expensive. Site licenses can be obtained but there is still the bother of copying, distributing, and installing a complex piece of software for each user. It also limits access to those with an IBM- compatible PC. This approach requires multiple workstations to be installed in the library to support multiple outside users. This approach did not seem feasible for us in light of the goals we had set for ourselves.

- Novell's Access Server

Novell's Access Server uses versions of the PCAnywhere ATERM program and Quarterdeck's DesqView along with a multiplexed version of Novell's IPX which is different from the regular IPX included with Novell. Also needed is a communications board which allows you to connect multiple modems to the host machine. Each user then runs under DesqView as a virtual PC.

- Everywhere Access

Another approach is offered by the Everywhere Access option. This is a very new piece of software which was not available at the time we were searching for our gateway or we would have certainly given it consideration. It is similar to the concept noted above in that it is a software solution with a PC inside the library dedicated to a user outside the library. Using Windows with Everywhere Access, a single PC inside the library can support multiple remote users so that many PC's need not be purchased to support many users. It allows access for any type of hardware which supports a VT100 or better terminal emulation so it does permit access to terminals and Macintoshes as well as PCs. Everywhere Access was not available at the time we were examining gateway options or we would have given it serious consideration.

Hardware Options for the Gateway

- Gandalf's Starport Server

- Logicraft's CD-Ware

A different option for building a gateway is to purchase hardware built especially for this purpose. At the time we set up our network there were only a few companies which offered a gateway option for a CD- ROM network. Virtual Microsystems produces the V-Server gateway which works with the DEC Infoserver. Gandalf offers the Starport server for a network running Meridian software, and Logicraft offers a gateway option specifically for VAX users. Any

of these options seemed to fit well with our goals and needs, particularly the goal of making the CD-ROM network available to off-campus users. We received permission to dial into systems which had been set up by the companies in order to test the systems and their response times. The DEC Infoserver and V-Server gateway system responded somewhat faster in this test and, because the bid on this system was somewhat lower in overall cost, we chose Virtual Microsystems as our vendor. Their networking proposal also seemed somewhat more simple and elegant.

- V-Server Gateway

The V-Server Gateway allows four simultaneous user sessions per gateway. It contains a dedicated 286 or 386 processor, memory, and network interface card for each user plus a dedicated master central processing unit and network interface card. When a remote user requests access to the CD-ROM network via the campus network, one of the client processors in the V-Server loads DOS and the network operating system, establishes a link between the requestor's desktop device and the client processor, and the desktop device is then able to contact the CD-ROM network. All screen and keyboard input/output to the network via the client processor is performed and viewed exactly the same way as with a PC physically connected to the CD-ROM network. The V-Server supports transparent access to DOS CD-ROM applications from VAX terminals, PCs, and Macintoshes. Multiple V-Servers can be connected to the network to provide additional simultaneous user sessions if needed.

NETWORK CONFIGURATION

Originally the DEC Infoserver ran only on Pathworks but now runs on Novell Netware also. The Infoserver itself is not a fileserver but appears as a SCSI device on the network. It allows the network to share access to either 13 or 14 CD-ROM drives, depending on whether a hard drive is installed in the Infoserver. We chose to run Novell as a network operating system rather than Pathworks since we already had another Novell network in the library thus giving us in-house expertise to exploit. Also, it is possible that in the future we may want to connect the two networks and this would be simpler if both were running on the same operating system. The V-Server gateway and the DEC Infoserver are connected to the Novell fileserver which runs the network. Figure 1 is a visual representation of the network configuration.

We used a local vendor to set up our Novell network in the library. We chose 10baseT unshielded twisted pair cabling and a star configuration for the network inside the library in order to reduce the difficulty of locating and repairing network wiring problems. The star configuration makes it easy to determine which connector is at fault when a workstation fails to connect to the network. This configuration also makes it easy to take a workstation offline and to add

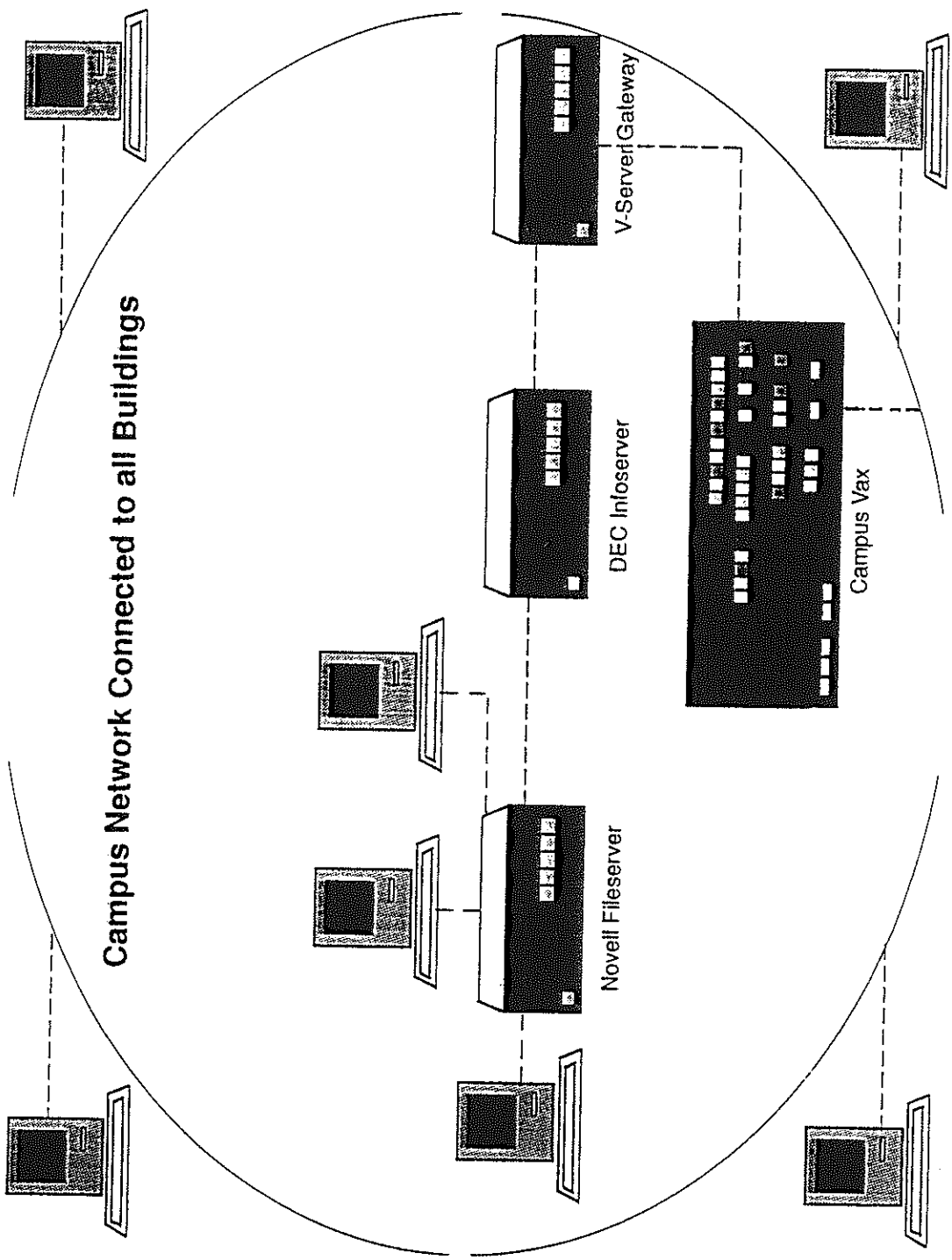

Figure 1. Network configuration

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other workstations without interrupting the workflow on the network. The wires are all brought together and fed into the fileserver using DEC Repeaters as hubs. For the remaining hardware needed, 8-bit DEC DE101-AA network cards, monochrome monitors, and 286 IBM-compatibles with 20-MB hard drives for the workstations were used. A 386 IBM-compatible with a 105-MB hard drive serves as the Novell fileserver. We have since upgraded most of the 286's to 386SX's in order to take advantage of the 386's improved memory capabilities.

Since the recent drop in prices on PC's, in setting up a new Novell network, I would recommend purchasing the fastest and most powerful fileserver affordable with at least a 200-MB hard drive and at least 8-MB of RAM. Workstations should be at least 386SX's due to the improved use of memory over older models. At this time, 16-bit network cards are not priced much above 8-bit cards and I would recommend 16-bit cards. I would also recommend VGA monitors due to their improved resolution and ability to take advantage of color highlighting. An uninterruptible power supply allows the fileserver to be shut down normally in case of a power failure and also helps smooth out power surges and dips. This is a necessity with a Novell network since Novell crashes in case of even a momentary power failure.

For network printing, we reused the original printers which came from our individual CD-ROM workstations. Electronic switchboxes were purchased and three printers are shared by nine public workstations. The electronic switchboxes automate the printing process for the users since the switchboxes constantly scan for incoming print jobs. Users need not manually switch the boxes to their home computer. Also, they have the advantage of being easy to reset if printer problems occur.

Figure 1. ...twork configuration

Often there are printing problems in which users send a large print job to the printer in error and want to stop it in order to save time and paper. Using normal Novell network printing procedures, stopping a print job can be somewhat complex and requires access to the Novell software. Stopping a print job when using electronic switchboxes simply requires canceling the print job at the source workstation and switching off the printer. Since Novell has not captured the print job, there is no record of it in memory and the printing stops. Students and reference librarians have had little difficulty in learning how to handle printing problems with this procedure.

INSTALLATION

Installation of the network took place during the interterm between the fall and spring semesters to allow for the least disruption of student and faculty library research activities. After deciding on the placement, the type, and number of terminals and printers we could afford, our on- campus physical plant electricians rewired the area and installed outlets for all the equipment. An independent contractor was hired to pull the 10baseT wiring for the network itself. Luckily, this is not a major task for us as we have an open ceiling with suspended tiles and fluorescent lighting. This allows us to run most of our wiring through the ceiling

without much difficulty. We were careful to avoid placing the wiring very near the fluorescent light fixtures since our cabling was unshielded and fluorescent lights can interfere with data traffic on this type of cable. Luckily all went well and we have had no problems with interference. The workstations were set up with their network cards and DEC Repeaters were used as hubs to bring all the 10baseT wiring together and into the fileserver.

The Novell software and the network fileserver were purchased from and installed by a local vendor who has a contract with the University to supply us with microcomputers. Finally, Virtual Microsystems (VM) arrived to install the DEC Infoserver with its CD-ROM towers of drives and the V-Server gateway. Of course, there were glitches in the installation and everything did not go as smoothly as planned. The 10baseT wiring was not completely installed when Virtual Microsystems arrived and we had not acquired the appropriate network card for the fileserver. We were still wiring and installing Novell while VM technicians were trying to install the V-Server and the Infoserver.

The menuing software VM sold and installed for us worked except that they had installed it with all users having the same name and level of rights (supervisory) so we had to alter all this when we discovered it in order to activate the metering option and in order to protect the integrity of the network. We also spent many weeks getting the ethernet line pulled between the library and the computing center in order to set up the V-Server gateway due to problems with the underground conduit. There were many other more minor software and hardware problems which had to be handled, but in the end, everything worked. And, fortunately, it has continued to work for well over a year now.

PROBLEMS

One obstacle we faced with the use of the V-Server was giving users the ability to download the results of searches. Inside the library, downloaded searches go directly to a disk in the workstation, however, through the V-Server, downloaded searches go to a virtual disk located on the VAX campus computer. Virtual Microsystems wrote a short program which copies downloaded searches from the virtual disk to the user's VAX account upon exit from the gateway. These searches can then be transferred to the user's personal workstation or printed on a system printer from the VAX account.

A final problem with the use of the V-Server gateway was that the telecommunications software we were using as the campus standard (Procomm) does not map the functions keys correctly on the gateway. Keyboard mapping had been discussed with Virtual Microsystems and we had been assured many times during the purchase of the gateway that Procomm would work. We experimented with many other telecommunications packages and none worked properly to send the function keys through the gateway to the network. I was rescued by another network gateway administrator who sent me a specially tailored Kermit program. Since Kermit is in the public domain we are able to distribute this keyboard map to our users for gateway access.

One added bonus of having to distribute the Kermit software is that it allows us to also distribute information on how to initialize the V- Server gateway and how to dial into the campus network. This is important in that dialing into the campus network is not trivial for novice users and most problems for them seem to occur in the initial stages of connecting, not in the actual use of the CD-ROM network.

NO MORE PROBLEMS?

Planning for the network began in earnest in November 1991 when grant money was received to build the network. Installation of the first stage which comprised the network inside the library was completed in January 1992. Installation and testing of the V-server gateway to the campus network was completed during the summer of 1992. This gave us a few months to work with the network inside the library before we dealt with training users to dial in from outside. Originally we had planned to install all parts of the network simultaneously but wiring problems between the buildings prevented this. Installing the network in two stages gave us a chance to work out most of the bugs of the first stage before proceeding to the problems inherent in the second stage.

Installation was the most difficult aspect of administrating the network and gateway. Now that most of the initial bugs have been worked out of the system, it works quite well. We are now up 99.9% of the time and we have not crashed since installing our uninterruptible power supply. Previous crashes were all caused by power failures. Maintenance is usually limited to a few minutes each week when new CD-ROMs are installed. Time spent on maintenance can be lengthier when new software releases are installed because there are generally a few problems to be solved. Some time is usually spent on customizing new releases to fit our needs, placing them on the menu, and so forth. If there are bugs in the software which cause problems, this is also time-consuming.

CD-ROM updates are generally placed on the network first thing in the morning when no users are logged onto the network. The network does not have to be brought down or rebooted to install new CD-ROMs or new searching software which is a big advantage over some other CD-ROM networks. In fact, the network fileserver is never rebooted unless maintenance needs to be done on the fileserver itself and this is a very rare occurrence.

We have distributed dozens of copies of the Kermit keyboard emulation and have hundreds of logins to the network through the gateway with very few problems. All the gateway questions referred to me thus far have been from people who cannot get their modems to dial properly or have other problems separate from actual use of the V-Server and CD-ROM network. Connection to the CD-ROM network requires only a single command once the user has gotten properly logged into the campus VAX. It seems that once people have determined how to dial into the campus network, connecting to the CD-ROM network and using it does not present a great challenge. Once the user has connected

with the CD-ROM network, there is no difference between remote use and local use inside the library, with the exception of printing or downloading search results as discussed above.

SUMMARY

Before installing a CD-ROM network and gateway, the goals to be accomplished should be established. The hardware and software chosen for the network and gateway should be able to meet the established goals and criteria for access, reliability, affordability, and ease of use (for more information on the related hardware and software, consult Appendix 1). In planning the network, be flexible in considering new technologies, but keep your goals firmly in mind. Installation should be scheduled so that the full attention of the systems administrator can be given to installation and so that disruption of services will be kept to a minimum. Bear in mind that technology will keep advancing even after the decisions have been made, but don't be fearful of making a choice. Time spent in waiting for new and better technologies is access denied to users.

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McQueen, Howard. (1990, July). Remote dial-in patron access to CD-ROM LANs. *CD-ROM Professional, 3* (4), 20–23.

APPENDIX 1. SOURCES OF FURTHER INFORMATION FOR NETWORKING PRODUCTS

Carbon Copy Plus

Microcom
500 River Ridge Dr.
Norwood, MA 02062
(617)–551–1000

Everywhere Access

Superior Network Software
P.O. Box 18
Warsaw, Ontario
Canada K0L-3A0

Logicraft CDWare

Information Handling Services
Dept. 59, 15 Inverness Way East
P.O. Box 1154
Englewood, CO 80150
(800)–241–7824

Novell

Novell
Communications Products Division
890 Ross Drive
Sunnyvale, CA 94089
(800) 453–1267
(408) 747–4000

PCAnywhere

Symantec
10201 Torre Avenue
Cupertino, CA 95014
(800) 442–7234

Starport Server

Gandalf
4550 Post Oak Place, Suite 343
Houston, TX 77027
(713) 840–7229

V-Server Gateway

Virtual Microsystems
1825 South Grant Street, #700
San Mateo, CA 94402
(415) 573–9596