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AFTER ROUGH START, LANTASTIC GIVES GOOD SERVICE IN A RESEARCH LABORATORY NETWORK

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Product Description

This review is of LANtastic 5.0 by Artisoft Inc., 2202 North Forbes Blvd., Tucson, AZ 85745. Phone: (800) 846-9726. LANtastic lists for $119 per machine. Government and educational pricing is available; call Artisoft for details.

We will describe our experience in installing and using a peer-to-peer local-area network (LAN). The LAN that we have installed is based on the Lantastic Adapter Independent Network Operating System (AI NOS) by Artisoft Inc. Lantastic/AI NOS has the ability to run with a dedicated server and nodes that can selectively define themselves as servers or workstations. Our LAN has been installed in a working multifaceted physics-research laboratory.

The Molecular Systems Laboratory (MSL) at the University of Tennessee is both an experimental-spectroscopy laboratory and a computational-physics laboratory. The experimental-spectroscopy portion includes a tunable diode-laser spectrometer for the study of gas-phase hydrocarbon molecules of planetary interest and a vacuum dispersive spectrometer for near- and mid-infrared studies. The spectrometer has a focal length of 5 m and incorporates 20×40-cm echelle-ruled gratings. It is fully computer-controlled and is currently being coupled to a computer-controlled sun tracker for atmospheric studies. The computational-physics segment of the laboratory concentrates on neural computational systems and image-enhancement efforts directed at Hubble-Space-Telescope-class problems.

The MSL has seven ether ports and seven terminal-server ports available. We use central services for much of our computing and especially for mail services. We have not made use of LAN mail services.

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Why a LAN?

There were times following our decision to introduce a LAN when the question of why we were doing so became less a question and more a matter of standing at the wailing wall beseeching the gods to have mercy. In retrospect, the benefits of installation have proven to be worth the cost, but we did not proceed without hesitation, because the demands of LAN management are not negligible. The promise of greater productivity and functionality became a compelling motivation for proceeding. We decided to incorporate only the PCs based on the Intel 80x86 and MS DOS into a laboratory LAN, relying on the connection of all of our systems to the campus backbone to make communications possible with the smaller number of Macintosh and Sun workstations that we use.

Many related matters influenced our decision to deploy a LAN. In this article we discuss technology choices, hardware and software requirements, and servicing issues. We also describe implementation, installation, and administration of the network, as well as achieved performance and cost benefits.

Peer-to-peer

Only two LANs—Lantastic and Novell—were contenders for laboratory use. Novell had the advantage of being supported by the network-engineering group at the University's computing center and was available at an attractive price. Since initially we had only an IBM Model 70 available to use as a server, the downside of the Novell for us was the central concept of a dedicated-server network. Lantastic, on the other hand, while supporting a dedicated server, did not require one. Rather, Lantastic was able to function with what one might call distributed-server capability. In other words, we could farm out part of the server function to each of several network systems, making the peer-to-peer Lantastic very attractive to us. In addition, because of the nature of the laboratory operation, the multiserver capability enhanced utility of the network.

Our laboratory network consists of 10 nodes, each connected to the thinwire network by Western Digital Ether Plus cards or SMC/WD Ether Plus Elite 8- or 16-bit Ethernet cards. These cards are essentially the university standard since they support dual stacking for TCP/IP and Novell (the administrative network of choice locally). The laboratory network, including nodes only on the University's Ethernet, is shown schematically in the figure on page 319. With the exception of a modified IBM Model 70, a MAC IIci, a DEC VXT2000

x-terminal, a NCD NCD-19, and a SUN Sparc2, all of our workstations are fabricated in-house as commodity items using standard, readily available parts, which we also treat as commodity items. (In this review, we shall refer to all of the systems by the generic term "workstation.")

Server capabilities

We wanted the fastest machine that we could afford for the dedicated server. Disk storage and tape backup were higher priorities than large amounts of memory since the server does not run application code.

Servicing the real-time systems is a major priority in the laboratory. The real-time systems include one 386SX-16 and one 386DX-25 real-time data-acquisition system with 8 Mbytes and 4 Mbytes, respectively, of RAM and sufficient disk storage to enable each system to function as a stand-alone instrument controller, should the network be unavailable. All the control programming is done in Microsoft Visual Basic v.3.0 with several real-time extensions. Since all of the laboratory data requirements are low-rate serial or A-Bus systems, we find that Visual Basic provides the easiest and best compromise that allows a Windows visual interface and straightforward control and acquisition programming.

Servicing non-real-time systems is important since a great deal of laboratory activity occurs outside of the experimental areas. The non-real-time systems on the network are 386 and 486 systems appropriately configured for the principal tasks allocated to the system. As much as possible, we have attempted to make the user environment on each network system similar to all the other nodes, because all of the systems on the network are shared systems.

A given node can easily be set up as either a workstation or server. An appropriate node is assigned for designated individuals in the laboratory to manage. In the laboratory full time are two faculty members, eight graduate students and four undergraduate researchers. Several other faculty members have guest privileges. The laboratory users discussed at length the desirability of sharing resources. Most users were certain that they wanted to share printer, plotter, and scanner resources but were skeptical of disk sharing and software sharing. Nevertheless, considerations of both productivity and economy nudged us into full resource sharing.

Getting started

Lantastic—the network we chose—was installed about two years ago. It offers peer-to-peer networking on the PC. The software is easy to install, requiring users only to know certain specifics about their particular network card, such as interrupt, iobase, rambase, and manufacturer. Other options, such as server or workstation and installation directory, are matters of choice.

Our Western Digital (WD) Ethernet cards seem to have a problem with heavy network traffic. According to Technical Support at Artisoft, most WD drivers "work around" the problem of heavy traffic, but for standards compatibility, Artisoft chose not to implement a workaround. As a result, heavy traffic often causes an internal stack overflow in *ailanbio.exe*, which, in turn, often results in a system lockup or makes rebooting necessary when Lantastic for TCP/IP is loaded. We have corrected the stack-overflow problem with an updated version of *ailanbio.exe* from the Artisoft bulletin-board system (BBS). The updated version has a 1-kbyte-larger internal stack. Our goal is to change from the WD drivers to NDIS (Network Driver Interface Specification) drivers, which give the added benefit of supporting dual stacking. Most of the files necessary for this change are found in the self-extracting file *AINDIS.exe* from the Artisoft BBS. NDIS drivers are required from the Ethernet-card manufacturer in order to complete the shift to full NDIS compliance.

Most of our problems in the initial setup came from Windows. If the network is installed after Microsoft Windows has been installed, it is necessary to reenter the Windows setup facility from DOS and tell it that a network is now installed. This works most of the time. In some cases, however, we had to resort to editing the Windows *System.ini* file as directed in the *NETWORKS.WRI* file. If Windows is installed after the LAN is up and running, Windows configures itself appropriately, and no manual changes are necessary.

The currently installed version of Lantastic/AI NOS is 5.0. We encountered some problems trying to run the V 5.0 drivers and NetBios Control for Version 5.0. With the assistance of several Artisoft technical-support people and some local detective work, the problem was discovered—a damaged crimp on a BNC connector. The V 5.0 drivers are of interest because they are NDIS-compliant and allow different Ethernet protocols (such as TCP/IP and Lantastic) to coexist on the LAN. Full NDIS support requires *AINDIS.exe* from Artisoft and NDIS software from the card manufacturer.

Many of the nodes, depending upon the needs of the regular node users and the node manager, have been configured with MS DOS 6.2 boot menu selections that allow OFF-LAN, LAN/SERVER, or LAN/WORKSTATION selections on bootup. The difference between LAN/SERVER and LAN/WORKSTATION is that other nodes cannot mount local disks of workstations. Thus, a workstation has access to network services and servers, but other users do not have access to the workstation on the network. The real-time systems exist as workstations when taking data.

The current dedicated server is a 486DX33 system with over 1 Gbyte of disk storage. Network performance improved significantly when we installed a caching disk controller on the dedicated server (The Super_Server). The large amount of central storage is mandated by the need to store large data files in our spectroscopy work and our image-processing activities.

Network administration or management is one of the liabilities of implementing a network. The peer-to-peer Lantastic is easy to manage, and only two of us have administrator privileges, but it is important that the network have more or less day-long administrator coverage. Once the network is an accepted, stable entity, the demands are minimal.

The biggest problem that we faced initially was that of fearful users. Whenever a problem arose, the LAN was always the culprit in the eyes of the end users, even if, for example, the power had failed, causing the server to reboot and drop all connections, or someone had installed and run a program that was not network-ready and had therefore locked up the server.

We recommend that a reasonably fast machine be used as a dedicated server. We attempted to use an IBM Model 70,

a 80386DX16 MHz, as our dedicated server. The machine proved extremely slow in servicing more than one user. Sending two print jobs simultaneously would slow it down to imperceptible motion. We eventually changed our server to an 80486DX33, which alleviated most, if not all, such problems.

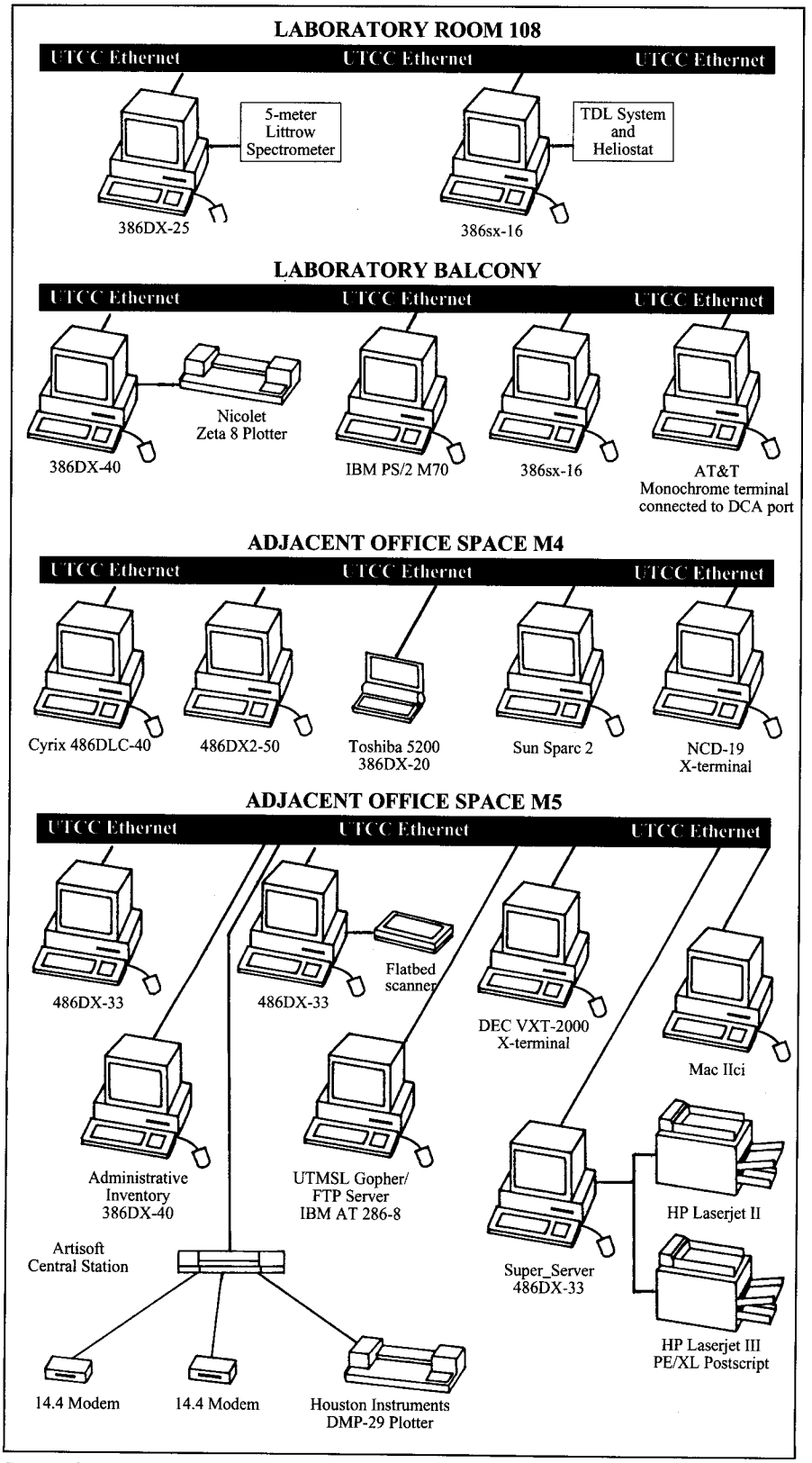

Figure. Thinwire UTCC Ethernet connects computer resources throughout Molecular Systems Laboratory.

Printer options

Printer sharing is a major LAN benefit. In our case, printing is handled by the network and dedicated server. There are three printer paths defined on the network: LPT1, which is a standard Laserjet II for non-Postscript printing, and LPT2 and LPT3, which are both redirected to the Laserjet III. This unit is equipped with a Pacific Page PE/XL Postscript accelerator in the form of a card/cartridge combination. The augmented Laserjet III is set to autoswitch between Printer Control Language (PCL) 5 and Postscript Level II, with the default being Postscript Level II. The Pacific Page card also supports autoswitching of input ports, an especially useful feature because of the higher data-transfer rate that parallel input offers. The Laserjet III is equipped with an Extended Systems Sharespool ESI-3212A with eight 19.2-kbyte serial connections to each system apart from the network so that systems have print services when not on the network. There is also a small AppleTalk network that is servicing a Powerbook 170, a MAC IIci, and various transient visitors, and which is connected to the Sharespool by an Extended Systems Bridgeport 2679B print server.

On a LAN that includes a Postscript printer, it is well worth the extra money to make the printer autoswitch between PCL and Postscript, especially if DOS is to be used. DOS can send raw text files to the printer. When the printer is in PCL mode, the printer will simply print them; however, when the printer is in Postscript mode, the Postscript interpreter will attempt to interpret the beginning of a text file as the required Postscript header, usually with disastrous results. In our case, the printer would try to use the text file as Postscript command codes. This resulted in the printer locking up or printing hundreds of pages of garbage. The introduction of auto-switching eliminates these problems.

Shared resources

Sharing software is another major LAN benefit. As do many teaching and research laboratories, ours uses a wide variety of software. Much of the application software resides on the server (with a sufficient number of legal copies

to account for peak usage in cases where a license manager does not control launches.) The saving in nonduplication of expensive, occasionally used packages has nearly paid for the installation of the LAN. Since the network operating system makes it possible to mount server disks on a DOS or Windows desktop, shared software is used exactly as if it were on a local hard drive. Speed is not a problem in general unless the software package is heavily overlaid and does much swapping of segments. Maple V, for example, runs well from a nonlocal network drive, whereas MathCad does not. We see as a major benefit not simply the saving in package costs, but also the saving in upgrade costs that the network makes possible. In addition, because of expenses saved by sharing, we have been able to install several reasonably costly packages that enhance productivity in the laboratory.

File sharing and node configuration are closely related. The dedicated server supports about 1 Gbyte of storage, with 75% or so of that space reserved for shared software and systems files and 25% reserved for student and faculty data storage.

All the machines on the LAN are using Microsoft DOS 5.0-6.2 and Microsoft Windows 3.1. We opted not to use Doublespace (driver-level compression software) on any of the machines, primarily to conserve memory. In the test cases, there were no problems with Doublespace in relation to data integrity and networking.

All the machines on the LAN run Norton Desktop for Windows (NDW). The major benefit of this replacement for Program Manager is the integration of the Program Manager and File Manager onto a single desktop. With NDW, all drives can be labeled with logical names such as CD-ROM or Syquest; networked drives are shown with a special network icon. The other major incentive to use NDW is the Norton Anti-Virus. This utility has proven to be well worth the small cost in low-DOS memory. On at least two occasions it has trapped a strain of the Stoned virus known as the Whit virus as well as the Michelangelo virus, both of which are potentially devastating in a networked environment.

Sharing of other resources is a fringe benefit of the LAN. The Super_Server has a 44-Mbytes Syquest drive, a Chinon CDS-435 CD-ROM drive, and a Colorado Jumbo 120-Mbytes Qic Tape for backups. An Abaton/Everex Color Scan 300 and a Nicolet/Zeta Graphics plotter are attached at two different nodes. We plan to install several Qic tape drives on shared nodes to make individual backup a simpler process. We also found it useful to equip three of our machines for multimedia. This involved installing Sound Blaster Pro 16-bit ISA sound cards and reconfiguring Windows. These machines make use of the CD-ROM drive on the central server for audio and video storage. Using the CD-ROM drive for storage works reasonably well, but video transfer through the network sometimes produces a choppy picture. We generally keep a Multimedia Encyclopedia in the server CD-ROM drive for reference, but other disks are available as well.

Communications

Communication has been the most problematic aspect of the laboratory LAN. The packet drivers that we had been using for file transfers and remote logins proved to be incompatible with the packet drivers used by Lantastic, even though the same network cards were used. This problem was resolved when Artisoft released Lantastic for TCP/IP, an add-on package for Lantastic that gives the user telnet resources within the Lantastic environment.

The package is more difficult to configure than the basic Lantastic Software. The user must know the names and IP addresses of all local machines and the names and IP addresses of all Name Servers, Domain Servers, and Gateways used by the telnet/FTP servers. Once set up, however, it is virtually transparent to the users. The package includes both DOS and Windows versions of the telnet and FTP software. The DOS version of telnet allows for five simultaneous connections; the Windows version allows for three. The Windows FTP interface is far superior to the DOS interface. It allows the user to scroll through a listing of files and tag files at will for transfer. The biggest advantage of the Lantastic TCP/IP software is its ability to transfer files to and from any network drive for which the user has privilege.

Lantastic for TCP/IP uses a licensed version of the Wollongong telnet software that works well with both Quarterdeck's Deskview X and NCD PC-Xware for Windows. Deskview X is slightly faster than PC-Xware but does not benefit from the graphics accelerators we use for Windows. It does, however, make use of VESA drivers to increase display resolution. PC-Xware takes full advantage of the acceleration offered under Windows. In our experience, however, it is slower than Deskview-X when attaching and opening new display windows.

An Artisoft Central Station II is also attached to the LAN. This unit offers three high-speed (up to 57.6 kbaud) and two bidirectional parallel ports. It attaches to the LAN by means of a thinwire connection and acts as a stand-alone connection server. We have attached two ZOOM VFX 14.4 send/receive fax modems to this server for dial-in to our LAN. The unit comes with networked serial- and parallel-port software support. The third serial port is used for the attachment of a Houston Instruments DMP-29 pen plotter. The parallel connections can be used for either printers or for the connection of a laptop computer as a full LAN node.

Conclusion—"pros" outweigh "cons"

Overall, we are quite satisfied with our peer-to-peer LAN. We did have our share of struggles and chaos while the network was being installed and shaken down, but, at this point, operation of the LAN has become stable. As we went along, we made changes. We upgraded machines to 386 or 486 processors, and, when small disks became cramped for local storage, we replaced them with larger disks. Every change is a potential problem, but only a few of the problems that arose were genuinely taxing.

Based on our experience, we do not hesitate to recommend the Lantastic/AI NOS—in an appropriate environment. One must always remember to match the tools to the tasks and seek real productivity enhancements—not virtual ones. LANdom does not come for free, and, as usual, the software costs are almost negligible compared to the manpower costs of installation and early LAN management. After about two years on the network, the time involved in management has become minimal but not negligible. The benefits now far outweigh the costs and drawbacks. And yes, productivity is increasing.