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Managing a small office local area network - HP Officeshare

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Introduction

In today's business world, efficiency in a communication network plays a key role in a company's success. In the office environment, the way information and resources are shared determines the productivity of a work group. Local area networks have played a large role in enhancing the flow of information in department work groups. While vendors of small office LANs have continually made installation and implementation easier, the basics for managing such networks have remained the same.

There are four phases to managing a small office network. They are planning, installation, user training and network maintenance. The examples I will be using came from my experiences with HP Officeshare.

Phase I - planning the network

Planning a network consists of three parts. They are network design, cable plant mapping, and naming and addressing selection for user nodes.

Network design includes selecting a network and peripherals and choosing applications from those supported on your particular LAN. The basis for selecting a network should be determined by the applications which are chosen or which need to supported. Applications include shared peripherals, application software and databases. At the same time that effort is being concentrated on designing your network around applications needs, it is necessary to identify who the network users will be. Logistics are a large part of designing your network, including not only who network users are and where they're located, but also selecting a centralized, easy-to-access location for the server and peripherals.

Cable plant mapping becomes the next important step in planning your network. Locations of users and servers play a large part in this process because most networks have distance restrictions. For example, the maximum length for each HP Thinlan segment is 185 meters. Because this paper is focusing on SMALL office networks, mapping out the cable plant should include visually inspecting the area where the cables need to run. For users in close proximity, the cable may not need to go into the ceiling. Instead, it can run along the floor as long as the exposed cable does not become a safety hazard.

The third step in planning your network is deciding on a naming and addressing convention for each node. Your facility systems administrator may be able to help you with a naming convention that is consistent with the rest of the site. Depending on the type of networking protocol used, you may need to select addresses for each node. Again, your system administrator will be able to provide the facility guidelines. If there are plans to connect the small office network to the site backbone in the future, then it is important that the addressing scheme is compatible with the site network. It is troublesome to go back to reset the addresses for the nodes. It is also a good idea to actually draw a detailed map of the network, including cable length, routing and node locations. This is a good way to communicate physical network layout to the installation person. You'll find it an even more useful tool if you're installing your network for yourself. At the same time you're mapping your network, start a list with user names, node addresses, and devices at the nodes. This network map and users list are basic documentation which will help you manage your LAN before, during and after implementation.

Planning doesn't stop after the network is installed and up and running. There is always room for expansion, adding nodes, shared peripherals and applications. The best way to manage changes to the network is to anticipate needs by staying familiar with your physical layout, your user needs and usage of the network.

Personal experience with HP Officeshare

In my case, the major reason the network was set up was so that I could gain experience, firsthand, in setting up and managing a LAN. As the product manger responsible for the LAN protocol analyzer business in marketing at my HP division, I had a vested interest in learning the LAN, from the ground up. Applications supported on the network include printer (HP LaserJet Plus) and plotter (HP 7550) sharing, file sharing (Memomaker and Lotus files) and application (Timeline) sharing. The network is HP Thinlan running Officeshare software. The network started out with no connection to the site backbone. The initial network had six user nodes and a single server node. All six users have access to both the plotter and printer. Three of the users have access to Timeline on the server. Since the LAN does not have any connection to the backbone network, all users connect to the mainframe computer environment (HP 3000s) through an asynchronous port. Initially, all nodes were Vectras.

My primary objective was to get the network up and running as soon as possible. I was anxious to try out the LAN protocol analyzer with real data to see how effective a tool it could be in helping manage the LAN (and to put it through its paces). As a result, I spent minimal time in network planning. However, I still used the simple planning guide in the HP LAN server installation guide and found it to be extremely easy to follow. Each node was assigned a name and an Internet Protocol (IP) address. Our facility system administrator for networks assigned our LAN a block of IP addresses and a department name. Our node names were xxxxxx.MARKETING.CTD where xxxxxx was the user's first name. Using first names turned out to be a little shortsighted. A better choice was using user's initials and internal phone extensions - BYR429.MARKETING.CTD. I eventually had to make server software configuration changes to rename all user nodes on a weekend. A little more planning would have alleviated this problem.

Phase 2 - installation

Installation consists of three steps: the cable network, the server and the nodes. Many small office networks are designed as user-installable. If, as part of network planning, it is apparent that part of the cabling for your network will reside in a ceiling or in floor trenches, it would be easier to have someone familiar with your site cabling implement your cable network for you. Again, before, during and after cabling installation, it is very important to physically map and update your original cable map. The map allows you to keep track of the size of the network, determine where best to add new user nodes and minimizes the time required to track down cable problems.

Server installation is the second step in the installation phase. Given a good manual, it should be relatively simple to install the hardware and to configure the server. After the server is configured, the next step is to bring up one user node. When in this phase of installation, pick a time when users being converted to network nodes are not using their PCs. This typically means after office hours or on weekends. Progress through user configurations one node at a time, testing all aspects of that user's configuration - access to shared peripherals and files, ability to load user software with no problem when booting. One distinct ease-of-use feature for users is to make network-user-software loading as transparent as possible. This can be done by adding the appropriate commands to an 'AUTOEXEC.BAT' file, so that it becomes an automatic part of the booting process.

Personal experience with HP Officeshare

The cable network for the small LAN which I managed was installed by our facilities maintenance personnel. Since the six users were not located in close proximity, the installer had to pay special attention to ensure that the entire LAN segment did not exceed 185 meters (the HP Thinlan IEEE 802.3 10base2 distance specification). In addition to wiring for the first group of users, he also put in drops for potential users. I kept a copy of the initial wiring map. The wiring map turned out to be difficult to keep updated because the layout of the area changed several times.

After the cable network was installed, the server and user nodes were set up. The server was booted first without any nodes attached to it. Then using the network-server software, the server was configured. In configuring the server, the first group of users as well as other potential users were defined so that I would not have to stop the server at some point in the future just to add a new name. Then, one workstation was configured to see if it worked. One by one, the rest of the users were configured and connected. The software and node hardware installation procedure was relatively simple as long as the manual was followed. As part of the user set up, commands were added to each user's 'AUTOEXEC.BAT' file to automatically load the LAN software when booting up.

Because the primary objective was to get a network up and running quickly (to test the capabilities of the LAN protocol analyzer), a detail was glossed over which blossomed into a bothersome task. The network-user software had been installed in the root directory. When, at a later point in time, the need to upgrade the network-user software arose, I ended up creating a batch file to delete the old LAN files and create a separate network-user software subdirectory for each node.

Total time spent setting up the server and the user nodes was about half a day. Early morning or late afternoon was the optimum time window to install the network-user software.

Phase 3 - user training

User training consists of three steps, preparatory (before the LAN is installed), novice (after initial LAN experience) and ongoing (when new features are added to the LAN. It is important to communicate to users the distinction between THEIR responsibilities and the LAN manager's responsibilities. Training users prior to using the network minimizes the number of start-up problems and errors. Novice training after users have used the network for a short period of time gives them the opportunity to ask informed and relevant questions. It is also a more appropriate time for the LAN manager to explain more in-depth about the LAN because users will relate and understand from their personal basis of experience. On-going training should be used to communicate new features on the LAN and to address any usage problems that may have surfaced. By staying in touch with your user base, you'll understand your LAN usage better and be a more effective manager.

Personal experience with HP Officeshare

Unfortunately, user training was not a priority when we installed and implemented our LAN. Coupled with the problem that most of the users did not have personal computer experience, the first two to three weeks were consumed with fire fighting. A lot of time was spent helping users set up their nodes so that they could access the shared peripherals on the network. There was more to making the LAN work than configuring user nodes. The number of repetitive questions from different users was amazing. It wasn't anticipated that I would be answering questions such as:

- I have just finished sending a file over to the server, why isn't it printing (or plotting)?
- Why is it taking so long ? (I had to explain about the single queue spooling of files to the server and had to educate users on how to check the output queue on the server to locate their position in this queue.)

Although training and educating users may sound like a lot of work and may take up much of your time, if the work is done up front, it saves time and trouble in the long run.

Phase 4 - using and maintaining the network

Personal experience with HP Officeshare

Using and maintaining the network involves many daily maintenance tasks. For example, in the start-up phase of the LAN which I managed, users were wondering why printouts were taking so long. It turned out the printer was out of paper. The users were not aware of the fact that checking the paper tray was a task which each and every user on the network owned. Each user should consider the shared peripherals as personal devices and treat the need for maintenance - supplying with paper, checking for errors, keeping a plotter stocked with fresh pens - as if the peripherals were connected solely to their PC. Another example was the shared plotter jamming when loading transparencies. Because of the single output queue, everything behind that one user's output was queued up, waiting until the problem with the plotter was noticed and resolved.

The network-server software does not support separate print and plot queues. Our user population included two graphics designers and two secretaries. Because of intensive output needs to both the plotter and the printer, it wasn't uncommon to find a needed PRN file queued up after 10 to 15 graphics files in the spooler. It typically meant a delay of an hour or more before the printout was in my hands. We have solved the single output queue problem by separating the printer and plotter to different servers on the same LAN.

When the network was first set up, we faced very tight budget constraints. As a result, the server only had a 20M byte hard disk. This is extremely marginal for six-user support of the LAN, particularly because four of our user population daily perform large file transfers through the server with a graphics application called Gallery. Because we limited our disk space to 20M bytes, the time it took to read a gallery file was extremely lengthy, tying up the server and the user's PC for long periods of time during the file transfer.

Massive cleanups of server disk space were necessary several times because users were not removing files from the public directory once they were done with them. Cleanups had to be done when the available disk space went down to 2M bytes. In one instance, a user working through the gallery output menu requested a continuous plot of 10 copies of the same graphic to the shared plotter. The plotting process was started when the user left work for the day, with the intention that it would run during low-usage network time at night. The next morning, the user found no output at the plotter. A check on the amount of disk space left on the server indicated that there were 0 bytes left. The server apparently was reading files faster than the plotter could process them. As a result, the 4M byte of space which had been free on the server filled up. Once filled, the server sat waiting for disk space to free up before it could proceed reading what the user-node PC was sending. The process became bottlenecked and quit.

There are several solutions to this problem. Optimally, load your server with as much disk space as possible. More simply, make use of the 'batch' file process for plotting a large number of graphics files continuously. A batch file allows a user to string together a series of drawings to be output continuously to the designated output device. This seems to work better with the HP Officeshare LAN. The server recognizes the end of each file (for each drawing) and begins processing the file as output, freeing up disc space for the next file which is being processed through the server.

We found that when we upgraded the network-server software, the problem had been addressed by allowing the server to continue to accept files from the user-node. However, once the disk space was used, the files were recognized as empty.

A hint is in order here. Regardless of the amount of disc space on your server, request that your users limit batch processing of graphics files to a maximum of 15 drawings. It wasn't unusual to find user-nodes on the LAN processing 40 to 50 drawings in a single batch file.

Problems that require troubleshooting

There were very few problems on the network that required serious troubleshooting. The most severe problem caused the server to lock up. It happened when one of the users tried to 'TYPE' a file located on the server. This is a simple, easy MS-DOS command to quickly look at a screen dump of a file. When the user tried the 'TYPE' command, nothing happened, with the end result being that no one else on the LAN could access the server. In the course of pinpointing the problem, a couple of potential problems were examined:

1. New nodes recently added to the network; and
2. A bad cable segment.

Even after the new nodes were taken off the LAN, the problem persisted. It seemed to be confined to a single node in the middle of the segment. Nodes further down (closer to the termination) were able to view the same file from the server. The network connection of the problem node was also examined very closely for physical cable problems. I also used the HP 4972A LAN protocol analyzer to watch the 'TYPE' transaction between the node and the server and observed that the server was sending out the file. In fact, the same frames were transmitted more than once, which is an indication that the server was not receiving an acknowledge from the node. At the same time, the node saw nothing of the file on the server.

The mystery was solved when someone mentioned that a new version of the transport software had been made available from our internal Information Systems department. It turned out the user had installed the new software without checking for backward compatibility with the version of software running on the server. A switch of the software solved the problem.

Tight control of software releases and coordinated software updates to both the server and user-nodes would have headed off the problem. This responsibility lies with the LAN manager.

Another problem requiring troubleshooting occurred after our department had been rearranged. A user tried to boot his node without success. It showed a strange boot-up error. Other user-nodes experienced the same problem. To make the problem even more obscure, each node had a different boot error. Since everything had worked the day before and the only element that had changed was the rearrangement of several offices (and the location of those user nodes), the next step was to isolate parts of the LAN with a terminator and reboot the isolated sections. That got to be very difficult after the first 2 nodes because there was not an updated version of the cable map available to assist in physically locating cable segments. The only recourse was to examine those cable segments that could be physically seen and traced by hand. An examination of cable segments located in the ceiling would have been the next logical step to pinpoint the problem. The culprit turned out to be an extra length of cable connecting a tee connector to a node card. The maintenance crew had discovered that the tee connector for one of the user-node PCs would not reach the back of the PC after relocating the user, so they added an extra cable segment from the tee to the card thus changing the impedance of the cable.

Another interesting fact about the network software was discovered by the HP 4972A LAN protocol analyzer. It was perceived as a 'problem' before close examination and investigation revealed that it was a factor of the boot process. The LAN protocol analyzer was continuously collecting network statistics even though utilization on this small LAN was low. During the initial stages of LAN implementation, the LAN protocol analyzer logged the occurrence of jabber frames on the network. These are frames longer than the allowable maximum (1514 bytes) on an 802.3 network. Since there were only six nodes on the network, the possible sources of the jabber frames were evident. After capturing the jabber frames with the HP 4972A LAN protocol analyzer, the content indicated that each node had sent out one jabber frame. We ran a few experiments and determined that it was all part of the LAN boot-up process.

Network expansion plans

Our LAN has expanded to ten users, with more potential users to be added yet. Usage has increased to the point that managing the LAN requires more time than I can put in. The realization that extensive preplanning will be needed to increase LAN productivity to its maximum possibility has had a sobering effect on everyone who uses the LAN as well as the LAN manager. Responsibilities for LAN management have been formally handed over to the 'marketing services' group within our marketing department. They have the charter for planning and implementing changes to the LAN which should keep us current with the latest which HP Officeshare has to offer. Together with the Information Systems department within our division, an expansion plan has been mapped out for the marketing network.

Our plan includes:

1. Two servers with one supporting the secretaries and graphics designers (5 people). The intent is to connect an HP eight-pen plotter (HP 7550) and a LaserJet plus to their server. This should help alleviate the single output queue problem for the rest of the user population who only require daily printouts on an infrequent basis. The remainder of the user population will be connected to a second server which will have access through its output queue to a LaserJet series II printer.

2. The number of LAN users has increased to 14. Since the current server software only supports 10 concurrent users, we will be updating to the latest revision of HP Officeshare software that supports 30 concurrent users.

3. Early this year, the department LAN was connected to the site-wide backbone through a Thinlan repeater. The marketing network is divided into two 185 meter segments with enough cable for future expansion beyond 14 users.

4. We would also like to eliminate asynchronous connections to the mainframe computer environment (HP 3000s), by using virtual terminal connections via the LAN.

5. The Information Systems department will also be working on a proposal to purchase a Mighty Mouse (HP 3000) for the next fiscal year for backing up the users on the marketing LAN. The computer will be located in the site-wide computer room and will be managed by the division Information Systems department. In the meantime, users can back up their disc via tape across the network.

Summary

In summary, I have discussed four phases in managing a small office network illustrated with my experiences as a LAN manager. To briefly review:

Phase 1. Planning the network includes selecting the services offered on the network (peripherals and applications), determining the number of users and the node devices to be connected, mapping out the cable network and network backup process. It also includes selecting addresses and a naming convention with assistance from your network management group. You also need to plan training sessions for users, allowing them the opportunity to use the LAN fully. This will also alleviate many start-up problems and help answer many questions. It is also useful to make up a schedule for the entire process from planning to installation to implementation.

Phase 2. The installation process includes the cable network, the server and peripherals, and the node software and hardware. It is also important to schedule installation to minimize the impact on the productivity of the work group.

Phase 3. User training should occur in three steps, preparatory, novice and ongoing.

Phase 4. Maintaining the LAN includes daily maintenance of the peripherals, system backup, user installation, updating software and problem troubleshooting. Most of the maintenance activities can be planned ahead except for problem troubleshooting. Quick problem isolation depends on good network documentation, knowledgeable usage of network diagnostics and common sense.