

Introduction

In analysing the brief that I was given by my manager to network our office, I had to consider many issues. There are numerous ways to build a network. Firstly, I had to consider what kind of topology my network would be based upon. After deciding on this, careful consideration and choice depended on the types of hardware, software and network devices that were chosen if my network was to be successful. The challenge once all the materials had been found was to set up a network that would be adequate for the daily routines in the travel agency.

Star Topology

My decision to network the office using a star topology was based on the number of computers being used within the office. A star topology is the most popular topology used for the type of network that I needed, Local Area Network (LAN). It is relatively inexpensive compared to the other types of network topologies. Every node on the network is connected through to a central device known as a hub. An Ethernet adaptor, is used to connect only two devices (workstation and hub) together, therefore a cabling problem will only affect two nodes at the most. A single malfunctioning cable/workstation cannot disable the star network. This star network is the basis for the more modern Ethernet server network that will be used within the office.

Ethernet Network

The standard type of LAN that is going to be used for this office is called an Ethernet network. As the name suggests Local Area Networks are indeed 'local' and span only short distances such as within an office, one or more floors in a building or among buildings on a campus. Ethernet networks can be used to connect anything from two to thousands of computers together. They are reliable, easy to use and cost effective. The computers that I have bought for my network has the 10/100 Mbps network interface cards (NIC's) already integrated in the computer. This means that it can offer dual speed network solutions that offer both 10 and 100 Mbps performance, which enables us to start with Ethernet and then if it is needed easily upgrade to fast Ethernet if the business requires greater network performance. The dual speed 10/100 Mbps NIC's are 'auto sensing,' which means that they can provide either speed; automatically adjusting to the speed of the network it is connected to. They are a good investment if the office decides to upgrade in the future.

Client/Server Network

Small businesses local area networks come in two basic configurations, or architectures, peer to peer and client/server networks. Considering the business needs of the office, I had to consider how many nodes (each computer, printer, or other office device connected to the network is a node) that I would have now and maybe in the future. My reasons for choosing a client/server network for this office was due to the fact that I knew there would be six or more nodes to connect within the office and with large files such as database and information that needs updating regularly this was the best choice. A client server network is faster, can accommodate more people and makes network management and back up easier as you no longer have to back up each PC workstation individually. It's also much easier to share software applications (databases) and more very large files between offices if expansion took place within this business.

Basically a client/server network is one that adds a server to the network. A server is a powerful network ready computer with a large hard drive. The server in the office network will have double the hard drive of the computers within the network. It has 256mb RAM compared to the 126mb RAM that the seven computers within the workstation have. It 'serves' the rest of the network as a central store for applications and files. The files and applications that are used within this office are stored on the server that can be accessed by the users quickly and conveniently. Therefore the server, not the individual PC's, need only do installation and updates. Network users can still store their own files on their own PC's then use the server to access shared files, databases, software and peripherals.

Plan/Proposal for Office Network

Firstly, the decision had to be made on whether to upgrade the two stand alone computer that were already in the office or to purchase all new computers for my network. However after researching for memory upgrades on the Internet I decided that it would be cheaper to buy all new computers. On the Comet website, 128mb pc100/133mhz memory upgrade was £37.95. To add the operating system to this, at PCWorld, such as Microsoft Windows 2000 Professional (see appendix page 11) it would cost £299 for the full version. I would have then had to upgrade the processing power on both the stand-alone computers in the office. Therefore from my thorough research I chose to buy seven new computers for my network from IBM. Each new computer has 128mb Ram and a 1700 MHz processor (see appendix page 1-4 for specifications). This processing power and ram is adequate for my network as the employees are using the computers for basic databases, Internet, email and file sharing. The Ram can be upgraded cheaply in the future to 256mb ram if the employees felt that it was necessary. Also if the network was functioning slowly, with the

10/100Mbps NIC's integrated in the computers the business can easily upgrade to fast Ethernet.

As well as purchasing seven new computers for the office, other equipment was also required for the network to function. A hub was bought which connects computers, printers and other network devices together. Its purpose is to pass data between devices. The reasons for having a hub within my network is that they simplify the cabling and wiring of the network by concentrating all the cabling in a single location. It reduces the point of failure so if one computer crashes within the network, the entire network will be safe from collapsing. I could have used two hubs within the network to reduce the point of failure if one hub doesn't work but seen, as it is only a small network I am trying to establish I thought that with the cost implications it wasn't really economic or necessary. The 16-port dual speed hub was chosen for my network from Dell, (see appendix page 10). This dual speed hub offers the flexibility that may be needed if it was necessary to upgrade to a fast Ethernet network.

As I have already discussed previously there are many benefits to having a server within a network. It is necessary to have a server within the network as because there are seven computers. The server that I chose to purchase from Dell (see appendix page 5-7) has a large hard drive 256mb ram that enables it to serve the rest of the network as a central store for applications and files. All the files and software that are used by the employees within the office can be stored on the server then accessed individually from their computers. The server has the same operating system as the other computers but had to have it installed on it manually which cost £299 from pc world. The 10/100Mbps ethernet NIC integrated within the server makes it compatible for fast ethernet as with the other computers. The server is going to be connected to broadband Internet via its 56k modem. The other seven computers within the network will access the Internet through the server's connection.

Employees can print from the laser printer (appendix page 8) that was purchased from Dell that is efficient and adequate for this office environment. This was set up as a local printer on the server and the other computers. When employees want to print their print job is sent to the printer and spooled in a print queue.

Finally, the whole network is set up as seen in the diagram (see diagram). Each of the computers is connected with unshielded twisted pair UTP category 5 cable. One cable is run to each computer and each cable connects to the hub. The server is connected to the hub this way, while the laser printer is connected to the network and hub via a USB adaptor. The server is connected to a broadband Internet connection via a USB adaptor aswell.

Connecting the network to the Internet

Microsoft Windows 2000 Professional is chosen as the operating system for each of the computers because it is 'internet ready'. Windows 2000 Professional makes it easy for businesses with networks to connect to the Internet. When the computers are started Windows 2000 Professional will detect the network adaptors and automatically start the local area connection. Therefore unlike other types of connections, the local area connection is created automatically and you don't have to click the local area connection to start it.

Once the network is created, Windows 2000 Professional includes a feature called Internet connection sharing. The server within the network will act as the single Internet connection because its modem is connected to a broadband Internet connection with a USB adaptor. The other computers within the network will connect to the Internet through the server. Windows 2000 Professional simplifies setting up an Internet link through the new connections wizard. This is a simple dialogue box that guides you through the defining connection. By editing the properties on the Internet connection, you can check a box to share the connection. Once all of this is done, Internet connection sharing configures your entire network so that anyone can access the Internet through that system. Connection sharing automatically sets up your network addresses, configures itself as the 'gateway' to the internet, creates the path to the name services on the internet, and lets all your systems share a single IP address to talk to web servers and other systems on the internet. As it includes a self-configuring network address translator, your PC's are hidden from the Internet to prevent unauthorised access. The whole office can then access broadband Internet through the server's connection.

Each employee within the travel agency will be able to send emails, as they will have their own email address when they are connected to the Internet. They will have access to Outlook Express that is one of the communication tools included in Windows 2000 Professional. Outlook Express is an email program that lets you exchange mail with friends and colleagues, and join newsgroups to trade ideas and information. The mail can be kept on the server so that each employee can view it from more than one computer. Outlook Express is opened by clicking start, point to programs then clicking outlook express.

Range of Solutions for Internet Access

The Internet can be accessed via a broadband connection or a dial up connection. Dial up connection uses a public switched telephone cable to access a remote server via modems at both the source (computers) and destination (LAN's server). However, the problem with the dial up connection is that it is unable to ensure a constant high rate connection. Currently, the most advance modems have a connection speed of 56kbps. This is a maximum, assuming that the connection between the initiator and the receiver is pristine.

Rarely is this achieved through your modem, due to points that your phone calls travels that affect the throughput. Dial up connections are slow, sluggish and inefficient.

Broadband connection is the most efficient way of connecting to the Internet. The term broadband refers to a high-speed Internet connection, traditionally in excess of 100kbps compared to dial up connection of 56kbps. Broadband is used in this network so there is a constant connection to the Internet for the employees. It is the most efficient way to access the Internet if more than two employees in the office want to use the Internet at once. It is also suitable for regularly transferring large files across the web or if eventually the travel agency wanted to have its own web site.

The network in the office would be connected to the broadband Internet through an ISDN line. This is one of the most popular choices to connect to the Internet for small businesses. It is the digital service where voice, data and video services can be carried along a single wire or fibre optic cable. ISDN gives the business a speed of up to 128kbps for data traffic or up to 56kbps on a line also used for voice traffic. As ISDN is digital it offers a clean and reliable service for sending and receiving data. Although broadband access is pricier than a dial up it makes up for it with additional bandwidth and speed.

Conclusion

Hopefully the network that I have established in this office is adequate and efficient enough for the daily tasks involved in the travel agency. I have designed a relatively simple network to accumulate all the details of the brief with each employees having access to the internet, email, and file sharing. In the future they could build their own website if they felt it was necessary on Windows 2000 Professional. It is also easy for the travel agency to upgrade their network if they wanted to expand to fast ethernet. I have tried to keep costs down on building this small network as much as possible by keeping it simple. They could expand the network by adding more hubs and computers in the future but this would have bigger cost implications, but less points of failure if the network was larger. There should not be many failures in this network with the computers as the hub reduces this but it's always possible with a small network to encounter some problems. With this network that I have designed I have tried to limit and plan for failures as much as possible so they don't occur.

Executive Summary

The main benefits of the network are that it is inexpensive, reliable and easy to use compared to other networks. A client/server network is faster, can accommodate more people and makes network management and back up easier as you no longer need to back up each individual computer. The Ethernet network can be easily upgraded to fast Ethernet because of the dual speed network interface cards if the office had more computers added to the network in the future. The operating system used in this network, Windows 2000 Professional is efficient and effective to recognise a network and connect to the internet. It automatically recognises the hardware devices installed and detects a network in place. Therefore unlike other types of connections, the local area connection is created automatically and you don't have to click the local area connection to start it. Connection to the Internet is simplified with the Internet connection-sharing wizard, which shares the Internet with the other computers within the network. The broadband Internet was chosen rather than dial-up connection as it is faster and more efficient especially if more than two people within the network want to access the Internet at once. Assuming that within this travel agency there will probably be at least two employees wanting to access the Internet at the same time.

Costings

Hardware

7 Computers (IBM)	@ £ 585.15	£ 4096.05
Printer (DELL)	@ £ 151.71	£ 151.71
Hub (DELL)	@ £ 98.20	£ 98.20
Server (DELL)	@ £ 779.00	£ 779.00
Total		<hr/> £ 5124.96

Software

Microsoft Windows 2000 Professional (PC World)	£299.99*
Total	<hr/> £299.99*

Network Devices

2 USB adaptors
7 Unshielded twisted pair UTP category 5 cables

<i>Total Cost for Network</i>	<hr/> £5424.95
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*Microsoft Windows 2000 Professional had to be installed on the server separately as was not included in the package deal.

Appendix

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