Designing a Client Server Network

April 11, 2011

Why Use a Server?

Eventually a company will add more computers to their network and workers will want to access a computer file such as a time sheet or customer order that is only on one machine. To solve the problem on a peer to peer network, we can share the folder and place each personal computer on the same workgroup. As our small organization grows their peer to peer network, they will have to keep the computers with shared folders turned on and the manager will have to backup several units instead of one. To avoid these hassles and to improve security of our critical data, many businesses choose to use a server. A server is specially made to hold information securely, have redundant backup (RAID) and to run continuously.

Advantages of Peer to Peer Shares
- No additional cost
- Computers on the same workgroup
- Computers on the same network

Advantages of a Network with a Server
- Secure access to folders
- Server is always on
- Easy backup of data
- Supports multiple RAID versions

Servers

Besides handling security, file storage and backup, many companies that write Network Operating Systems (NOS) have made their servers applications capable of handling multiple admission to databases, or they are able to write an image to a client PC, or they can distribute web pages.

The following chart gives the name and a short description of some popular types of servers.
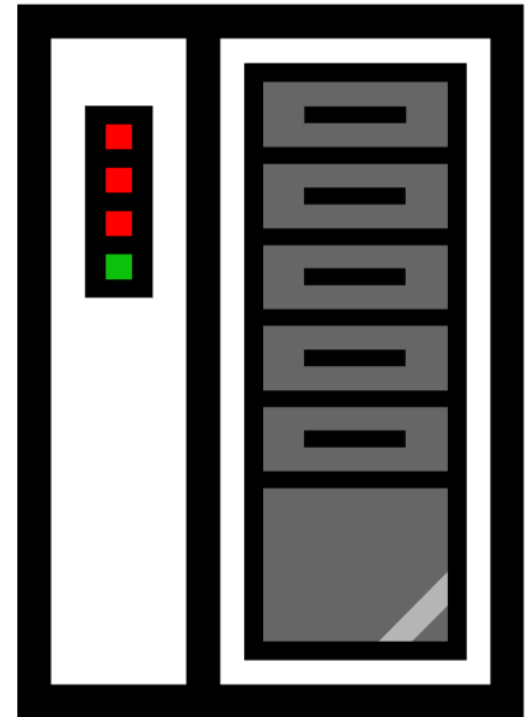
Types of Servers

Server Name	Description
Active Directory	Active Directory servers act as a domain controller and manage all clients
DNS	Domain Name Service servers resolve names to IP addresses for Internet access
Backup	Secondary servers will mirror the information of the primary server and can take over operation of the primary server
DHCP	Dynamic Host Configuration Protocol servers will assign IP addresses to PCs joining the network
Exchange	Exchange servers handle internal and external email
File	File servers hold folders guarded by permissions
NAT	Network Address Translation servers act as a router
Print	Print servers manage printers and print jobs
RIS	Remote Installation Servers allow us to load images to client computer's hard drives
SQL	SQL servers manage databases
VPN	Virtual Private Network servers allow external access across the Internet
Web	Web servers hold Intranet or Internet web sites

A Standard Server

A standard server should be a Domain Controller with Active Directory loaded on the machine. A Domain Controller will also be a DNS server that will resolve URL names to IP addresses. We will make the machine a NAT device to connect to the Internet, so the client machines can communicate with customers. The unit will be a File server, so we can hold our data in a single computer. The server will be using RAID 1 (mirroring) or RAID 5 (striping) to maintain redundancy of every data file.

Standard Server
- DNS
- Domain Controller (Active Directory)
- NAT for routing
- File server to hold data
- RAID 1 or 5 for backup

Specialty Servers

A specialty server often is a unique machine built to perform just one function. An Exchange server will handle email, a Print server will coordinate the print jobs, the RIS server will load an image of the operating system and application software to client machines. Secondary servers mirror the primary server and can take over operation of the primary server when it fails. The SQL server manages more complex databases and allows for multiple client access to the data. A Web server holds the HTML or web files for people to access either through an Intranet or Internet connection.
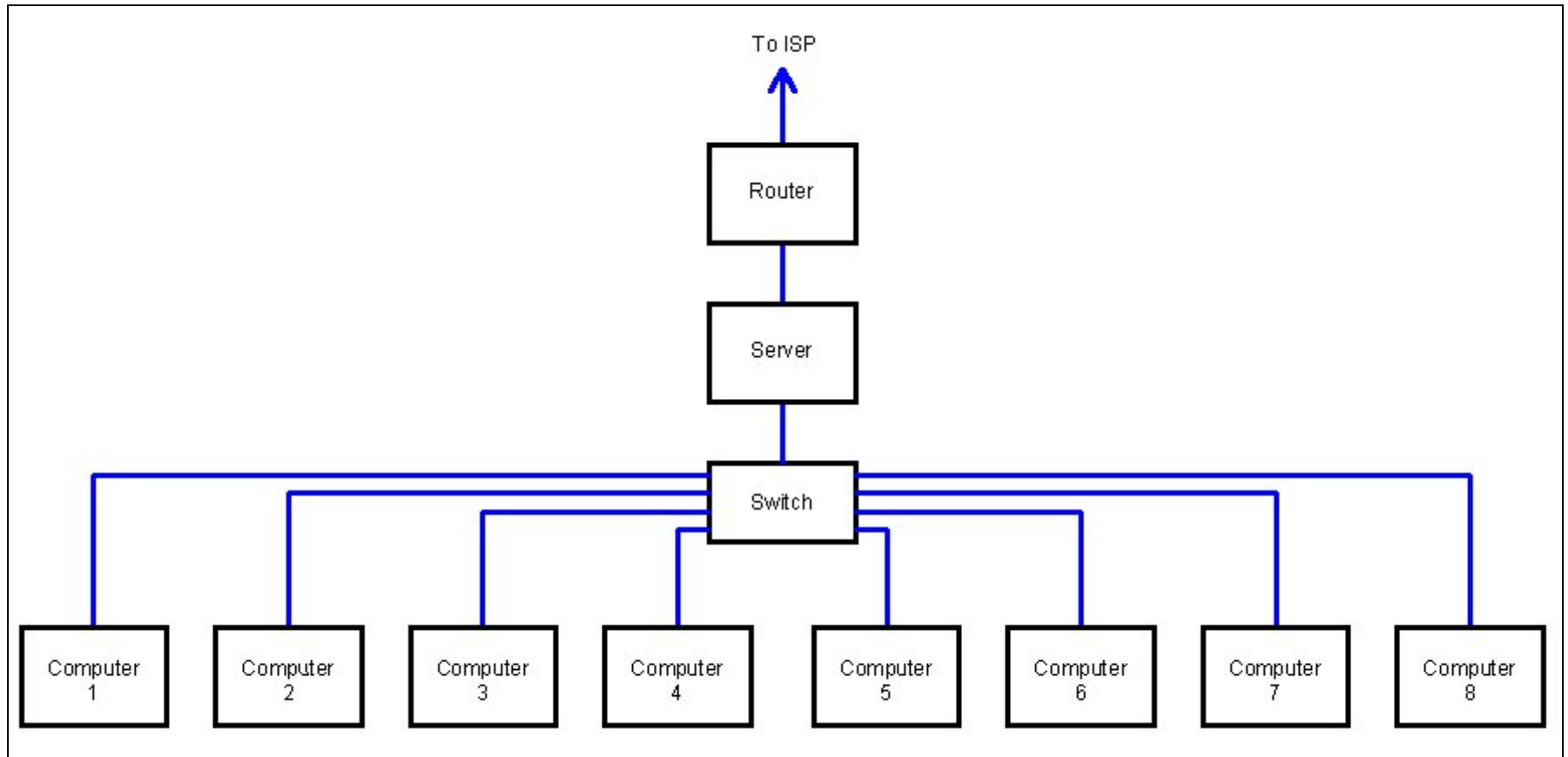
Specialty Servers
- Exchange
- Print
- RIS
- Secondary
- SQL
- Web

Servers Inline to the Internet

A Domain Controller (DC) will most likely act as a NAT server and be placed directly inline from the switch to the router or modem connecting to the Internet. A NAT server will have an internal and an external Network Interface Card (NIC).

Servers Not Inline to the ISP

A File server that is present to hold data files does not have to act as a router and can be placed anywhere on the network switch. Clients can communicate with the Internet without going through the server.
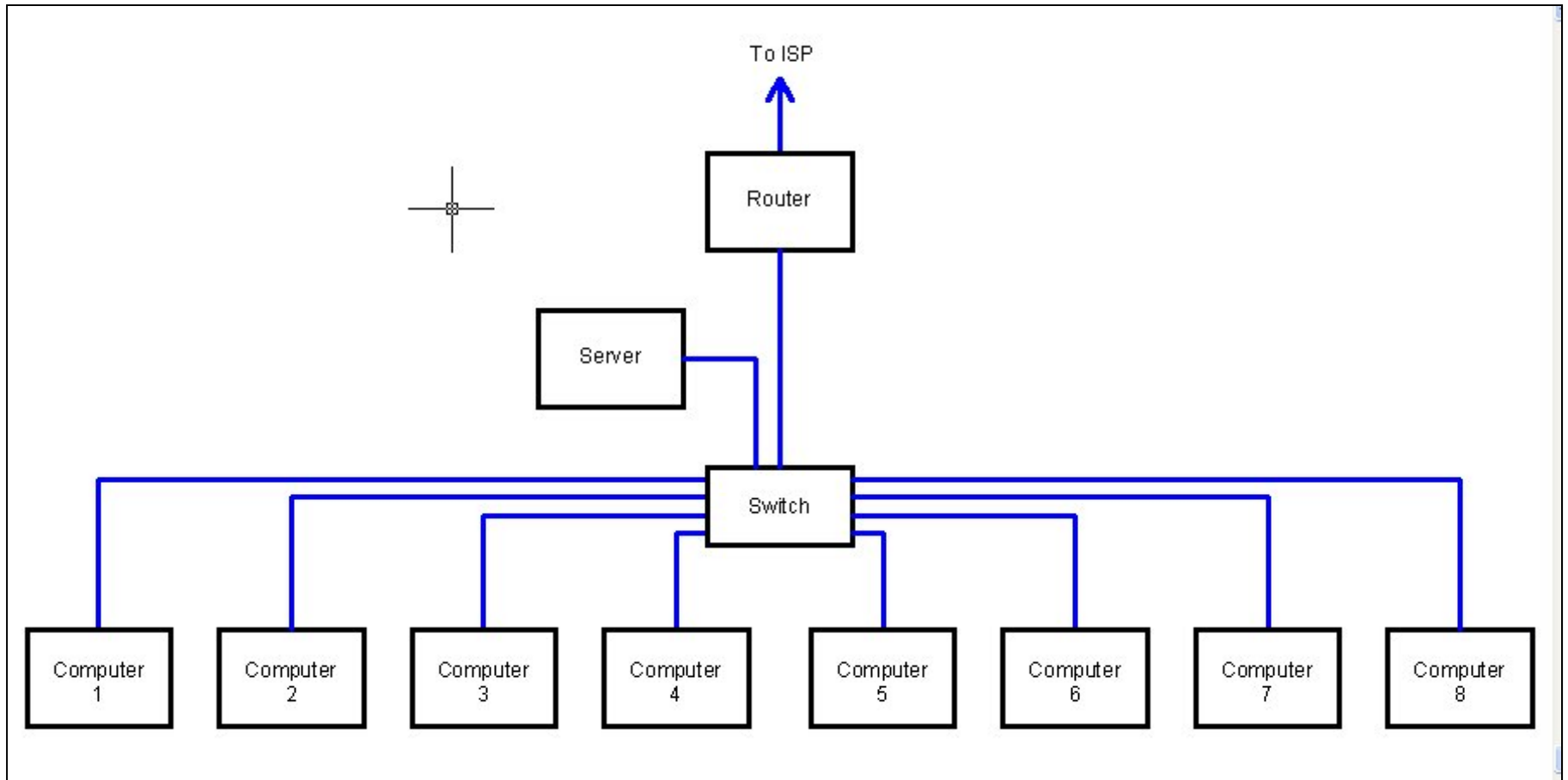
Popular Network Operating Systems

There is a large list of choices that we can make when selecting a server. If the managers at the company where we will install our server feel more comfortable with a Microsoft operating system, then we will plan to use the Windows 200 Server. If they are managing a graphics department, they might feel the MAC OS X server is their preference. Many providers like the Linux option, because price can be negligible.

Windows 2008 Server

Windows 2003 Server

Linux Ubuntu Server

Linux Red Hat Server

Novell Open Enterprise Server

MAC OS X Server

OpenBSD or FreeBSD

Solaris

Design a Network

Now that we know a little about servers, we will design a network for a small business. It makes sense to use a standard server that is inline with the Wide Area Network (WAN) supplied by the ISP.

Meeting the Client

When we meet the client, we need to discover what they wish to do with their system. However, if this is their first server network, they will rely on our expertise to provide a secure and reliable system. Since they do not have a network manager, we will want to make the server operate automatically for updates, easy to add accounts and that the backup of critical data happens flawlessly.

For the PCs, we will want to know the location of the desks where they will sit and how far the electrical outlets are from the machines. On this job, we will run a cable to each workstation, so we need to plan the cable routes.

Site Visit Equipment List

When we visit a customer, we want to gather sufficient information, so we can create an accurate quote that has the correct number of computers, an adequate length on the cables and the location of the devices including the distances to available and open power outlets. We need to bring equipment with us to make a proper site visit,

Site Visit Checklist
- ❑ Pen / paper/ notepad
- ❑ Flashlight
- ❑ Measuring tape
- ❑ Digital camera
- ❑ Standardized LAN diagrams
- ❑ Red pen
- ❑ Ladder

We need a notepad and pens to record the customer requests and to sketch the ideas. We need a flashlight to see in dark areas such as crawl spaces where the network cable could go. We need a measuring tape to determine lengths for cables and distances to open power outlets, so the surge protectors have a long enough cord. We can have standardized diagrams to reduce the time to make sketches and a digital camera to capture the images of the rooms. On some site visits, we may need a ladder to look above a drop ceiling where cables will run.
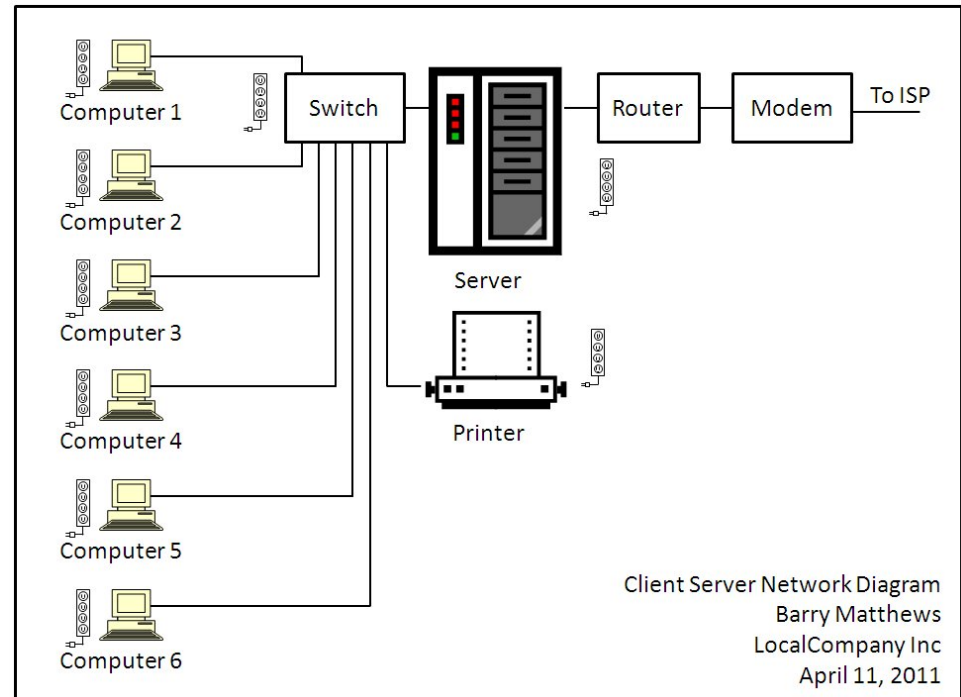
Cable Lengths

Network cables should be 25% to 50% longer than what we actually need, so the customer can change the location of a workstation without making new cables. The extra length can be above a drop ceiling or in the crawl space, so there is not a bunch of cable lying on the floor. We can ask the customer how much extra cable they want.

We can also use RJ45 receptacles that we mount in the wall for a neat and clean look.

Draw a Diagram

When we return from the site visit, we will draw the diagram. We should show all the hardware we need to purchase. If we have a floor plan of the building, our blueprint can show the devices in the exact room and location where they will be installed. Do not forget to account for power receptacles.

Computer 1
Computer 2
Computer 3
Computer 4
Computer 5
Computer 6
Switch
Server
Printer
Router
Modem
To ISP

Client Server Network Diagram
Barry Matthews
LocalCompany Inc
April 11, 2011

A personal computer can require two power receptacles, one for the desktop unit and the second for the monitor. The customer may require a printer, and speakers which will also need a power plug. If the router and modem are at the same desk, there will be two more plugs. Count the plugs you need at each workstation.

Create a Quote in a Spreadsheet

In a spreadsheet application, we need to create a quote that details every item in the project. We begin with the router and the cables. Then we add the server and the components of the workstations. We can place warrantee statements on the quote.

March 23, 2011

Brian White
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8200 Pivot St., Columbus, Ohio, 43215
Telephone: (614) 222-9200
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Customer: Mr. Barry Matthews
LocalCompany Inc
15 Side St, Columbus, Ohio 45454
999-888-7777
bmatthews@localcompany.com

Items	Qty	Price	Extended Price
Router	1	$ 69.99	$ 69.99
Category 6 cable, 6 ft	4	$ 12.00	$ 48.00
Category 6 cable, 25 ft	6	$ 25.00	$ 150.00
Server - Xenon X3440 processor, 2.53 Ghz, 4 GB memory, 2 - 2 TB hard drive, built-in Gb LAN, 7.1 audio, 18.5" Widescreen LCD monitor, standard keyboard/mouse, DVD-R/CD-R combo	1	$ 999.00	$ 999.00
Workstations - Intel I5 processor, 3.2 Ghz, 6 GB memory, 1 TB hard drive, built-in Gb LAN, 7.1 audio, 18.5" Widescreen LCD monitor, standard keyboard/mouse, DVD-R/CD-R combo	6	$ 799.99	$ 4,799.94
Speakers	6	$ 24.99	$ 149.94
Laser printer, black and white	1	$ 199.00	$ 199.00
Switch, 16 port	1	$ 99.00	$ 99.00
Surge protector	9	$ 12.50	$ 112.50
Windows 2008 Server Network Operating System	1	$ 750.00	$ 750.00
Windows 7 Operating System	6	$ 80.00	$ 480.00
Microsoft Office Home and Business 2010	6	$ 199.99	$ 1,199.94
Antivirus software licenses	6	$ 49.99	$ 299.94
Labor - Shop time hours	24	$ 75.00	$ 1,800.00
Labor - Site time hours	8	$ 75.00	$ 600.00
Warranty of computers, router and components by their manufacturers.			
Installation of equipment is warranted for 60 days			
Modem and ISP costs provided by customer			
Sub Total			$ 11,757.25
Tax at 6.75%			$ 793.61
Total			$ 12,550.86

Quotes have the business' name, address and contact information. It also has the date and the customer name and contact data. There is a subtotal, tax amount and grand total.

Write a Cover Letter

The last document we will make is the cover letter. As a professional correspondence, the document has three paragraphs, an opening that quotes a price for their work. The second paragraph summarizes the system and the last paragraph will offer our warrantee and provide the contact information for the client.

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Network Technician

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April 11, 2011

Mr. Barry Matthews
LocalCompany Inc
15 Side St.
Columbus, Ohio 45454

Mr. Matthews,

We have designed a client server network wired with Gigabit cable for your company for $12,550.86. The majority of work building your system will be done at our shop as to limit any disruption of your busy schedule.

Your computer network has one Windows 2008 Server with RAID 1 drives, six personal computers with Intel I5 processors, 6 GB of internal RAM and 1 Terabyte hard drives, DVD-R/CD R/W, and a 18.5 inch widescreen monitor. The PCs have speakers and the office will have a black and white network laser printer. The six systems will have the Windows 7 operating system, Microsoft Office and Business 2010 application, Adobe Reader, Adobe Flash Player, and Antivirus software. We will install a Gigabit Ethernet router, a 16-port switch, multiple tested Category 6 cables, and surge protectors in your business. We will post the manufacturer warranties for you and you will receive your documentation in a permanent binder for easy reference. Our installation warrantee is valid for 60 days.

If you desire to purchase an extended warranty, we will add an additional $200 a year to covers all equipment. If you wish to contact me to schedule your installation or to make changes to our quote, you can call me at 614-222-9200 Monday through Friday from 8 AM to 5 PM, or email me at bwhite@gmail.com. Thanks you for your consideration.

Sincerely,

Brian White

Brian White
Network Technician

Attachments: Network Diagram (1)
Spreadsheet (1)

Checking the Quote Documents

Have another network technician check your three quote documents. You can provide the site visit notes to the checker when they are verifying the quote.

On some more expensive systems, the organization may require a supervisor to sign off on your quote before it is mailed or emailed to the client.

Sending the Quote

We should send the quote to our customer and verify they receive it. We can put a receipt on the email, so we will be sent a return email that our correspondence has been opened. We will find that some customers do not have the capability to open the quote documents because they do not have the software to view them. A good idea is to convert the diagram, quote and cover letter to the PDF format, so they can be read and printed using free Adobe Reader software. Some companies will email their quote so the customer gets the information quickly and then we would send a hardcopy of the documents in the regular mail to handle the printing issue.
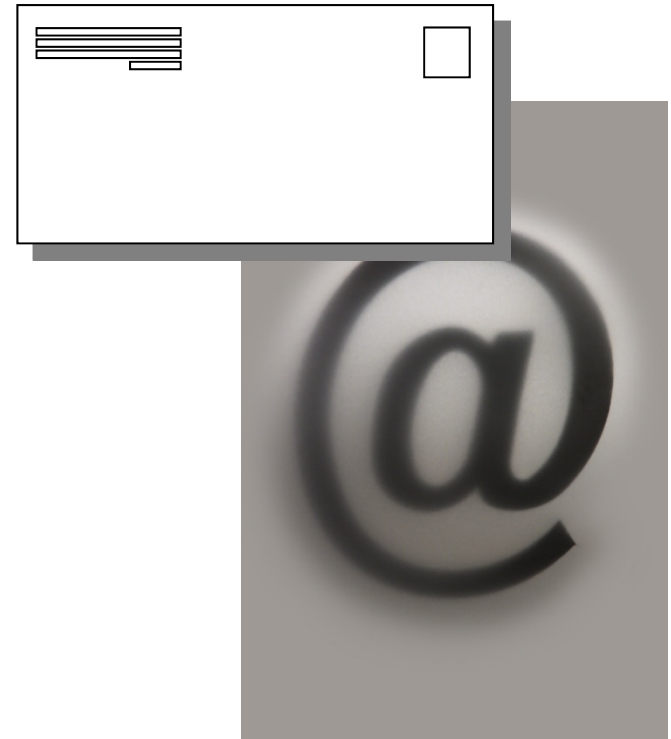
Presenting the Quote

For customers who need an explanation of our design, we can give a presentation to them that covers the layout, itemized quote and summarizes how their new system will operate. We can create a Power Point presentation quickly from our work and make a 15 minute slide show. The talk should concentrate on the performance and appeal of the network such as the look of the workstations, the applications that will be on them, and the speed of the connections. Some of our customers may need training on how to use email, handling attachments and more. Adding another item to the quote for training is good customer support and it will help us expand our business.

Accepting and Scheduling

When the customer decided to install the system, we will want to have a contract ready for them to sign. In many cases, they will put as much as 50% down to cover the purchase of equipment. We should schedule an installation date at the meeting with enough time for us to receive the devices and build their system.

We should order the equipment as soon as possible, since some items may take up to two weeks for shipment. Call the customer 48 hours ahead of time to verify the day we will be there setting up their system. While this lesson was designing a wired network, in another tutorial, we will cover the actual installation day.

Review Questions

1. What are the advantages of having one or more machines sharing folders on a network?
2. How do we share multiple folders on Window computers for others to see?
3. What are the advantages of having a server on a network?
4. What types of servers are on a standard server? What functions do they do?
5. A NAT server is _____ between the ISP and the PCs and resolves traffic to and from the Internet.
6. A File server does not have to be _____ between the ISP and the PCs.
7. What are two popular Microsoft server Network Operating Systems (NOS)?
8. What are two popular Linux server Network Operating Systems (NOS)?
9. What is the popular Apple server Network Operating System (NOS)?
10. Why would we plan on setting up a server to have automatic updates, automatic backups and an easy application to add a new account?

Types of Servers

Server Name	Write a Brief Description of Each Server
Active Directory	
DNS	
Backup	
DHCP	
Exchange	
File	
NAT	
Print	
RIS	
SQL	
VPN	
Web	

Network Design Exercise

Design a simple wired network for the customer:

Brian Jones

Widget Corporation

999 Main St.

Bigtown, Ohio 55555

664-777-8989

bjones@widgetco.com

Widget Corporation wants a sixteen computer network for their business with a Domain Controller (DC). The DC should have Active Directory with their employees loaded. It should be a DNS server, a NAT server and be setup for RAID 1 operation. The 16 computers just need the most recent version of Microsoft Office.

Create a diagram, spreadsheet quote and cover letter for the job and send the documents to your instructor with attachments. Make an informative PowerPoint presentation highlighting the features of the network you designed.