NEAR EAST UNIVERSITY

Faculty Of Engineering
Department Of Computer Engineering

NETWORK SOLUTION

Graduation Project
COM-400

Student ; Ersin GÜRBÜZ (90262)
Supervisor ; Mr.Ümit İLAHAN

Nicosia – 1995

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First of all, I would like to say that I am very grateful to my supervisor, Mr. Ümit İlhan, Prof. Dr. Doğan İbrahim AKAY, to my friends, and my parents.

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ABSTRACT

Computers are indispensable in business life today. Today corporations have to deliver the best quality and economic products in a very short time under tense competitive conditions. To accomplish their tasks they need a robust, secure and high technology infrastructure.

Today corporations should pick their own network solutions which are adaptable to latest technologies while corporations worldwide build their networks.

TABLE OF CONTENTS

INTRODUCTION

In this project I acknowledged a new company about networking solutions and formed corporate network topology.

The thesis consists of the introduction, fifteen chapters and conclusion.

CHAPTER-1 Information on Internet, Internet protocols, Internet connection types.

CHAPTER-2 Information on Network, Network types, Cabling, Network Operating systems, Network security

CHAPTER-3 Information on backup and backup types.

CHAPTER-4 Information on printer technologies and printer types.

CHAPTER-5 Information on Barcode, Barcode types and technologies, barcode readers and barcode printers.

CHAPTER-6 Information on uninterruptible power supplies and technologies.

CHAPTER-7 Information on voice solutions and types.

CHAPTER-8 COMPANY INETRNET TOPOLOGY was structured.

CHAPTER-9 COMPANY CABLE TOPOLOGY was structured.

CHAPTER-10 COMPANY NETWORK SECURITY was structured.

CHAPTER-11 COMPANY BACKUP TOPOLOGY was structured.

CHAPTER-12 COMPANY PRINTER TOPOLOGY was structured.

CHAPTER-13 COMPANY UPS TOPOLOGY was structured.

CHAPTER-14 COMPANY VOICE TOPOLOGY was structured.

CHAPTER-15 COMPANY SERVER TOPOLOGY was structured.

CHAPTER 1. INTERNET

1.1.WHAT IS THE INTERNET ?

Internet is a worldwide network of computer networks. It is a constantly growing interconnection of large and small networks around the globe. Internet is a technology as a response for needs to store, share and access the processed information easily.

1.2. WHAT DOES THE INTERNET OFFER ?

Technically the Internet offers various TCP/IP based services. For example, a user with access to the Internet, if permitted, can access to any other computer on the Internet to get, download or send information. This feature offered by the Internet is known as file transfer and the protocol whic enables sending and receiving files is known as file transfer protocol (ftp). Similarly users connected to the Internet may send and receive electronic mails. This process takes place through simple mail transfer protocol (SMTP). The Internet offers users many services via various protocols. That is with the help of the Internet you can access "any kind of" information. The Internet also provides users with different 'data search/seek' methods. The Internet actually offers an immense ocean of information where it's quite likely for a user to get lost.

1.3. WHAT IS TCP/IP?

TCP/IP is short for Transmission Control Protocol/Internet Protocol, the suite of communications protocols used to connect hosts on the Internet. TCP/IP uses several protocols, the two main ones being TCP and IP. TCP/IP is built into the UNIX operating system and is used by the Internet, making it the de facto standard for transmitting data over networks. Even network operating systems that have their own protocols, such as Netware, also support TCP/IP.

1.4. FILE TRANSFER PROTOCOL (FTP)

File transfer protocol is the protocol for exchanging files over the Internet. FTP works in the same way as HTTP for transferring Web pages from a server to a user's browser and SMTP for transferring electronic mail across the Internet in that, like these technologies, FTP uses the Internet's TCP/IP protocols to enable data transfer.

1.5. HOW INFORMATION IS DELIVERED TO ITS DESTINATION ON THE INTERNET?

Routing is the technique by which data finds its way from one host computer to another. In the Internet context there are three major aspects of routing

1. Physical Address Determination
2. Selection of inter-network gateways
3. Symbolic and Numeric Addresses

The first of these is necessary when an IP datagram is to be transmitted from a computer. It is necessary to encapsulate the IP datagram within whatever frame format is in use on the local network or networks to which the computer is attached. This

encapsulation clearly requires the inclusion of a local network address or physical address within the frame.
The second of these is necessary because the Internet consists of a number of local networks interconnected by one or more gateways. Such gateways, generally known as routers, sometimes have physical connections or ports onto many networks. The determination of the appropriate gateway and port for a particular IP datagram is called routing and also involves gateways interchanging information in standard ways.
The third aspect which involves address translation from a reasonably human friendly form to numeric IP addresses is performed by a system known as the Domain Name System or DNS for short. It is not considered further at this stage.

1.6. WHAT DO THE ABBREVIATONS IN URLS MEAN?

gov	Government agentb
edu	Educational institutions (e.g. universities)
org	Non-commercial organizations
com	Commercial organizations
mil	Military organizations
net	Servers (e.g. Internet Service Providers)
ac	Academic organizations (in some countries used for edu)
int	International organizations
ftp	FTP Archive Site (prefix)
www	World Wide Web Page

ABBREVIATIONS OF SOME COUNTRIES :

tr:Turkey, jp:Japan, uk:England, it:Italy, ch:Switzerlan, ca:Canada, ru:Russia, id:Endonesia, nl:Neterlands, de:Germany, fr:France, il:Israel, no:Norway, se:Sweden, fi:Finland, gr:Greece, hr:Croatia, yu:Yugoslavia, br:Brasil, bg:Bulgaria

1.7. INTERNET CONNECTION TECHNOLOGIES

1.7.1 ISDN

Abbreviation of integrated services digital network, an international communications standard for sending voice, video, and data over digital telephone lines or normal telephone wires. ISDN supports data transfer rates of 64 Kbps (64,000 bits per second). There are two types of ISDN:

- Basic Rate Interface (BRI) -- consists of two 64-Kbps B-channels and one D-channel for transmitting control information.
- Primary Rate Interface (PRI) -- consists of 23 B-channels and one D-channel (U.S.) or 30 B-channels and one D-channel (Europe).

The original version of ISDN employs baseband transmission. Another version, called B-ISDN, uses broadband transmission and is able to support transmission rates of 1.5 Mbps. B-ISDN requires fiber optic cables and is not widely available.

1.7.2 ATM (ASYNCHRONOUS TRANSFER MODE)

ATM is a network technology based on transferring data in *cells* or *packets* of a fixed size. The cell used with ATM is relatively small compared to units used with older technologies. The small, constant cell size allows ATM equipment to transmit video, audio, and computer data over the same network, and assure that no single type of data hogs the line.

Some people think that ATM holds the answer to the Internet bandwidth problem, but others are skeptical. ATM creates a fixed channel, or route, between two points whenever data transfer begins. This differs from TCP/IP, in which messages are divided into packets and each packet can take a different route from source to destination. This difference makes it easier to track and bill data usage across an ATM network, but it makes it less adaptable to sudden surges in network traffic.

When purchasing ATM service, you generally have a choice of four different types of service:

- **constant bit rate (CBR)**: specifies a fixed bit rate so that data is sent in a steady stream. This is analogous to a leased line.

- **variable bit rate (VBR)**: provides a specified throughput capacity but data is not sent evenly. This is a popular choice for voice and videoconferencing data.

- **available bit rate (ABR)**: provides a guaranteed minimum capacity but allows data to be bursted at higher capacities when the network is free.

- **unspecified bit rate (UBR)**: does not guarantee any throughput levels. This is used for applications, such as file transfer, that can tolerate delays.

1.7.3 FRAME RELAY

A packet-switching protocol for connecting devices on a Wide Area Network (WAN). Frame Relay networks in the U.S. support data transfer rates at T-1 (1.544 Mbps) and T-3 (45 Mbps) speeds. In fact, you can think of Frame Relay as a way of utilizing existing T-1 and T-3 lines owned by a service provider. Most telephone companies now provide Frame Relay service for customers who want connections at 56 Kbps to T-1 speeds. (In Europe, Frame Relay speeds vary from 64 Kbps to 2 Mbps.

1.7.4 ADSL (Asymmetric Digital Subscriber Line)

(Asymmetric Digital Subscriber Line) -- A method for moving data over regular phone lines. An ADSL circuit is much faster than a regular phone connection, and the wires coming into the subscriber's premises are the same (copper) wires used for regular phone service. An ADSL circuit must be configured to connect two specific locations, similar to a leased line. A commonly discussed configuration of ADSL would allow a subscriber to receive data (download) at speeds of up to 1.544 Megabits per second, and to send (upload) data at speeds of 128 kilobits per second. Thus the 'Asymmetric'

part of the acronym. Another commonly discussed configuration would be symmetrical: 384 kilobits per second in both directions. In theory ADSL allows download speeds of up to 9 megabits per second and upload speeds of up to 640 kilobits per second. ADSL is often discussed as an alternative to ISDN, allowing higher speeds in cases where the connection is always to the same place.

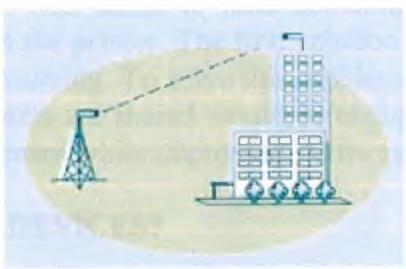
1.7.5 DIAL-UP MODEM

A modem is a device or program that enables a computer to transmit data over, for example, telephone or cable lines. Computer information is stored digitally, whereas information transmitted over telephone lines is transmitted in the form of analog waves. A modem converts between these two forms.

1.7.6 WIRELESS INTERNET

Wireless computer network devices were first developed for military purposes and then used for civil purposes. It uses DIRECT SEQUENCE modulation on SPREAD SEQUENCE technique. Direct Sequence Spread Spectrum (DSSS), is the technology that allows to place RF signal on a wide bandwidth and processing the information within this bandwidth. RF signals use 2.4-2.5 Ghz frequency signals determined by Radio Headquarters.

Improved with Direct Sequence Spread Spectrum modulation and standardized according to IEEE- 802.11b (DS) Wireless Local Area Network (WLAN), can reach a data stream rate of 11 Mbps (megabit per second). A two port bridge with wireless network interface and ethernet interface and a send/receive antenna conducts the communication between wireless network and local area network. Bridge which has frame filtering and dynamic address learning features operates at Data Link layer of OSI.



Two types of send/receive aerials are available for WLAN applications:

- Unidirectional antenna
- Omnidirectional antenna

  Unidirectional antennas operates at 14 db. There are 3 types of unidirectional antennas:

  a. 7 db omnidirectional antenna
  b. 5 db omnidirectional antenna (car kit)
  c. 5 db omnidirectional desktop antenna

CHAPTER 2. NETWORK

2.1 NETWORK

Network is share base for data and softwares. A small network may be composed of at least two PCs whereas a wide network includes thousands of interconnected computers, fax-modems, printers and othar peripherals.
Network technologies has dramatically developed and many companies has manufactured network devices on their own. First network solution was Local Area Network (LAN). LANs is an interconnected structure of network nodes within an office or a building. LAN was at first adequate for file and printer sharing but sooner it became inadequate for large enterprises with a wide range of networking needs. Enterprises has required to interconnect their LANs. As a result Wide Area Networks (WAN) have been developed to meet these requirements. WANs are collections of LANs. WANs soon have expanded have an extent to cover cities, countries and even continents.

2.1.1 LAN (LOCAL AREA NETWORK)

Local Area Network are relatively smaller networks. LANs are usually limited to a building, a group of neighboring buildings or a relatively small geographical area. Computers in a LAN rarely goes beyond a few kilometers. In a typical LAN configuration a computer is dedicated as a file server. File server holds all softwares for controlling network and other softwares shared accross the network.

Basic aims of LANs are to provide a shared hardware, software and data to save time. For example, take an office with then PCs in it. Each PC needs to print documents. If there's no networking in this office the solution could be either to buy one printer for each PC or asking the user who needs to print something to save his/her file on a diskette and use the PC with the printer. The first solution is an expensive one and the second is too much time consuming. To solve this problem economically establishing a LAN where one or two printers are shared would be enough. This way it's possible to save time and cut down expenses while improving performance.

2.1.1.1 WHAT ARE LAN DEVICES?

Devices in a network are computers, peripherals, network interfece cards and all other devices for data processing and communication.

a. Servers

A server is the heart of many networks. They need to have relatively more RAM, larger storage area and fast network interface cards. Many necessary applications and softwares suc as network operating systems, application softwares and files can be installed on a server. A server controls communications among terminals on a network. For example a server can transfer a word document from computer to computer and get a database file from a computer and save an e-mail message simultaneously.

b. Workstations

All computers connected to a file server on a network ar called workstations. A typical workstation is a computer with a network interface card, network software and necessary cables. It's not necessary to have diskette drives or hard drives on workstations because all files and applications can be kept on a file server.

c. Cards

c.1 Network Interface Cards:

Network Interface Card (NIC) establishes the physical connection between the network and the computer. Network Interface cards are one of the most important factors affecting network performance. Most common network interface cards are Ethernet cards, Local Talk connectors and Token Ring cards. According to a survey by International Data Corporation the most commonly used NICs are NIC Ethernet, Token Ring and Local Talk.

c.2 Ethernet Cards:

Ethernet cards work using BNC connectors on coaxial cables, RJ45 on twisted pair cables and SX/LX connectors on fibre optic cables. Some Ethernets use AUI instead of RJ45.

c.3 Local Talk Connectors:

Local Talk Connectors were developed by Apple for Macintosh computers. They use an external case and cable. The biggest disadvantage they hold is their speep at 230Kbps(0.23Mbps).

c.4 Token Ring Cards:

They are similar to Ethernet cards in appearence. They have different type of connector. Generally 9 pin DIN type connectors are used.

d. Active Devices

d.1 Hub

Hubs are central connection units on star topology networks. Hub allow all the nodes on a network to communicate with each other. While each device connected a hub may have its own power supply a hub also has its own power supply. LEDs on a hub lets you understand the activity on a network and helps diagnose problems on the network.


HP 10Base-T HUB-16M

More than two hubs can be interconnected but Ethernet has some limitations. Using switch to hub connections instead of hub to hub connections increases network performence. Hubs ara available for 10 Mbps or 100 Mbps networks.

d.2 Bridge

Bridges are used to connect independet workgroups. They forward data. They can connect 10 Mbps and 100 Mbps networks.

d.3 Swicth

As mentioned earlier switches are in fact more sophisticated hubs. They divide a large network into smaller networks (e.g segments) and in turn improve network performance. Switches makes it possible to forward date to a spesific node instead of sending data to all nodes. A switch monitors network status, sends data and checks data delivery. This feature is called store and forward.

Catalyst 1900 Switch

d.4 Repeater

10/100 Series Repeater

Repeater is preferred where distance between a central connection point and node is exceeded in an Ethernet environment. They ara cabable of receiving, reinforcing and forwarding signals. Hubs or switchs are also repetares.

d.5 Router

Routers filter network traffic and links various protocols to ensure file delivery. Due to filtering process a router works slower than a switch or bridge. Unlike hubs and swithces routers offer network administraton services.

7100 Series VPN Router

2.1.2 WAN (WIDE AREA NETWORK)

WAN is wide area network. That is a WAN is a collecton of two or more LANs. WAN's are mostly composed of telephone networks, ATMs, Frame Relay, satellites, leased lines and TDM. The largest WAN in the world is the Internet.

2.1.2.1 Why establish a WAN

a. **Data exchange:** To exchange data among LANs. To monitor data simultaneously through a network. To share information on sales, accounting, stocks etc.

b. Voice/Data/Fax Integration: To cut down on expenses of a company establishing value added services and to optimize work force. Establishing a voice communication on a network could reduce telephone expenses. To realize B2B and B2C applications.

c. E-commerce over the Internet: The whole world is in your hands now. It's quite possible to find new investment oppurtunities and business partners over the Internet. You can benefit from e-mailing which gives you an advantage to detail your communication in a written form. You can perform B2B an B2C between your own company and your clients and partners.

d. Video conferencing: Via your WAN it's possible to carry out video conferencing without having to be in a place physically.

2.2. CABLING

2.2.1 WHAT'S CABLING?

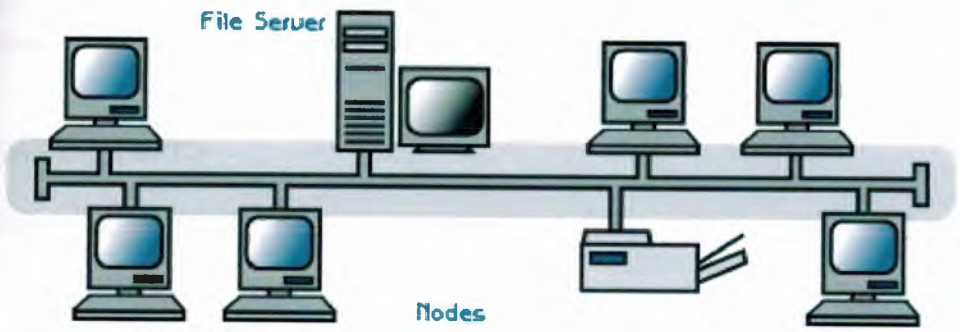
Cable is the physical medium over which data is transferred from a node on a network to another node. In LANs various cables might be used. On a network a single cable type can be used or more than one type can be used. The type of cable depends on network topology, protocols and scale of the network.

a. Physical topologies

Physical topology of a network demonstrates its cabling, configuration of computers and other peripherals.

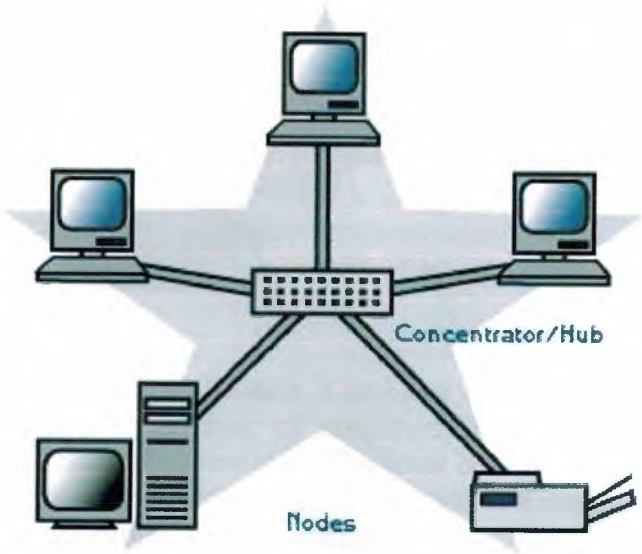
b. Linear Bus:

In linear bus topology all terminals (file servers, workstations and other peripherals) are connected along a linear cable. Linear topology is common in Ethernet and Local Talk networks.



c. **Star Topology:**

In a star topology each terminal (file servers, workstations and peripherals) is connected directly to a switch or hub. Data passes from hub or switch to be delivered to the destination computer. In star topologies commonly UTP/STP cable is used.



d. **Star-Wired Ring:**

This is used in Token Ring networks. They look like star topologies in appearance. Görünüş olarak yıldız topoloji gibidir. But in Multistation Access Unit (MAU) has a ring topology. Token Ring topology data goes through all nodes on network to reach its destination.

e. **Tree Topology:**

A method of connecting devices that is similar to a bus topology, except that tree networks can contain branches with multiple nodes. Transmissions from a station propagate the length of the medium and are received by all other stations.

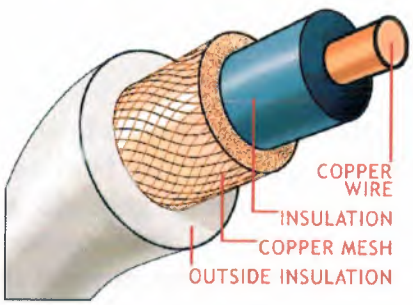
2.2.2 CABLE TYPES

Following ar network cable types:

- Coaxial Cable
- Twisted Pair Cable
- Fiber Optic Cable

2.2.2.1. Coaxial Cable

Coaxial cable is the kind of copper cable used by cable TV companies between the community antenna and user homes and businesses. Coaxial cable is sometimes used by telephone companies from their central office to the telephone poles near users. It is also widely installed for use in business and corporation Ethernet and other types of local area network.



Coaxial cable is called "coaxial" because it includes one physical channel that carries the signal surrounded (after a layer of insulation) by another concentric physical channel, both running along the same axis. The outer channel serves as a ground. Many of these cables or pairs of coaxial tubes can be placed in a single outer sheathing and, with repeaters, can carry information for a great distance.
Coaxial cable was invented in 1929 and first used commercially in 1941. AT&T established its first cross-continental coaxial transmission system in 1940. Depending on the carrier technology used and other factors, twisted pair copper wire and optical fiber are alternatives to coaxial cable.

2.2.2.1.1 Coaxial Cable Types:

a. RG-8 : RG8 - (Or "thicknet" - "thick Ethernet") The original "full spec" cable, used for 10base5 Ethernet networks. RG8 is stiff, large diameter coaxial cable with an impedance of 50 ohms, a member of the "Radio Guide" series. The outer sheath is usually yellow, to indicate double shielding, so it is often just called "yellow cable".

10base5 cable is designed to allow transceivers to be added while existing connections are live. This is achieved using a "vampire tap" - a device which (with sufficient practise) clamps onto the cable, forcing a spike through the outer shielding to contact the inner conductor while other spikes bite into the outer conductor. This is often built into the transceiver and a more flexible multi-wire cable carries the connection between the transceiver and the node.

b. RG-58 : RG58 a common, low-impedance (52 ohm), quarter-inch diameter coaxial cable used for 10base2 Ethernet wiring, sometimes called "cheapernet" in comparison with "full spec" RG8 cabling.

2.2.2.2 Twisted Pair Cable

Most commonly used network cables are the ones twisted pair cables similar to telephone cables. There are twisted cable types.

a. Shielded Twisted Pair-STP :

Often abbreviated *STP*, a type of copper wiring in which each of the two copper wires that are twisted together are coated with an insulating coating that functions as a ground for the wires. The extra covering in shielded twisted pair wiring protects the transmission line from electromagnetic interference leaking into or out of the cable. STP cabling often is used in Ethernet networks, especially fast data rate Ethernets.

b. Unshielded Twisted Pair-UTP :

UTP (Short for ***unshielded twisted pair)*** a popular type of cable that consists of two unshielded wires twisted around each other. Due to its low cost, UTP cabling is used extensively for local-area networks (LANs) and telephone connections. UTP cabling does not offer as high bandwidth or as good protection from interference as coaxial or fiber optic cables, but it is less expensive and easier to work with.

c. UTP Categories

UTP cables are divided into categories according to their data transfer capacities.

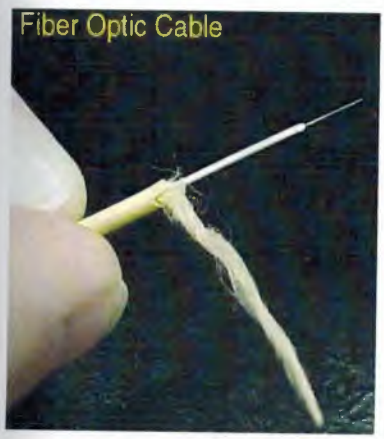
Category	Maximum Data Rate	Usual Application
CAT 1	Less than 1 Mbps	Analog voice (POTS) Integrated Services Digital Network Basic Rate Interface in ISDN
CAT 2	4 Mbps	Mainly used in the IBM Cabling System for token ring networks
CAT 3	16 Mbps	Voice and data on 10BASE-T Ethernet
CAT 4	20 Mbps	Used in 16 Mbps Token Ring Otherwise not used much
CAT 5	100 Mbps	100 Mbps TPDDI (100BASE-T or Fast

	1000 Mbps (4 pair)	Ethernet) 155 Mbps ATM Gigabit Ethernet
CAT 5E	100 Mbps	100 Mbps TPDDI (100BASE-T or Fast Ethernet) 155 Mbps ATM
CAT 6	200-250 MHz	Super-fast Broadband Applications.

CAT6 is currently added to 568A standart. That is its available for use. CAT6 is the most suitable cable for 1000 Mhz speed e.g. Gigabit ethernet. As shown in the image there is no difference in appearance.

2.2.2.3 Fiber Optic Cable

A technology that uses glass (or plastic) threads (fibers) to transmit data. A fiber optic cable consists of a bundle of glass threads, each of which is capable of transmitting messages modulated onto light waves.



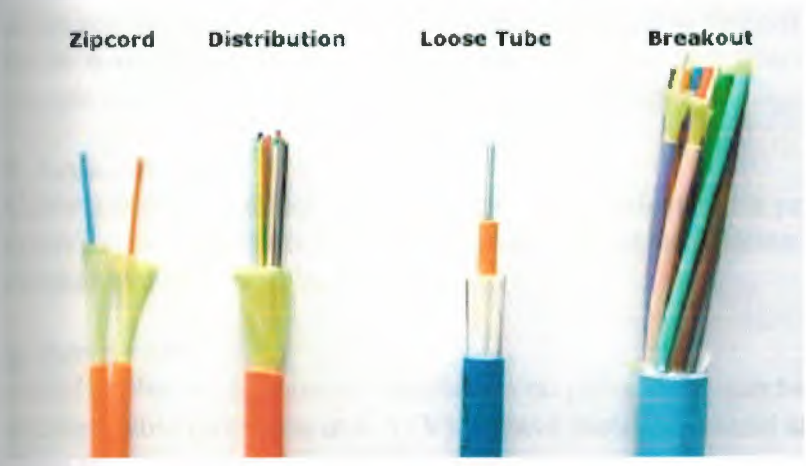
Fiber optics has several advantages over traditional metal communications lines:

- Fiber optic cables have a much greater bandwidth than metal cables. This means that they can carry more data.
- Fiber optic cables are less susceptible than metal cables to interference.
- Fiber optic cables are much thinner and lighter than metal wires.
- Data can be transmitted digitally (the natural form for computer data) rather than analogically.

The main disadvantage of fiber optics is that the cables are expensive to install. In addition, they are more fragile than wire and are difficult to split.

Fiber optics is a particularly popular technology for local-area networks. In addition, telephone companies are steadily replacing traditional telephone lines with fiber optic cables.

2.2.2.3.1 Cable Types:



a. Simplex and zip cord:
Simplex cables are one fiber, tight-buffered (coated with a 900 micron buffer over the primary buffer coating) with Kevlar (aramid fiber) strength members and jacketed for indoor use. The jacket is usually 3mm (1/8 in.) diameter. Zipcord is simply two of these joined with a thin web. It's used mostly for patch cord and backplane applications, but zipcord can also be used for desktop connections.

b. Distribution cables:
They contain several tight-buffered fibers bundled under the same jacket with Kevlar strength members and sometimes fiberglass rod reinforcement to stiffen the cable and prevent kinking. These cables are small in size, and used for short, dry conduit runs, riser and plenum applications. The fibers are double buffered and can be directly terminated, but because their fibers are not individually reinforced, these cables need to be broken out with a "breakout box" or terminated inside a patch panel or junction box.

c. Breakout cables:
They are made of several simplex cables bundled together. This is a strong, rugged design, but is larger and more expensive than the distribution cables. It is suitable for conduit runs, riser and plenum applications. Because each fiber is individually reinforced, this design allows for quick termination to connectors and does not require patch panels or boxes. Breakout cable can be more economic where fiber count isn't too large and distances too long, because is requires so much less labor to terminate.

d. Loose tube cables:
These cables are composed of several fibers together inside a small plastic tube, which are in turn wound around a central strength member and jacketed, providing a small, high fiber count cable. This type of cable is ideal for outside plant trunking applications, as it can be made with the loose tubes filled with gel or water absorbent powder to prevent harm to the fibers from water. It can be used in conduits, strung overhead or buried directly into the ground. Since the fibers have only a thin buffer coating, they must be carefully handled and protected to prevent damage.

e. Ribbon Cable:
This cable offers the highest packing density, since all the fibers are laid out in rows, typically of 12 fibers, and laid on top of each other. This way 144 fibers only has a cross section of about 1/4 inch or 6 mm! Some cable designs use a "slotted core" with up to 6 of these 144 fiber ribbon assemblies for 864 fibers in one cable! Since it's outside plant cable, it's gel-filled for water blocking.

f. Armored Cable:
Cable installed by direct burial in areas where rodents are a problem usually have metal armoring between two jackets to prevent rodent penetration. This means the cable is conductive, so it must be grounded properly.

g. Aerial cable:
Aerial cables are for outside installation on poles. They can be lashed to a messenger or another cable (common in CATV) or have metal or aramid strength members to make them self supporting.
Even More Types Are Available: Every manufacturer has it's own favorites, so it's a good idea to get literature from as many cable makers as possible.

2.3 NETWROK OPERATING SYSTEMS

Although networking and file and print sharing are still vital requirements, organizations today are relying on the server operating system to provide many additional servers such as:

- Running business applications and providing an infrastructure for the next generation of distributed applications.
- Running Internet and intranet sites.
- Providing a comprehensive communications infrastructure to provide services such as remote access through virtual private networking (VPN) and dial-up connections.
- Providing comprehensive directory and desktop management services.

2.3.1 TYPES OF NETWORK OPERATING SYSTEMS

2.3.1.1 NetWare 5.0

Novell NetWare 5.0 provides the services in the major customer deployment scenarios, however as this document describes in detail, NetWare 5.0 falls short in providing customers with an integrated solution. Many of the services are simply provided as add-ons and lack common installation, management interfaces, and security infrastructure. Because of the lack of an integrated architecture, NetWare 5.0 is very difficult to use and administer at times. Furthermore, NetWare 5.0 lacks many of the features, such as clustering, load balancing, VPN support, distributed file system, dynamic volume management, and others that provide customers with better availability and lower TCO. Even Novell's strongest feature—NDS—fails to deliver the infrastructure to provide support beyond basic user management needed for directory-enabled applications.

2.3.1.2 NT Server

Windows NT Server provides many of the same services found in Windows 2000 Server, however it lacks an extensible, hierarchical directory. Although the directory in Windows NT Server 4.0 provides organizations with a centralized directory for managing users and groups and single logon services, it is less comprehensive than the feature-set in either Active Directory or Novell Directory Services (NDS).

Although not as comprehensive as Windows 2000 Server, networking support is still far better than NetWare 5.0—offering several unmatched capabilities such as integrated dial-up access and VPN support.

Application support is outstanding, providing numerous capabilities such as message queuing, clustering and load balancing, and a thin-client solution in the form of the Terminal Server Edition of Windows NT Server. Distributed component support is also superior - the combination of COM and Transaction Server offers many capabilities not found in NetWare 5. Furthermore, with the addition of Active Server Pages (ASP), the power of COM and Transaction Server-based applications can be extended to the Web.

2.3.1.3 Windows 2000 Server

Windows 2000 Server provides an integrated, comprehensive and easy-to-use solution. Windows 2000 Server, like Windows NT Server 4.0, has been designed from the ground up as an integrated multipurpose operating system. As opposed to combining un-integrated services, Windows 2000 Server provides complete integration between its services resulting in easier management and lower TCO. For instance, once authenticated to the directory, users don't need to re-authenticate themselves to access other applications and services.

2.3.1.3.1 Advantages of Windows 2000 Server;

a. File Server

- Makes it easier to locate a shared file using Active Directory
- Ability to store encrypted files. When encrypted back-up files remains encrypted thus increasing security.
- Disk Quotas
- Multi-protocol support for Unix, Novell, Mac
- Improved indexing features
- Dynamic Volume Management helps control hard drive space

b. **Print Server**

- Easier access to printers by querying through Active Directory (This feature is one of the most important innovations making it possible to find the nearest printer to among tens of printers on a network.)
- Printer sharing over the Internet through Internet Printing Protocol
- More printer and protocol support.

c. **Web Server**

- CPU optimization for each web server
- Easy to establish SSL security through new wizards
- Simplified publishing and sharing options on web pages

d. **Networking and Communication Server**

- More security over authentication and encryption
- Optimization in TCP/IP performance, new user interface in VPN

2.4 NETWORK SECURITY

Many methods are used to maintain security on networks primarily on the Internet. There are various methods such as encryption, firewalls, passwords for authentication or user recognition or digital signatures.

2.4.1 Firewall

Firewall is a system designed to prevent unauthorized access to or from a private network. Firewalls can be implemented in both hardware and software, or a combination of both. Firewalls are frequently used to prevent unauthorized Internet users from accessing private networks connected to the Internet, especially *intranets*. All messages entering or leaving the intranet pass through the firewall, which examines each message and blocks those that do not meet the specified security criteria.

There are several types of firewall techniques:

- **Packet filter:** Looks at each packet entering or leaving the network and accepts or rejects it based on user-defined rules. Packet filtering is fairly effective and transparent to users, but it is difficult to configure. In addition, it is susceptible to IP spoofing.

• **Application gateway:** Applies security mechanisms to specific applications, such as FTP and Telnet servers. This is very effective, but can impose a performance degradation.

• **Circuit-level gateway:** Applies security mechanisms when a TCP or UDP connection is established. Once the connection has been made, packets can flow between the hosts without further checking.

• **Proxy server:** Intercepts all messages entering and leaving the network. The proxy server effectively hides the true network addresses.

In practice, many firewalls use two or more of these techniques in concert.

A firewall is considered a first line of defense in protecting private information. For greater security, data can be encrypted.

2.4.2 VPN (Virtual Private Networks)

Basically, a VPN is a private network that uses a public network (usually the Internet) to connect remote sites or users together. Instead of using a dedicated, real-world connection such as leased line, a VPN uses "virtual" connections routed through the Internet from the company's private network to the remote site or employee. In this article, you will gain a fundamental understanding of VPNs, and learn about basic VPN components, technologies, tunneling and security.

A well-designed VPN can greatly benefit a company. For example, it can:

- Extend geographic connectivity
- Improve security
- Reduce operational costs versus traditional WAN
- Reduce transit time and transportation costs for remote users
- Improve productivity
- Simplify network topology
- Provide global networking opportunities
- Provide telecommuter support
- Provide broadband networking compatibility
- Provide faster ROI (return on investment) than traditional WAN

What features are needed in a well-designed VPN?

It should incorporate:

- Security
- Reliability
- Scalability
- Network management
- Policy management

Internet Protocol Security Protocol (IPSec) provides enhanced security features such as better encryption algorithms and more comprehensive authentication.

IPSec has two encryption modes: **tunnel** and **transport**. Tunnel encrypts the header and the payload of each packet while transport only encrypts the payload. Only systems that are IPSec compliant can take advantage of this protocol. Also, all devices must use a common key and the firewalls of each network must have very similar security policies set up. IPSec can encrypt data between various devices, such as:

- Router to router
- Firewall to router
- PC to router
- PC to server

In short built-in encrypted data transfer feature in VPN technology secures network communications.

2.4.3 Antivirus

Most damaging viruses today come from the Internet in email (SMTP & POP) or Internet (HTTP) traffic. While a complete defense includes desktop anti-virus software, a great deal of viruses can be eliminated before they can get into the network. Built on the award winning TrendMicro anti-virus engine, OfficeScreen blocks inbound viruses by inspecting inbound traffic against it's onboard signature database. Pro-Assist engineers maintain daily updates to insure the latest signatures are downloaded, providing outbreak protection and virus mitigation when infections do occur.

Network-based antivirus protection, unlike desktop or host based antivirus, scans network traffic for viruses giving IT administrators control of how and when to scan for viruses in the network. By scanning for viruses in the most commonly used protocols – including content such as mail, web and file transfers – as it crosses the network perimeter, network-based antivirus solutions can stop viruses before they spread and

infect desktops. Using a multi-layered security strategy gives IT administrator the ability to control how best to protect the organization at every level. Moreover, network-based antivirus products are cost-effective, as one single license can protect distributed systems in the network segment.

Network-based antivirus scanning

- Stops viruses before they spread and infect desktops and other network assets
- Provides IT administrators control of how and when to scan for viruses in the network
- Offers comprehensive coverage with an extensive database of over 80,000 signatures
- Scans SMTP, HTTP, POP3 and Webmail traffic covering the most common multi-vector attacks
- Decodes and scans BINHEX, UUENCODE, MIME, S/MIME, and BASE64 attachments
- Decompresses and scans files with the ability to scan files up to 20 layers deep. Compression protocols supported include: PKZIP, ZIP2EXE, ARJ, ARJ2EXE, LHA, LHA2EXE, TAR, GZIP, LZEXE, PKLITE, DIET, MSCOMPRESS, CABINET, UNIX LZW, COMPRESS, and UNIX PACK

2.4.4. Web filtering solutions (URL Filtering)

Most employees working in companies have Internet access. However user activities such as which web pages they visit, how much time they spend on o web page etc. should be monitored. Recent research shows that most web traffic is composed of unnecessary, harmful web visits which in turn causes trojan/virus susceptibility on the network, unnecessary network usage, ungregistered software download and installation (which is illegal according to BSA).

To prevent harmful network traffic URL filtering is used. URL filtering softwares are updated constantly and web pages are categorized according to their contents. These softwares allows you to define user, group, IP address space filters. Thus you are able to determine which user/users can have access to which resources. Or time quotas can be defined. For example, permission to check online newspapers from 9:00 to 12:00 can be assigned to users or unlimited permisson between 12:00 and 13:00 etc. Even key word based filtering (for example, MP3) can be applied by URL filtering softwares.

2.4.5 IDS(Intrusion Detection System)

Network intrusion detection systems (NIDS) monitors packets on the network wire and attempts to discover if a hacker/cracker is attempting to break into a system (or cause a

denial of service attack). A typical example is a system that watches for large number of TCP connection requests (SYN) to many different ports on a target machine, thus discovering if someone is attempting a TCP port scan. A NIDS may run either on the target machine who watches its own traffic (usually integrated with the stack and services themselves), or on an independent machine promiscuously watching all network traffic (hub, router, probe). Note that a "network" IDS monitors many machines, whereas the others monitor only a single machine (the one they are installed on).

CHAPTER 3. BACKUP

Backup is to copy files to a second medium (a disk or tape) as a precaution in case the first medium fails. One of the cardinal rules in using computers is. Back up your files regularly. Even the most reliable computer is apt to break down eventually. Many professionals recommend that you make two, or even three, backups of all your files. To be especially safe, you should keep one backup in a different location from the others. You can back up files using operating system commands, or you can buy a special-purpose backup utility. Backup programs often compress the data so that backups require fewer disks.

3.1. What are needed to backup ?

In a healthy backup model various componenets should be selected in order to work in harmony. Following are the components in a backup model:

3.1.1 Sourcce

Space where data to be backed up resides.

3.1.2 Backup Hardware

Backup hardware is any hardware on which back up data is stored. In addition to standard storage devices special purpose hardwares could also be used.

a. Hard disk

b. Backup hard disk

c. RAID hard disk

d. Diskette

e. CD-R / CD-RW

f. DVD-R / DVD-RW /DVD+R / DVD+RW

g. Zip Disk / LS Disk

h. External hard disk

i. USB memory

j. Tape drive

k. Network Attached Storage

3.1.3 Backup Software

Backup software is a kind of software that is responsible for reading the files being backed up and writing them to the backup device. In some cases more than one backup software can be deployed.

a. Built-in features provided by the operating system (Win 9x / ME /NT1 / XP2/ 2000)

b. Compression Softwares (WinZip3, WinRAR, etc.)

c. CD / DVD writer softwares (CD Creator, Nero, etc.)

d. RAID software

3.1.4 Backup Environment

The environment where data to be stored is also of importance and can bring about some limitations.

CHAPTER 4. PRINTERS

A **printer** is an essential item for any modern home or office. If you don't currently have a printer or if you're looking for a new one, the vast selection of printers available today can be overwhelming.

Printers are an essential resource for creating a hard copy — a physical depiction of data on paper — version of documents and collateral for business, academic, and home use. Printers have become an indispensable peripheral in all levels of business and institutional computing. This chapter discusses the various printers available and compares their uses in different computing environments.

Like any other computer peripheral, there are several types of printers available. Some printers employ technologies that mimic manual typewriter-style functionality, while others spray ink on paper, or use a laser to generate an image of the page to be printed. Printer hardware interfaces with a PC or network using parallel, serial, or data networking protocols. There are several factors to consider when evaluating printers for procurement and deployment in your computing environment.

The following sections discuss the various printer types and the protocols that printers use to communicate with computers.

4.1 Printing Considerations

There are several aspects to factor into printer evaluations. The following specifies some of the most common criteria when evaluating your printing needs.

4.1.1 Function

Evaluating your organizational needs and how a printer services those needs is the essential criteria in determining the right type of printer for your environment. The most important question to ask is "What do we need to print?" Since there are specialized printers for text, images, or any variation thereof, you should be certain that you procure the right tool for your purposes.

For example, if your requirements call for high-quality color images on professional-grade glossy paper, it is recommended you use a dye-sublimation or thermal wax transfer color printer instead of a laser or impact printer.

Conversely, laser or inkjet printers are well-suited for printing rough drafts or documents intended for internal distribution (such high-volume printers are usually called workgroup printers). Determining the needs of the everyday user allows administrators to determine the right printer for the job.

Other factors to consider are features such as duplexing — the ability to print on both sides of a piece of paper. Traditionally, printers could only print on one side of the page (called simplex printing). Most lower-end printer models today do not have duplexing by default (they may, however, be capable of a manual duplexing method that requires

the user to flip the paper themselves). Some models offer add-on hardware for duplexing; such add-ons can drive one-time costs up considerably. However, duplex printing may reduce costs over time by reducing the amount of paper used to print documents, thus reducing the cost of consumables — primarily paper.

Another factor to consider is paper size. Most printers are capable of handling the more common paper sizes:

- letter — (8 1/2" x 11")
- A4 — (210mm x 297mm)
- JIS B5 — (182mm x 257mm)
- legal — (8 1/2" x 14")

If certain departments (such as marketing or design) have specialized needs such as creating posters or banners, there are large-format printers capable of using A3 (297mm x 420mm) or tabloid (11" x 17") paper sizes. In addition, there are printers capable of even larger sizes, although these are often only used for specialized purposes, such as printing blueprints.
Additionally, high-end features such as network modules for workgroup and remote site printing should also be considered during evaluation.

4.1.2 Cost

Cost is another factor to consider when evaluating printers. However, determining the one-time cost associated with the purchase of the printer itself is not sufficient. There are other costs to consider, such as consumables, parts and maintenance, and printer add-ons. As the name implies, consumables is a general term used to describe the material used up during the printing process. Consumables primarily take the form of media and ink. The media is the material on which the text or image is printed. The choice of media is heavily dependent on the type of information being printed.

For example, creating an accurate print of a digital image requires a special glossy paper that can withstand prolonged exposure to natural or artificial lighting, as well as ensure accuracy of color reproduction; these qualities are known as color fastness. For archival-quality documents that require durability and a professional level of legibility (such as contracts, résumés, and permanent records), a matte (or non-glossy) paper should be used. The stock (or thickness) of paper is also important, as some printers have a paper path that is not straight. The use of paper that is too thin or too thick can result in jams. Some printers can also print on transparencies, allowing the information to be projected on a screen during presentations.

Specialized media such as those noted here can affect the cost of consumables, and should be taken into consideration when evaluating printing needs. Ink is a generalized term, as not all printers use liquid inks. For example, laser printers use a powder known as toner, while impact printers use ribbons saturated with ink. There are specialized printers that heat the ink during the printing process, while others spray small droplets of ink onto the media. Ink replacement costs vary widely and depend on whether the container holding the ink can be recharged (refilled) or if it requires a complete replacement of the ink cartridge

4.2 TYPES OF PRINTERS

Basically there are three types of printers: impact printers, ink jet printers, and laser printers. The characteristics of the various printers are discussed in this section.

4.2.1 Impact Printers

Impact printers are the oldest printing technologies still in active production. Some of the largest printer vendors continue to manufacture, market, and support impact printers, parts, and supplies. Impact printers are most functional in specialized environments where low-cost printing is essential. The three most common forms of impact printers are dot-matrix, daisy-wheel, and line printers.

4.2.2 Dot-Matrix Printers

The technology behind dot-matrix printing is quite simple. The paper is pressed against a drum (a rubber-coated cylinder) and is intermittently pulled forward as printing progresses. The electromagnetically-driven printhead moves across the paper and strikes the printer ribbon situated between the paper and printhead pin. The impact of the printhead against the printer ribbon imprints ink dots on the paper which form human-readable characters.

Dot-matrix printers vary in print resolution and overall quality with either 9 or 24-pin printheads. The more pins per inch, the higher the print resolution. Most dot-matrix printers have a maximum resolution of around 240 dpi (dots per inch). While this resolution is not as high as those possible in laser or inkjet printers, there is one distinct advantage to dot-matrix (or any form of impact) printing. Because the printhead must strike the surface of the paper with enough force to transfer ink from a ribbon onto the page, it is ideal for environments that must produce carbon copies through the use of special multi-part documents. These documents have carbon (or other pressure-sensitive material) on the underside and create a mark on the sheet underneath when pressure is applied. Retailers and small businesses often use carbon copies as receipts or bills of sale.

4.2.3 Daisy-Wheel Printers

If you have ever worked with a manual typewriter before, then you understand the technological concept behind daisy-wheel printers. These printers have printheads composed of metallic or plastic wheels cut into petals. Each petal has the form of a letter (in capital and lower-case), number, or punctuation mark on it. When the petal is struck against the printer ribbon, the resulting shape forces ink onto the paper. Daisy-wheel printers are loud and slow. They cannot print graphics, and cannot change fonts unless the print wheel is physically replaced. With the advent of laser printers, daisy-wheel printers are generally not used in modern computing environments.

4.2.4 Line Printers

Another type of impact printer somewhat similar to the daisy-wheel is the line printer. However, instead of a print wheel, line printers have a mechanism that allows multiple characters to be simultaneously printed on the same line. The mechanism may use a large spinning print drum or a looped print chain. As the drum or chain is rotated over

the paper's surface, electromechanical hammers behind the paper push the paper (along with a ribbon) onto the surface of the drum or chain, marking the paper with the shape of the character on the drum or chain.
Because of the nature of the print mechanism, line printers are much faster than dot-matrix or daisy-wheel printers. However, they tend to be quite loud, have limited multi-font capability, and often produce lower print quality than more recent printing technologies.
Because line printers are used for their speed, they use special tractor-fed paper with pre-punched holes along each side. This arrangement makes continuous unattended high-speed printing possible, with stops only required when a box of paper runs out.

Impact Printer Consumables

Of all the printer types, impact printers have relatively low consumable costs. Ink ribbons and paper are the primary recurring costs for impact printers. Some Impact printers (usually line and dot-matrix printers) require tractor-fed paper, which can increase the costs of operation somewhat.

4.2.5 Inkjet Printers

An Inkjet printer uses one of the most popular printing technologies today. The relatively low cost and multi-purpose printing abilities make inkjet printers a good choice for small businesses and home offices.

Inkjet printers use quick-drying, water-based inks and a printhead with a series of small nozzles that spray ink onto the surface of the paper. The printhead assembly is driven by a belt-fed motor that moves the printhead across the paper.

Inkjets were originally manufactured to print in monochrome (black and white) only. However, the printhead has since been expanded and the nozzles increased to accommodate cyan, magenta, yellow, and black. This combination of colors (called CMYK) allows the printing of images with nearly the same quality as a photo development lab (when using certain types of coated paper.) When coupled with crisp and highly readable text print quality, inkjet printers are a sound all-in-one choice for monochrome or color printing needs.

Inkjet Consumables

Inkjet printers tend to be low cost and scale slightly upward based on print quality, extra features, and the ability to print on larger formats than the standard legal or letter paper sizes. While the one-time cost of purchasing an inkjet printer is lower than other printer types, there is the factor of inkjet consumables that must be considered. Because demand for inkjets is large and spans the computing spectrum from home to enterprise, the procurement of consumables can be costly.

4.2.6 Laser Printers

An older technology than inkjet, laser printers are another popular alternative to legacy impact printing. Laser printers are known for their high volume output and low cost-per-page. Laser printers are often deployed in enterprises as a workgroup or

departmental print center, where performance, durability, and output requirements are a priority. Because laser printers service these needs so readily (and at a reasonable cost-per-page), the technology is widely regarded as the workhorse of enterprise printing.

Laser printers share much of the same technologies as photocopiers. Rollers pull a sheet of paper from a paper tray and through a charge roller, which gives the paper an electrostatic charge. At the same time, a printing drum is given the opposite charge. The surface of the drum is then scanned by a laser, discharging the drum's surface and leaving only those points corresponding to the desired text and image with a charge. This charge is then used to force toner to adhere to the drum's surface.

The paper and drum are then brought into contact; their differing charges cause the toner to then adhere to the paper. Finally, the paper travels between fusing rollers, which heat the paper and melt the toner, fusing it onto the paper's surface.

4.2.7 Color Laser Printers

Color laser printers aim to combine the best features of laser and inkjet technology into a multi-purpose printer package. The technology is based on traditional monochrome laser printing, but uses additional components to create color images and documents. Instead of using black toner only, color laser printers use a CMYK toner combination. The print drum either rotates each color and lays the toner down one color at a time, or lays all four colors down onto a plate and then passes the paper through the drum, transferring the complete image onto the paper. Color laser printers also employ fuser oil along with the heated fusing rolls, which further bonds the color toner to the paper and can give varying degrees of gloss to the finished image.

Because of their increased features, color laser printers are typically twice (or several times) as expensive as monochrome laser printers. In calculating the total cost of ownership with respect to printing resources, some administrators may wish to separate monochrome (text) and color (image) functionality to a dedicated monochrome laser printer and a dedicated color laser (or inkjet) printer, respectively.

Laser Printer Consumables

Depending on the type of laser printer deployed, consumable costs usually are fixed and scale evenly with increased usage or print job volume over time. Toner comes in cartridges that are usually replaced outright; however, some models come with refillable cartridges. Color laser printers require one toner cartridge for each of the four colors. Additionally, color laser printers require fuser oils to bond toner onto paper and waste toner bottles to capture toner spillover. These added supplies raise the consumables cost of color laser printers; however, it is worth noting that such consumables, on average, last about 6000 pages, which is much greater than comparable inkjet or impact consumable lifespans. Paper type is less of an issue in laser printers, which means bulk purchases of regular xerographic or photocopy paper are acceptable for most print jobs. However, if you plan to print high-quality images, you should opt for glossy paper for a professional finish.

The initial cost of dot matrix printers is typically somewhere between the other two printer types, but the ribbons are fairly inexpensive and they tend to last a long time.

Choosing an inkjet printer

If you decide that an inkjet printer would be best for your needs and budget, here are a few tips for choosing one:

- Cost of the printer- Unless you have a need for super fast printing, the most inexpensive printers available today will do a good job for you.
- Cost of the ink cartridges - Cartridge prices vary a great deal from one printer model to another. One printer might require a $30 cartridge while the printer next to it uses a $17 one.
- Printer speed - For home use, even the slowest inkjet printers will probably be acceptable, but if you prefer a faster printer, be prepared to pay more.

Choosing a laser printer

If you need a laser printer, the factors to consider are:

- Cost of the printer - Since these printers are used primarily in an office setting, they usually get a lot of use. This goes double for a networked printer. You'll probably want to consider reliability over price when comparing laser printers.
- Cost of consumables - Toner cartridges and drums vary widely in price. A less expensive printer may well end up costing more over the course of a year if you purchase a model that uses more expensive consumables.

4.2.8 Other Printer Types

There are other types of printers available, mostly special-purpose printers for professional graphics or publishing organizations. These printers are not for general purpose use, however. Because they are relegated to niche uses, their prices (both one-time and recurring consumables costs) tend to be higher relative to more mainstream units.

a. Thermal Wax Printers

These printers are used mostly for business presentation transparencies and for color proofing (creating test documents and images for close quality inspection before sending off master documents to be printed on industrial four-color offset printers). Thermal wax printers use sheet-sized, belt driven CMYK ribbons and specially-coated paper or transparencies. The printhead contains heating elements that melt each wax color onto the paper as it is rolled through the printer.

b. Dye-Sublimation Printers

Used in organizations such as service bureaus — where professional quality documents, pamphlets, and presentations are more important than consumables costs — dye-sublimation (or dye-sub) printers are the workhorses of quality CMYK printing. The concepts behind dye-sub printers are similar to thermal wax printers except for the use of diffusive plastic dye film instead of colored wax. The printhead heats the colored film and vaporizes the image onto specially coated paper.

Dye-sub is quite popular in the design and publishing world as well as the scientific research field, where preciseness and detail are required. Such detail and print quality comes at a price, as dye-sub printers are also known for their high costs-per-page.

c. Solid Ink Printers

Used mostly in the packaging and industrial design industries, solid ink printers are prized for their ability to print on a wide variety of paper types. Solid ink printers, as the name implies, use hardened ink sticks that that are melted and sprayed through small nozzles on the printhead. The paper is then sent through a fuser roller which further forces the ink onto the paper.

The solid ink printer is ideal for prototyping and proofing new designs for product packages; as such, most service-oriented businesses would not have a need for this type of printer.

d. Thermal Bar-code Printers

These are special printers which can print bar-code labels. These printers are mainly used in the packaging departments where bar-code labels of the products are printed and then they are stuck on the products to identify them. There are several typs of thermal bar-code printers. A good quality thermal type should be selected for maintenance free operation. Bar-code printers do not print on ordinary paper and special sticky labels are used in the form of rolls which are loaded into the printers.

4.3 PRINTER LANGUAGES AND TECHNOLOGIES

Before the advent of laser and inkjet technology, impact printers could only print standard, justified text with no variation in letter size or font style. Today, printers are able to process complex documents with embedded images, charts, and tables in multiple frames and in several languages, all on one page. Such complexity must adhere to some format conventions. This is what spurred the development of the page description language (or PDL) — a specialized document formatting language specially made for computer communication with printers.

Over the years, printer manufacturers have developed their own proprietary languages to describe document formats. However, such proprietary languages applied only to the printers that the manufacturers created themselves. If, for example, you were to send a print-ready file using a proprietary PDL to a professional press, there was no guarantee that your file would be compatible with the printer's machines. The issue of portability came into question.

Xerox® developed the Interpress™ protocol for their line of printers, but full adoption of the language by the rest of the printing industry was never realized. Two original developers of Interpress left Xerox and formed Adobe®, a software company catering mostly to electronic graphics and document professionals. At Adobe, they developed a widely-adopted PDL called PostScript™, which uses a markup language to describe text formatting and image information that could be processed by printers. At the same time, the Hewlett-Packard® Company developed the Printer Control Language™ (or PCL) for use in their ubiquitous laser and inkjet printer lines. PostScript and PCL are now widely adopted PDLs and are supported by most printer manufacturers.

PDLs work on the same principle as computer programming languages. When a document is ready for printing, the PC or workstation takes the images, typographical information, and document layout, and uses them as objects that form instructions for the printer to process. The printer then translates those objects into rasters, a series of scanned lines that form an image of the document (called Raster Image Processing or RIP), and prints the output onto the page as one image, complete with text and any graphics included. This work-flow makes printing documents of any complexity uniform and standard, resulting in little or no variation in printing from one printer to the next. PDLs are designed to be portable to any format, and scalable to fit different paper sizes.

Choosing the right printer is a matter of determining what standards the various departments in your organization have adopted for their needs. Most departments use word processing and other productivity software that use the PostScript language for outputting to printers. However, if your graphics department requires PCL or some proprietary form of printing, you must take that into consideration as well.

4.3.1 Networked Versus Local Printers

Depending on organizational needs, it may be unnecessary to assign one printer to each member of your organization. Such overlap in expenditure can eat into allotted budgets, leaving less capital for other necessities. While local printers attached via a parallel or USB cable to every workstation are an ideal solution for the user, it is usually not economically feasible.

Printer manufacturers have addressed this need by developing departmental (or workgroup) printers. These machines are usually durable, fast, and have long-life consumables. Workgroup printers usually are attached to a print server, a standalone device (such as a reconfigured workstation) that handles print jobs and routes output to the proper printer when available. More recent departmental printers include built-in or add-on network interfaces that eliminate the need for a dedicated print server.

CHAPTER 5. BAR-CODE

5.1 INTRODUCTION

A bar code (often seen as a single word, *barcode*) is the small image of lines (bars) and spaces that is affixed to retail store items, identification cards, and postal mail to identify a particular product number, person, or location. The code uses a sequence of vertical bars and spaces to represent numbers and other symbols. A bar code symbol typically consists of five parts: a quiet zone, a start character, data characters (including an optional check character), a stop character, and another quiet zone.

The benefits of using Bar Codes for automated data collection are very simple: speed and accuracy. Time after time, it has been proven that entering Bar Code data is at least 100 times faster and more accurate than traditional manual keyboard entry, which translates into a dramatic increase in efficiency and productivity for any operation.

A bar-code reader is used to read the code. The reader uses a laser beam that is sensitive to the reflections from the line and space thickness and variation. The reader translates the reflected light into digital data that is transferred to a computer for immediate action or storage. Bar codes and readers are most often seen in supermarkets and retail stores, but a large number of different uses have been found for them. They are also used to take inventory in retail stores; to check out books from a library; to track manufacturing and shipping movement; to sign in on a job; to identify hospital patients; and to tabulate the results of direct mail marketing returns. Very small bar codes have been used to tag honey bees used in research. Readers may be attached to a computer (as they often are in retail store settings) or separate and portable, in which case they store the data they read until it can be fed into a computer.

There is no one standard bar code; instead, there are several different bar code standards called symbologies that serve different uses, industries, or geographic needs. Since 1973, the Uniform Product Code (UPC), regulated by the Uniform Code Council, an industry organization, has provided a standard bar code used by most retail stores. The European Article Numbering system (EAN), developed by Joe Woodland, the inventor of the first bar code system, allows for an extra pair of digits and is becoming widely used. POSTNET is the standard bar code used in the United States for ZIP codes in bulk mailing. The following table summarizes the most common bar code standards

CODE	USAGE
Uniform Product Code (UPC)	Retail stores for sales checkout; inventory, etc.
Code 39	(Code 3 of 9) Identification, inventory, and tracking shipments

POSTNET	Encoding zip codes on U.S. mail
European Article Number (EAN)	A superset of the UPC that allows extra digits for country identification
Japanese Article Number (JAN)	Similar to the EAN, used in Japan
ISSN bar code	Based on ISSN numbers, used on periodicals outside the U.S.
Code 128	Used in preference to Code 39 because it is more compact
Interleaved 2 of 5	Used in the shipping and warehouse industries
Codabar	Used by Federal Express, in libraries, and blood banks
OCR-A	The optical character recognition format used on book covers for the human readable version of the ISBN number
Maxicode	Used by the United Parcel Service
PDF417	A new 2-D type of bar code that can encode up to 1108 bytes of information; can become a compressed, portable data file (which is what the "PDF" stands for)

The most popular Bar Code format is the UPC (Universal Product Code) Format, which we find in all supermarket products. Available since the early 1970's this format is known worldwide, and is universally recognized.

For Automatic Identification Applications, however, Bar Code CODE 39 Format is the de facto standard for Government, Manufacturing, Bar Code Industry, Education, and Business applications. The popularity of the CODE 39 Format is based on several factors, which include: ease of use, ability to code numbers and letters, flexible word length capability (can generate Bar Codes with any number of characters), and universal reading capability (Bar Code equipment from any manufacturer can read this code).

5.2 EXAMPLE BAR-CODE

An example UPC type bar-code is given in thic section. Glancing at the UPC symbol below, you can easily see that it is divided in half. In fact, a UPC symbol can be divided into seven parts. We will consider these parts one at a time, starting from the left:

The first part of a UPC symbol is the left guard pattern. This consists of two thin vertical lines a bit taller than the other bars. The guard pattern doesn't contribute to the actual code, but is simply an indicator to identify the start of a UPC symbol.

The second part of a UPC symbol is the number system digit, which indicates what type of product the symbol is identifying.

The third part of a UPC symbol is the manufacturer's code. This consists of five numbers (and their corresponding bars) and identifies the product manufacturer.

The fourth part of a UPC symbol is the centre guard pattern which consists of two thin vertical lines a bit taller than the other bars. The centre guard pattern divides the symbol in half.

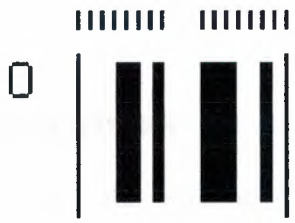
The fifth part of a UPC symbol is the product code. This consists of five numbers (and their corresponding bars) and identifies the product.

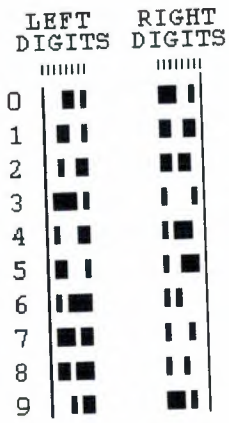
The sixth part of a UPC symbol is the check digit, whose value is based on a weighting of the other digits in the code (see below).

The seventh part of a UPC symbol is the right guard pattern, which serves the same purpose as the left guard pattern.

5.2.1 The Bars

The bars in a UPC symbol consist of two bars and two spaces for each digit to be encoded. These bars and spaces fit into seven modules and are unique for each digit. The encodation of a digit in the left half of the symbol is the logical opposite of the encodation of the same digits in the right half of the symbol. All of the left digits have odd parity (the sum of the bar module widths is odd) while all of the right digits have even parity (the sum of the bar module widths is even).





5.2.2 The Check Digit

To prevent against errors when scanning in UPC symbols, a check digit is used. The check digit is the last digit in the UPC number, and if the computer detects an error, the UPC symbol must be scanned in again. To determine if a UPC symbol is valid, the following check procedure is used:

3 x (sum of digits in even positions) + (sum of digits in odd positions) = a multiple of 10

A UPC number has 12 digits, going from position 0 to position 11. The symbol code is in position 0 and the check digit is in position 11.

eg. 1) For the bar code at the top of this page, the symbol code is 0 and the check digit is 5.

$3 \times (0 + 2 + 4 + 6 + 8 + 0) + (1 + 3 + 5 + 7 + 9 + 5) = 90$

eg.2) Is the check digit in 0 63487 05148 3 correct?
$3 \times (0 + 3 + 8 + 0 + 1 + 8) + (6 + 4 + 7 + 5 + 4 + 3) = 89$ (invalid)

eg.3) Calculate the check digit for 0 57712 21043.
$3 \times (0 + 7 + 1 + 2 + 0 + 3) + (5 + 7 + 2 + 1 + 4 + ?) = 58 + ?$ (check digit = 2)

5.3 BAR-CODE READERS

Bar-code readers read the infortmation on the bar-code labels and then transfer this information to a computer. The reader converts the black stripes into numbers and letters which can be understood by a computer program.

5.3.1 Bar-code Wand Readers

Bar Code Wands are the most popular Bar Code readers or scanners, due to their low cost. Wands are manually moved across Bar Codes to perform the reading function, hence their classification as "contact" scanners.

Bar Code Wand are extremely simple to use, but require users to keep a reasonably constant scanning motion accross the Bar Code, and a flat surface behind the Bar Code to support the pressure applied by the operator during the scanning motion.

5.3.2 Ccd Readers

Bar Code CCD Scanners are faster and easier to use than Wand Scanners. User simply holds the CCD Scanner slightly above the Bar Code, and pulls the trigger button. CCD scanners typically read Bar Codes from contact to about one-half inch distance, hence their classification as "near-contact" scanners.

Bar Code physical length must be considered when using CCD Bar Code Scanners, as the complete Bar Code must be covered by the CCD scanner optical head.

5.3.3 Laser Readers

Bar Code Laser Scanners are faster and easier to use than Wand or CCD Scanners. User simply holds the Laser Scanner above the Bar Code, and pulls the trigger button. Laser scanners typically read Bar Codes from near contact to 12 inch distance (some models up to four feet), hence their classification as "non-contact" scanners.

Bar Code Laser Scanners are best suited for reading Bar Codes from a distance, reading poorly printed labels, reading a wide range of label sizes, and reading labels on irregular surfaces.




5.4. BAR-CODE PRINTERS

The best way to start printing Bar Codes is to use your existing laser, ink jet or dot matrix printer.

In order to do this, you require a Bar Code TrueType Font, which is very inexpensive. A Bar Code TrueType Font provides the ability to print Bar Codes directly from Word, WordPerfect, Access, FoxPro, Excel, or any other Windows program. Bar Codes can be printed on labels or directly on documents.

When choosing a bar-code printer it is important to know the labelling requirements, such as the label size, its durability, cost etc. Thermal transfer type bar-code printers are the most popular ones since they produce durable labels with low cost.

CHAPTER 6. UNIVERSAL POWER SUPPLIES (UPS)

6.1 INTRODUCTION

To protect your equipment from power failure, slowdowns and brownouts, you need more than a simple surge suppressor. Blackouts and brownouts make up as much as 90% of all power disturbances affecting electrical equipment. You will need a dependable Uninterruptible Power Supply, or UPS to keep your switches and PBXs up for an extended period of time.

UPSs all come with a nickel-cadmium or lead-acid battery backup, to get you through anywhere from a few minutes to several hours of time without power. Battery power supplies direct current, and since your equipment will only run on alternating current, there's also a conversion that takes place, facilitated by an inverter. The conformity of the inverter's output wave to a true 50-cycle sine wave is an important measure of the inverter's quality. Most UPSs have microprocessors that regulate some of the functions and communicate over a LAN.

Although there is only so much variation you can produce with UPSs, telecom equipment fares best with purer output waveforms, extended battery time and the ability to manage the devices remotely.

An energy spike occurs when there is a rapid load reduction on the power grid. This can cause voltage levels to jump as much as 100%, causing electrical components to become unstable and forcing a system crash. Surges, which are basically the same as a spike, but of longer duration, will physically damage equipment. Surges are caused by lightning, a storm blowing power lines together, or sometimes by the electric company. Line noise or electrical static is caused by low-level fluctuations.

The per-hour loss for a 900-number service without power is over $50,000, illustrating vividly the point that downed equipment is more than just a nuisance. UPSs protect you from all types of power variations, but most important is protection from a power outage, which results in lost revenue and wasted employee time.

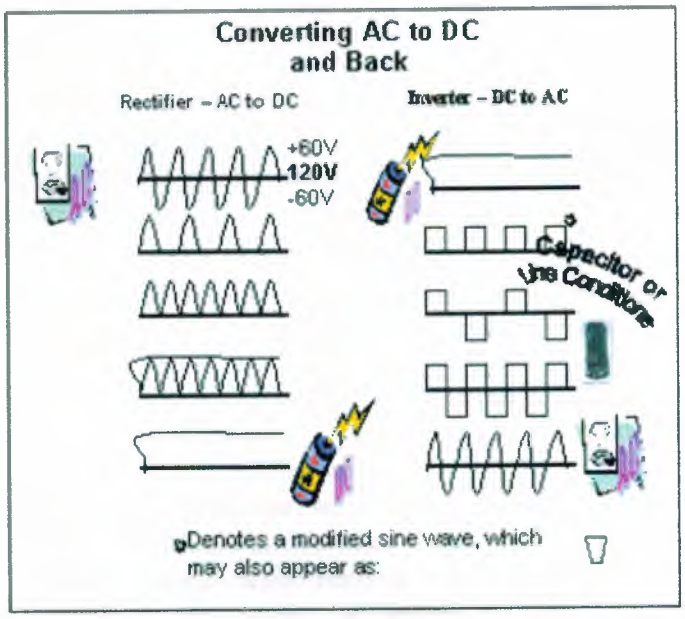


Fig. 9.1 AC to DC conversion process

A brownout results when there is a uniformly lower voltage that doesn't distort the power signal. Brownouts sometimes occur when internal office equipment, especially air conditioners and laser printers switch on; or during peak demand for power by a local heavy use industry. New equipment may continue to operate fine under these circumstances for some time, but it will cause damage in the long run.

When a power failure occurs and the UPS switches power to the battery, the signal generated by the inverter and supplied to the equipment may not be a true sine wave (it may be called a "modified" or "simulated" sine wave). The modified or simulated sine wave can range from a square wave to a trapezoidal wave. These pseudo-sine waves are the product of less expensive components than those used to make true sine wave generators. Computers using the power supplies found in most desktop PCs and servers will work fine with square waves, better with trapezoidal waves, and best with true sine waves. Generally speaking, only continuous on-line UPSs require the true sine wave to be effective.

UPSs also have a third component; the rectifier module. The rectifier keeps the batteries charged by changing AC current to DC. UPSs are classified by the way its 3 components, the inverters, rectifiers, and batteries are connected. Here are some of the more common configurations:

6.1.1Standby

Standby UPSs feed AC power from the utility line through the bus, to the equipment. It will only switch to battery during a blackout or brownout. Surge protectors and filters are also utilized to smooth out high frequency spikes and line noise. Standbys commonly work best on single-use computer equipment.

6.1.2 Line Interactive

Like the standby, the online interactive passes the AC directly through, but will ride out fluctuations to preserve battery life. To accomplish this, a regulator filters the voltage, raising or lowering it to the proper range. When the voltage is too far out of range, the CPU will utilize the battery. As with the standby, filters are used to even out high frequency spikes and eliminate line noise.

6.1.3Online

With an online UPS, the inverter is always on, converting DC to AC so there is no delay in switch-over in the event of a failure. These work by converting the power from the wall outlet from AC to DC, continually charging the batteries, through the inverter where it is converted back to AC and sent out to the equipment that is relying on it for backup, a process called "double conversion". This design facilitates voltage regulation and pure sine wave output with limited distortion. Some also have isolation transformers which block out surges and spikes by separating the input and output lines.

6.2 Which one is right for your business?

Standby UPSs are generally not used for telecom equipment because the square wave output is not tolerated by even the best equipment. These UPSs are best for PCs because they usually supply just enough time to shutdown. Telecom equipment needs a much longer back-up period.
With line interactive and online UPSs, the battery is always on the "power bus", hence there is no switchover time and no power interruption. There is also a pure sine wave output. Built in to the design is superior voltage regulation, surge protection and noise/spike filtering. Both can be outfitted with extra battery packs for extended periods of outage.

Line interactives can deliver the perfect sine-wave, but the option to provide that will cost extra. They usually have a fair switchover time, usually less than four milliseconds. Their surge protection meets industry standard specs, although they cannot absorb the many joules of energy that the onlines can, due to the interactive's lack of isolation transformers. Line interactives are less error prone than the Online UPSs, partly because aside from some filtering, they are at rest most of the time. If you have only infrequent outages, you may find this the best choice, however the Line interactive UPS may not completely compensate for voltage shifts.

To get the clean AC signal from an Online UPS, you will pay more in up-front cost due to expensive special circuitry and in maintenance, with the double conversion process resulting in extra power usage. The special circuitry that makes the Online's signal so clean is also more prone to failure than that used by the interactive. Some reports suggest that the onlines run half as long between failures as do the interactives.

Line Interactive or On-line

UPSes suitable for backup of small server installations come in two classes: line-interactive units and on-line units (the latter tend to cost more).

The main distinction between line-interactive UPSes and on-line UPSes, practically speaking, is what happens to output voltage at the moment of a power loss. A line-interactive unit lets through a small and usually inconsequential power gap (measure d in milliseconds as a *transfer time*) when it switches to battery power during an outage.

Line-interactive units are basically high-class standby UPSes that have microprocessors, some voltage regulation, better performance characteristics, and a greater ability to communicate with software on a server, usually through a serial connection. (We didn't test standby UPSes with lesser capabilities.)

A typical on-line UPS constantly converts AC to DC and then back to AC again, and a power outage (or just about any other power abnormality) has little or no effect on output. Most PC power supplies, especially server-quality units, can easily withstand voltage dropouts of 20 milliseconds, and sometimes longer, without consequence. The longest transfer time we measured from a line-interactive UPS was 15 ms. Some electronic equipment may not tolerate any transfer time, and touchy power supplies in some older PCs might reboot with transfer times as short as 5 ms, but these are not typical situations on most networks.

Quality of voltage regulation is perhaps a more important difference between the two classes. On-line UPSes produce a nearly constant, purely sinusoidal voltage between 115 VAC and 120 VAC regardless of input voltage. Line-interactive units pass utility power directly through to their output receptacles, although with noise filtering and surge suppression. As a result, output voltage rises as input voltage does. At a lower-threshold voltage, and usually at an upper-threshold voltage, the UPS switches to battery power.

To extend its operational voltage range and reduce variations in output voltage, a line-interactive design uses a transformer that boosts low voltages and often trims (or bucks) high voltages. One result is that a line-interactive UPS can power through extended periods of low utility voltage (i.e., brownouts).

The power supplies in most computers can operate over a wide range of AC voltages, generally 220 V to 250 V, but running long-term near either end of the range shortens operating life. If power in your area is consistently high or low, an on-line unit makes sense. Some line-interactive UPSes, while running on battery power, produce output that is nicely sinusoidal (it costs more to do), but many units create just a rough approximation (a stepped square wave) that is tough to digest for some equipment. Fortunately, your servers need use it only during a controlled shutdown.

An on-line UPS can offer power factor correction -- circuitry that reduces the "spiking" effects of the switching power supplies used in computers so that they draw less current

from the wall (and you can run more equipment). An on-line UPS also has a higher crest factor (i.e., the ability to take a short surge of current much higher than it's rated for, typically 3 to 1) than that of line-interactive units (often just 2 to 1); thus, they can better handle the surge that occurs when computers are first turned on.

The typical on-line UPS's disadvantages are equipment cost, lower power efficiency (its rectifier and inverter constantly run), and heat production, which requires a fan. A line-interactive UPS costs less because of its simpler design, so it's less expensive to manufacture. A line-interactive UPS runs more efficiently because power is usually just passing through. And a line-interactive unit generates little heat because no real circuitry is active.

For mission-critical applications, you will probably want the reassurance of cleaner, more regular power, which you get from an on-line UPS. For most ordinary networks, line-interactive units are adequate.

6.3 When you're running on your UPS

When telecom equipment stability is your prime concern, you'll want to ride through the power-outage waiting for the power to return. In this case preventive maintenance is key.
Before an outage occurs, you will want to know:

1. The current charge on the battery
2. The battery temperature

If your battery is too warm, it will lose its effectiveness and it may be a sign of another problem. Sometimes the batteries are installed backwards, or an overloaded UPS transformer may be heating up a battery pack nearby.

Load on the system, measured in KVA's is key in determining the necessary capacity. UPSs are rated by how much load they can support. If the devices supported by the UPS are drawing too much current, the UPS will be unstable. Some UPSs will support an adapter card with sensors that measure such external surrounding conditions as the current temperature and humidity and the presence of smoke and fire. They can even tell you whether the door to the room has been opened. Some UPSs offer a Graphical User Interface (like Windows, which uses graphics instead of characters and works with a mouse or trackball) displaying all of the above information on simulated, dials, meters, and LEDs.

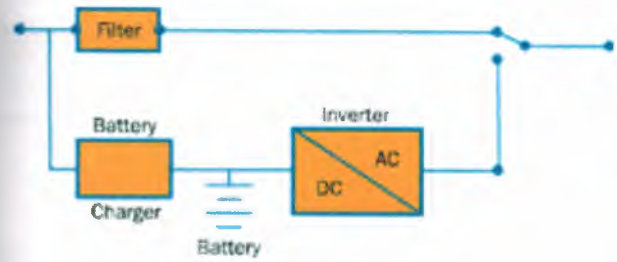
Most UPSs now allow you to interface with network managing software to monitor your UPS. Besides passive monitoring, you will be able to send commands to the UPS to run diagnostic tests and to turn on and off devices that are plugged into them. This would be useful during an outage. If you see your battery runtime meter drop, you may decide to run off some non-critical equipment to preserve power for the PBX. You can do this right from your remote console.

There is no question that with the potential loss or damage to costly equipment, the investment in an Uninterruptible Power Supply is a sound one.

6.4 UPS Types

There are three types of UPS systems, which are designed for different applications

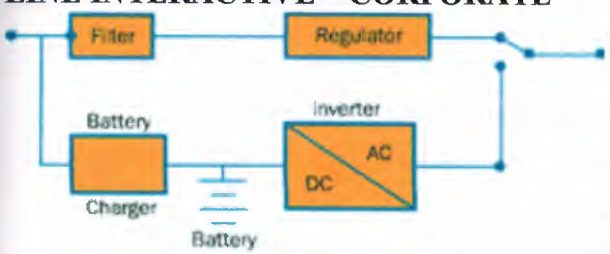
OFFLINE – HOME OFFICE



An offline UPS provides battery power to equipment when the mains power supply falls below a pre-determined limit (usually around 200 V AC). This battery will usually last ten minutes.

Offline UPS units are often referred to as standby systems, as the inverter is in standby mode until the mains power supply fails. They are inexpensive and recommended for home offices. Offline technology should be avoided for applications where there is frequent power disturbance.

LINE INTERACTIVE – CORPORATE

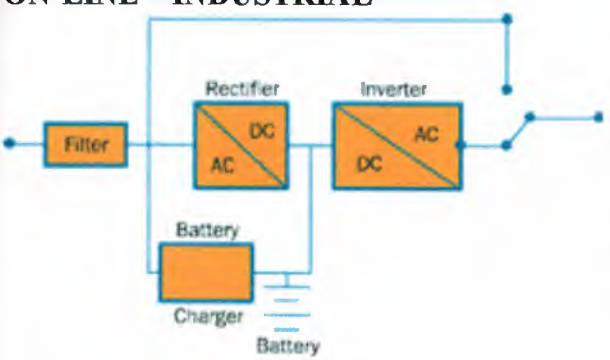


A line interactive UPS contains a regulator that boosts the mains power supply when it falls. It can regulate power to an acceptable level, without the use of a battery, during a brownout or surge in supply voltage.

Similar to an offline UPS, there is a short period (i.e. transfer time) when a line interactive UPS will switch to battery mode during a blackout.

Most line interactive UPS units have additional features including sinewave output, enhanced software and connectivity options. They provide a high level of protection, at an affordable price, for corporate applications.

ON-LINE – INDUSTRIAL



True on-line UPS units provide the highest level of protection. An on-line UPS absorbs the incoming AC supply, converts it to DC then inverts it to AC to supply critical power loads. An inverter supplies regulated AC power to loads at all times; either from rectified mains or a battery with an on-line UPS.

In the event of a blackout, there is no transfer time or break in power supply.

Most on-line UPS units contain an automatic bypass to ensure continuous power supply during a short-term

overload or UPS failure. They are ideal for critical loads, sensitive equipment such as medical or scientific technology and industrial loads. All on-line UPS units are fully generator compatible.

These UPS units are often referred to as double conversions because they can convert from AC–DC to DC–AC.

NPS can assist you in selecting the correct UPS for your application. For further information, including prices, contact the nearest NPS office listed on the back cover.

Some popular UPS types are given in Table 9.1.

The internal structures of the Line Interactive and the Online UPS systems are given in Figures 9.2 and 9.3 respectively.

Table 9.1 Popular UPS types

Some Popular Uninterruptible Power Supplies

Manufacturer	Product	KVA	Backup Time (full load in minutes)
APC*	Smart-UPS 1000	1000	10
APC*	Smart-UPS 1400	1400	12
APC	AP2000XL	2000	30+
APC	Smart UPS2200	2200	9
Best Power	Fortress LI1420U	1420	5
Deltec	Power Rite Pro II	1920	9
MGE	Pulsar EX20	2000	10
Para Minuteman	XRT 2000	2000	10
Toshiba	1400SE	2000	10
Tripp	Tripp PS 450 Online UPS	450	5
Tripp	Tripp PS 700 Online UPS	700	5
Tripp	Tripp 1250XLNET Smart	1250	10+
Tripp	Tripp 1050XL SmartPro	1050	16
TrippLite Smart	Tripp 2200 Net Smart 2200		13

*Main Resource's Local Installation Division recommends and installs these models. They produce a true sine wave output, are moderate in price ($600-$700) and are good for telecommunications applications.

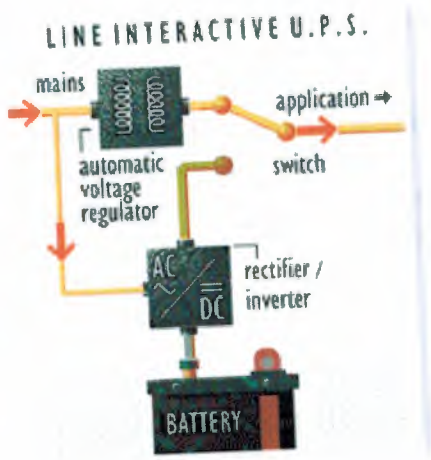


Fig. 9.2 Line Interactive UPS

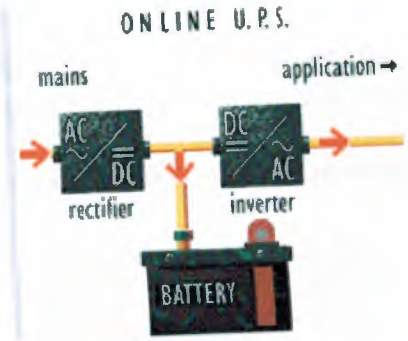


Fig 9.3 Online UPS

6.5 How to Choose an Uninterruptible Power Supply

An uninterruptible power supply (UPS) is the most effective way to protect your computer hardware and documents from power fluctuations. It also lets you continue to work during brief power failures.

Steps:

1. If you have a limited budget, choose a standby (also called "off-line") UPS that switches to battery power when power goes out.

2. Choose an "on-line" UPS if you need unlimited backup power.

3. Select a "line-interactive" UPS if your needs fall between the two other types.

4. Determine the total power needs (in watts and volt-amperes) of equipment you will connect to the UPS.

5. Choose a UPS that equals or exceeds the total power requirements of the equipment that you'll connect to it.

6. Compare the following five specifications for different models: maximum surge current (expressed in amps - more is better), surge suppression (expressed in joules - more is better), suppression response time (faster is better), battery recharge time (faster is better), and number of AC outlets (more is better).

7. Find out if the unit under consideration has a replaceable battery, and if the battery is user-replaceable.

8. Compare battery operating times (how long the UPS will keep equipment running after power failure).

9. Look for a unit with modem surge protection and electromagnetic interference (EMI) and radio-frequency interference (RFI) noise reduction if you need those features.

10. Check for alarms or LEDs that indicate wiring problems, whether the equipment is running on UPS battery, and whether the battery is low.

11. If you are buying a more expensive unit, get one with software that automatically saves documents, closes applications, and turns off equipment when power goes out.

12. Compare warranties and insurance guarantees.

CHAPTER 7. SOUND SOLUTIONS

7.1 GATEWAY SOLUTIONS

a. Analog Gateway distributor

These equipment can provide 24 simultaneous sound communications at the same time. The port numbers can be sellected depending upon the requirements.

b.Diğital Gateway distributor

These equipment can provide 30 simultaneous sound communications at the same time. The port numbers can be sellected depending upon the requirements.

The required number of VoIP gateways are installed between the telephone exchange and the internet connections and the devices are configured so that local and international calls can be performed. VoIP gateway converts your voice into IP packets and sends to anywhere you want.

Gateway Products	
 Cisco ATA 186	This device is suitable for small and medium size applications where two communications channels can be used at the same time. These devices can be connected to PBX exchanges or to direct analog phones.
 Quintum A400	This device is suitable for medium scale applications where four communications channels can be used at the same time. These devices can be connected to PBX exchanges or to direct analog phones.
 Quintum A800	This device is suitable for medium to large scale applications where eight communications channels can be used at the same time. These devices can be connected to PBX exchanges or to direct analog phones.
 Cisco 1751-V  Cisco 1760-V	This device is suitable for small to medium size applications where two communications channels can be used at the same time. They can be connected to PBX exchanges or to direct analog phones. Existing Cisco 1750 and 1760 series routers can carry voice if required

	by adding cards.
 Cisco AS 5350	This device is suitable to large scale applications where up to 60 communications channels can be used at the same time. It is connected to the digital ports (E1) of the PBX exchanges. There are two E1 ports on a PBX exchange.

7.2 DIALLING SOLUTIONS

a. Internal Automatic Code Diallers
These devices direct the dialled numbers to e-kolay lines by the configuration of the software inside the exchanges.

b. External Automatic Code Diallers
These devices are mounted between the local or the international lines of the business and the Telekom lines.

These devices can be modified to work with your exchange lines and they provide low cost telephone conversations. These diallers sense whether or not a call is international and they provide low cost international calls.

The properties of the dialler;

- Wide area internet connection is not required.
- Easy to install.
- No need to to learn new usage techniques.
- Can be used between existing PBX exchange and the lines coming from TT.
- No need to have a spare unused port on the PBX exchange.
- Has LCR characteristics.

7.3 IP TELEPHONE SOLUTIONS

a. IP Telephone Services

It enables the companies with conenctions over the Dogan Online backbone to configure their connections so that they can make low cost calls using the IP. In this solution, the users are encouraged to use the IP phones and are trained on how to use the equipment.

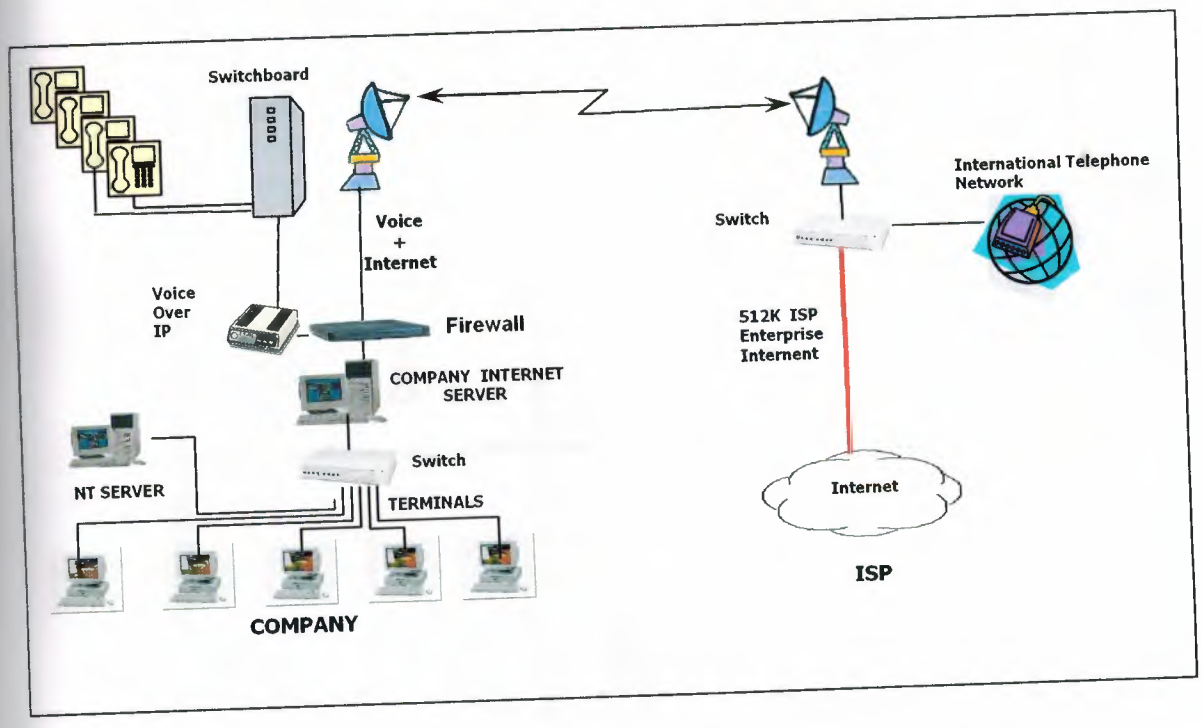
The firms which use this service can make calls between cities and also international calls over the Dogan Online backbone with a guarantee of high quality and low cost.

b. SoftPhone Services

The networks of the firms which have connections over the Dogan Online backbone are configured using the IP telephone configuration software (Softphone) so that they can carry out their calls using the IP platform at reduced costs.

The firms which use this service of ours can make calls between cities and also international calls with a cost advantage and a guarantee of high quality.

CHAPTER 8. COMPANY INETRNET TOPLOGY



As seen in the topology of the company Internet connection is carried on Wi-LAN dish antenna and ISP POP point dish antenna offering 512K organizational Internet service.

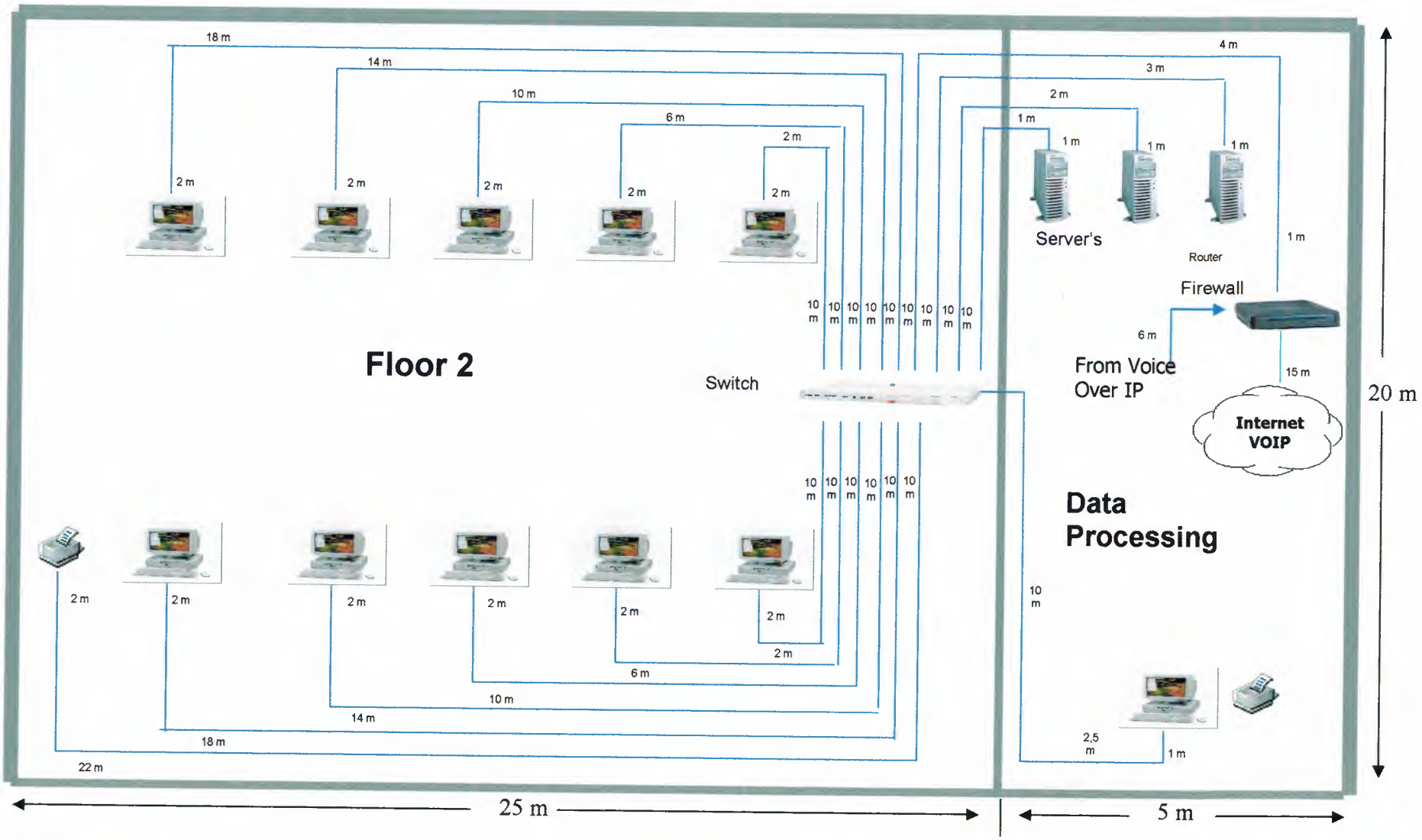
Required Components

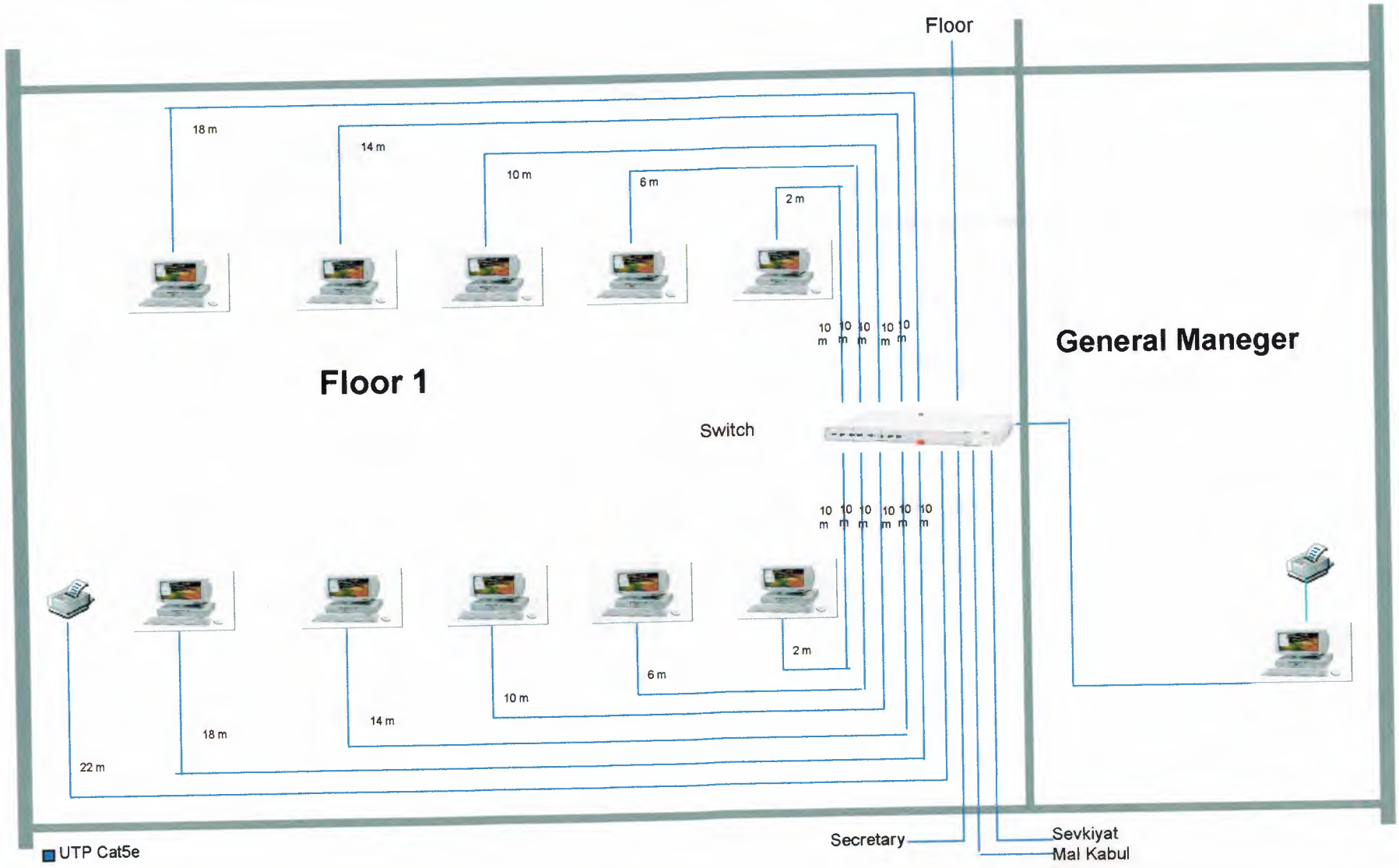
1 Wi-Lan Antenna

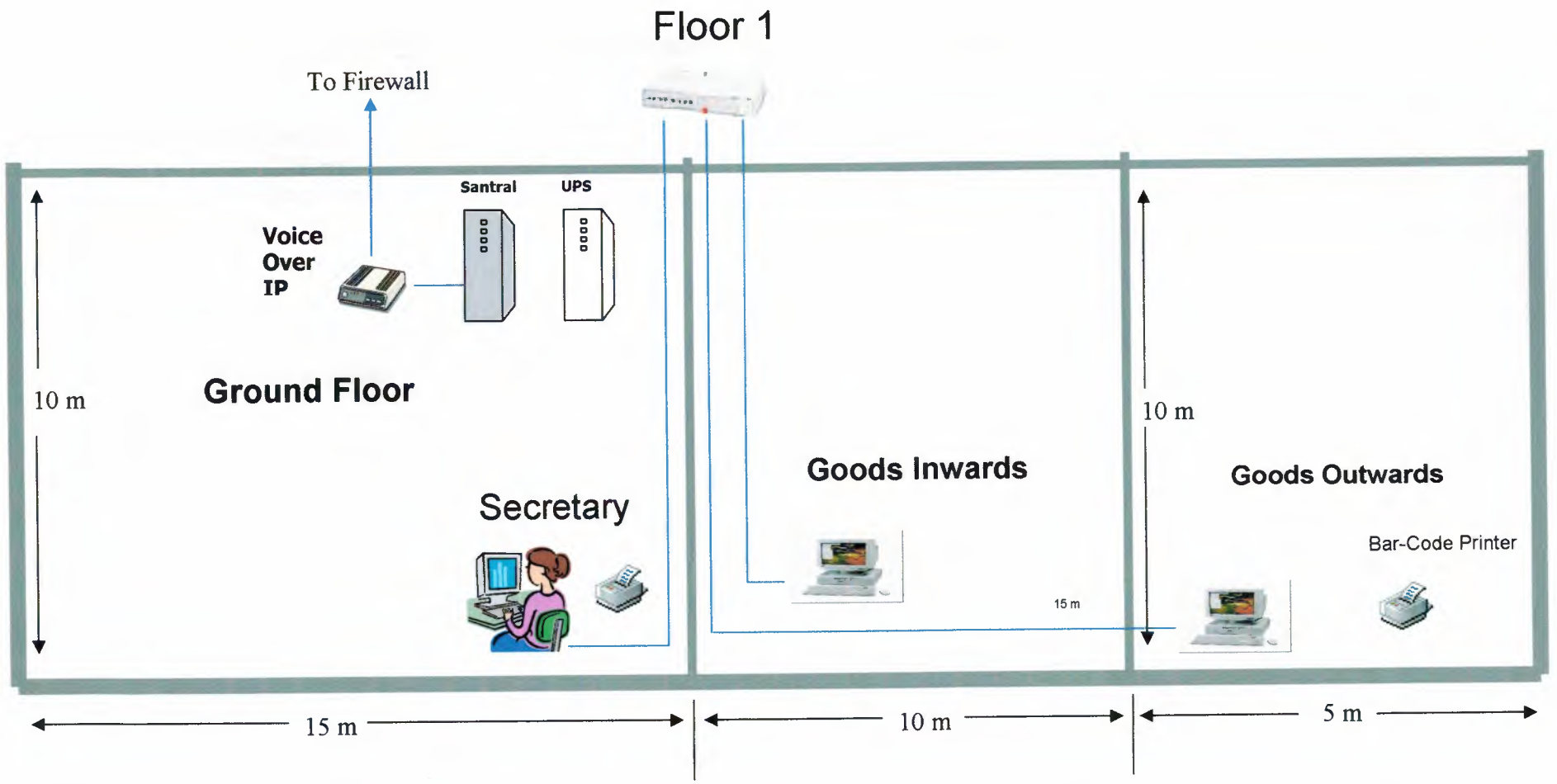
1 Server

CHAPTER 9. COMPANY CABLE TOPOLOGY

VLAN Anten


Floor 2
Switch
Server's
Router
Firewall
From Voice Over IP
Internet VOIP
Data Processing
25 m
5 m
20 m
UTP Cat5e


Floor
18 m
14 m
10 m
6 m
2 m
10 m
10 m
10 m
10 m
10 m
General Maneger
Floor 1
Switch
10 m
10 m
10 m
10 m
10 m
10 m
2 m
6 m
10 m
14 m
18 m
22 m
UTP Cat5e
Secretary
Sevkiyat
Mal Kabul


Floor 1
To Firewall
Santral
UPS
Voice
Over
IP
Ground Floor
10 m
Secretary
Goods Inwards
15 m
10 m
Goods Outwards
Bar-Code Printer
15 m
10 m
5 m

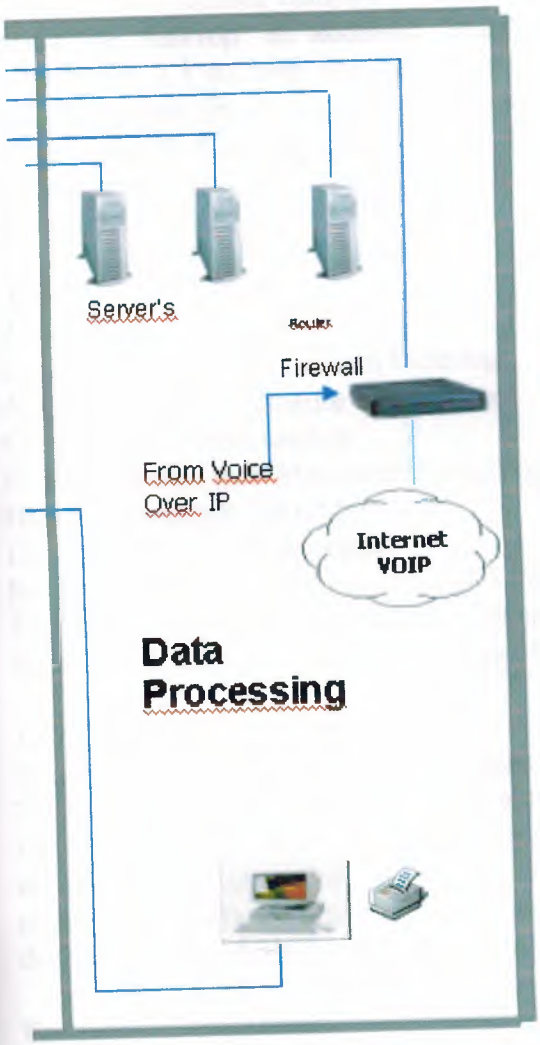
As seen in the topologies, UTP Cat5e is preferred on star topology when installing a LAN. Total 647,5 meters of cat5e UTP is used;

Ground Flor = 34 m.
Floor 1 = 272 m.
Floor 2 = 341,5 m.

Required Components

647,5 meters UTP Cat5e cable.

CHAPTER 10. COMPANY NETWORK SECURITY TOPOLOGY



As seen in the topology above Cisco Pix 506E Firewall is preferred because of its features mentioned below.

The Cisco PIX 506E is a robust, purpose-built security appliance that delivers enterprise-class security for remote and branch office environments.
The compact desktop chassis of the Cisco PIX 506E provides two autosensing Fast Ethernet (10/100) interfaces. Ideal for securing high-speed Internet connections, the Cisco PIX 506E delivers up to 100 Mbps of firewall throughput, 16 Mbps of Triple Data Encryption Standard (3DES) VPN throughput, and 30 Mbps of Advanced Encryption Standard-128 (AES) VPN throughput in a cost-effective, high-performance solution.

Trend Scanmail For Microsoft Exchange and Trend Office Scan are picked for antivirus solutions. Below are the features of the products:

10.1 ScanMail for Microsoft Exchange

Trend Micro™ ScanMail™ Suite for Microsoft™ Exchange™ provides comprehensive antivirus and content security to help ensure the uninterrupted flow of inbound and outbound messaging traffic. The solution is designed to filter malicious threats and inappropriate content from both inbound and outbound email in real time before they reach the desktop. In addition, ScanMail Suite includes Trend Micro™ Control Manager™ 2.5 to help contain virus outbreaks with the deployment of prevention policies during the critical pre-pattern stage of an outbreak. ScanMail Suite also uses Trend Micro Control Manager to provide centralised configuration, reporting, management, and deployment of scan engine and virus pattern files across an enterprise.

Key Features

Active Message Filter
Anti-spam and Email Content Filtering
Automatic Virus Signature File Updates
Customisable Notifications
Full Integration with Microsoft Technology
High-performance Scanning
Outbreak Prevention Services
Real-time Detection and Removal of Viruses
Scalable Configuration and Remote Management
ScanMail Suite for Microsoft Exchange 2000 & 2003

10.2 Trend Office Scan

Trend Micro™ OfficeScan™ Corporate Edition is a client/server (server part available 2005) security solution that integrates the core capabilities of multiple security technologies. Its Web-based management console gives administrators transparent access to desktop and mobile clients to coordinate automatic deployment of security policies and software updates. OfficeScan helps enforce security policies and mitigates the daily threat of file-based and network viruses, intruders, spyware, and other threats.

Required Components

1. Cisco Pix 506E Firewall
2. Trend Office Scan
3. Scanmail For Microsoft Exchange

CHAPTER 11. COMPANY BACKUP TOPOLOGY

Attaching the back-up unit to the busy file server is purposive. HP StorageWorks DLT VS80 Tape Drive was picked owing to its features below.

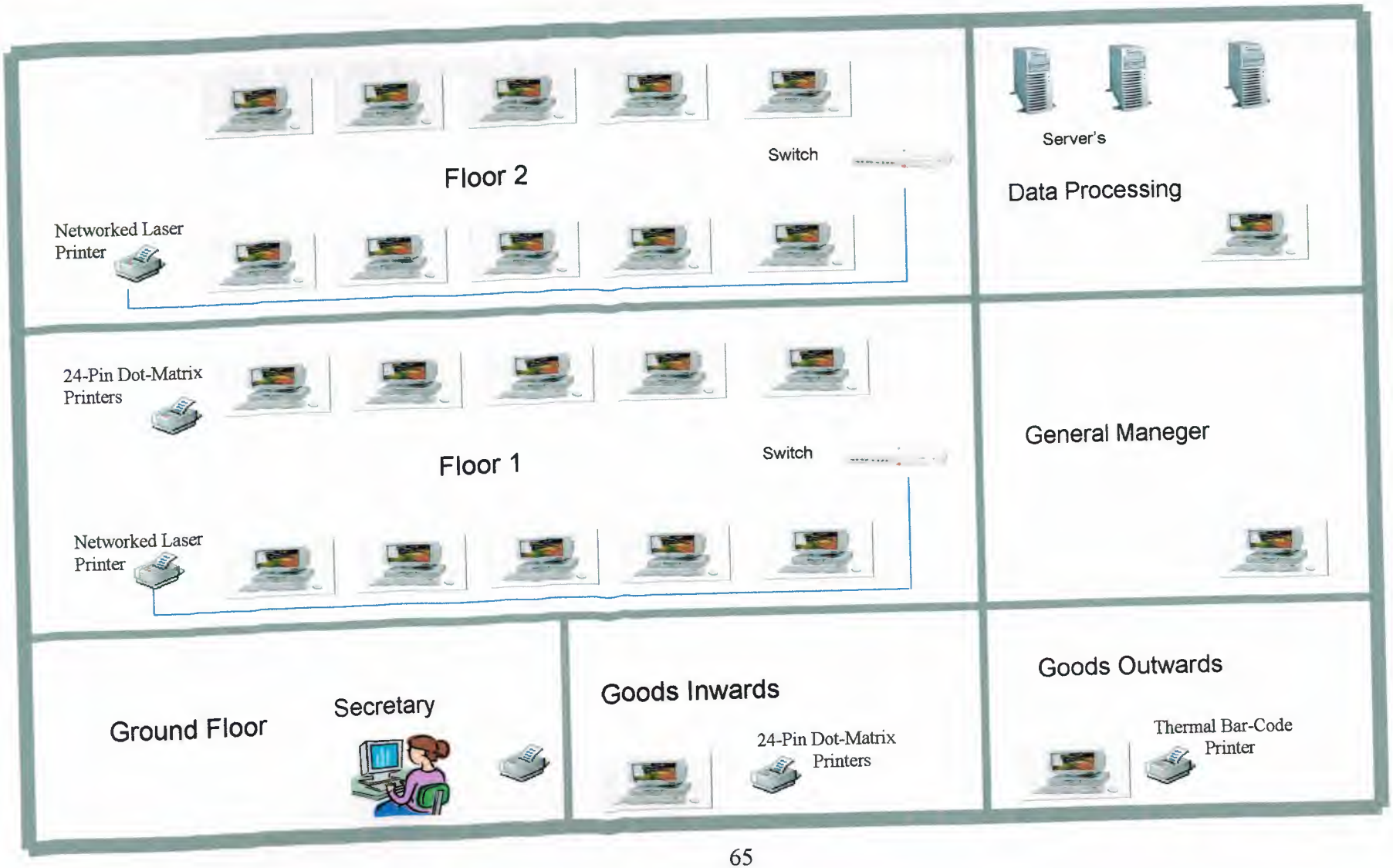
Features & benefits

- Affordable: This drive has a price that allows midrange customers to benefit from DLT technology, the industry standard that offers reliability and scalability.
- Half Height Technology: For customers who are losing space inside the server, the DLT VS technology is half height compared to the full height DLT technology. This leaves more room for other options.
- Scalability: The HP StorageWorks DLT VS80 Tape Drive has backward read compatibility (BRC) with the DLT 4000 and the DLT 1 media. The DLT VS80 media can be read by the HP StorageWorks SDLT 220 and SDLT 320 Tape Drives.
- Reliability: The mean time before failure is up to 200,000 hours
- Manageable: The VS80 Tape Drive is easier to manage and upgrade with HP StorageWorks Library and Tape Tools.
- Rackmountable: The DLT VS80 Tape Drive can be mounted inside of a rack in a 3U or 5U module. The 3U module can hold up to 2 DLT VS drives and the 5U module can hold up to 4 drives.

Required Components

1 Unit HP StorageWorks DLT VS80 Tape Drive

CHAPTER 12. COMPANY PRINTER TOPOLOGY



As shown in the topology above, there will be a networked laser printer at each storey of the building. In addition there will be two 24 pin dot-matrix printers in the Accounting Department. The reason for choosing networked laser printers is because they are fast and very good quality.

A thermal bar-code printer should also be installed in the Packaging department so that bar-code tickets can be obtained to stick on the products.

Required Components

As a summary, the following printers will be required in the company:

2 off networked Laser printers
2 off 24-pin dot-matrix printers
1 off thermal bar-code printer

CHAPTER 13. COMPANY UPS TOPOLOGY

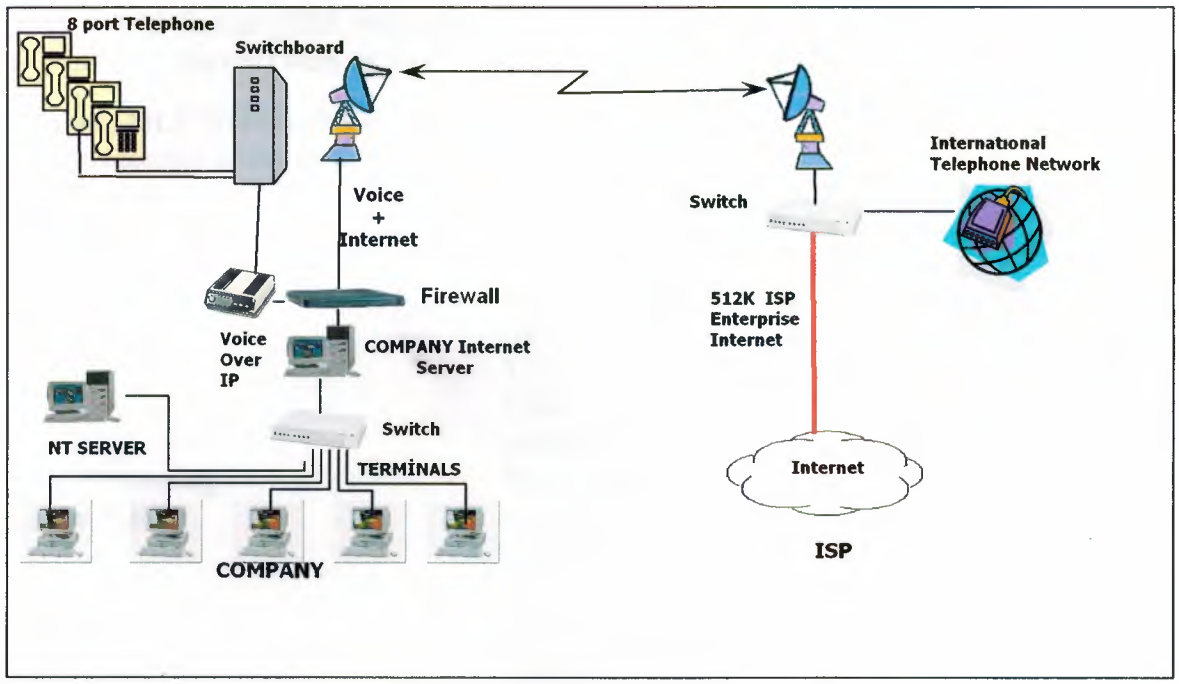
APC Symmetra LX 4kVA is preferred due to its features and need for power supply.

General Features:
Audible Alarms
Automatic internal bypass
Automatic restart of loads after UPS shutdown
Automatic self-test
Battery modules connected in parallel
Cold-start capable
Configurable for N+1 internal redundancy
Disconnected battery notification
Field-replaceable power distribution panel
Frequency and voltage regulation
Generator Compatible
Hot-swappable batteries
Hot-swappable intelligence modules
Hot-swappable power modules
InfraStruXure Manager Compatible
Input Power Factor Correction
Intelligent Battery Management
LCD display
Manageable external batteries
Modular design
Network manageable
Plug-and-Play external batteries
Power conditioning
Power Modules connected in parallel
Predictive failure notification
Programmable Frequency
Rack/Tower Convertible
Redundant Intelligence Modules
Removable input/output wiring tray
Resettable circuit breakers
Safety-agency approved
Scalable Power Capacity
Scalable runtime
Shippable with modules installed
SmartSlot
User-replaceable batteries
User-replaceable intelligence modules
User-replaceable power modules

Required Components

1 APC Symmetra LX 4kVA

CHAPTER 14. COMPANY VOICE TOPOLOGY



In this topology is suggested as 512 Kbit synchronized organizational Internet access over an ISP. Through the 8 external ports on the current switchboard, Voice Over IP Digital Gateway and ISP VOIP backbone internataional and intercity calls will be made. A reduction of 80% in international calls and 20% percent in intercity calls is suggested with this system. Over 1 Quintum A800 attached to the switchboard 8 people will be able to make calls simultaneously and voice converted into IP will reach ISP backbone over VLAN wireless. Taking 24K bandwith for a call, thus 24*8=192K bandwith is adequate. Wi-Lan device already offers 10 Mbit bandwith.

Required Components

1 Unit Wi- Lan Wireless Device (Dish antenna)
1 Unit 8 port Quintum A800 VOIP Device

CHAPTER 15. COMPANY SERVER TOPOLOGY

1- Win 2003 Server (Domain and Mail Server)
2- Win 2003 Server (ERP, Muhasebe, File Server)
3- Win 2003 Server (Web ve FTP Server)

Compaq ML370 G3 as the server. For each server 80 GB SCSI HDD is picked.. Below are the features of the server.

Features

Form Factor	5U (rack and tower models available)
Processor	Intel Xeon™ DP 2.8GHz, 2.8GHz/1MB, 3.06GHz, 3.06GHz/1MB, 3.2GHz/1MB, and 3.2GHz/2MB HiPerf: (2) 3.06GHz Intel Xeon processors standard
Dual Processing	Yes, optional
Cache (KB)	512K L2 on all speeds, 1GB L3 on 2.8GHz, 3.06GHz and 3.2GHz only, 2MB L3 on 3.2 GHZ only.
Chipset	ServerWorks GC-LE
Standard Memory (MB)	1GB on 3.06GHz/3.2GHz, 2.8/1M is 1GB
Maximum Memory (MB)	12GB
Dual Interleaved Memory	Yes
Bays (Total/Removable/Disk)	10/4/6 (Supports 2 additional HP hard drives with optional 2 bay drive cage installed into removable media area)
Available I/O Slots (Total/Breakout)	(6) 64-bit/ 100MHz PCI-X
SCSI	Integrated Dual Channel Wide Ultra160 HiPerf: Smart Array 6402/128 standard
NIC	Embedded 10/100/1000 WOL (NC7781)
Video (Std./Max.)	8MB/8MB
Redundant Power Supply	500W HP standard / Optional HP redundant 1+1
Online Spare Memory Capable	Yes
Fans	Hot Plug (optional 3+3 redundancy) HiPerf: redundant fans standard
Redundant ROM	Yes
Remote ROM Flash	Yes
Automatic Server Recovery	Std, ASR
Online Server Management	Integrated Lights-Out with optional upgrade
Server Management	HP Systems Insight Manager
Pre-Failure Warranty	Std
3-Year Warranty	3/3/3 NBD
Intelligent Installation	Smart Start, RBSU

Required Components
3 Unit Compaq ML370 G3

CONCLUSION

In this project I built the network of a company. I got informed about various network solutions while forming this network.
The network I deployed is solution for many companies and is used by many companies.
By this project I learned more about network solutions.

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