Computer Hardware & Networking& Server Configurations (H7E3 04)

UNIT 04:
Structure Cabling, Termination and Testing

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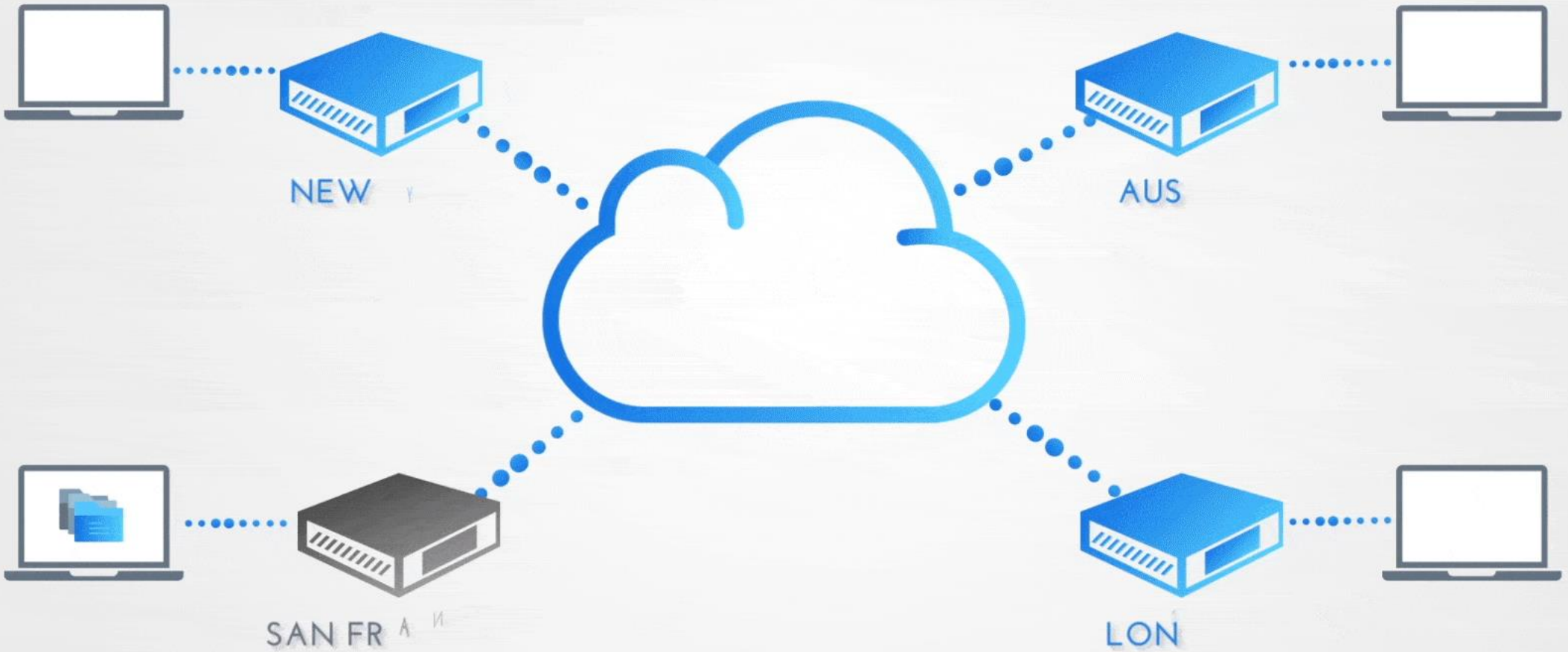
Networking MEDIA

Guided Media :

- Coaxial Cable
- Unshielded Twisted Pair (UTP)
- Shielded Twisted Pair (STP)
- Optical Fiber

Unguided Media :

- IR
- Bluetooth
- Wi-Fi
- Wi Max
- Radio Transmission
- Microwave
- Satellite Communication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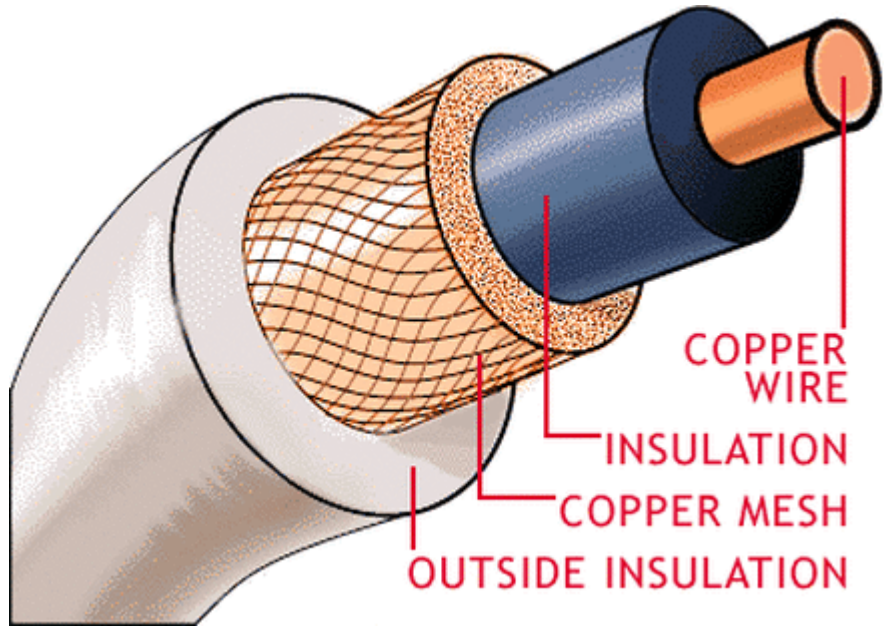
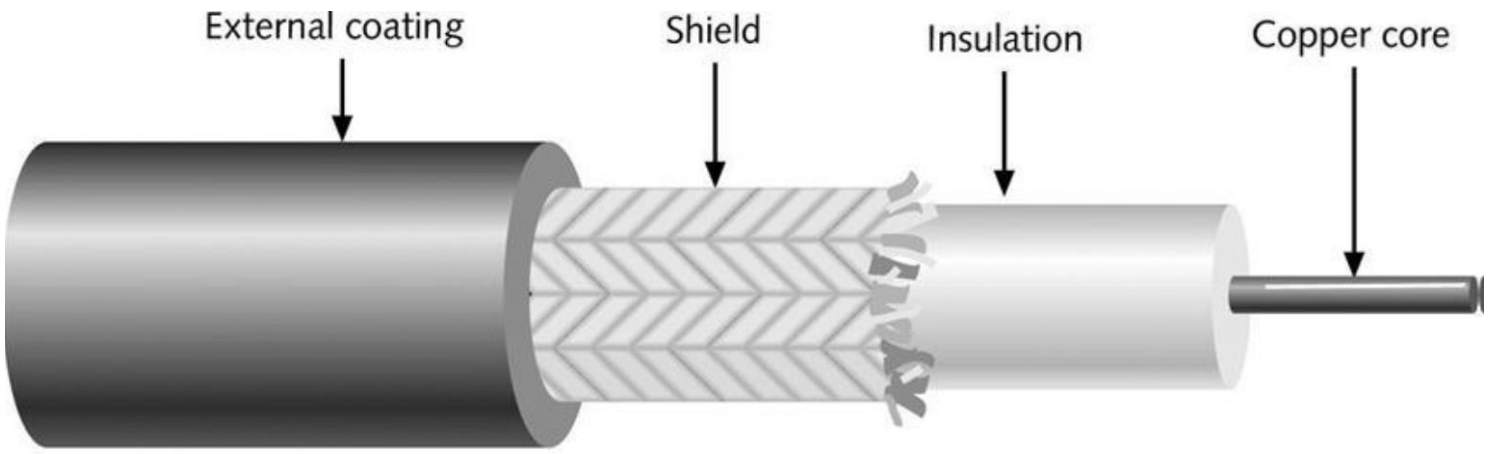
Coaxial cabling (Thick-net and Thin-net)

- Coaxial cable is a two-conductor cable in which one conductor forms an electromagnetic shield around the other. The two conductors are separated by insulation



It is a constant impedance transmission cable. This media is used in base band and broadband transmission. Coaxial cables do not produce external electric and magnetic fields and are not affected by them. This makes them ideally suited, although more expensive, for transmitting signals.



Coaxial cable

Advantages and Disadvantages of coaxial cabling

Advantages of coaxial cabling

- ✓ Cable lengths are longer than UTP/STP
- ✓ Less susceptible to interference than UTP
- ✓ Hubs are not required, direct connection

Disadvantages of coaxial cabling

- X Thick-net is very difficult to install
- X More expensive than UTP
- X Difficult to troubleshoot

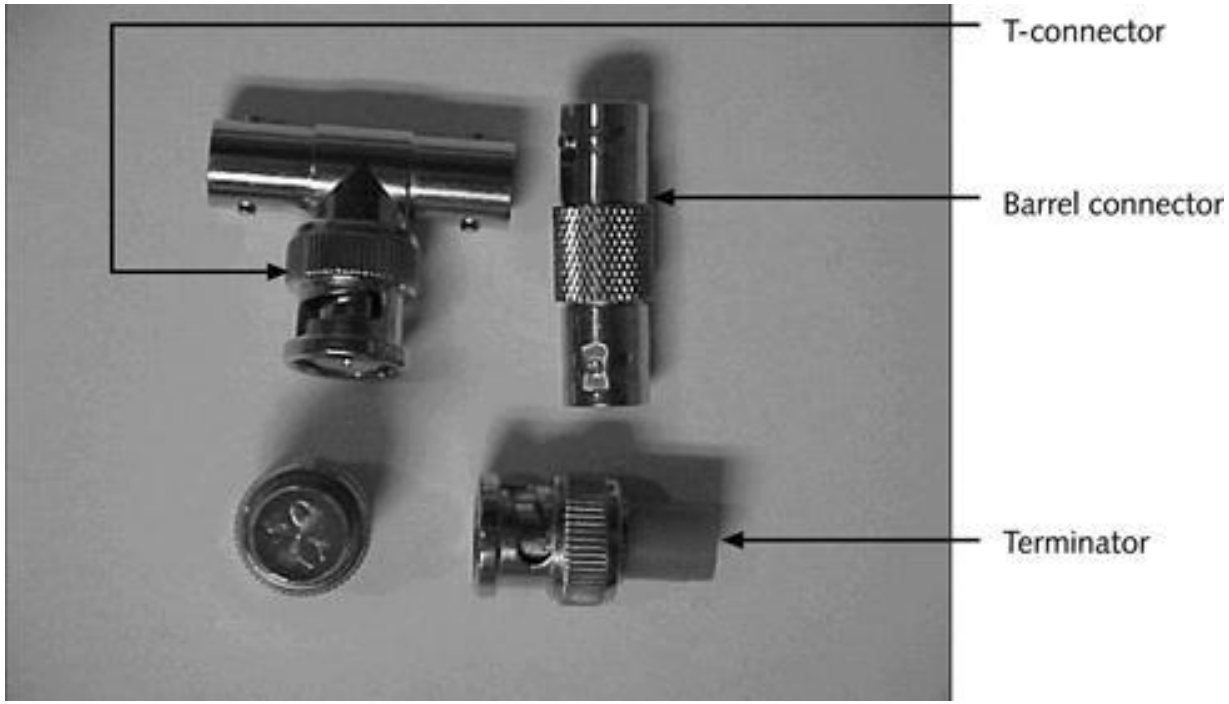
Coaxial Cable Types

Cable Type	Description
RG-8	50 - ohm Thicknet (10 Base 5) Cabling
RG-58	50 - ohm Thicknet (10 Base 2) Cabling RG-58/U - Solid Copper Core RG-58 A/U - Wire Strand Center Conductor RG-58 C/U - Military Specification for Thicknet
RG-59	75 - ohm broadband cable (Cable TV)
RG-62	93 - ohm ARCNet

Thin-net and Thick-net Connectors

- RG-58 cabling
- BNC
- Attachment unit interface (AUI)
- Barrel connectors
- T-connectors
- Terminators

RG-58 cabling

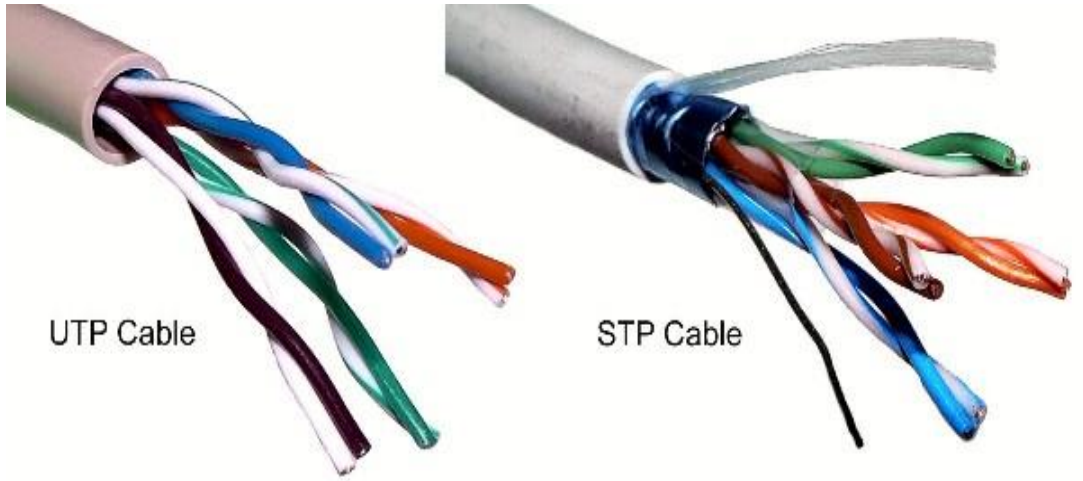


Twisted pair cabling

In its simplest form, twisted-pair cable consists of two copper strands woven into a braid and covered with insulation.

Two types of twisted pair cable are generally recognized:

- Shielded Twisted Pair (**STP**)
- Unshielded Twisted-Pair (**UTP**)



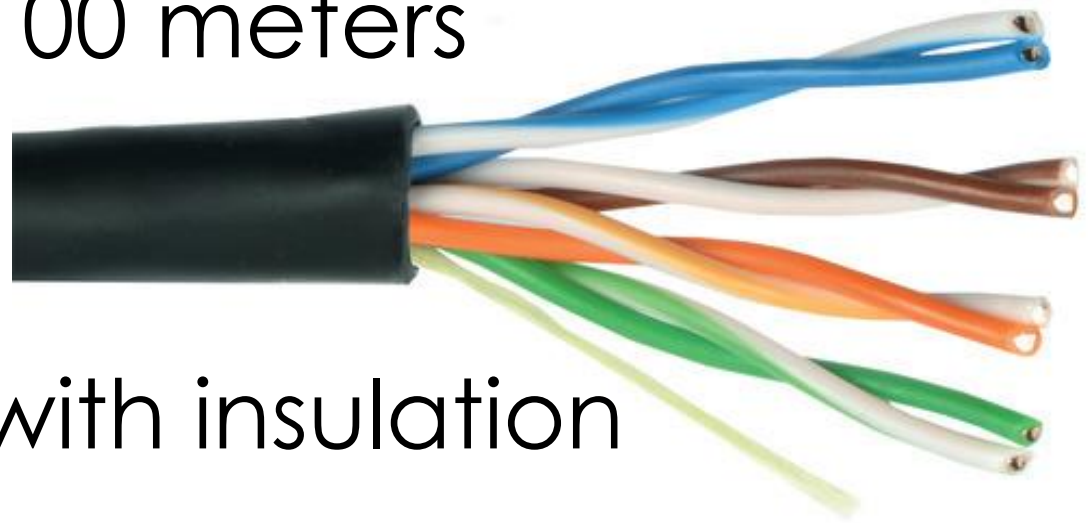
A cable is often made of several twisted pairs grouped together inside a protective jacket. The twisting eliminates noise (electrical interference) due to adjacent pairs or other sources (motors, relays, transformers).

Twisted pair is therefore suitable for a local network with few nodes, a limited budget and simple connectivity. However, over long distances at high data rates it does not guarantee data integrity (i.e. loss-less data transmission).

Unshielded Twisted Pair (UTP)

UTP cable complies with the 10BaseT specification. This is the most commonly used twisted pair type and the most widely used on local networks. Here are some of its characteristics:

- Maximum segment length: 100 meters



- Composition:

    2 copper wires covered with insulation

UTP Standards: determine the number of twists per foot (33 cm) of cable depending on the intended use

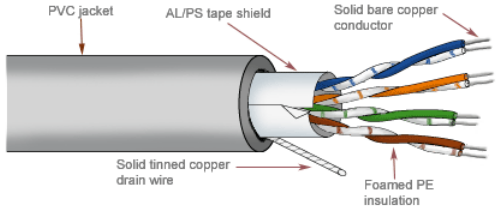
UTP: collected in the EIA/TIA (Electronic Industries Association / Telecommunication Industries Association) Commercial Building Wiring Standard 568. The EIA/TIA 568 standard used UTP to create standards applicable to all sorts of spaces and cabling situations, thereby guaranteeing the public homogeneous products. These standards include Seven categories of UTP cables:

Ethernet Type	Bandwidth	Cable Type	Maximum Distance
10Base-T	10Mbps	Cat 3/Cat 5 UTP	100m
100Base-TX	100Mbps	Cat 5 UTP	100m
100Base-TX	200Mbps	Cat 5 UTP	100m
100Base-FX	100Mbps	Multi-mode fiber	400m
100Base-FX	200Mbps	Multi-mode fiber	2Km
1000Base-T	1Gbps	Cat 5e UTP	100m
1000Base-TX	1Gbps	Cat 6 UTP	100m
1000Base-SX	1Gbps	Multi-mode fiber	550m
1000Base-LX	1Gbps	Single-mode fiber	2Km
10GBase-T	10Gbps	Cat 6a/Cat 7 UTP	100m
10GBase-LX	10Gbps	Multi-mode fiber	100m
10GBase-LX	10Gbp	Single-mode fiber	10Km

Most telephone installations use UTP cable. Many buildings are pre-wired for this type of installation (often in sufficient number to satisfy future requirements). If the pre-installed twisted pair is of good quality, it can be used to transfer data in a computer network. Attention must be paid, however, to the number of twists and other electrical characteristics required for quality data transmission.

UTP's major problem is that it is particularly susceptible to interference (signals from one line mixing with those of another line). The only solution to this is shielding

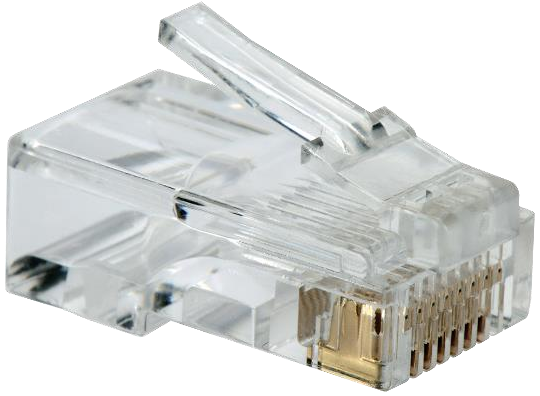
Shielded Twisted Pair (STP)



- **STP** (*Shielded Twisted Pair*) cable uses a copper jacket that is of better quality and more protective that the jacket used for UTP cable. It contains a protective envelope between the pairs and around the pairs. In an STP cable, the copper wires of one pair are themselves twisted, which provides STP cable with excellent shielding, (in other words, better protection against interference).
- It also allows faster transmission over a longer distance.

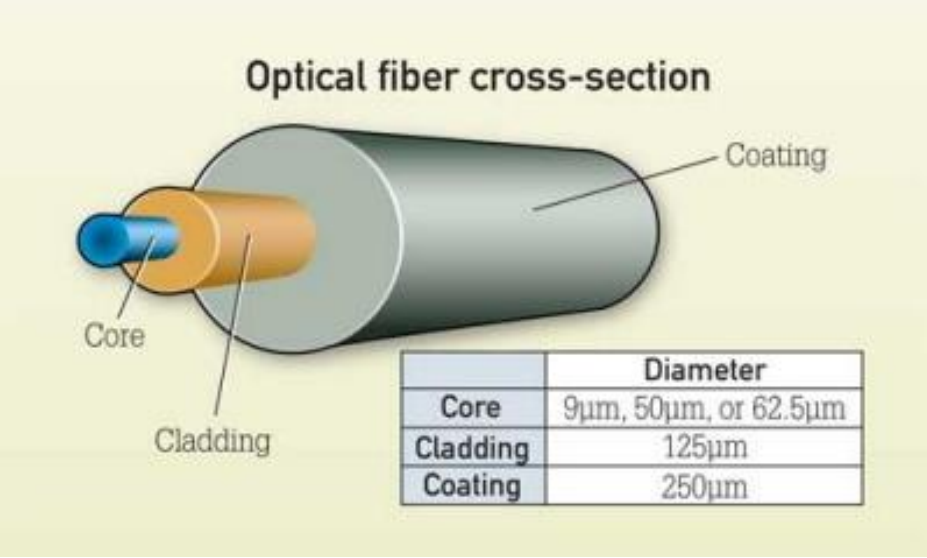
Twisted pair connectors

Twisted pair cable is connected using an RJ-45 connector. This connector is similar to the RJ-11 used in telephony, but differs on a few points: RJ-45 is slightly larger and cannot be inserted into an RJ-11 jack. In addition, the RJ-45 has eight pins while the RJ-11 has no more than six, usually only four.

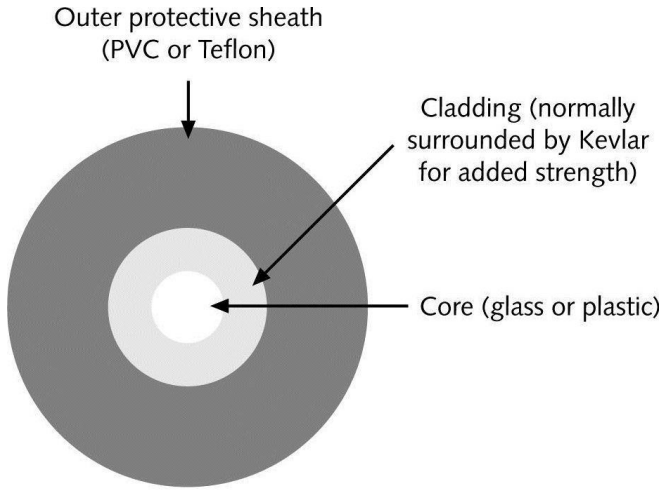


Fiber optics

- Optical fiber consists of thin glass fibers that can carry information at frequencies in the visible light spectrum and beyond. The typical optical fiber consists of a very narrow strand of glass called the core. Around the core is a concentric layer of glass called the cladding.

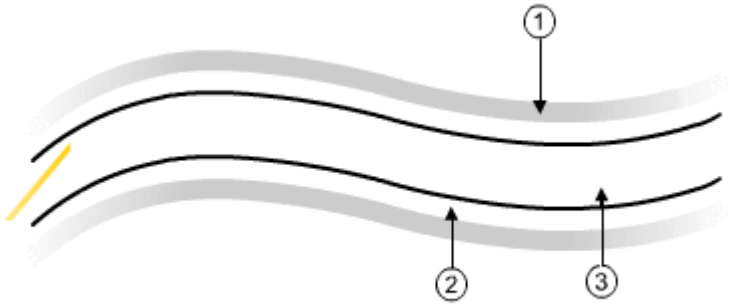


	Diameter
Core	9μm, 50μm, or 62.5μm
Cladding	125μm
Coating	250μm



Fiber-optic cable

- A typical core diameter is 62.5 microns .Typically cladding has a diameter of 125 microns. Coating the cladding is a protective coating consisting of plastic, it is called the Jacket. An important characteristic of fiber optics is refraction.



- Refraction is the characteristic of a material to either pass or reflect light. When light passes through a medium, it “bends” as it passes from one medium to the other. An example of this is when we look into a pond of water If the angle of incidence is small, the light rays are reflected and do not pass into the water.

If the angle of incident is great, light passes through the media but is bent or refracted. Optical fibers work on the principle that the core refracts the light and the cladding reflects the light. The core refracts the light and guides the light along its path.

The cladding reflects any light back into the core and stops light from escaping through it - it bounds the medium!

Advantages and Disadvantages of fiber-optic cabling

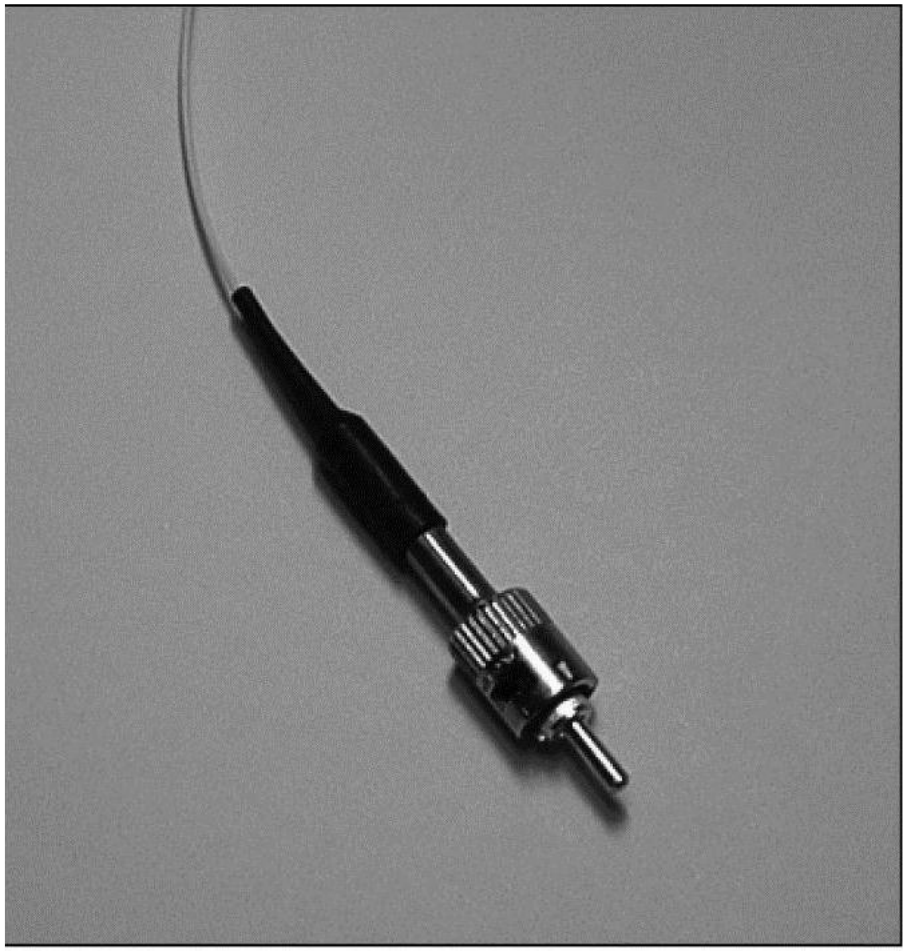
Advantages of Fiber-optic Cabling

- Transmit data over long distances
- Not susceptible to EMI
- High transmission rates
- Not susceptible to eavesdropping
- Small cable size

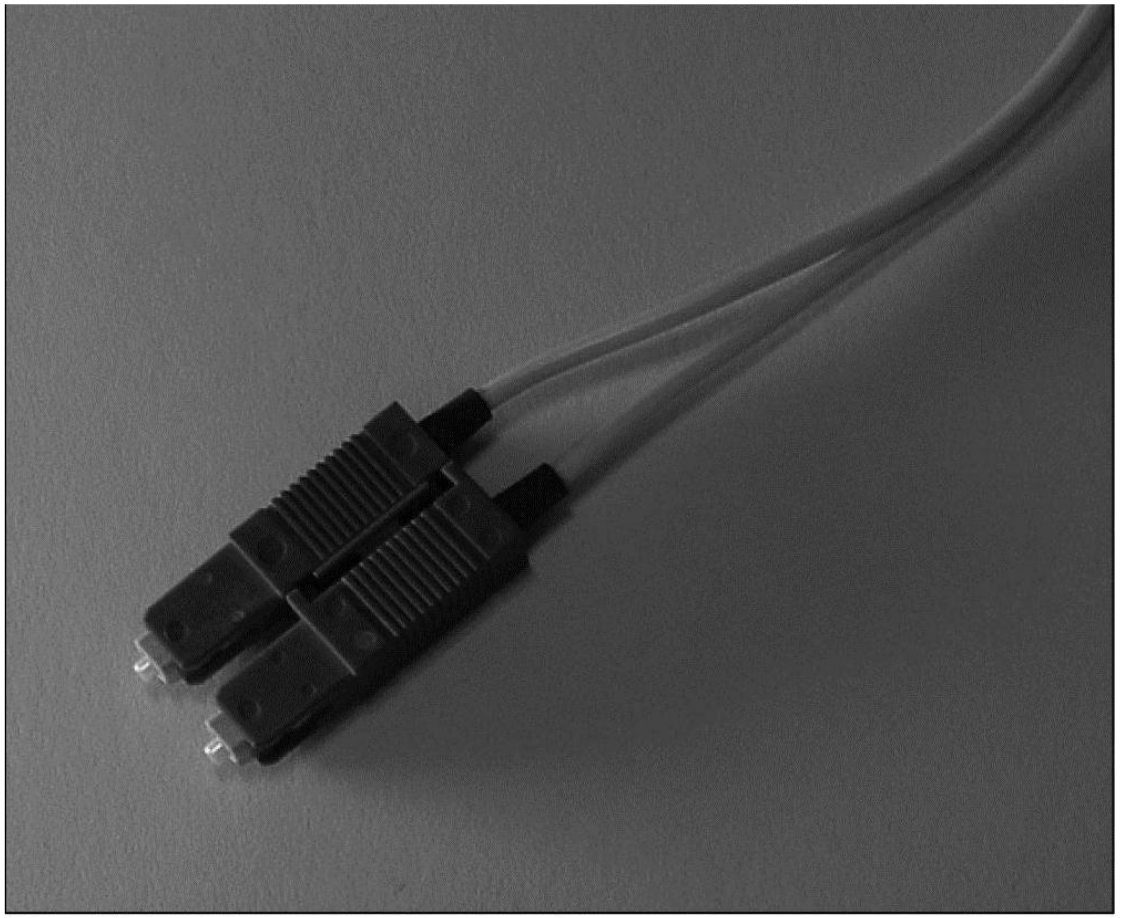
Disadvantages of fiber-optic cabling

- Expensive
- Cable can be easily damaged during install making installations more difficult
- Manual termination of ends is time consuming

Fiber Optic Connectors



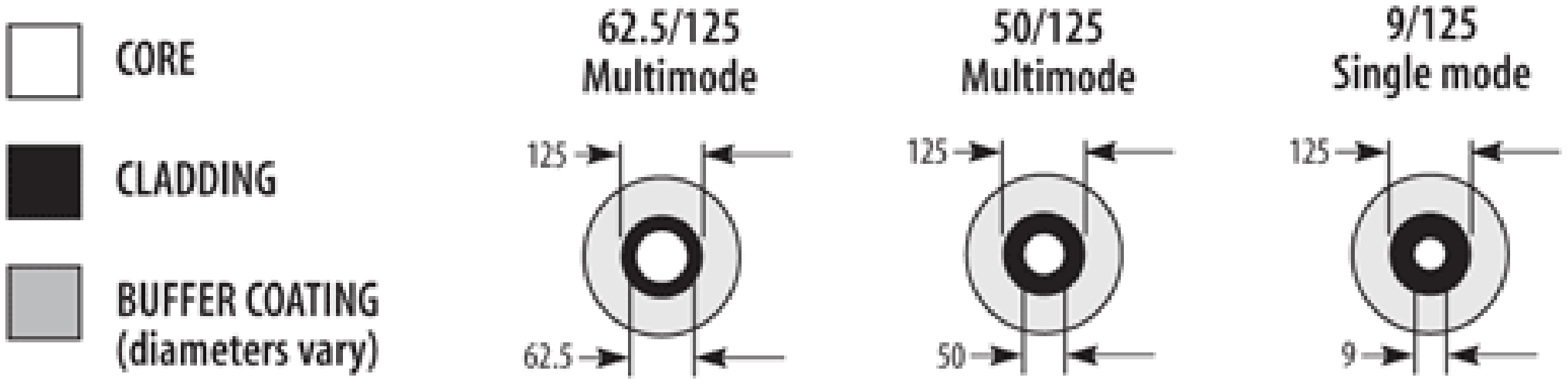
ST connector



SC connector

Fiber Core Sizes

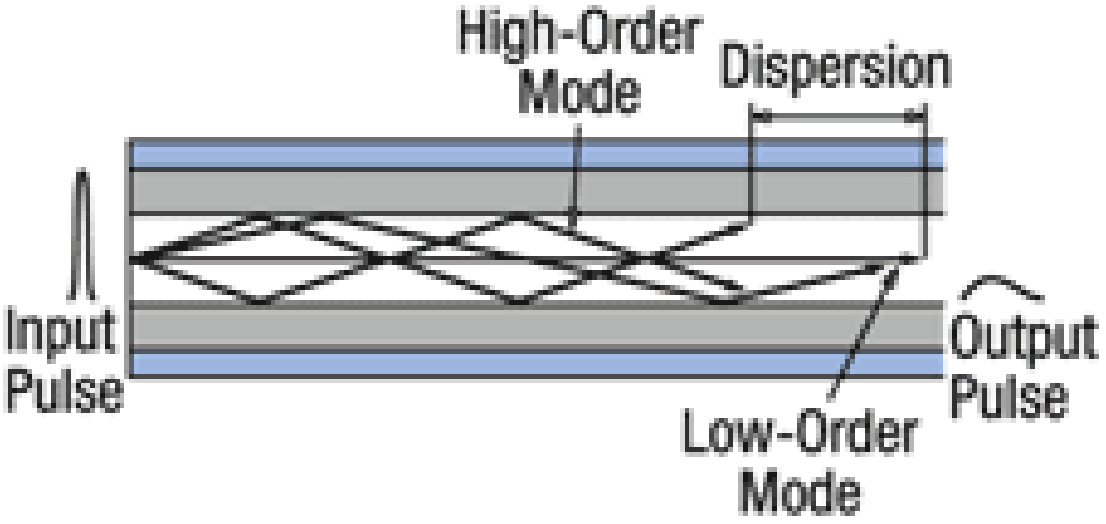
- Fiber specifications list the core and cladding diameters as a ratio. Multimode fiber is commonly 62.5/125 or 50/125 micron, single mode fiber is commonly 9/125 micron.



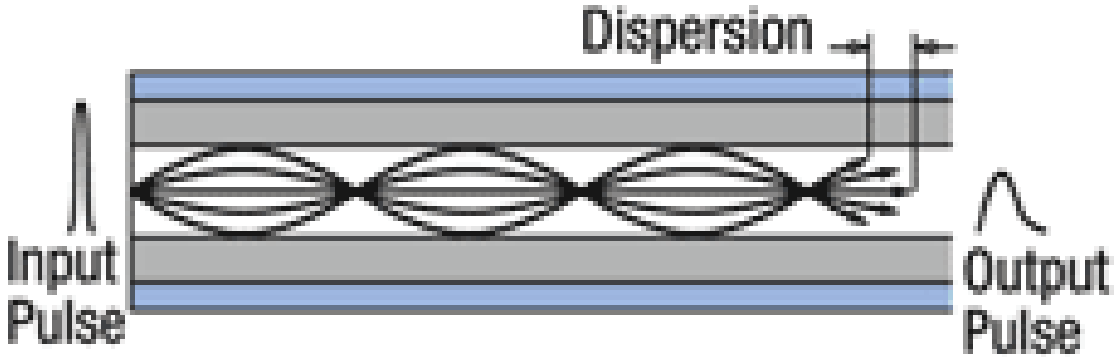
❖1 mm = 1,000um (Micron)

Fiber Glass Types

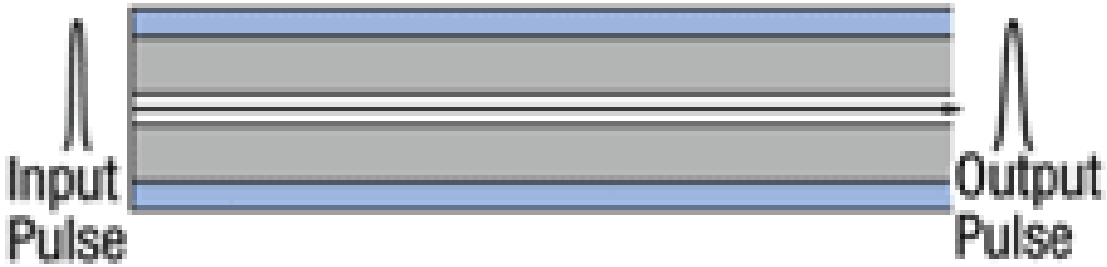
MULTIMODE, STEP-INDEX



MULTIMODE, GRADED-INDEX



SINGLE MODE, STEP-INDEX



Brief Over View Of Fiber Optic Cable Advantages Over Copper:

- **Speed:** Fiber optic networks operate at high speeds - up into the gigabits

- **Bandwidth:** large carrying capacity

- **Distance:** Signals can be transmitted further without needing to be "refreshed" or strengthened.

- **Resistance:** Greater resistance to electromagnetic noise such as radios, motors or other nearby cables.

- **Maintenance:** Fiber optic cables costs much less to maintain.

Network Management and Monitoring

Network Management

Network management is a very vast and vital process for an organization's hierarchy to perform well and easy. The network management is handled by a specialized personality in every organization, which is the network analyst. He uses a lot of tools to monitor the working of a network, and catch the rise and falls, and he has got to get everything going smoothly, because a single minute of downtime can create a chaos in the workflow of the whole organization.

Network Monitoring

- One of the most important tool to implement this smooth workflow is to use various network monitoring tools. While the IDS detects the threats and problems from outside the network, a Network monitor monitors the problems caused internally due to the overload on a server, or due to minor crashes in one of the network components or staff.

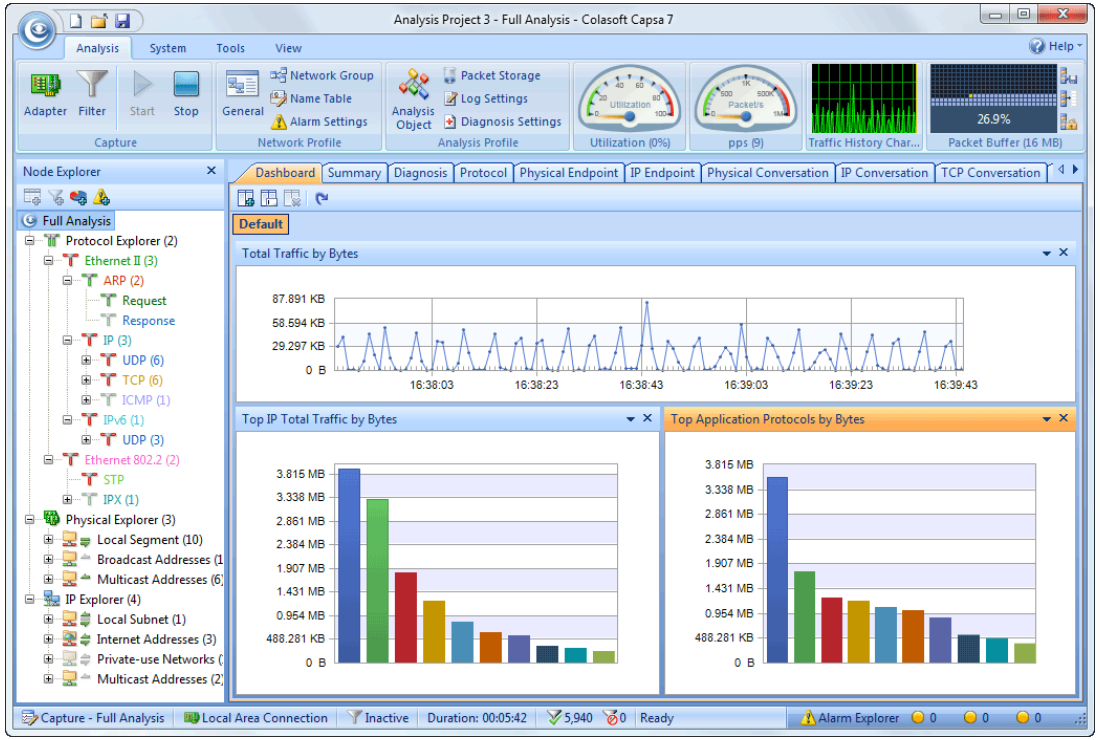
The network monitor tracks the flow of packets, and where ever it finds the packets to be showing some weird activity, it detects the error at that particular point.

For an example, to detect the working of a web server, the network monitor will keep on sending a small 32 byte ping request periodically, and track whether it receives It and gets back in time.

Network Management and Monitoring Tools

- Tools are Divided to Hardware and Software

- Software Tools Divided to Firewalls, Free Tools and Commercial Tools



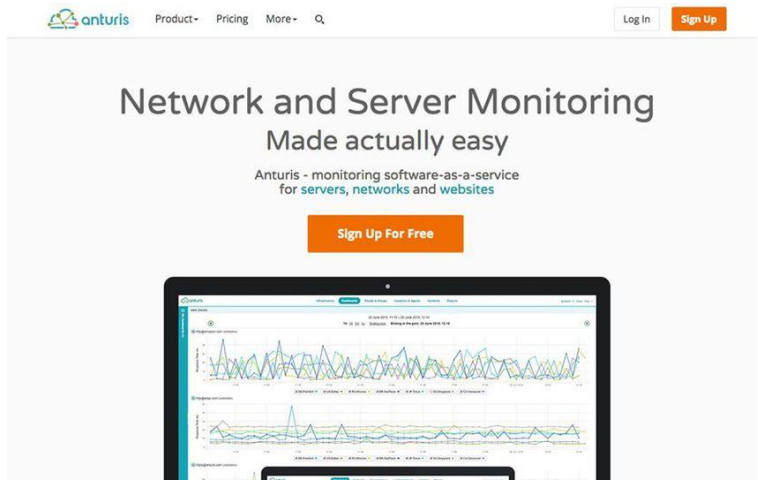
Hardware Tools are Firewalls

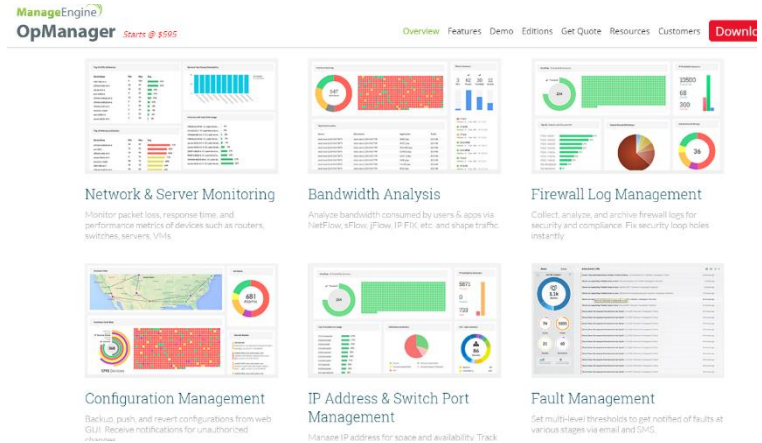
Hardware firewalls can be purchased as a stand-alone product but more recently hardware firewalls are typically found in broadband routers, and should be considered an important part of your system and network set-up, especially for anyone on a broadband connection. Hardware firewalls can be effective with little or no configuration, and they can protect every machine on a local network.

Most hardware firewalls will have a minimum of four network ports to connect other computers, but for larger networks, business networking firewall solutions are available.

Software Tools - Free

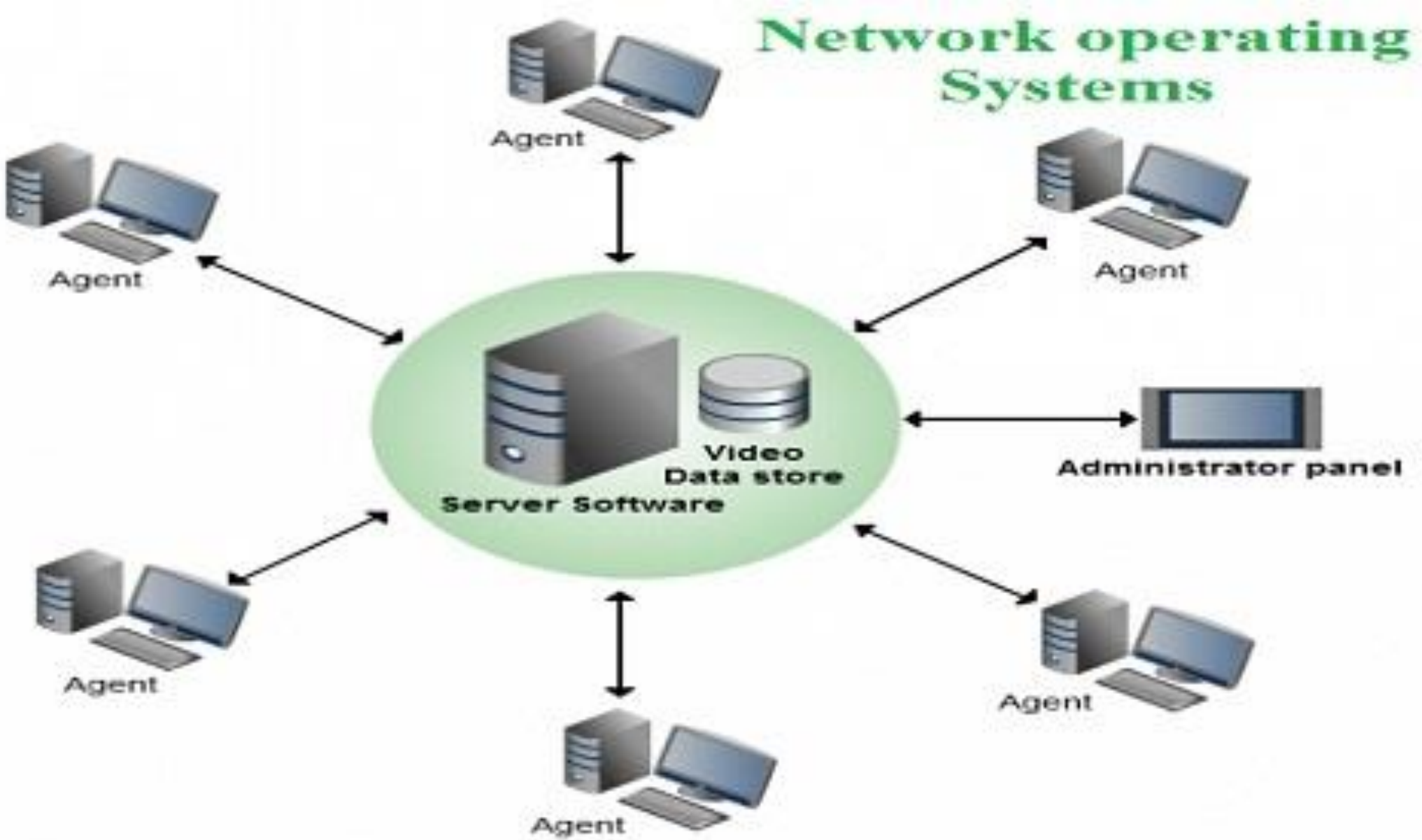
01. Wireshark
02. Microsoft Network Monitor
03. CurrPorts
04. SmartSniff
05. NetworkTrafficView
06. HTTPNetworkSniffer
07. TcpLogView
08. AdapterWatch
09. DownTester
10. Wireless Network Watcher
11. NetResView
12. PingInfoView
13. FastResolver
14. BluetoothView
15. WirelessNetView
16. WifiInfoView
17. WifiChannelMonitor
18. IPNetInfo
19. WhoisThisDomain
20. DNSDataView
21. QuickSetDNS
22. NetRouteView
23. NetConnectChoose
24. DNSQuerySniffer
25. NetworkLatencyView





NOS – Network Operating Systems

NOS - Network Operating System



- Abbreviated as *NOS*, a network operating system includes special functions for connecting computers and devices into a local-area network (LAN). Some operating systems, such as UNIX and the Mac OS, have networking functions built in.

- The term *network operating system* is generally reserved for software that enhances a basic operating system by adding networking features.

Novell Netware, Artisoft's LANtastic, Microsoft Windows Server, and Windows NT are examples of a NOS.

The salient features of network operating systems are:

Basic operating system features support like protocol support, processor support, hardware detection and multiprocessing support for applications

Security features like authentication, restrictions, authorizations and access control Features for file, Web service, printing and replication Directory and name services management User management features along with provisions for remote access and system management Internetworking features like routing and WAN ports Clustering capabilities

Common Tasks Associated With Network Operating Systems Include:

- User administration
- System maintenance activities like backup
- Tasks associated with file management
- Security monitoring on all resources in the network.
- Setting priority to print jobs in the network

What is a server operating system?

- Server OSes are designed from the ground up to provide platforms for multi-user, frequently business-critical, networked applications. As such, the focus of such operating systems tends to be security, stability and collaboration, rather than user interface.
- Server OSes provide a platform for multi-user applications, and most come bundled with a batch of common server applications, such as Web servers, e-mail agents and terminal services.

Common applications for server OSes

- **File and printer sharing:** File sharing involves setting up a common storage point for a company's documents - a network drive, as it were. Print sharing allows multiple computers to use a single printer. Windows 95, 98 and ME do have file and print sharing, but are not recommended for use as server OSes.

Application services (including databases): a server OS's ability to run the applications you need is obviously crucial. Servers function as crucial database stores and shared environments for collaborative applications (such as networked MYOB or Quicken).

Web site services: A hypertext transfer protocol (HTTP) server is included with many server OSes, either via an integrated application, or other HTTP applications such as the Apache open source server.

Some OSes also come with more advanced features, such as database integration (so you can dynamically build Web pages based on information in a database), personalization and scripting. The world's most popular HTTP server application, Apache, comes with just about every version of Unix and also runs on Windows. Microsoft provides Internet Information Server (IIS) for Windows platforms.

- **E-mail, groupware and messaging:** A central e-mail server allows you to forward and receive e-mails to and from your business, as well as control individual e-mail accounts based on a domain. Groupware applications, such as Lotus Notes, Microsoft Exchange or Novell GroupWise, provide email as well as much more sophisticated collaboration.). These applications can include shared calendars, document version management, group forums, database/messaging integration, instant messaging and whiteboard sharing. Open source mail systems such as Send Mail and Exim are also popular.

Terminal services: Allow a client to run a productivity application on a server, while seeing the visual results of the application on their screen. For instance, a client ('terminal') could be running Microsoft Word on the server from their desktop.

- The server does all the processing work, and just transmits the graphical changes to the terminal, while taking the user's input (mouse movements and key strokes) and sending them to the server. This model allows a company to use clients that don't have a lot of processing power (and enforces the storage of documents on the server, rather than on local hard drives). A server with a lot of memory and a fast processor is needed if it's going to be running productivity applications for the whole office.

- Nearly every current server OS can do this via Windows Terminal Server, Citrix MetaFrame or the X Window System (which is used by Novell and just about every Unix variant.

- **Caching:** Speeding up network access (usually Internet access) by storing previously downloaded files in a cache - kind of like the way an Internet browser keeps a cache of the Web pages you have visited so it doesn't have to download the files all over again. Examples of caching server applications include Novell Border Manager, Microsoft Internet Security and Acceleration Server, Inktomi Traffic Server and Squid.

NOS Categories

We can divided to main three categories.

1) Windows
2) Apple
3) Open Source

Server Operating Systems				
Operating System	Company	Hardware Platform	No. of processors	Appropriate for:
Windows 2000 Server/Advanced Server/Datacenter	Microsoft	Intel/AMD	4 (Server) 8 (Advanced) 32 (Datacentre)	Small, medium and large servers
Windows Server 2003 R2 Standard/Enterprise/Datacenter/Web Server/Small Business	Microsoft	Intel/AMD & IA-64, Opteron for 64-bit versions of Windows Server 2003	4 (Standard) Up to 8 (Enterprise) Minimum 8, Maximum 64 (Datacentre)	Small, medium and large servers
Linux (Red Hat, Mandrake, Debian, SuSE, etc.)	Open Source	Many (esp. Intel/AMD)	32 (Linux is readily used on more than 4 CPUs)	Small to large servers
FreeBSD 7.0	Open Source	x86, Alpha, IA-64, PC-98 and UltraSPARC	4	Small to large servers
Mac OSX Server v10.4	Apple	PowerPC with a G3, G4, or G5 processor (Apple)	2 (4 available later)	Small to medium servers
NetWare 6.5	Novell	Intel/AMD	32	Medium to large servers
Solaris 10	Sun Microsystems	Sparc, Intel x64 or x86	128	Medium to enterprise servers
HP-UX 11i v1.6 & HP-UX 11i v2	Hewlett-Packard	PA-RISC, Intel Itanium	64	Enterprise servers
IRIX 6.5	SGI	MIPS	64	Enterprise servers
AIX 5L 5.2	IBM	PowerPC (RS/6000)	32	Enterprise servers

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THANK YOU