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Chapter 1 : Computer Notes: Transmission Media and Its Types

Transmission Media and its types, Guided and unguided transmission media with examples (guided = (i) Twisted pair cable (ii) Coaxial cable (iii) Fiber optical Slideshare uses cookies to improve functionality and performance, and to provide you with relevant advertising.

Used to transmit both analog and digital signals. Superior frequency characteristics compared to twisted pair. Can support higher frequencies and data rates. Shielded concentric construction makes it less susceptible to interference and crosstalk than twisted pair. Constraints on performance are attenuation, thermal noise, and intermodulation noise. Requires amplifiers every few kilometers for long distance transmission. Usable spectrum for analog signaling up to MHz. Requires repeaters every few kilometers for digital transmission. Application of Coaxial cable The use of coaxial cable started in analog telephone networks where a single coaxial network could carry 10, voice signals. Later it was used in digital telephone networks where a single coaxial cable could carry digital data up to Mbps. Most common use is in cable TV. Coaxial cabling is often used in heavy industrial environments where motors and generators produce a lot of electromagnetic interference EMI , and where more expensive fiber-optic cabling is unnecessary because of the slow data rates needed. Another common application of coaxial cable is in traditional Ethernet LANs. Because of its high bandwidth, and consequently high data rate, coaxial cable was chosen for digital transmission in early Ethernet LANs. Fiber-optic cabling has higher bandwidth capacity than copper cabling, and is used mainly for high-speed network Asynchronous Transfer Mode ATM or Fiber Distributed Data Interface FDDI backbones, long cable runs, and connections to high-performance workstations. A fiber-optic cable is made of glass or plastic and transmits signals in the form of light. Light is a form of electromagnetic energy. It travels at its fastest in a vacuum: The speed of light depends on the density of the medium through, which it is traveling the higher the density, the slower the speed. Light travels in a straight line as long as it is moving through a single uniform substance. If a ray of light traveling through one substance suddenly enters another more or less dense , the ray changes direction. This change is called. The direction in which a light ray is refracted depends on the change in density encountered. A beam of light moving from a less dense into a denser medium is bent towards vertical axis. When light travels into a denser medium, the angle of incidence is greater than the angle of refraction; and when light travels into a less dense medium, the angle of incidence is less than the angle of refraction. A beam of light moving from a denser into a less dense medium, as the angle of incidence increases the angle of refraction also increases. Critical Angle At some point in this process, the change in the incident angle results in a refracted angle of 90 degrees, with the refracted beam now lying along with horizontal. The incident angle at this pt is known as the critical angle. When the angle of incidence becomes greater than the critical angle, a new phenomenon occurs called reflection. Light no longer passes into the less dense medium at all. Reflection Optical fiber use reflection to guide light through a channel. A glass or plastic core is surrounded by cladding of less dense glass or plastic. The difference in density of the two materials must be such that a beam of light moving through the core is reflected off the cladding instead of being refracted into it. Information is encoded onto a beam of light as a series of on-off flashes that represents 1 and 0s. Comparison of optical fiber with twisted pair and coaxial cable 1. Capacity Can carry hundreds of Gbps Gigabit per second over tens of Kilometers kms. Smaller size and lightweight Very thin for similar data capacity. Much lighter and easy to support in terms of weight structural properties. Significantly lower attenuation 4. EM isolation Resistance to noise. Not affected by external EM Electromagnetic fields. Not vulnerable to interference, impulse noise, or crosstalk. No energy radiation; little interference with other devices; security from eavesdropping. Greater repeater spacing Lower cost and fewer error sources. Speed Fiber optic networks operate at high speeds - up into the gigabits. Distance Signals can be transmitted further without needing to be "refreshed" or strengthened. Maintenance Fiber optic cables costs much less to maintain. Attenuation limits are based on intended application. In recent years it has become apparent that

fiber-optics are steadily replacing copper wire as an appropriate means of communication signal transmission. They span the long distances between local phone systems as well as providing the backbone for many network systems. Other system users include cable television services, university campuses, office buildings, industrial plants, and electric utility companies. The applications of optical fiber communications have increased at a rapid rate, since the first commercial installation of a fiber-optic system in Telephone companies began early on, replacing their old copper wire systems with optical fiber lines. Some 10 billion digital bits can be transmitted per second along an optical fiber link in a commercial network, enough to carry tens of thousands of telephone calls. A fiber-optic system is similar to the copper wire system that fiber-optics is replacing. The difference is that fiber-optics use light pulses to transmit information down fiber lines instead of using electronic pulses to transmit information down copper lines. Looking at the components in a fiber-optic chain will give a better understanding of how the system works in conjunction with wire based systems. At one end of the system is a transmitter. This is the place of origin for information coming on to fiber-optic lines. The transmitter accepts coded electronic pulse information coming from copper wire. It then processes and translates that information into equivalently coded light pulses. Using a lens, the light pulses are funneled into the fiber-optic medium where they transmit themselves down the line, Think of a fiber cable in terms of very long cardboard roll from the inside roll of paper towel that is coated with a mirror. If you shine a flashlight in one you can see light at the far end - even if bent the roll around a corner. When this principle is applied to the construction of the fiber-optic strand, it is possible to transmit information down fiber lines in the form of light pulses. Fiber Optic cable The light is "guided" down the center of the fiber called the "core". The core is surrounded by an optical material called the "cladding" that traps the light in the core using an optical technique called "total internal reflection. The fiber is coated with a protective plastic covering called the "primary buffer coating" that protects it from moisture and other damage. Transparent glass or plastic fibers, which allows light to be guided from one end to the other with minimal loss. Fiber optic cable functions as a "light guide," guiding the light introduced at one end of the cable through to the other end. The light source can either be a light-emitting diode LED or a laser. The light source is pulsed on and off, and a light-sensitive receiver on the other end of the cable converts the pulses back into the digital ones and zeros of the original signals. While fiber optic cable itself has become cheaper over time - an equivalent length of copper cable cost less per foot but not in capacity. Fiber optic cable connectors and the equipment needed to install them are still more expensive than their copper counterparts. The bandwidth of a fiber-optic cable depends on the distance as well as the frequency. Bandwidth is usually expressed in frequency distance form, for example in MHz-km. In other words, there is an inverse relationship between frequency and distance for transmission over fiber-optic cables. Propagation Mode There are two different modes for propagating light along optical channels: There are two basic types of fiber: Propagation modes Multimode Multimode is so named because multiple beams from a light source move through the core in different paths. Multimode cable is made of glass fibers, with a common diameters in the to micron range for the light carry component the most common size is Multimode fiber gives you high bandwidth at high speeds over medium distances. Typical multimode fiber core diameters are 50, However, in long cable runs greater than feet [In multimode step-index fiber, the density of the core remains constant from the center to the edges. Multimode, Step-index fiber A beam of light moves through this constant density in straight line until it reaches the interface of the core and the cladding. The term step-index refers to the suddenness of this change. Step-index multimode fiber has a large core, up to microns in diameter. As a result, some of the light rays that make up the digital pulse may travel a direct route, whereas others zigzag as they bounce off the cladding. These alternative pathways cause the different groupings of light rays, referred to as modes, to arrive separately at a receiving point. The pulse, an aggregate of different modes, begins to spread out, losing its well-defined shape. The need to leave spacing between pulses to prevent overlapping limits bandwidth that is, the amount of information that can be sent. Consequently, this type of fiber is best suited for transmission over short distances, in an endoscope, for instance. It is less costly variety of multimode fiber, it uses a wide core with a uniform index of refraction,

causing the light beams to reflect in mirror fashion off the inside surface of the core by the process of total internal reflection. Because light can take many different paths down the cable and each path takes a different amount of time, signal distortion can result when step-index fiber is used for long cable runs. Use this type only for short cable runs. A second type of fiber, called multimode graded index fiber, decreases this distortion of the signal through the cable. The word index here refers to the index of refraction. Multimode, graded-index fiber Index of refraction is related to density. A graded-index fiber, therefore, is one with varying density.

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Chapter 2 : What is transmission media ? Types of transmission media.

The key difference between guided and unguided media is that guided media uses a physical path or conductor to transmit the signals whereas, the unguided media broadcast the signal through the air. The guided media is also called wired communication or bounded transmission media.

Microwaves are unguided communication media that use a high frequency band of a radio broadcast transmission to transmit the data through the space wireless communication. It uses dish shaped antennae for sending and receiving the information. Microwaves are called line-of-sight because the microwave signal cannot bend around the surface of the earth. This type of communication is not possible for distance communication. When microwaves are used for longer distances, a separate device called repeater is used to amplify the signals because the signals become weaker after traveling certain distances. Microwave systems have the speed of about 16 Giga bits per second. A microwave system can support about , voice channels simultaneously. The microwave installation cost is very high as compared to other guided communication media. These are basically microwave transmission systems in space. A satellite is an amplifier or repeater that receives information from one location on the earth,repeats the data and sends it to one or more receiving location on the earth. Satellite communication media are very cost effective for moving large amount of information specially where there are many receiving locations. Data transmission costs are independent of distances between two points as long as these two points are within the satellite coverage area. A satellite communication does not need any cables and associated cost for land digging. However the initial cost for setting up the satellite is very high. Satellite communication is the fastest communication medium than others. Radio Broadcast is an unguided communication medium similar to microwaves and satellite except that the receiving locations need not be in line of sight or have a dish-shaped antennae to receive information transmission. Infrared is an unguided communication medium that uses a red light below the of human eye to transmit information. In the area of network, infrared is used to connect the local area network in the same room and to connect computer with peripheral device such mouse, keyboard etc. It is a low cost, low power, wireless radio frequency technology that allows various devices to communicate with each other. One of the advantages of bluetooth over infrared is that close proximity between the communication devices is not required and distance of up to 10 meters or 32 feet are allowed.

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Chapter 3 : Computer Networks Notes: transmission media

Unguided Wireless Media. Here information is transmitted by sending electromagnetic signals through free space and hence the name unguided media, as the signals are not guided in any specific direction or inside any specific medium.

The communication in a network is only possible if the information is coded into a signal and is transferred through a transmission medium. The transmission medium acts as the medium or physical path between the transmitter and the receiver in the data transmission system. Characteristics of the Media: It provides good quality communication at long distance. It ensures higher data rate at long communication distance at a lower cost. There are 3 factors which affect the maximum communication distance and maximum data rate of a medium. These factors are interference, communication bandwidth of medium and the transmission impairments. The interference is the distortion on signal in the transmission due to the unwanted signals from the outside sources. The bandwidth of the medium determines the signal frequencies. The transmission impairments include noises, distortion during the signal propagation. Classification of Transmission Media: The transmission media is classified into two major categories i. It constrains and guides the communication signal. The Signals are transmitted through the physical and tangible guide between communicating points. Types of Guided Transmission Media: Twisted Pair Cable- The pairs of wires are twisted around to make this type of cable. The wires are twisted together to reduce the crosstalk and noise susceptibility. This type of cable is of 2 types i. STP Shielded Twisted Pair is covered with the foil shield to reduce interference and cross talk between the pair of wires. It is bulky and difficult to use. It is cheap and easy to install. It is also known as Coax. It carries the signal of higher frequencies. Fiber Optics Cable- This kind of cable uses the light to send the information. It provides high bandwidth for voice, video and applications of data. It is more reliable and secure. It can carry larger information than the other wires. The information loss is very less in this kind of cable. It permits the signal to be transmitted but never guide them. There is no direct physical connection between the two points i. The examples of Unguided Transmission Media are radio signals, microwave, Satellite signal and infrared. Types of Unguided Transmission Media: Satellite Communication- The artificial satellite is man made. It consists of a radio transmitter and transponder. It provides communication over longer distance than others. The microwave is a kind of electromagnetic waves. It is used when the physical transmission media cannot be installed under any circumstances mountains, jungles, rivers etc. The microwave transmission is the line of sight transmission. It is used for wireless communication. The infrared technology allows the devices to communicate via short range wireless signals.

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Chapter 4 : Guided Transmission Media: CS Lecture notes

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IR disperses quickly, can reflect off a smooth hard surface, is easily blocked by anything opaque, and is also blocked by moisture in the air. IR is good for indoor, low bandwidth applications, where there are clear lines of sight between communicating objects. TV remote controls, connections from computers to printers and other peripherals. Bandwidth ranges from Kps to 4Mbps. Unlike IR, the beam of light remains pencil-thin over a long distance. It has relatively high bandwidth Transmitters and receivers must be precisely aligned. It can be used outdoors as a substitute for stringing wires. Initial cost is high but upkeep is low. RF ranges from about 3KHz to GHz Government agencies, like the FCC regulate the allocation of electromagnetic frequencies for communication and the setting of allowable power outputs at each range of frequencies. Medium Frequency RF ranges between 2 and 30 MHz and can reflect off layers of the atmosphere hence longer range. Medium Earth Orbit - elliptical orbit - used for communication at the poles. Geostationary Earth Orbit - fixed position relative to earth, but longer delay. The ground-to-GEO-satellite delay for a communication signal is about 0. For some applications, this delay is significant. At current power levels, there is room for GEO satellites in orbit above the equator. There are probably locations near the north and south poles where none are visible or where the only ones visible touch the horizon. Delays are in the 1 to 5 millisecond range. Tracking from the ground is difficult because the satellites move very fast relative to the ground. Typically LEO satellites work as clusters, for example: This continues until the information is relayed to a satellite currently over the intended destination, say Tokyo. Finally the satellite over Tokyo transmits the information to a receiver on the ground. Number of bits per second that can be sent Delay: The Max Data Rate on a Communication channel is twice the analog bandwidth times the base-two log of the number of possible signal levels. The maximum channel capacity is the product of the hardware bandwidth and the the base-two log of one plus the signal-to-noise ratio. Sometimes a signal to noise ratio is converted to decibels: The Shannon-Hartley Law reminds us that things such as background radiation present everywhere in the universe will always be there holding us back from achieving ideal data rates.

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Chapter 5 : Difference Between Guided and Unguided Media (with Comparison Chart) - Tech Differences

Wire transmission is slower and more expensive, but has low(er) latency. Twisted pair is the cheapest, oldest, most common guided media. A century of phone company experience.

Twisted-pair bandwidth proportional to copper diameter and run length. Cat 5 cabling can handle up to 1 Gbps links. Cat 6 and 7 cabling can handle up to 10 Gbps links. High bandwidths achieved in parallel over several twisted pair. Transmission Electronics A receiver may be a sender, and vice versa. A repeater undoes attenuation by amplifying the signal, and possibly reshaping the usually digital signal. There may be zero or more repeaters. Coaxial cable coax is single strand, heavy gauge, shielded wire. Shielding and gauge improve over twisted pair. Baseband coax transmits digital signals. Copper-clad aluminium braid shield conductor C: Central conductor copper-clad steel Broadband Coax Broadband coax transmits analog signals. Greater distances require electronic assistance amplifiers, for example. Amplifiers are one-way devices. Amplified signals form simplex channels. Broadband Networks Simplex is fine for cable tv , but data networks require two-way transmissions. Dual cable systems have two cables, one in each direction. Midsplit systems divide a single cable into several channels. In either case the cable company head-end is the router. Baseband vs Broadband Baseband systems are easy and cheap to set up, use, and maintain. Broadband systems are harder and more expensive. Broadband systems are more capable over longer distances. Baseband systems are not. The choice is straightforward depending on intention. Fiber optic signals are light pulses. Lasers or light-emitting diodes LED convert from electricity to light. The fiber transmits light. A photo diode light detector converts from light to electricity.

Chapter 6 : Transmission Media - WikiEducator

UnBounded or UnGuided Transmission Media. Unguided medium transport electromagnetic waves without using a physical conductor. This type of communication is often referred to as wireless communication.

There are two wires insulated from each other, open to free space. This type of media is suitable for connecting equipments that are separated less than 50 meters. This media can support data rate up to a theoretical maximum of 19 Kbps. A two-wire transmission media can directly connect two computers. However, if a computer is to be connected to a communicating device like a modem, multiple communication lines are required. In this case, a number of separate insulated wires are moulded in the form of a flat ribbon with terminating connectors as shown in Figure b. The limitations of this transmission media are their poor noise characteristics, failure to provide connectivity over long distances, low bit rate. This type of transmission media is often used in telephone networks. UTP is the copper media, inherited from telephony, which is being used for increasingly higher data rates, and is rapidly becoming the de facto standard for horizontal wiring, the connection between, and including, the outlet and the termination in the communication closet. The twisting increases the electrical noise immunity, and reduces the bit error rate BER of the data transmission. A UTP cable contains from 2 to twisted pairs. UTP is a very flexible, low cost media, and can be used for either voice or data communications. Its greatest disadvantage is the limited bandwidth, which restricts long distance transmission with low error rates. STP is heavier and more difficult to manufacture, but it can greatly improve the signaling rate in a given transmission scheme Twisting provides cancellation of magnetically induced fields and currents on a pair of conductors. Magnetic fields arise around other heavy current-carrying conductors and around large electric motors. Various grades of copper cables are available, with Grade 5 being the best and most expensive. Grade 5 copper, appropriate for use in Mbps applications, has more twists per inch than lower grades. More twists per inch means more linear feet of copper wire used to make up a cable run, and more copper means more money. Shielding provides a means to reflect or absorb electric fields that are present around cables. Shielding comes in a variety of forms from copperbraiding or copper meshes to aluminized. Mylar tape wrapped around each conductor and again around the twisted pair. 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. 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. A typical core diameter is Typically cladding has a diameter of 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. 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! Transmission media then looking at analysis of using them unguided transmission media is data signals that flow through the air. They are not guided or bound to a channel to follow. Following are unguided media used for data communication.

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Chapter 7 : Bounded/Guided Transmission Media in Computer Networks | Studytonight

GUIDED MEDIA Guided media, which are those that provide a conduit from one device to another, include twisted-pair cable, coaxial cable, and fiber-optic cable.

Communication Networks Transmission media is a pathway that carries the information from sender to receiver. We use different types of cables or waves to transmit data. Data is transmitted normally through electrical or electromagnetic signals. An electrical signal is in the form of current. An electromagnetic signal is series of electromagnetic energy pulses at various frequencies. These signals can be transmitted through copper wires, optical fibers, atmosphere, water and vacuum Different Medias have different properties like bandwidth, delay, cost and ease of installation and maintenance. Transmission media is also called Communication channel. Types of Transmission Media Transmission media is broadly classified into two groups. Bound transmission media are the cables that are tangible or have physical existence and are limited by the physical geography. Popular bound transmission media in use are twisted pair cable, co-axial cable and fiber optical cable. Each of them has its own characteristics like transmission speed, effect of noise, physical appearance, cost etc. Unbound transmission media are the ways of transmitting data without using any cables. These media are not bounded by physical geography. This type of transmission is called Wireless communication. Nowadays wireless communication is becoming popular. Wireless LANs are being installed in office and college campuses. This transmission uses Microwave, Radio wave, Infra red are some of popular unbound transmission media. The data transmission capabilities of various Medias vary differently depending upon the various factors. It refers to the data carrying capacity of a channel or medium. Higher bandwidth communication channels support higher data rates. It refers to the leakage of signal from the medium due to undesirable electrical characteristics of the medium. It refers to the susceptibility of the media to external electrical noise that can cause distortion of data signal. It refers to loss of energy as signal propagates outwards. The amount of energy lost depends on frequency. Radiations and physical characteristics of media contribute to attenuation. Dinesh authors the hugely popular Computer Notes blog. Where he writes how-to guides around Computer fundamental , computer software, Computer programming, and web apps. For any type of query or something that you think is missing, please feel free to Contact us.

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Chapter 8 : chapter 07 -- transmission media

Guided media are more commonly known as wired media, or those media in which electrical or optical signals are transmitted through a cables or wires. Unguided media are more commonly known as wireless media, in which electromagnetic signals are sent through space with no direction. Both types of.

Chapter Four Transmission Media and Network Devices This chapter covers various transmission media available in Hong Kong for transferring information, the characteristics and the ways to carry data during its transmission are also included. Network configurations between two ends including point-to-point and multi-point are also covered. The final section of this chapter is about the supporting communications devices in a network to facilitate the transportation of data. Upon completion of this chapter, you should Understand different transmission media including telephone wire, coaxial cable, optical fiber and microwave link List the different network configuration methods List the different communication devices such as PABX, patch panel, switch, front-end processor etc. Transmission Media Transmission media used to provide a connection between sender and receiver to exchange information are generally grouped into two major categories namely guided and unguided. Type Description Guided Signals are transmitted via a physical and tangible guide between the communicating points. These include twisted pair telephone cable, optical fiber, waveguide, and coaxial cable. Unguided Physically, there is no direct physical connection between two points such as microwave and satellite links. Your mobile phone also uses unguided transmission medium. Can you classify Light Frequency Infrared? Unguided Guided transmission media Wire pairs or telephone wire Wire pairs are the most common medium in short distance such as connecting computer port to modem or telephone set to telephone exchange. The modular telephone jack installed in your house makes use of telephone wires. The wires are made of copper and coated with insulating material like PVC. The cable is highly reliable if it is protected by telephone duct. The transmitted signal relies on the movement of electronics. It is manufactured in twisted wire pairs in order to reduce crosstalk. You usually experience this effect while talking to your friends over the phone and hear a very low background voice. Higher bandwidth will be chopped by the Switch. It is the cheapest transmission medium and costs around 2 dollars per meter depending on the quality, shielding and number of wires. The typical number of wires in the cable is two Twist or four Quad. Figure shows a few examples of wire pairs. This type of telephone cable is Category 5 cable, which supports this speed at a short distance. Can you figure out the unused bandwidth compared with a modem operating at the speed of 56k bps? Coaxial cable It is basically a single wire surrounded by a tube-shaped conductor of solid copper. The signal is transmitted by use of of microwave rather than electronics. Coaxial cable can be grouped into two types: In baseband transmission, digital signal like Manchester Code will be used to carry data along the channel, which relies on voltage fluctuations. In Broadband transmission, the digital data is modulated into different frequency channels separated by frequency guardbands. Because of wider bandwidth and more frequency channels, broadband transmission can support a mixture of signals such as voice and video. The cost of coaxial cable is more expensive than telephone wire and costs around a few Hong Kong dollars per meter. Figure shows the male and female coaxial cables. Baseband coaxial cable also allows the DC voltage to pass, which is necessary for collision detection in Ethernet network. Four-wire telephone cable is regarded as quad with individually insulated and housed in a jacket. If the coaxial cable is damaged, the signal will attenuate sharply. This prevents the third party to tap information. Optical Fiber It is a popular high bandwidth transmission medium and is used in backbone communication as shown in Figure. Signal is transmitted by use of light through the glass fiber. It provides an electrical isolation and totally reduces electromagnetic interference or noise by surrounding equipment. Unlike telephone wire, installing and connecting the fibers requires special equipment. Recently, Hong Kong Telecom is laying fiber optic cables to provide data superhighway to support personal video services. It is expected that the future communications network in Hong Kong will consist of one optical fiber with coaxial cable as the backbone within the building. The

terminator erected around each three stories will provide a transmission bandwidth to each household at 20 M bps. At that you can use it to watch movie, shopping, a real e-commerce world. Figure shows a typical circuit that converts the digital signal to light travelling along the optical fiber. Here, the electronic signals are converted into light signals passing along the optical fibre and received by the remote. The remote then converts the light signals into electronic signals. Note that light emitting diode and photo diode are used to convert the electronics signal and accept the light signal. Unguided transmission media Microwave relays It consists of transmission tower responsible for transmitting or repeating the signal for each hop the distance is around 30 Kilometers to 50 Kilometers. The microwave in Figure uses the line of sight the received tower can be visual by the transmitted tower transmission. The transmission rate can be up to M bps. The transmission quality however is subject to weather changes. The use of microwave is ideal for short-haul and high bandwidth applications due to no cabling cost once the transmission tower is built. In Hong Kong, a lot of large public utilities such as China Light and Power and Hong Kong Electric use microwave in transmitting signal for power protection. Satellite The use of Satellite is to extend the coverage area. Signal is transmitted up and down between ground stations. The satellite is therefore used as a repeater for re-generating the signal. Figure shows how it works. Here, a transmit signal is reflected by the satellite to cover a region on the earth. Microwave transmission above MHz. It uses bandwidth between GHZ, C-band, GHz, Ku-band and also the GHz Signal requires amplification due to attenuation after travelling from the ground station to the satellite and vice versa. Similar to microwave, the transmission quality is also subject to weather changes. There will be a time delays between the sender and receiver and is typical 70 ms for a single hup. Comparison amongst all transmission media Type Disadvantages Network Configurations This is about the network configuration between two or more nodes within a large network topology. These are commonly used between terminal-to-computer configurations in order to fully utilize the physical channel. Point-to-point configuration This is the simplest way of connecting a terminal to a computer or computer to computer. It makes use of switched, leased line or hard-wired service. It is usually used for low volume traffic such as Bulletin Board. Different communication path is formed by the telephone exchanges. It is quite flexible in terms of data transportability. Using Leased line such as cluster controller in a branch bank to front end processor in the central office. It is a private line and leased from Hong Kong Telecom. Form voice grade channels with speed up to 1. It is ideal for high usage and high volume application like linking two computers by use of T1 link. It is less flexible once it is installed. Hardwired direct connection between terminal and computer It is about the short distance between two computing machines. Independent of other links Figure shows various connection methods. A master modem is connected to the main computer while a few slave modems are connected to other computers. Multiplexing This uses a high speed link to share a few terminals in order to optimize the line usage and reduce the operating cost of using multiple separate telecommunication lines as shown in Figure Here, three terminals are shared with a multiplexer through a common medium. High speed channel shared by multiple devices Reduces line costs only one high speed line is required in Figure Reduces modem costs by using a pair of modems only Can you figure out how many modems are required if multiplexer is not used? Logical connection is introduced rather than physical connection. Terminal Connection Methods Figure shows various connection methods through PSTN switched line , leased line or direct-wire to the computer at a short distance:

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Chapter 9 : What are Guided and Unguided media? | Computer Networking Demystified

Bounded or Guided Transmission Media Guided media, which are those that provide a conduit from one device to another, include Twisted-Pair Cable, Coaxial Cable, and Fibre-Optic Cable. A signal travelling along any of these media is directed and contained by the physical limits of the medium.

The signal requires a physical path for transmission. The signal is broadcasted through air or sometimes water. Alternative name It is called wired communication or bounded transmission media. It is called wireless communication or unbounded transmission media. Direction It provides direction to signal for travelling. It does not provide any direction. Types Twisted pair cable, coaxial cable and fibre optic cable. Radio wave, microwave and infrared. Definition of Guided Media Guided transmission media are more commonly known as the wired communication or bounded transmission media. As the medium for transmission is a physical conductor, it also provides direction to the signal. But there are physical limitations of the conductor in the guided media. Like the length of the conductor, its installation cost, its maintenance, etc. The guided media is categorized further into three categories that are twisted-pair cable, coaxial cable and fiber-optic cable. The twisted pair cable has two conductors wires wounded around each other and each surrounded by an insulating material. The twisted pair cable is flexible and easy to install. But it has low bandwidth and provide less protection from interference. Twisted pair cable are also of two types shielded and unshielded twisted pair cable. The coaxial cable has a central core conductor usually copper enclosed in an insulating sheath, which is further encased in an outer metallic braid, it serves as both protection against noise and as a second conductor which completes the circuit. Now, the outer metallic covering is also covered by an insulating sheath. The coaxial cable carries signals of higher frequency than the twisted pair cable. The third category is the optical fibre which is made of glass or plastic, and it transmits signals in the form of light. The optical fibre is noise resistance, has less signal attenuation and has a higher bandwidth in comparison to twisted pair cable and coaxial cable. But it also has some drawbacks like; it is very expensive, it requires a lot of installation and maintenance charge as any defect in the cable can diffuse light and alter the signals. As the optical fibre is made of glass, it is very fragile. So, we have discussed the major categories of guided media lets move on to unguided media. Definition of Unguided Media The unguided media is also called wireless communication. It does not require any physical medium to transmit electromagnetic signals. In unguided media, the electromagnetic signals are broadcasted through air to everyone. These signals are available to one who has the device capable of receiving those signal. The unguided media is also called unbounded media as it does not have any border limitation. The unguided media allows the user to connect all the time, as the communication is wireless the user can connect himself from anywhere to the network. The unguided media is categorized into radio waves, microwaves and infrared waves. The radio waves are generated easily; they are low-frequency signals and can travel a long distance. The radio waves can penetrate through the buildings. The microwaves are transmitted in a straight line and hence require the line-of-sight transmission. The distance covered by the microwave signal depend on the height of the two antenna. More the taller are antennas longer is the distance covered by the signal. The microwave has a frequency higher than the radio waves. Microwave are used for telephone communication mobile phones, television distribution, etc. Infrared waves are used for short range communication. Like, the remote control for televisions, VCRs, etc. It can not penetrate through obstacles. The government licence is not required, to operate an infrared system as it is more secure against eavesdropping. Key Differences Between Guided and Unguided Media The key difference between guided and unguided media is that guided media uses a physical path or conductor to transmit the signals whereas, the unguided media broadcast the signal through the air. The guided media is also called wired communication or bounded transmission media. However, the unguided media is also called wireless communication or unbounded transmission media. The guided media provide direction to the signal whereas, the unguided media does not direct the signal. Categories of guided media are twisted pair cable, coaxial cable

and optical fibre. On the other hands, the categories of unguided media are radio wave, microwave, and infrared signal. Guided media is a wired communication it transmits data either using twisted pair cable, coaxial cable or fibre optics; it requires maintenance charge. The unguided media is a wireless communication it transmits signal by broadcasting it through the air.