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Subject: Introdcution to ICT

Answer(1):

Multimedia:

Multimedia refers to content that uses more than one medium. The categories of media are slippery, but they generally include:

* Text
* Sound
* Graphics/images
* Animation/video (live footage as opposed to animation)

Multimedia became an important concept as the Web moved away from a largely textual layout to a graphical one. Many sites were competing to become true multimedia sites with a mixture of text, sound, images and videos.

Types of Multimedia:

Text: The form in which the text can be stored can vary greatly. In addition to ASCII based files, text is typically stored in processor files, spreadsheets, databases and **annotations** on more general multimedia objects. With availability and proliferation of GUIs, text fonts the job of storing text is becoming complex allowing special effects(color, shades..).

Graphics: There is great variance in the quality and size of storage (**Image file formats**) for still images (**Bitmap - gif, jpg, bmp**) (**Vector - svg, pdf, swf, ps**). **Digitalized images** are sequence of pixels that represents a region in the user's graphical display.

Audio: An increasingly popular datatype (**audio file format**) being integrated in most of applications is Audio. Its quite space intensive. One minute of sound can take up to 2-3 Mbs of space. Several techniques are used to compress it in suitable format.

Animation: It involves the appearance of motion caused by displaying still images one after another. Often, animation is used for entertainment purposes. In addition to its use for entertainment, animation is considered a form of art. It is often displayed and celebrated in film festivals throughout the world. Also used for educational purposes.

Video: One on the most space consuming multimedia data type is digitalized video. The digitalized videos are stored as sequence of frames. Depending upon its resolution and size a single frame can consume upto 1 MB. Also to have realistic video playback, the transmission, compression, and decompression of digitalized require continuous transfer rate.

Graphic Graphics (Objects): These consists of special data structures used to define 2D & 3D shapes through which we can define multimedia objects. These includes various formats used by image, video editing applications.

Answer(2):

Relationship Between Hardware and Software:

Essentially, computer software controls computer hardware. These two components are complementary and cannot act independently of one another. In order for a computer to effectively manipulate data and produce useful output, its hardware and software must work together. Without software, computer hardware is useless.

Conversely, computer software cannot be used without supporting hardware. Similarly, computer software has to first be loaded into the computer's hardware and then executed. There are several categories of software, with the two main categories being operating-system software, which makes the hardware usable, and application software, which does something useful.

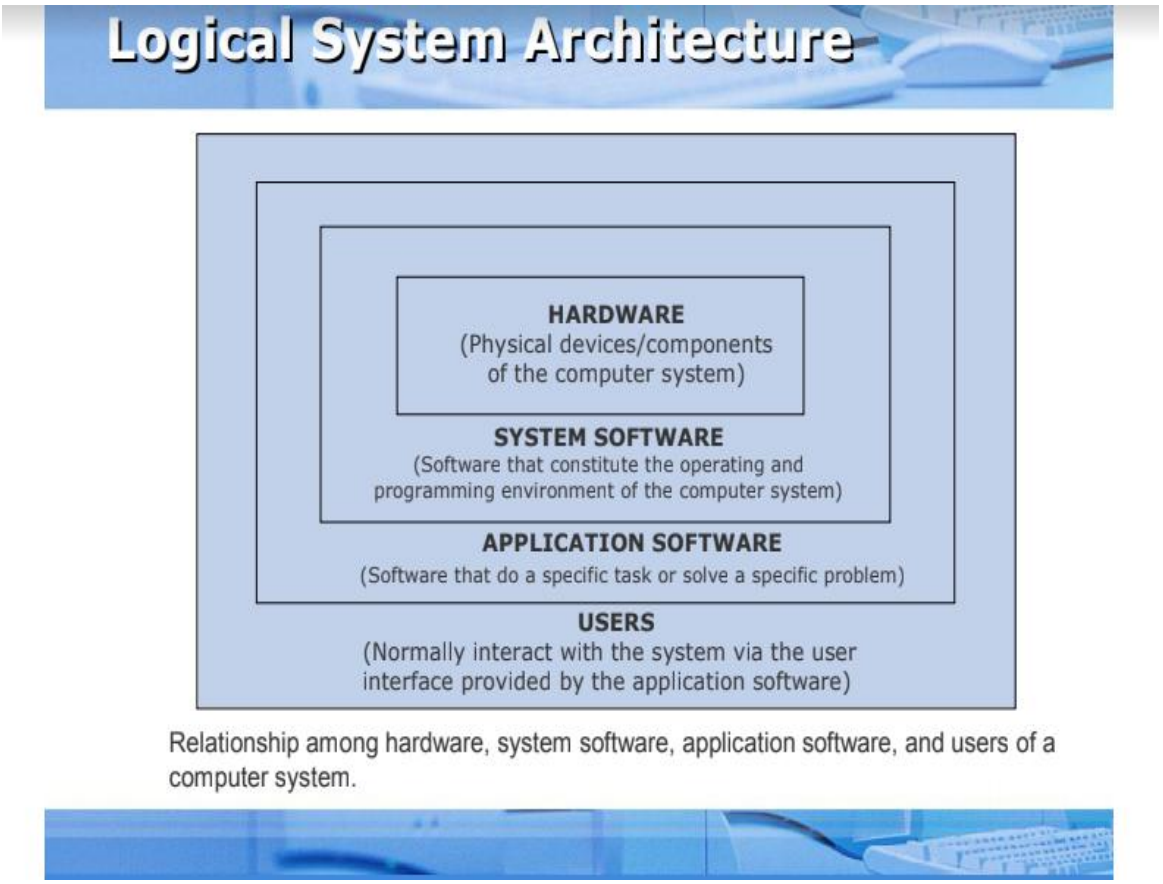
Examples: Operating systems include Microsoft Windows on a personal computer and Google's Android on a mobile phone. Examples of application software are Microsoft Excel and Angry Birds.

Types of Software with Logical system architecture:
Most software can be divided into two major categories:

1) **System software:** System software are designed to control the operation and extend the processing capability of a computer system

2) **Application software:** Application software are designed to solve a specific problem or to do a specific task

Logical system architecture:



Relationship among hardware, system software, application software, and users of a computer system.

Answer(3):

(a) Modulation Techniques:

Amplitude Modulation:
It was the earliest modulation technique used to transmit voice by radio. This type of modulation technique is used in electronic communication. In this modulation, the amplitude of the carrier signal varies in accordance with the message signal, and other factors like phase and frequency remain constant.

Frequency Modulation:
In this type of modulation, the frequency of the carrier signal varies in accordance with the message signal, and other parameters like amplitude and phase remain constant. Frequency modulation is used in different applications like radar, radio and telemetry, seismic prospecting and monitoring newborns for seizures via EEG, etc.

Phase Modulation:
In this type of modulation, the phase of the carrier signal varies in accordance with the message signal. When the phase of the signal is changed, then it affects the frequency. So, for this reason, this modulation is also comes under the frequency modulation.

ASK (Amplitude Shift Keying):
A digital modulation method that sends transmission data by varying the presence/absence of analog signals.

FSK (Frequency Shift Keying):
This technique utilizes the difference in the amplitude of analog signals to modulate digital signals by switching between low frequency and high frequency in order to represent 0 and 1.

Phase-shift keying (PSK): PSK is a digital modulation process which conveys data by changing (modulating) the phase of a constant frequency reference signal (the carrier wave). The modulation is accomplished by varying the sine and cosine inputs at a precise time

(b) Multiplexing & DeMultiplexing:

Multiplexing:

Gathering data from multiple application processes of sender, enveloping that data with header and sending them as a whole to the intended receiver is called as multiplexing.

Demultiplexing:

Demultiplex (DEMUX) is the reverse of the multiplex (MUX) process – combining multiple unrelated analog or digital signal streams into one signal over a single shared medium, such as a single conductor of copper wire or fiber optic cable. Thus, demultiplex is reconverting a signal containing multiple analog or digital signal streams back into the original separate and unrelated signals.

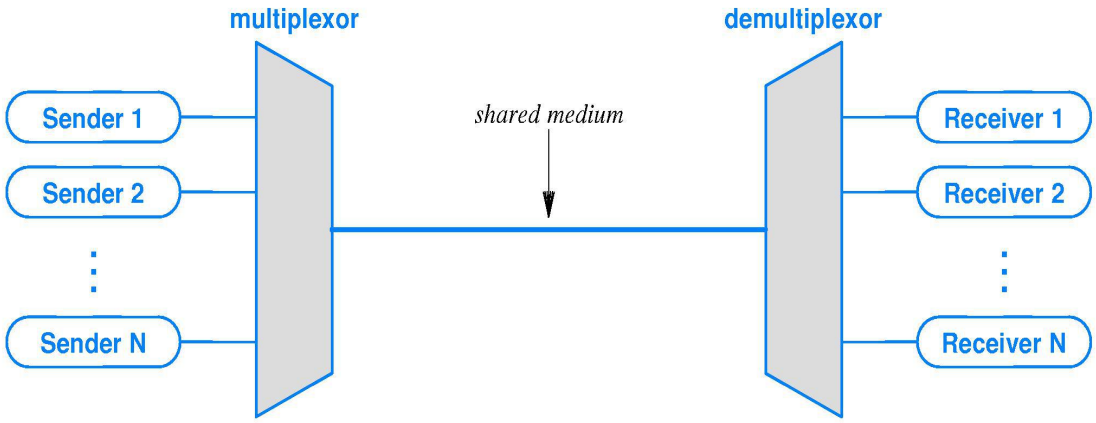


Figure 11.1 The concept of multiplexing in which independent pairs of senders and receivers share a transmission medium.

(c) Switching Techniques:

There are mainly three types of Switching techniques:

1) Circuit Switching
2) Message Switching
3) Packet Switching

1) Circuit Switching:

* Circuit Switching is a technique that directly connects the sender and the receiver in an unbroken path.

* For example take telephone switching equipment establishes a path that connects the caller's and reciever's telephone by making a physical connection.

* Routing decisions in circuit must be made when the circuit is first established, but there are no decisions made after that time.

* A complete end to end path must exist before communication can take place.

* Once the connection has been initiated and completed, the destination device must acknowledge that it is ready and able to carry on a transfer.

2) Message Switching:

* In message switching there is no dedicated path required between two communicating devices, because the message switching is the follow the connectionless network.

* With message switching there is no need to establish dedicated path between two stations.

* When a station sends a message, the destination address is appended to the message.
* The message is then transmitted through the network in its entirety, from node to node.

* Each node receives the entire message, stores it in its entirety on disk and then transmits the message to the next node. This type of network is called a store and forward network

3) Packet Switching:

- In packet switching message are broken up into packet.
- Each packet is tagged with appropriate source and destination address.
- Individual packets take different routes to reach the destination.

Packet switching: Datagram:

- Datagram packet switching is a packet switching technology by which each packet is treated as a separate entity and are called as datagram.
- Packets have their own complete addressing information attached.
- Each packet follows different routes to reach the destination.
- So, the packets may arrive at different times, and may be in a disturbed order. In this case reordering is done.

Packet switching: Virtual:

- In this type of switching a preplanned route is established before the packets are sent.
- Sender sends a **"call request packet"** to establish a logical connection and receiver sends back an acknowledgement packet **"packet accepted"**.
- It is a cross between circuit switching network and packet switching network.

(d) Optical Fiber Communication System:

Optical communication is any type of communication in which light is used to carry the signal to the remote end, instead of electrical current. Optical communication relies on optical fibers to carry signals to their destinations. A modulator/demodulator, a transmitter/receiver, a light signal and a transparent channel are the building blocks of the optical communications system.

Because of its numerous advantages over electrical transmission, optical fibers have largely replaced copper wire communications in core networks in the developed world.

Optical communication systems consist of the following components:

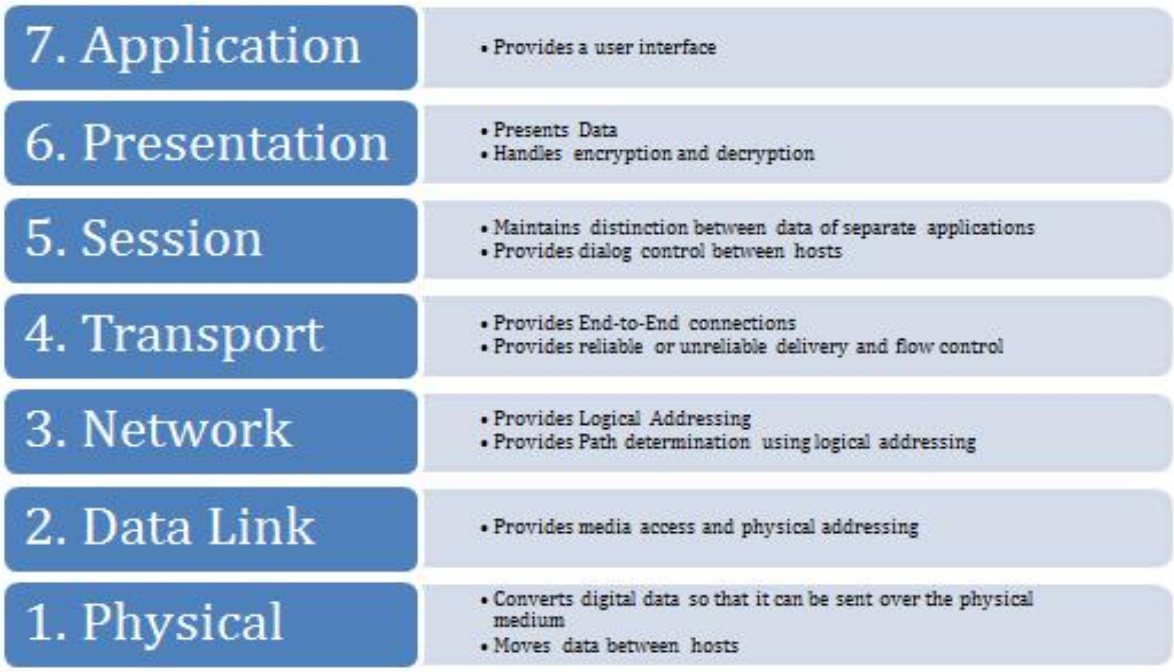
1) **Transmitter:** Converts and transmits an electronic signal into a light signal. The most commonly used transmitters are semiconductor devices, such as light-emitting diodes (LEDs) and laser diodes.

2) **Receivers:** Typically consist of a photo-detector, which converts light into electricity using the photoelectric effect. The photo detector is typically a semiconductor-based photodiode.

3) **Optical Fiber:** Consists of a core, cladding and a buffer through which the cladding guides the light along the core by using total internal reflection

Answer(4):

The 7 Layers of the OSI Model:



1) Physical Layer:

The lowest layer of the OSI Model is concerned with electrically or optically transmitting raw unstructured data bits across the network from the physical layer of the sending device to the physical layer of the receiving device. It can include specifications such as voltages, pin layout, cabling, and radio frequencies. At the physical layer, one might find “physical” resources such as network hubs, cabling, repeaters, network adapters or modems.

2) Data Link Layer:

At the data link layer, directly connected nodes are used to perform node-to-node data transfer where data is packaged into frames. The data link layer also corrects errors that may have occurred at the physical layer.

The data link layer encompasses two sub-layers of its own. The first, media access control (MAC), provides flow control and multiplexing for device transmissions over a network. The second, the logical link control (LLC), provides flow and error control over the physical medium as well as identifies line protocols.

3) Network Layer:

The network layer is responsible for receiving frames from the data link layer, and delivering them to their intended destinations among based on the addresses contained inside the frame. The network layer finds the destination by using logical addresses, such as IP (internet protocol). At this layer, routers are a crucial component used to quite literally route information where it needs to go between networks.

4) Transport Layer:

The transport layer manages the delivery and error checking of data packets. It regulates the size, sequencing, and ultimately the transfer of data between systems and hosts. One of the most common examples of the transport layer is TCP or the Transmission Control Protocol.

5) Session Layer:

The session layer controls the conversations between different computers. A session or connection between machines is set up, managed, and termined at layer 5. Session layer services also include authentication and reconnections.

6) Presentation Layer:

The presentation layer formats or translates data for the application layer based on the syntax or semantics that the application accepts. Because of this, it at times also called the syntax layer. This layer can also handle the encryption and decryption required by the application layer.

7) Application Layer:

At this layer, both the end user and the application layer interact directly with the software application. This layer sees network services provided to end-user applications such as a web browser or Office 365. The application layer identifies communication partners, resource availability, and synchronizes communication.

THE END