UNIVERSITY OF DAR ES SALAAM

COLLEGE OF INFORMATION AND COMMUNICATION TECHNOLOGIES
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
IS 171 LAB WORK

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Title: INTRODUCTION TO COMPUTER NETWOKING DEVICES AND MEDIA.

Group: CS9

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INTRODUCTION:

Computer Network is the collection of computers or other hardware devices (such as servers, network devices, etc.) connected together, either physically or logically, using special hardware and software in such a way that there's a sharing of data and information among them.

There are five basic components of a Computer Network; Sender, Message, Transmission Medium, Receiver and Protocol. Computer Network can be classified into Local Area Network, Wide Area Network, and Metropolitan Area Network.

The first and the fundamental level is Local Area Network (LANs). Under this level, Computer Network covers small geographical areas such as schools, homes, library, college, hospital, office or group of buildings. A number of devices that are found in this level, Local Area Network – LANs, include the following;

I.   **Access Point:**
     Access Point is the networking device that is used to connect wired LANs and wireless LANs (WLANs), where by data/information from wired LANs is received and converted to wireless signals. On the other hand, Access Point connects to wired router, switch or hub via an Ethernet cable and projects a Wi-Fi signal to the designated area.

II. **Bridge;**
     Bridge is the computer network device that is used to join similar topologies and to divide network segment. In other words, Bridge creates a single, aggregate network from multiple communication networks or network segments. This device usually operates on the Network Layer 2 (Data Link Layer). There are different forms of Bridging Technologies, such as; Multiport Bridging, Simple Bridging, and Transparent/Learning Bridging.

III.   Hub;

Hub is network device used to connect/link several computers together as they repeat every signal that comes at one point and copy it to other point(s) (a process called, either Unicast, Multicast or Broadcast). Under OSI reference model, Hubs are found in the Layer One - Physical Layer. Data is transmitted in form of electrical signals or bits at the speed of 10Mbps. Drawbacks about Hub is that it is not an intelligent device as it cannot learn or store MAC Address and the collisions do occur commonly in setups.

IV.   Network Interface Card (NIC);

Network Interface Card is the electronic card device that provides the physical connection between the network and workstation. In other words, it's the circuit board installed in a computer that provides a dedicated network connection to the computer. NIC are of two common types; Internal NIC and External NIC.
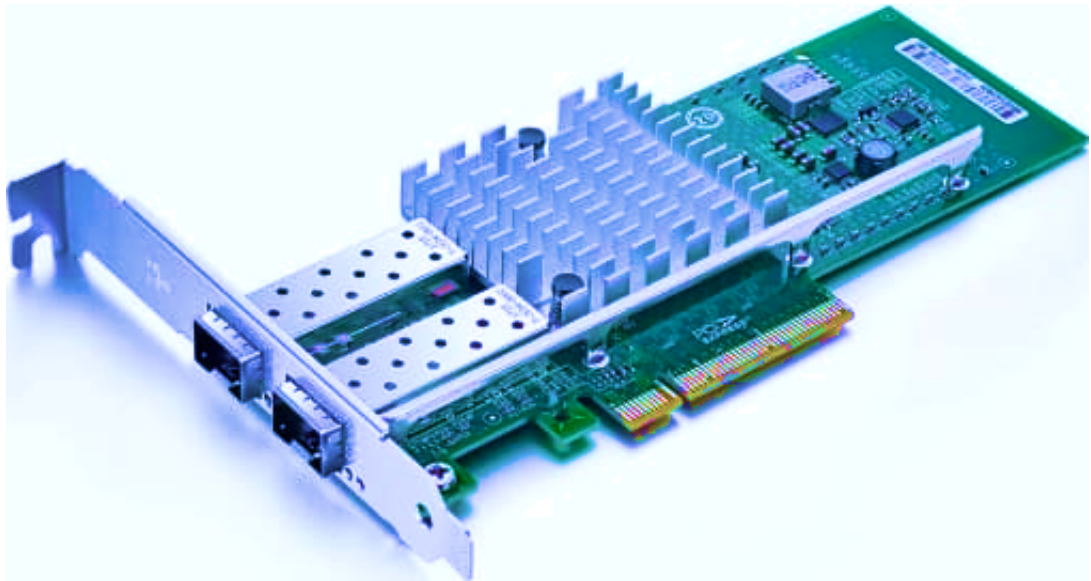
V.   Router;

Routers are the highly intelligent devices that connect multiple network types with separate IP addresses and determine the best path for sending data. Router is sometimes referred as Layer 3 (Network Layer) Device as it allows the accomplishment of identifying remote network and sends data to it. Routers have a routing table in them that is refreshed periodically according to the changes in network, consulted in order to transmit data packets, and using a routing protocol. Common types of Routers are; Wireless Routers, Broadband Routers, Core Routers, Edge Routers and Brouters. Routers do function on both Local Area Network - LANs and Wide Area Network - WANs.

VI. Switch;

Switch is the advanced computer networking device that is used to connect many devices together on the computer network. They do operate on the Layer Two - Data Link Layer of the OSI Model, but there's a special case where by Network Switch (a type of Switch) operate on the Layer Three – Network Layer of the OSI Model. Data is transmitted in the form of Data Frames (for Layer2 Switch) or Data Frames/Data Packets (for Layer3 Switch) at the speed ranging from 10/100Mbps to 1Gbps. Transmission mode can be Half/Full Duplex.
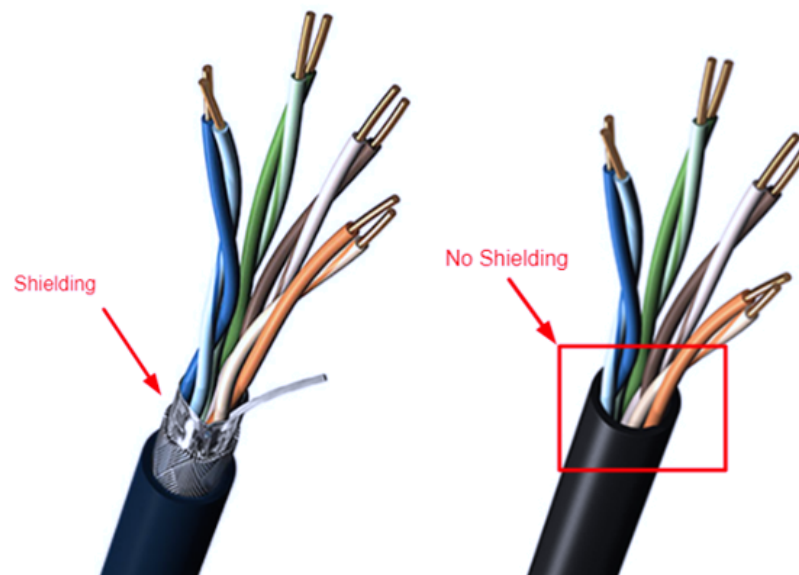
MODE OF TRANSMISSION OR COMPUTER NETWORKING MEDIA:

Networking Medium is the means through which send data from one place to another over the computer network. Networking Media can be classified into two major forms; Conducted/Guided media and Wireless/Unguided media. Conducted/Guided media do use a conductor such as a wire or fiber-optic cable to move the signal from sender to the receiver. Wireless/Unguided media use radio waves of different frequencies and do need a wire or cable in order to transmit signals. But, before choosing a suitable networking media we have to consider a number of design factors; Bandwidth, Transmission Impairments, Interference, Number of receivers, and, Cost and ease of installation. The following are different types of Guided Networking Media;

a) **Twisted Pair Wires**;
Consists of two insulated copper wires arranged in a regular spiral pattern to minimize the electromagnetic interference between the adjacent pairs. There are two types of Twisted Pair Wires, which are; Shielded Twisted Pair Wire - The pair is wrapped with metallic foil or braid to insulate the pair form electromagnetic interference, and, Unshielded Twisted Pair Wire - Each pair is insulated with plastic wrap, but the pair in encased n an outer covering. Despite being susceptible to interference, having attenuation problems, and relatively low bandwidth, Twisted Pair Wires are inexpensive and readily available, flexible and light weight, and easy to work with and install.

b) **Coaxial Cable (Coax);**
A computer networking medium, whose inner conductor is surrounded by a braided mesh. Common types of Coax are; Base band – A 50ohm coaxial cable that is used for digital transmission, and, Broad band – Uses analog transmission on standard cable television cabling. Coaxial cables have higher bandwidth transmission, can easily be trapped, and less susceptible to interference. On the other hand, Coaxial cable is too bulky and posses higher attenuation.
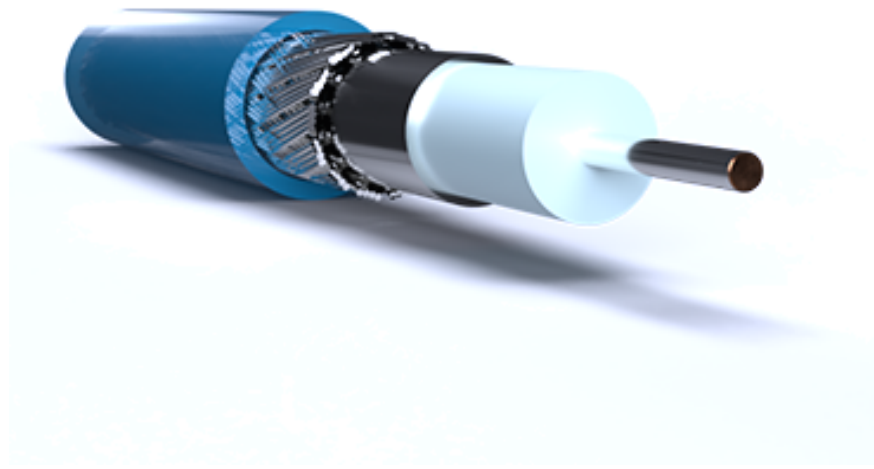
c) **Fiber-Optic Cable;**

Transmission medium that requires a light source with injection laser diode (ILD) or light emitting diode (LED), and consists of three concentric sections; Fiber core, Glass cladding and Plastic jacket. Singlemode and Multimode are the two common types of Fiber-optic cables. The most fundamental difference between the two, is as follows; Size of the fiber core, the associated attenuation, and bandwidth of the fiber. The basic thumb rule is that the smaller the core diameter, the higher the fiber's bandwidth and the lower the attenuation. Fiber-Optic have grater speed capacity (2Gbps), smaller size and lighter weight, lower attenuation, immunity to environmental interference, and are highly secure. On another side, Fiber-Optics are expensive over short distance, require highly skilled labour, and it's very difficult to add additional node.