Computer Networks

Lecture 16a

Sequence of Content

- **What is a Network?**
- **Networking Applications**
  The Internet, Telephone, GPS, Television and Radio Broadcasting, Wi-Fi and Bluetooth, Cellular Radio Transmissions
- **Network Characteristics**
  Topologies, Architectures, Size and Coverage Area
- **Communication Protocols and Networking Standards**
  TCP/IP, Ethernet, WiMAX, Cellular Standards, Wireless Standards
- **Networking Hardware**
  Network Adapters, Hubs, Switches and Routers

Networking Hardware

Hubs:

- A Hub is a hardware device that allow other devices to connect together to form a LAN.
- A hub transmits a received data packet to all devices on a network which often lead to network traffic.
- Hubs are not very secure, since data packets are sent to all devices on the network.
- Hubs create unnecessary traffic leading to reduce bandwidth.
- A Hub can not communicate beyond the LAN.

If PC1 wants to send a message to PC 3, the Hub will send it to all other computers instead of just to PC 3

Switches:

- A switch is a smart version of a hub, it stores the MAC addresses of all devices connected to its ports on a look-up table.
- A switch matches the MAC address of an incoming data packet to the destination device using a look-up table and sends it to the desired destination MAC address.
- Switches are more secure than hubs, and do not waste bandwidth as in hubs.
- Switches can not communicate beyond the LAN

A switch allows PC 1 to send data packets to just PC 3, by making use of the MAC address of destination PC

Port number	MAC address
1	a4-00-22-a4-fe-d1
2	0d-3e-4f-1a-22-00
3	33-11-ad-6f-f1-00
4	a4-00-22-b2-24-11
5	00-1c-b3-44-ff-02

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Networking Hardware

Comparison between Hubs and Switches:

| Hubs	Switches
▪ Used to connect devices in a LAN	▪ Use to connect devices in a LAN
▪ Can not communicate outside the LAN	▪ Can not communicate outside the LAN
▪ Uses data packets	▪ Uses data packets
▪ Sends data packets to all computers on network	▪ Sends data packets only to desired device
▪ No look-up table used during data transfer	▪ Uses a look-up table to match the destination address
▪ No MAC address used during transfer	▪ Use MAC address to identify destination device

Networking Hardware

Bridges:

- Bridges are network devices used to connect two LANS together that use the same communication protocols (rules).

- They are also used to connect different parts of a LAN for them to function as a single LAN.
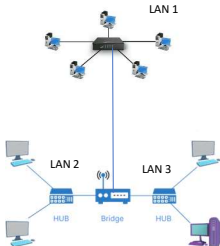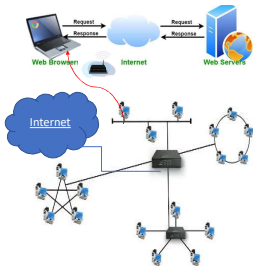
Networking Hardware

Routers:

- Routers are used to join LANs to the internet.
- Each router has its own IP address which enables it to send/receive data packets between different networks devices based on their IP addresses.
- Routers use a routing table to store the IP addresses of all devices in their network and connected on the networks.
- When a router receives a data packet, it inspects it to determine the destination IP address.
- The data packet is either sent to its local hub/switch or transmitted to another network till it reaches the correct destination.
- The router makes use of the routing table containing addresses of all devices on the network to route data packets from device to device in a network.
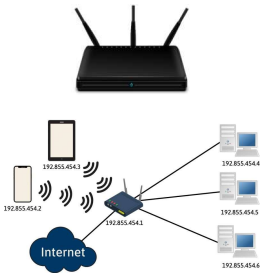
Routers:

- Every device connected to the internet has an assigned IP address.
- Web pages have unique IP addresses and domain names.
- Web pages are stored on web servers.
- Routers only store IP addresses of the devices, the MAC addresses are stored by the switches on the local network.
- Routers send received data packets to a switch/hub on the local network which then redirect them to the destination device (s).

Networking Hardware

Comparison between bridges and routers:

Bridge	Router
▪ Transfers data packets	▪ Transfers data packets
▪ Connects two or more LANs together	▪ Connects a network to the internet
▪ Scans and Uses a devices MAC address	▪ Scans and uses devices IP address
▪ No routing table use	▪ Uses a routing table to find direct data to the right device
▪ Connects networks that use the same protocols	▪ Connects networks with different protocols

Thank You!