

Networking and Internet

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Network Fundamentals

- Network Classifications:
 - Personal area network (PAN)
Less than a few meters (e.g. wireless headset and smartphone, wireless mouse and PC)
 - Local area network (LAN)
Collection of computers in a single building complex (e.g. Computers on university campus)
 - Metropolitan area network (MAN)
Interconnect users with computer resources in a geographic area or region (designed for a town or city)
 - Wide area network (WAN)
Machines over a greater distance (e.g. Opposite sides of the world)

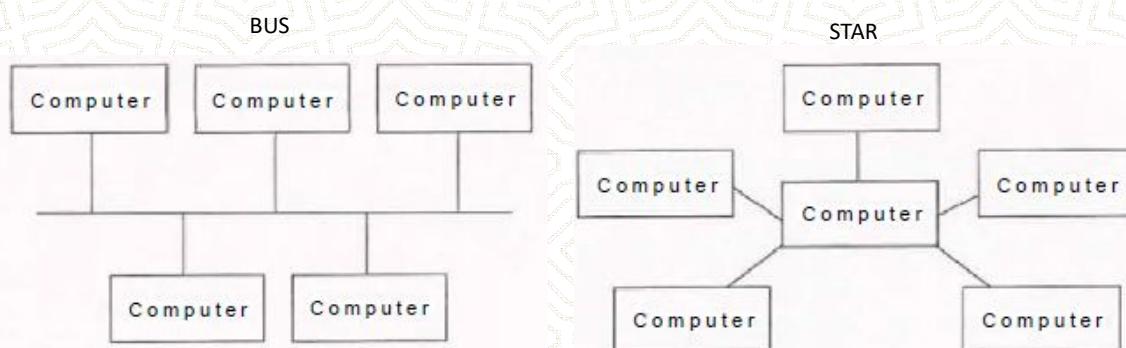
Network Fundamentals

- Network Classifications:
 - Open Network
 - Network's internal operation is based on designs that are in the public domain
 - Closed (Proprietary) Network
 - Controlled by a particular entity



Network Fundamentals

- Network classifications:
 - Based on the topology of the network



BUS TOPOLOGY

- Connects networking components along a single cable or that uses a series of cable segments that are connected linearly
- Cheapest way of connecting computers to form a workgroup or departmental LAN
- Single loose connection or cable break can bring down the entire LAN.
- Difficult to identify the problem if the entire network shuts down.
- Not meant to be used as a stand-alone solution in a large building.



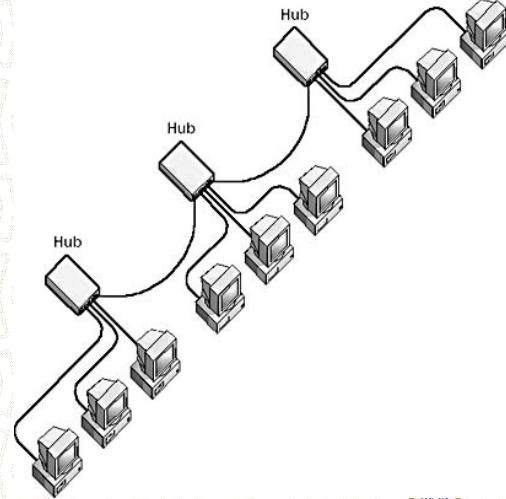
STAR TOPOLOGY

- Components are connected by individual cables to a central unit, usually a hub.
- Failure of a single computer or cable doesn't bring down the entire LAN.
- Easy to install and wire.
- No disruptions to the network when connecting or removing devices.
- Easy to detect faults and to remove parts.
- If the hub, switch, or concentrator fails, nodes attached are disabled.
- Slightly more expensive than linear bus topologies because of the cost of the hubs, etc.



STAR BUS TOPOLOGY

- Combination of a star and a bus topology.
- Hubs for workgroups or departmental local area networks (LANs) are connected by using a network bus to form a single network.
- Failure of one computer will not affect the rest of the network because the other nodes can still communicate.



NETWORK DEVICES

- Connecting existing networks to form an extended communication system
 - Repeaters
 - Hubs
 - Bridges
 - Switches
 - Routers

REPEATERS

- Enables the data signals to travel further
- Passes the signals back and forth between two buses
- Does not allow for the joining of two different types of network
- Do not translate or filter signals



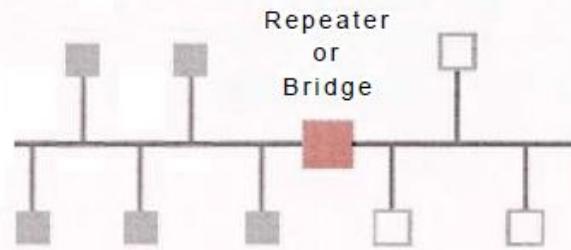
HUBS

- Very similar to repeaters (Multiport repeater)
- Any electrical signal that comes into one port, goes out all other ports



BRIDGES

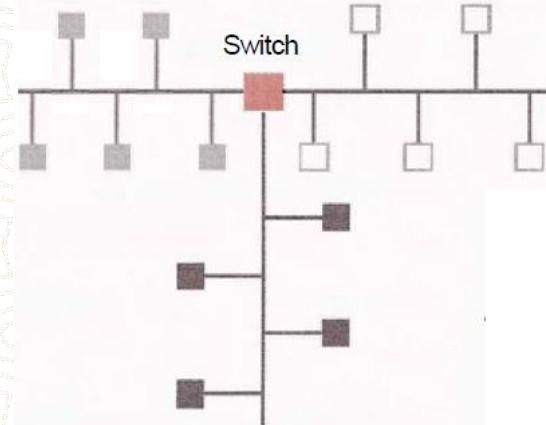
- Connects two buses, but not pass all messages across the connection
- Looks the destination address (MAC address) and forwards a message across the connection only when the destination is a computer on the other side



- Two machines residing on the same side of a bridge can exchange messages without interfering with the communication taking place on the other side

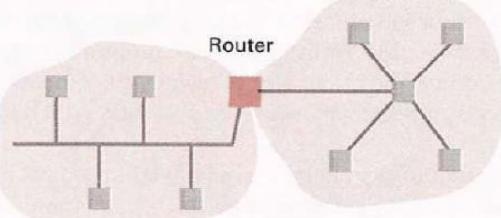
SWITCHES

- A bridge with a multiple connections
- Allowing connect several buses rather than just two



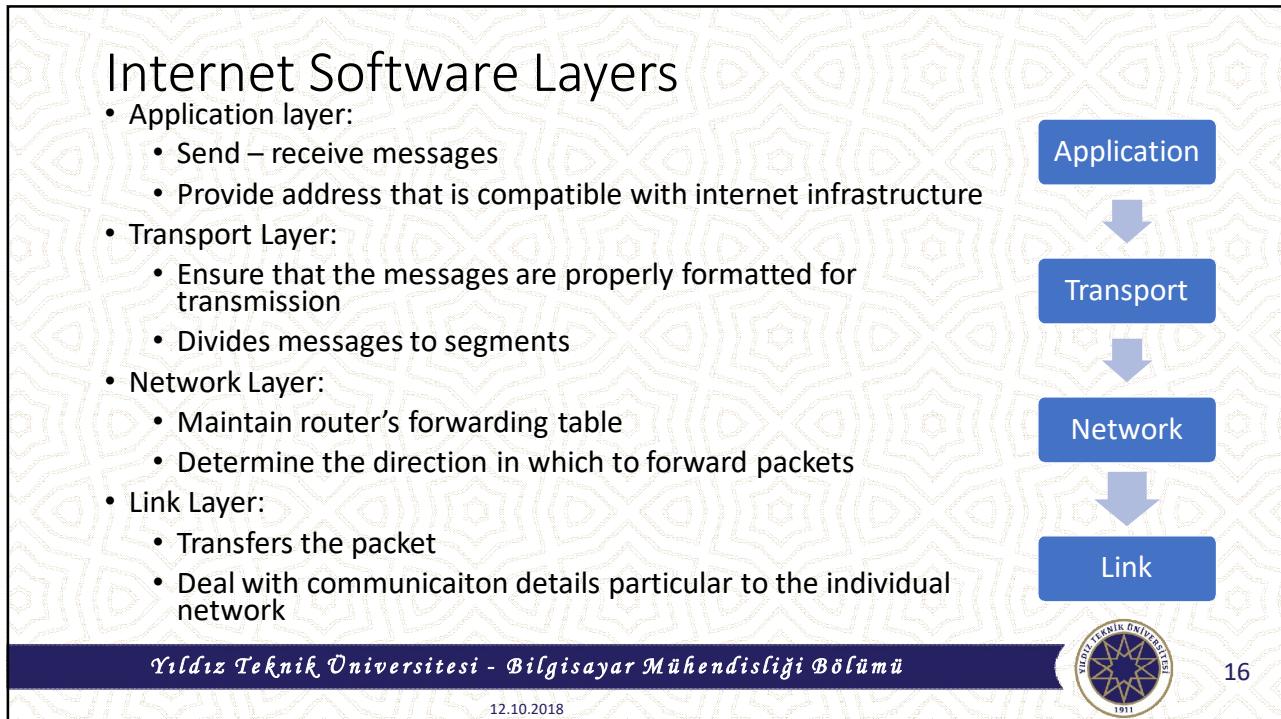
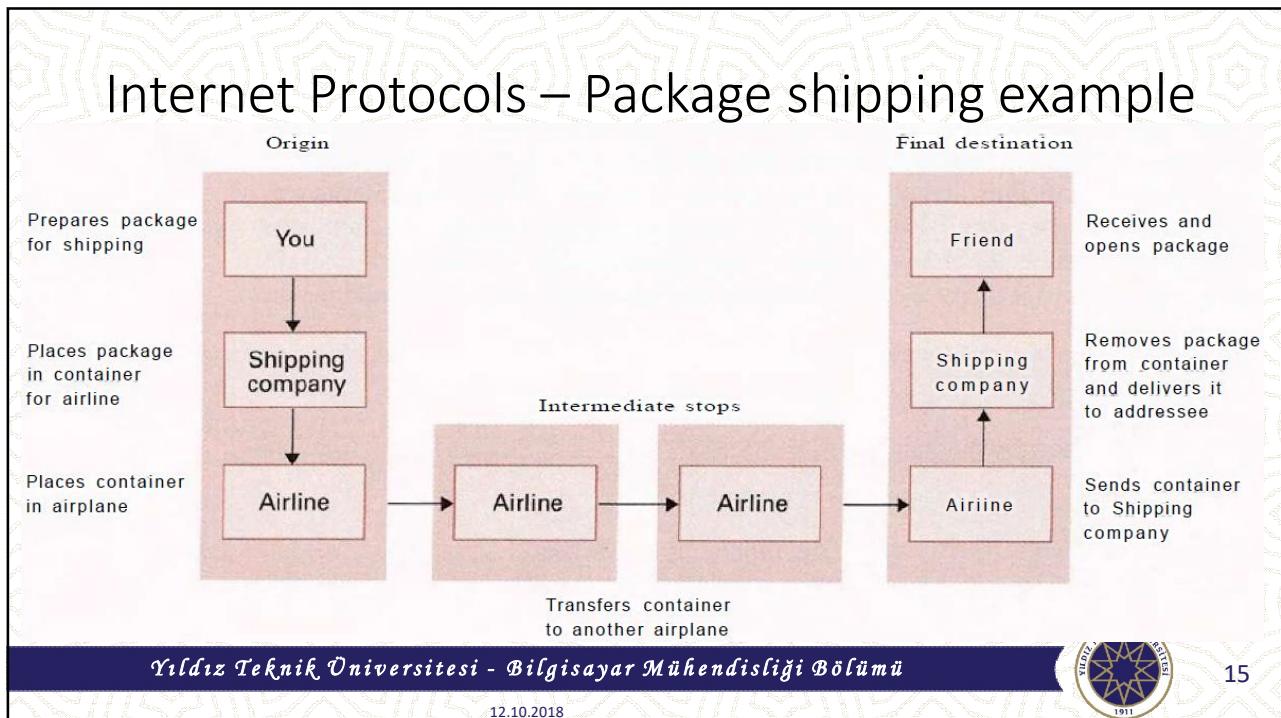
ROUTER

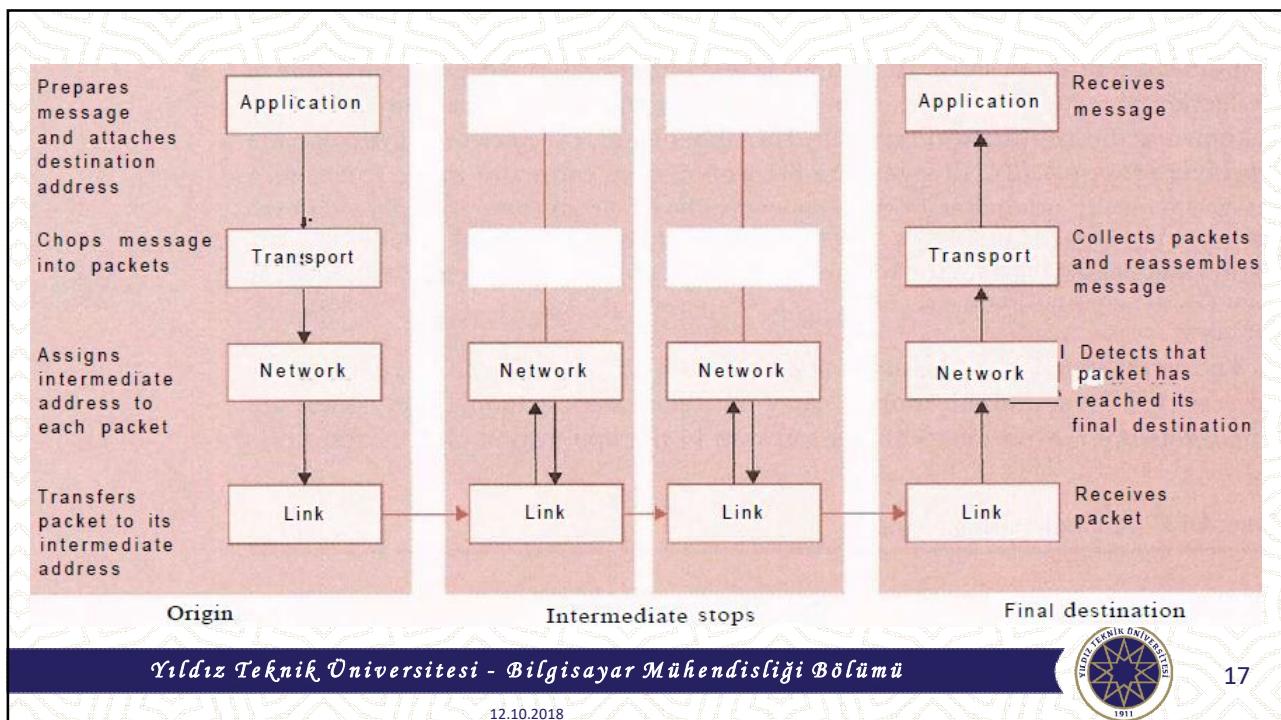
- When networks are connected via repeaters, bridges and switches, the result is a single large network
- If networks to be connected have incompatible characteristics (Wifi network and Ethernet network) we use Routers
- Routers are special purpose computers used for forwarding messages
- Provide link between networks while allowing each network to maintain its internal characteristics



Internet Protocols

- Protocols are rules and procedures for communicating.
- Principle task of networking software is to provide the infrastructure required for transferring messages from one machine to another





OSI Model

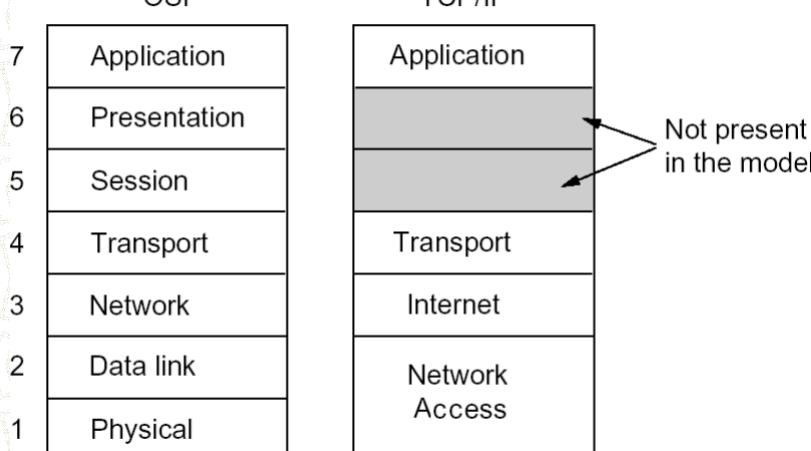
- Demand for open networks has generated a need for published standards
- International Organization for Standardization (ISO) produce Open System Interconnection (OSI) reference model
- Seven – level hierarchy

TCP /IP Model

- TCP/IP is not a single networking protocol – it is a suite of protocols
- Named by the two most important protocols or layers within it – TCP (***Transmission Control Protocol***) and IP (***Internet Protocol***).
- Nearly all computers today support TCP/IP.
- TCP/IP also is a layered protocol but does not use all of the OSI layers, though the layers are equivalent in operation and function



OSI vs TCP/IP Model



TCP/IP Model

