

Canterbury Institute of Management



MBIS404 Networks and Communications

Tutorial - Week 3

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Combining Wired and Wireless Networks

The client device must be equipped with at least one of each type of **Network Interface Cards (NIC)** for wired and wireless connections. Once the device drivers are properly configured, networks must be configured with **Wireless Access Point, Router, Switch**. Then the router must be configured with routing tables to enable communications between intranet and internet if applicable. The switch will act as a gateway for wired connections and access point will be a gateway for wireless connections. Once the physical layer is configured, application layer must also be configured according to make sure redundant connectivity is utilized as intended, for example fall back to wireless mode if physical connections fail.

Switch *versus* Hubs

A hub functions as a dead broadcaster, where all data packets are broadcast to connected peers. This means that the NICs of peer devices will continue to receive data packets intended for different destinations perhaps even data packets bound to external networks.

Whereas a switch would keep a track of the identity of the connected peers through Internet Protocol *IP* addresses and their Media Access Control *MAC* addresses. This enables the switch to intelligently decide what data packets needs to be forwarded to which peer or subnet, in turn reducing data transmissions through the network leading to better bandwidth for all peers that are connected to the switch.

Functions of a Router

The main function of a router is to direct data packets between networks. Router act as a gateway between network of networks this means that a router

can take up multiple roles depending on how it is configured within the network in question. For example, a router can double itself as a Dynamic Host Configuration Protocol *DHCP* server in charge of assigning IP addresses for the peers connecting to the network. As both inbound and outbound traffic must pass through a router, it can also take the role of a firewall controlling who can access what however there are dedicated hardware routers built for enhance the security.

Data Transmission - Hubs & Switches

As per the explanation of (Shaw, 2022), *Hubs function in Layer 1 - Physical Layer of the Open System Interconnection OSI model for networks, Whereas a switch operates in the Layer 2 - Data Link Layer.*

Hubs

As the name suggests, physical layer is tangible connections between device nodes therefore a hub would electronically establish connection between peers and all the signal that are directed towards a hub will be broadcast to connected nodes this means the network will be full of transmissions that are only in value for a particular node.

The scenario apparently creates collisions as multiple nodes try to transmit and receive at the same time making the entire system half-duplex *either transmit or receive but not both at the same time* greatly reducing available bandwidth or rate of data transfer for all the nodes.

Switches

A switch is functioning on Layer 2 meaning its functions are one step advanced than merely providing physical connectivity. It can understand and decide what data packets are to be directed at what nodes greatly improving collision scenarios compared to hubs. This also means each node get to both transmit and receive at the same time resulting a full duplex network with improved bandwidth.

References

Shaw, K. (2022). The osi model explained and how to easily remember its 7 layers: A tutorial on the open systems interconnection networking reference model and tips on and how to memorize the seven layers. *Network World (Online)*. <https://www.proquest.com/trade-journals/osi-model-explained-how-easily-remember-7-layers/docview/2639060995/se-2>