# COMS3200 Study Notes

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## 1 Internet?

- Collection of billions of connected devices.
- Connected via `communication links` such as fiber, copper, radio and satellites.
- Controlled by `packet switches` such as routers and switches.
- Standardized by `protocols` such as TCP, IP, HTTP, Skype, 802.11
- Standards are made by organizations such as `RFC: Request for comments and IETF: Internet Engineering Task Force`

> Actually a network of networks (ISPs connected together)

## 2 Protocol?

`Protocols` define a guide for messages (packets) sent and received between network entities by defining the:

- `format` of messages
- `order` of messages
- `actions` taken when messages are transmitted or received

## 3 Network Edge/Core

`Network Edges` are host devices i.e. client machines or servers.
`Network Cores` are interconnected routers.

> `Frequency division multiplexing`: different channels transmitted in different frequency bands

## 4 Application Layer

The Application Layer provides the interface between the end-user and network communication.
Implementation aspects of network protocols

- transport-layer service models
- client-server paradigm

# 5 Network Applications

Network applications run on `different end systems` (network edges) and `communicate over the network.`

Network applications **do not** run on network cores.

Network applications allow for `rapid app development and propagation.`

# 6 Network Architectures

- Client-server
- Peer-to-peer (P2P)

> `Client-server Architecture` is the classical architecture consisting of communication between `multiple clients` and a `singular server.`
> The server is `always-on` with a `fixed address` that `can be scaled` to multiple devices.
> Clients communicate with directly with the server and `do not need to be always on or have a fixed address.` Clients `do not communicate with each other.`

> `Peer-to-peer Architecture` is a form of network communication where clients (now peers) do not connect to an always-on server and instead `communicate directly with each other.`
> Peers request service from other peer and provide service in return to other peers. Think torrents.
> Peers are `intermittently connected and can change addresses.`

# 7 Processes

A `Process` is a program running within a host.

Inter-process communication is two processes communicating on the same host.

Messages are exchanged by processes communicating on different hosts.

> **Client process:** initiates communcation
> **Server process:** waits for communcation from clients

> `P2P Applications have both client and server processes`

# 8 Sockets

Processes send and receive messages to and from sockets.

`Sockets` are connections between host devices.

# 9 Addressing Processes

Processes require `identifiers` so that messages can be sent back to the correct process.

Each `host` has a `32-bit IP address.`

A host can have `multiple processes` so IP addresses are combined with `port numbers` as `identifiers.`