Dynamic routing Protocols:

Interior Gateway Protocols (used within an autonomous system):

- Distance Vector Routing Protocol:
    - Routing Information protocol (RIP):
    - Enhanced Interior gateway routing protocol (EIGRP)
- Link state routing protocol:
    - Open Shortest Path First (OSPF)

Exterior Gateway Protocols (used between two autonomous system)

- Border Gateway Protocol (BGP)

Link state routing protocol- Open shortest path first/intermediate system to intermediate system:

- Allows for routers to be grouped into areas for: scalability and to increase performance
- Updates are triggered when network topology changes
- Less bandwidth use because of no periodic update (think opposite of Distance vector where broadcasted periodically)
- Uses **cost** mainly + speed as **routing metric** to make decision on routing

OSPF Operation/Process:

- Router forms **neighbour adjacencies** with neighbouring routers
- **Link state advertisements** is flooded to neighbouring routers
- **Link state database** in router stores the information received from link state advertisements
- Use dijkstra's algorithm to determine best route
- Install best route in **routing table**

Neighbour adjacencies operation/Process:

- Routers with OSPF configured **send** hello packets on all interfaces involved in OSPF (think lab and how we set up router table with network [interface IP] involved with OSPF path)
- Routers that is running OSPF **receives** the hello packet on OSPF enabled interface will form neighbour adjacencies
- Therefore, routing updates will only be sent to links where neighbour adjacencies exist

- If router doesn't receive hello packet for some time then link is assumed failed and neighbour adjacencies formed will be broken

        - Trigger updates to notify other routers of changes

Link state advertisements:

- Contain info about subnet, router and other network information

Link state database:

- Contains a list of all LSA that the router received
- A representation of the network topology known by OSPF
- Used to calculate the best route to each destination using SPF algorithm
- Best route install in routing table
    - Show ospf route (Lab)

Network statements:

- Network [] 0.0.0.0 area
- Specify which interfaces which interfaces will be involved in routing process

ADD OSPS COST (MATHS)

OSPF Areas:

- Networks are broken down into areas which are semi-independent routing domains.
    - Each area maintains a link state database
    - The Link state advertisements are contained within their area to save bandwidth and make scalable
- The general structure of OSPF network is it contains-
    - Backbone area (Area 0) or transit area
    - Area border router: summarises the link state advertisements for both areas so that they are connected to and propagate these summaries to opposite area

Exterior gateway protocol- Border Gateway Protocol:

- Allows routing between autonomous systems and manage large number of routers
- Can be used internally (usually for large networks) and uses TCP
- A path vector protocol that has two message types announcement and withdrawals
- Uses **policy based routing** not metric (Think not interior gateway protocol)

***Policy based routing: (not a point)**

- Allows border gateway protocol to manipulate path attributes such as: next hop, weight and local preference but these attributes are usually based on organisation polices and agreements
- Routers will exchange these attributes as part of BGP router updates

MIGHT NOT NEED TO KNOW EXAM

Peering: **MIGHT NOT NEED TO KNOW except definition

- Exchange of traffic between two ISP without cost.
- Usually mutually beneficial for both providers or else use **transit**
- Connection between services providers occur at an **internet exchange point**

Transit: Pay another ISP to carry traffic to another network if peering doesn't work. (Think at the internet exchange point the exchange may be free: if there is mutually benefit between ISP or may cost money.) **

Internet exchange point:

- Connection point between two or more ISP facilitates peering to interconnect their technologies
- Usually house in data centres (colocation facilities)
- Can be non-profit government run

Point of Presence:

- Is a facility owned by telecommunication carrier and it is the point at which isp deploy equipment to connect customers to their network (think meet me room)
- Larger ISP often maintain large networks of point of presences

https://www.youtube.com/watch?v=TKNQ1lgguM8 **watch internet exchange points General process Data broken down into packets→ they meet at internet exchange point = Transit or peering

Service provider's tiers:

- Tier 1: Internet backbone:
  - Usually large network providers own their or network that connect to other tier 1 providers
  - May or may not be retail providers
  - EG: AT&T and Telstra
- Tier 2: National providers:
  - Purchase capacity and routing services and bandwidth from tier 1 providers
  - **Peer** with other tier 2 providers (and some tier 1)

    - Operate on national level with **point of presence**
    - EG: Comcast, TPG??
- Tier 3: Local providers
    - Usually have no infrastructure of their own purchase capacity and routing services from higher tier providers
    - Operate in a small geographical region
    - EG: dodo, iinet (nbn resellers)

Contention distribution network:

- Geographically distributed networks of servers specifically designed to deliver content to end users. (Think network to deliver videos, files, audio)
- Each server in the network holds a copy of hosted content to ensure users are served by their nearest server in order to
    - Minimise delay to end users
    - Reduce transit cost (Above definition)
    - Reduce load on original content server (and to provide redundancy)

***Approaches of Content distribution network:**

- **Http Redirect Server:**
    - Users sends Get server request → Main server redirects user browser to local cache server
    - Advantages: Server selection is based on client IP
    - Disadvantages: Additional TCP handshake, and a lot of overhead because all devices will access it.
- **DNS based server selection:**
    - User requests cdn.site.com
    - Dns request will reach authoritative DNS server of CDN provider
    - Authoritative DNS server will reply with IP of CDN cache server closest to user
    - Advantage: No added overhead, response cached after request (so no need to calculate)
    - Disadvantages: DNS caching increases update, Based on IP address of ISP dns
- **Anycast routing server selection:**
    - Packets will be routed to closest server based on BGP routing info
    - Advantage: no dependency on DNS or tcp
    - Disadvantages: complex implementation (requires multiple peers and consistent transit providers)

**Exterior vs Interior gateway routing

**BGP vs Interior gateway protocols

**Maybe add net neutrality