內部訓練 Day 2

Outline

- Routing Protocol
  - RIP
  - OSPF
  - EIGRP
- NAT/PAT
- CDP

Routing Information Protocol

Routing

▶ Layer 3

▶ 封包從一個網段轉發到另一個網段

    ▶ 140.123.239.0/24 轉發到 140.123.241.0/24

▶ Routing Table

    ▶ # show ip route

▶ Default Route

    ▶ 如果遇到不知道怎麼處理的封包，就往該方向前進

Static Route

▶ 手動告訴 Router 如何轉發封包

▶ (config)# ip route 0.0.0.0 0.0.0.0 DEFAULT_GATEWAY

▶ (config)# ip route 0.0.0.0 0.0.0.0 FastEthernet 0/1

　　▶ 此設定會掃描所有可能的對點

▶ 直連網段自動會加入(Directly connect network)

▶ 如遇到Topology改變必須手動切換

▶ 較不浪費資源

▶ 順位較高

Dynamic Route

- Routing Protocol
  - 路由器間的語言
  - 學習並維護 Routing Update (Up-to-date)
  - 可得知其他Router的位置(IP)與狀態(Up/Down)
- Routing Protocol 的預設順位 (Administrative Distance，AD值)
  - Directly connect   =>   0
  - Static route   =>   1
  - RIP   =>   120
  - OSPF   =>   110
  - Internal Eigrp   =>   90
  - External EIGRP   =>   170

Routing Information Protocol

▶ Distance Vector (路徑向量式)

　▶ 周期性把自己的Routing Table更新給鄰居

　▶ 當週期間有路徑變更，須等待下個更新時間才能送出

　　▶ 也就是越遠的會越晚知道 (Ex. 30s , 10 Router)

　▶ Path Cost 會累加

▶ 路徑好壞計算方式：Hop

　▶ 經過Router數量

▶ 最多15個點，超過則學習不到

Routing Information Protocol

▶ Routing Loops
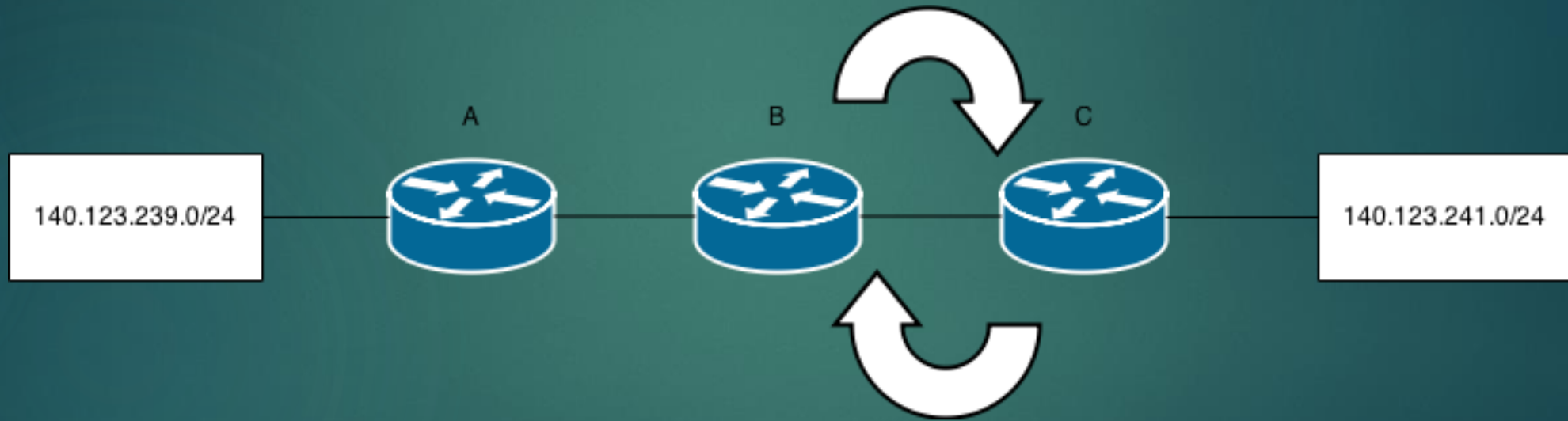
Routing Information Protocol

- 避免方法：
  - Split Horizon
    - 不能對路徑來源處返回路徑
  - Routing Poisoning && Poison Reverse
    - Hop Count 設定為16 往其他地方丟
    - 其他路由器收到Hop 變為16，會回傳Possibly Down (忽略Split Horizon)
  - Hold-down timers
    - 不會馬上標記下線，等待180秒後才會真正移除路由
    - 期間還是會幫忙轉發
  - Triggered update
    - 路由一但變更即傳送資料

Routing Information Protocol

- Version 1
  - Classful
  - Broadcast

- Version 2
  - Classless
  - Multicast (224.0.0.9)
  - Auto-summary

Routing Informantion Protocol

- (config)# router rip
- (config-router)# version 2
- (config-router)# network 140.123.239.0
- (config-router)# network 10.123.239.0
- (config-router)# no auto-summary

- # show ip protocol
- # show ip route
- # show ip rip database
- # show ip rip database NETWORK NETMASK

Open Shortest Path First

Link-State Routing Protocol

- 會計算整個網路拓璞(Topology)
- OSPF、IS-IS

Open Shortest Path First

- Dijkstra Algorithm
- 步驟：
  - 交換LSA封包
  - 依據收到的資料，各自計算出以自己為root的tree
- Multicast 224.0.0.5 (10秒)
- 收到後存放40秒
- 可設定Authentication

OSPF Path Cost

▶ Path Cost =
$$\frac{10^8 (\ Default\ Value\ )}{Bandwidth}$$

▶ 調整 Reference Bandwidth

  ▶ (config-router)# auto-cost reference-bandwidth 10240

  ▶ 單位 Mbit

OSPF Hierarchical Routing

- 階層式架構
- Area 0 必須要有
- 其他Area 只能直接接Area 0
- 其他Area 透過Area 0 做Routing
- 通常用於中型到大型企業
- 會進行Auto Summary

Area0
Backbone Area

ABR
Area Board Router

ABR
Area Border Router

Area1

Area2
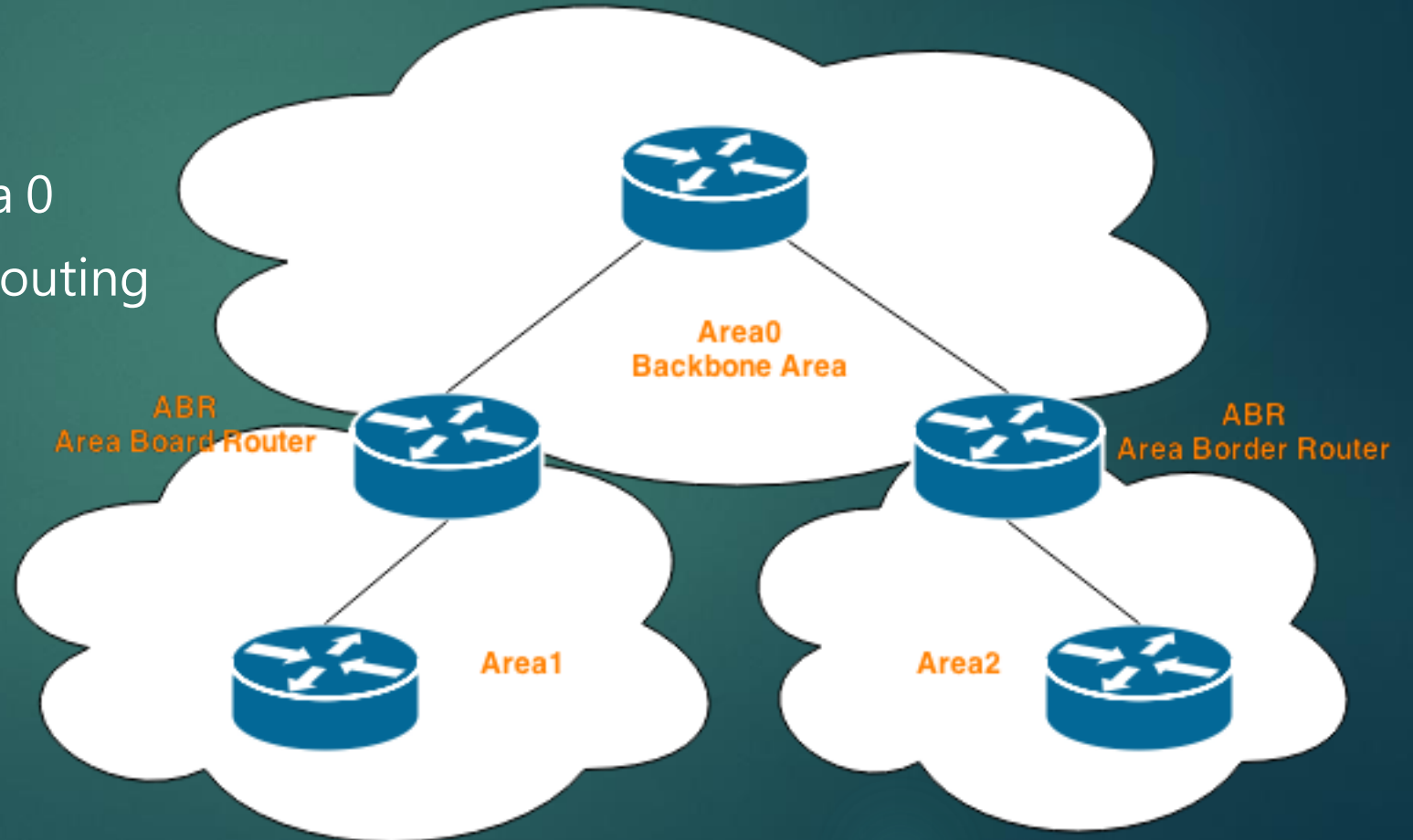
OSPF Adjancencies

- 建立鄰居關係
  - 相同
    - Hello & Dead time Interval
    - Area ID
    - Authentication
    - Stub area flag (will not mention)
    - Subnet

Open Shortest Path First

- (config)# router ospf NUMBER
  - NUMBER 1~65535 隨便一個皆可
- (config-router)# network 140.123.239.0 0.0.0.255 area 0
- (config-router)# network 10.123.239.0 0.0.0.255 area 0

- Router# show ip protocol
- Router# show ip ospf [NUM]
- Router# show ip ospf neighbor
- Router# show ip ospf interface [INTERFACE]

Router ID

- OSPF 中識別 Router 的名稱
- 手動設定 > 最大的 loopback interface IP > 最大的實體 interface IP
- (config-router)# router-id 1.1.1.1
- Or
- (config)# interface loopback 0
- (config-if)# ip addr 192.168.1.253 255.255.255.0
- 設定 loopback 的好處：
  - 可讓遠端連線
  - 可用來模擬網段

DR & BDR Elect

- DR (Designated Router)
  - 發送路徑資訊給此網段其他Router (LSAs)
- BDR (Backup DR)
- DR Other
  - 當同一Area中的Topology發生改變，只會將訊息傳給DR

- 選擇DR
  - OSPF interface Priority (比大者，如設為0則表示放棄競選)
  - Router-id (比大)

DEMO

EIGRP

EIGRP 特點

- Cisco only
- Diffusing Update Algorithm (DUAL)
- 快速收斂
- Load Balancing (支持 equal or unequal cost path)
- Multicast and unicast (沒有broadcast)
  - Multicast addr. ： 224.0.0.10
- 可自由summarization

- 以上廣告詞.......

EIGRP Table

- EIGRP Neighbor Table
  - 紀錄直連的鄰居
- EIGRP Topology Table
  - 紀錄從其他Router學到的完整資訊
- Routing table
  - 實際運作中的路由

EIGRP Path Calculation (1)

► Advertised Distance

    ► 鄰居通告他到目的地成本

► Feasible Distance

    ► 自己到鄰居 + 鄰居的AD

    ► = 自己到目的地的總成本

► 計算方式

    ► 利用K value (Default K1=1 ,K2=0 ,K3=1 ,K4=0 ,K5=0)

    ► (config-router)#metric weights 0 2 3 1 0 1

    ► Metric = [(K1*Minimum Throughput + {K2*Minimum Throughput} / 256-Load) + (K3*Total Latency) + (K6*Extended Attributes)]* [K5/(K4 + Reliability)]
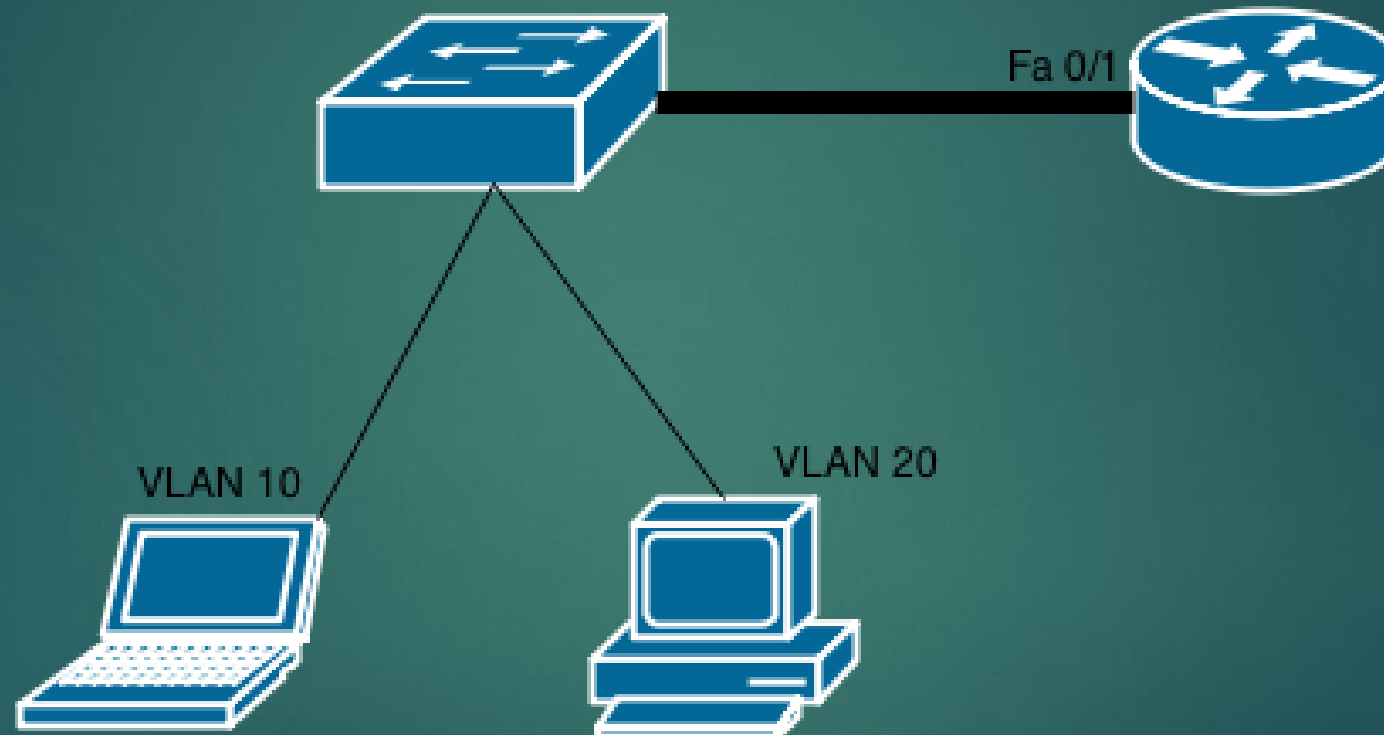
K1 = Bandwidth
K2 = Loading
K3 = Delay
K4 = Reliability
K5 = MTU

EIGRP Path Calculation (2)

- 得到 FD/AD 值後
  - 最小的FD　　　=>　　放入Topology Table & Routing Table (Successor)
    - 如果 FD 相同，則成為Equal-cost Load Balance (預設最多4條)
  - AD < 最小的FD　=>　　放入Topology Table 成為 Backup Path (Feasible Successor)
- 假如有設定大於一的 variance 值
  - 可以做Unequal-cost load-balance

中場休息

Inter VLAN Routing

Fa 0/1

VLAN 10

VLAN 20

Inter VLAN Routing

Router

- (config)# interface FastEthernet 0/1
  - no ip address
- (config)# interface FastEthernet 0/1.1
  - encapsulation dot1Q 1 native
  - ip addr 10.1.1.1 255.255.255.0
- (config)# interface FastEthernet 0/1.2
  - encapsulation dot1Q 10
  - ip address 10.2.2.1 255.255.255.0
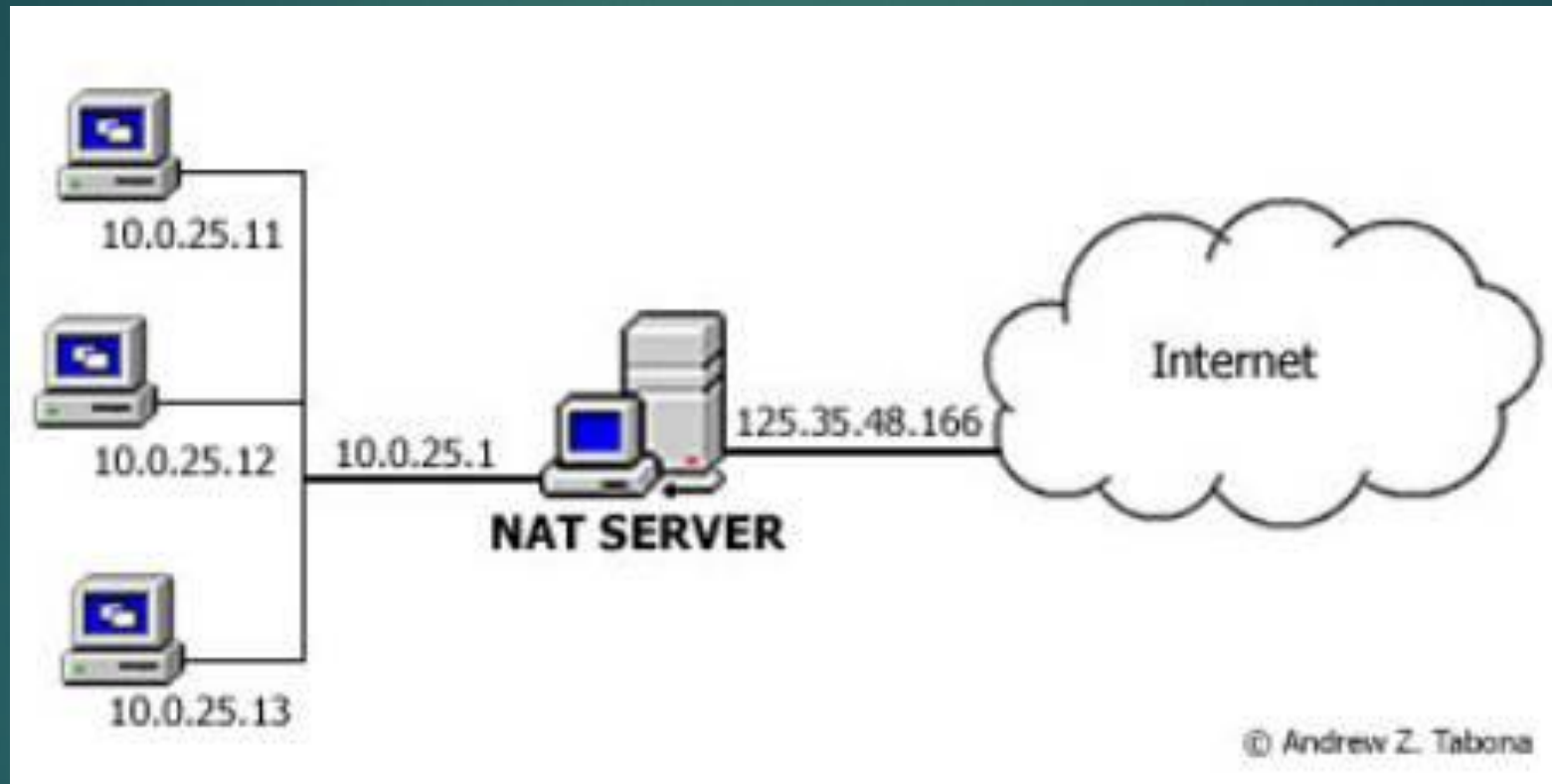
Switch

- (config)# interface FastEthernet 0/1
  - switchport mode trunk

Network Address Translation

- 網路地址轉換
- 暫緩IPv4不足問題

Network Address Translation

Network Address Translation

- IP對應關係
- Static NAT (one to one)
- Dyamic NAT (many to many)

- NAT overloading (Port Address Translation)

Network Address Translation

- Static NAT
- (config)# ip nat inside source static 10.123.239.1 140.123.239.1

- (config-if)# ip nat inside
  - 設定NAT內部網卡
- (config-if)# ip nat outside
  - 設定NAT外部網卡

- # show ip nat translations

Network Address Translation

- Dynamic NAT

- (config)# access-list 1 permit 10.123.239.0 0.0.0.255
- (config)# ip nat pool POOLNAME 140.123.239.230 140.123.239.239 netmask 255.255.255.0

- (config)# ip nat inside source list 1 pool POOLNAME overload
- (config-if)# ip nat inside
- (config-if)# ip nat outside

- # show ip nat translations

Port Address Translation

- 一般人說的NAT
- 包含Port Mapping

NAT PAT

- (config)# access-list 1 permit 10.123.239.0 0.0.0.255
- (config)# ip nat inside source list 1 interface gi0/2 overload

- (config-if)# ip nat inside
- (config-if)# ip nat outside

- # show ip nat translations

Cisco Discovery Protocol

Cisco Discovery Protocol

- Cisco Only
- Layer 2
- 看看相鄰 Cisco 設備有哪些、在哪個 port 上

- 啟動cdp
- (config)# cdp run

- 特定 port 不傳送 cdp 資訊
- (config-if)# no cdp enable

Cisco Discovery Protocol

- # show cdp

- # show cdp neighbors
- # show cdp neighbors detail

QAQ時間