16F - NET2000 - Intermediate Networking

Case Study

II. Implementation Analysis (IA)

By: Owen Yuen & Sinclair Dacombe
Lab Section: A2

Carleton University / Algonquin College
December 4th, 2016

1. Addressing requirements

1.1 Addressing for networks

Addressing for OTT_A
- 300 users with growth of 25% for a total of 375 users
    - IPv4 block 192.168.0.0 /23
    - IPv6 block 2001:FACE:BE50:1920::1/64

Addressing for OTT_B
- 120 users with growth of 25% for a total of 150 users
    - IPv4 block 192.168.2.0 /24
    - IPv6 block 2001:FACE:BE50:1922::1/64

1.2 Addressing for VLANs

- VLAN 5 (DMZ) requires 10 users with growth of 25% for a total of 13 users
    - DLS_A IPv4 address and block: 150.50.5.251 /28
    - DLS_B IPv4 address and block: 150.50.5.252 /28
    - ALS_1 IPv4 address and block: 150.50.5.253 /28
    - DLS_A IPv6 address and block: 2001:FACE:BE50:5::A1 /64
    - DLS_B IPv6 address and block: 2001:FACE:BE50:5::B1 /64
    - ALS_1 IPv6 address and block: 2001:FACE:BE50:5::C1 /64

- VLAN 10 (ADMIN) requires 20 users with growth of 25% for a total of 25 users
    - DLS_A IPv4 address and block: 150.50.10.251 /27
    - DLS_B IPv4 address and block: 150.50.10.252 /27
    - ALS_1 IPv4 address and block: 150.50.10.253 /27
    - DLS_A IPv6 address and block: 2001:FACE:BE50:10::A1 /64
    - DLS_B IPv6 address and block: 2001:FACE:BE50:10::B1 /64
    - ALS_1 IPv6 address and block: 2001:FACE:BE50:10::C1 /64

- VLAN 20 (SALES) requires 80 users with growth of 25% for a total of 100 users
    - DLS_A IPv4 address and block: 150.50.20.251 /25
    - DLS_B IPv4 address and block: 150.50.20.252 /25
    - ALS_1 IPv4 address and block: 150.50.20.253 /25
    - DLS_A IPv6 address and block: 2001:FACE:BE50:20::A1 /64
    - DLS_B IPv6 address and block: 2001:FACE:BE50:20::B1 /64
    - ALS_1 IPv6 address and block: 2001:FACE:BE50:20::C1 /64

- VLAN 30 (ACCT) requires 15 users with growth of 25% for a total of 19 users
    - DLS_A IPv4 address and block: 150.50.30.251 /27
    - DLS_B IPv4 address and block: 150.50.30.252 /27
    - ALS_1 IPv4 address and block: 150.50.30.253 /27
    - DLS_A IPv6 address and block: 2001:FACE:BE50:30::A1 /64
    - DLS_B IPv6 address and block: 2001:FACE:BE50:30::B1 /64
    - ALS_1 IPv6 address and block: 2001:FACE:BE50:30::C1 /64

1.3 Addressing for point-to-point links

- Between ISP and OTT_A
    - ISP S0/0/0
        - IPv4 address and block: 205.5.5.254 /24

- IPv6 address and block: 2001:FACE:BECA:205::254/ 64

  - OTT_A S0/0/0
    - IPv4 address and block: 205.5.5.50 /24
    - IPv6 address and block: 2001:FACE:BECA:205::50/ 64

- Between OTT_A and DLS_A
  - OTT_A G0/0
    - IPv4 address and block: 150.50.2.2 /30
    - IPv6 address and block: 2001:FACE:BE50:2::2/ 64
  - DLS_A F0/1
    - IPv4 address and block: 150.50.2.1 /30
    - IPv6 address and block: 2001:FACE:BE50:2::1/ 64

- Between DLS_A, DLS_B, and ALS_1
  - DLS_A PO10 (F0/3-6)
    - IPv4 address and block: 150.50.3.1 /30
    - IPv6 address and block: 2001:FACE:BE50:3::1/ 64
  - DLS_B PO10 (F0/3-6)
    - IPv4 address and block: 150.50.3.2 /30
    - IPv6 address and block: 2001:FACE:BE50:3::2/ 64
  - DLS_A PO1 (F0/7-10)
    - IPv4 address and block: 150.50.4.1 /30
    - IPv6 address and block: 2001:FACE:BE50:4::1/ 64
  - ALS_1 PO1 (F0/7-10)
    - IPv4 address and block: 150.50.4.2 /30
    - IPv6 address and block: 2001:FACE:BE50:4::2/ 64
  - DLS_B PO2 (F0/7-10)
    - IPv4 address and block: 150.50.6.1 /30
    - IPv6 address and block: 2001:FACE:BE50:6::1/ 64
  - ALS_1 PO2 (F0/7-10)
    - IPv4 address and block: 150.50.6.2 /30
    - IPv6 address and block: 2001:FACE:BE50:6::2/ 64

- Between DLS_B and OTT_B
  - DLS_B F0/1
    - IPv4 address and block: 150.50.7.1 /30
    - IPv6 address and block: 2001:FACE:BE50:7::1/ 64
  - OTT_B G0/0
    - IPv4 address and block: 150.50.7.2 /30
    - IPv6 address and block: 2001:FACE:BE50:7::2/ 64

1.4 Addressing for loopbacks and end-device links

- For ISP
    - Loopback0
        - IPv4 address and block: 2.2.2.2/ 32
        - IPv6 address and block: 2001:FACE:BECA:2::2/ 128
- For DLS_A
    - Loopback0
        - IPv4 address and block: 22.2.2.2/ 32
        - IPv6 address and block: 2001:FACE:BECA:22::2/ 128
    - F0/2 to INTRA_WEB SERVER (in VLAN 5)

- For DLS_B
    - Loopback0
        - IPv4 address and block: 11.1.1.1 /32
        - IPv6 address and block: 2001:FACE:BECA:11::1/ 128
- For OTT_B
    - Loopback0
        - IPv4 address and block: 1.1.1.1 /32
        - IPv6 address and block: 2001:FACE:BECA:1::1/ 128

2. <u>Routing</u>

2.1 OSPFv3 in area 0

- Router ID
    - OTT_A in area 0
        - Router-id 1.1.1.1
    - OTT_B in area 0
        - Router-id 2.2.2.2
    - DLS_A in area 0
        - Router-id 3.3.3.3
    - DLS_B in area 0
        - Router-id 4.4.4.4
- Networks
    - OTT_A
        - Interface g0/0
            - Ipv6 ospf 1 area 0
        - Interface loop0

- - - ● Ipv6 ospf 1 area 0
    - ○ OTT_B
      - ■ Interface g0/0
        - ● Ipv6 ospf 1 area 0
      - ■ Interface loop0
        - ● Ipv6 ospf 1 area 0
    - ○ DLS_A
      - ■ Interface f0/1
        - ● Ipv6 ospf 1 area 0
      - ■ Interface loop0
        - ● Ipv6 ospf 1 area 0
      - ■ Interface vlan 100 (need to neighbour through area 0 in OSPFv3)
        - ● Ipv6 ospf 1 area 0
    - ○ DLS_B
      - ■ Interface f0/1
        - ● Ipv6 ospf 1 area 0
      - ■ Interface loop0
        - ● Ipv6 ospf 1 area 0
      - ■ Interface vlan 100
        - ● Ipv6 ospf 1 area 0
- ● Routing updates disabled on unnecessary interfaces using passive-interface
  - ○ OTT_A
    - ■ Passive-interface on g0/1
    - ■ Passive-interface on s0/0/0
  - ○ OTT_B
    - ■ Passive-interface on g0/1

- ● Routes must be summarized
  - ○ DLS_A
    - ■ Area 0 range 2001:FACE:BE50::/56
  - ○ DLS_B
    - ■ Area 0 range 2001:FACE:BE50::/56

- ● Hello timers modified for fast convergence
  - ○ OTT_A
    - ■ Interface g0/0
    - ■ Ip ospf hello-interval 1
    - ■ Ip ospf dead-interval 4

- - - DLS_A
      - Interface f0/1
      - Ip ospf hello-interval 1
      - Ip ospf dead-interval 4
    - OTT_B
      - Interface g0/0
      - Ip ospf hello-interval 1
      - Ip ospf dead-interval 4
    - DLS_B
      - Interface f0/1
      - Ip ospf hello-interval 1
      - Ip ospf dead-interval 4
- Bandwidth modified for correct metric calculation
  - OTT_A, OTT_B, DLS_A, DLS_B
    - Auto-cost reference bandwidth 10000
- Implement MD5 authentication in area 0
  - OTT_A
    - Interface g0/0
    - Ospfv3 authentication md5 0 cisco123
  - DLS_A
    - Interface f0/1
    - Ospfv3 authentication md5 0 cisco123
  - OTT_B
    - Interface g0/0
    - Ospfv3 authentication md5 0 cisco123
  - DLS_B
    - Interface f0/1
    - Ospfv3 authentication md5 0 cisco123
- Place DR in appropriate place
  - OTT_A to be DR
    - Priority 255

2.2 OSPFv3 in area 10
- Router ID
  - DLS_A in area 10
    - Router-id 3.3.3.3
  - DLS_B in area 10
    - Router-id 4.4.4.4
- Networks

- ○ DLS_A
    - ■ Interface vlan 5
        - ● Ipv6 ospf 1 area 10
    - ■ Interface vlan 10
        - ● Ipv6 ospf 1 area 10
    - ■ Interface vlan 20
        - ● Ipv6 ospf 1 area 10
    - ■ Interface vlan 30
        - ● Ipv6 ospf 1 area 10
    - ■ Interface vlan 99
        - ● Ipv6 ospf 1 area 10

- ○ DLS_B
    - ■ Interface vlan 5
        - ● Ipv6 ospf 1 area 10
    - ■ Interface vlan 10
        - ● Ipv6 ospf 1 area 10
    - ■ Interface vlan 20
        - ● Ipv6 ospf 1 area 10
    - ■ Interface vlan 30
        - ● Ipv6 ospf 1 area 10
    - ■ Interface vlan 99
        - ● Ipv6 ospf 1 area 10

- ● Routing updates disable on unnecessary interfaces using passive-interface
    - ○ DLS_A
        - ■ Passive-interface on f0/2 to intra_web server
- ● Routes must be summarized
    - ○ DLS_A
        - ■ Area 10 range 2001:FACE:BE50::/56
    - ○ DLS_B
        - ■ Area 10 range 2001:FACE:BE50::/56
- ● Hello timers modified for fast convergence
    - ○ DLS_A
        - ■ Interface PO10
            - ● Ip ospf hello-interval 1
            - ● Ip ospf dead-interval 4
        - ■ Interface PO1
            - ● Ip ospf hello-interval 1
            - ● Ip ospf dead-interval 4
    - ○ DLS_B

- - - ■ Interface PO10
      - Ip ospf hello-interval 1
      - Ip ospf dead-interval 4
    - ■ Interface PO2
      - Ip ospf hello-interval 1
      - Ip ospf dead-interval 4
  - Bandwidth modified for correct metric calculation
    - DLS_A, DLS_B
      - ■ Auto-cost reference bandwidth 10000
  - Implement MD5 on all interfaces in area 10

    - DLS_A
      - ■ Interface PO10
      - ■ Ospfv3 authentication md5 0 cisco123

    - DLS_B
      - ■ Interface PO10
      - ■ Ospfv3 authentication md5 0 cisco123
  - Place DR in appropriate place
    - DLS_A to be DR
      - ■ Priority 255

2.3 EIGRP for IPv4
  - Router ID in AS 20
    - OTT_A
      - ■ Eigrp router-id 1.1.1.1
    - OTT_B
      - ■ Eigrp router-id 2.2.2.2
    - DLS_A
      - ■ Eigrp router-id 3.3.3.3
    - DLS_B
      - ■ Eigrp router-id 4.4.4.4

  - Networks
    - OTT_A
      - ■ Network 150.50.2.2 0.0.0.0
      - ■ Network 192.168.0.0 0.0.1.255
      - ■ Network 205.5.5.50 0.0.0.255
    - OTT_B
      - ■ Network 150.50.7.2 0.0.0.0
      - ■ Network 192.168.2.1 0.0.0.0

- - - ■ Network 1.1.1.1 0.0.0.0
    - ○ DLS_A
      - ■ Network 150.50.0.0 0.0.127.255
      - ■ Network 150.50.2.1 0.0.0.0
      - ■ Network 22.2.2.2 0.0.0.0
    - ○ DLS_B
      - ■ Network 150.50.0.0 0.0.127.255
      - ■ Network 150.50.7.1 0.0.0.0
      - ■ Network 11.1.1.1 0.0.0.0

- ● Routing updates disable on unnecessary interfaces using passive-interface
    - ○ OTT_A
      - ■ Passive-interface on g0/1
    - ○ OTT_B
      - ■ Passive-interface on g0/1
    - ○ DLS_A
      - ■ Passive-interface on f0/2
- ● Routes must be summarized
    - ○ DLS_A
      - ■ Interface PO10
        - ● No auto-summary
        - ● Ip summary-address eigrp 20 150.50.0.0 255.255.0.0
      - ■ Interface f0/1
        - ● No auto-summary
        - ● Ip summary-address eigrp 20 150.50.0.0 255.255.0.0
    - ○ DLS_B
      - ■ Interface PO10
        - ● No auto-summary
        - ● Ip summary-address eigrp 20 150.50.0.0 255.255.0.0
      - ■ Interface f0/1
        - ● No auto-summary
        - ● Ip summary-address eigrp 20 150.50.0.0 255.255.0.0

2.4 Static and Default Routes
- ● ISP to OTT_A needs a default route:
    - ○ ISP
      - ■ Ip route 0.0.0.0 0.0.0.0 s0/0/0
      - ■ Ipv6 route ::/0 s0/0/0

- ● OTT_A to ISP needs a static route:

- ○ OTT_A
  - ■ Ip route 205.5.5.0 255.255.255.0 s0/0/0
  - ■ Redistribute static
  - ■ Ipv6 route 2001:FACE:BECA:205::/64 s0/0/0
  - ■ Redistribute static

2.5 DHCP

- DLS_A
  - ○ Ip dhcp pool VLAN_5
    - ■ Network 150.50.5.0 255.255.255.248
    - ■ Default-router 150.50.2.1
    - ■ Ip dhcp excluded-address 150.50.5.1 150.50.5.1
  - ○ Ip dhcp pool VLAN_10
    - ■ Network 150.50.10.0 255.255.255.240
    - ■ Default-router 150.50.2.1
    - ■ Ip dhcp excluded-address 150.50.10.1 150.50.10.2
  - ○ Ip dhcp pool VLAN_20
    - ■ Network 150.50.20.0 255.255.255.192
    - ■ Default-router 150.50.2.1
    - ■ Ip dhcp excluded-address 150.50.20.1 150.50.20.6
  - ○ Ip dhcp pool VLAN_30
    - ■ Network 150.50.30.0 255.255.255.240
    - ■ Default-router 150.50.2.1
    - ■ Ip dhcp excluded-address 150.50.30.1 150.50.30.2
  - ○ Ip dhcp pool VLAN_99
    - ■ Network 150.50.99.0 255.255.255.128
    - ■ Default-router 150.50.2.1
    - ■ Ip dhcp excluded-address 150.50.99.1 150.50.99.14
- DLS_B
  - ○ Ip dhcp pool VLAN_5
    - ■ Network 150.50.5.8 255.255.255.248
    - ■ Default-router 150.50.7.1
    - ■ Ip dhcp excluded-address 150.50.5.9 150.50.5.9
  - ○ Ip dhcp pool VLAN_10
    - ■ Network 150.50.10.16 255.255.255.240
    - ■ Default-router 150.50.7.1
    - ■ Ip dhcp excluded-address 150.50.10.17 150.50.10.18
  - ○ Ip dhcp pool VLAN_20
    - ■ Network 150.50.20.64 255.255.255.192
    - ■ Default-router 150.50.7.1
    - ■ Ip dhcp excluded-address 150.50.20.65 150.50.20.70

- - Ip dhcp pool VLAN_30
    - Network 150.50.30.16 255.255.255.240
    - Default-router 150.50.7.1
    - Ip dhcp excluded-address 150.50.30.17 150.50.30.18
  - Ip dhcp pool VLAN_99
    - Network 150.50.99.128 255.255.255.128
    - Default-router 150.50.7.1
    - Ip dhcp excluded-address 150.50.99.129 150.50.99.141
  - Ip dhcp pool OTT_B_OFF
    - Network 192.168.2.0 255.255.255.0
    - Default-router 150.50.7.1
    - Ip dhcp excluded-address 192.168.2.1 192.168.2.25
- Configure DHCP snooping and spoofing security
  - OTT_A
    - Ip dhcp snooping vlan 5,10,20,30,99
    - Interface G0/0
      - Ip dhcp snooping trust
  - OTT_B
    - Ip dhcp snooping vlan 5,10,20,30,99
    - Interface G0/0
      - Ip dhcp snooping trust
    - Interface G0/1
      - Ip dhcp snooping limit rate 255

2.6 FHRP

- Configure redundant gateway for every VLAN in IPv4
  - DLS_A VLANs will be configured as standby with priority 110
  - DLS_B VLANs will be configured as standby with priority 100
  - Virtual gateway for VLANs on DLS_A and DLS_B:
    - VLAN 5: 150.50.5.200
    - VLAN 10: 150.50.10.200
    - VLAN 20: 150.50.20.200
    - VLAN 30: 150.50.30.200
    - VLAN 99: 150.50.99.200
  - Configure standby preempt on DLS_A and DLS_B's PO10 interface
  - Configure standby track on DLS_A and DLS_B's PO10 interface

3. <u>Network Switching</u>

3.1 Etherchannels

- DLS A and DLS B connected to each other via Etherchannel Po10 using native vlan 666
  - Interface range f0/3-6
    - Channel-group 10 mode active
  - Interface Po10
    - Switchport trunk native vlan 666
    - Switchport trunk encapsulation dot1q
    - Switchport mode trunk
    - Switchport trunk allowed vlan 5,10,20,30,99
- DLS A and ALS 1 connected to each other via Etherchannel Po1 using native vlan 666
  - Interface range f0/7-10
    - Channel-group 10 mode active
  - Interface Po1
    - Switchport trunk native vlan 666
    - Switchport trunk encapsulation dot1q
    - Switchport mode trunk
    - Switchport trunk allowed vlan 5,10,20,30,99
- DLS B and ALS 1 connected to each other via Etherchannel Po2 using native vlan 666
  - Interface range f0/11-14
    - Channel-group 10 mode active
  - Interface Po2
    - Switchport trunk native vlan 666
    - Switchport trunk encapsulation dot1q
    - Switchport mode trunk
    - Switchport trunk allowed vlan 5,10,20,30,99

3.2 Configuring Switchports

- DLS_A
  - Interface F0/2
    - Switchport mode access
    - Switchport access vlan 5

- DLS_A
  - Interface range F0/11-24, G0/1-2
    - Switchport access vlan 999
    - Shut
- DLS_B
  - Interface range F0/2, F0/7-10, F0/15-24, G0/1-2
    - Switchport access vlan 999
    - Shut

- ALS_1
    - Interface range F0/3-6, F0/15-24, G0/1-2
        - Switchport access vlan 999
        - Shut

3.3 Configuring STP Security
- Configure BPDU guard and portfast on interfaces connecting to end devices
    - DLS_A
        - Interface F0/2
        - Spanning-tree portfast
        - Spanning-tree portfast bpdu-guard

3.4 Configuring Default Gateways for ALS_1's VLANs
- VLANs need to send traffic in the most balanced manner possible. Use Virtual Gateways for load balancing
    - ALS_1
        - Interface vlan 5
            - Ip default-gateway 150.50.5.200
        - Interface vlan 10
            - Ip default-gateway 150.50.10.200
        - Interface vlan 20
            - Ip default-gateway 150.50.20.200
        - Interface vlan 30
            - Ip default-gateway 150.50.30.200
        - Interface vlan 99
            - Ip default-gateway 150.50.99.200