Victory University Sydney

NIT2222 – ASSIGNMENT 2

Wide Area Network Technologies

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Table of Contents

Introduction

The purpose of this assignment is to assess and test the knowledge that we have attained through the past weeks. This report provides information about the computer network of a small retail business company, ABC Holdings Limited. The business has decided to shift from IPv4 to IPv6, however, only two of its offices, A and C, and their HQ will be moved first because of cost restrictions. The migration of Branch C will be implemented the following year. To execute, this change of network, the company has hired us. This report will show the address planning of the networks as well as the thorough steps to accomplishing this migration.

IPv4 and IPv6 Address Planning – IPv4 Routing Configuration

IPv4 network: 150.50.25.0/24
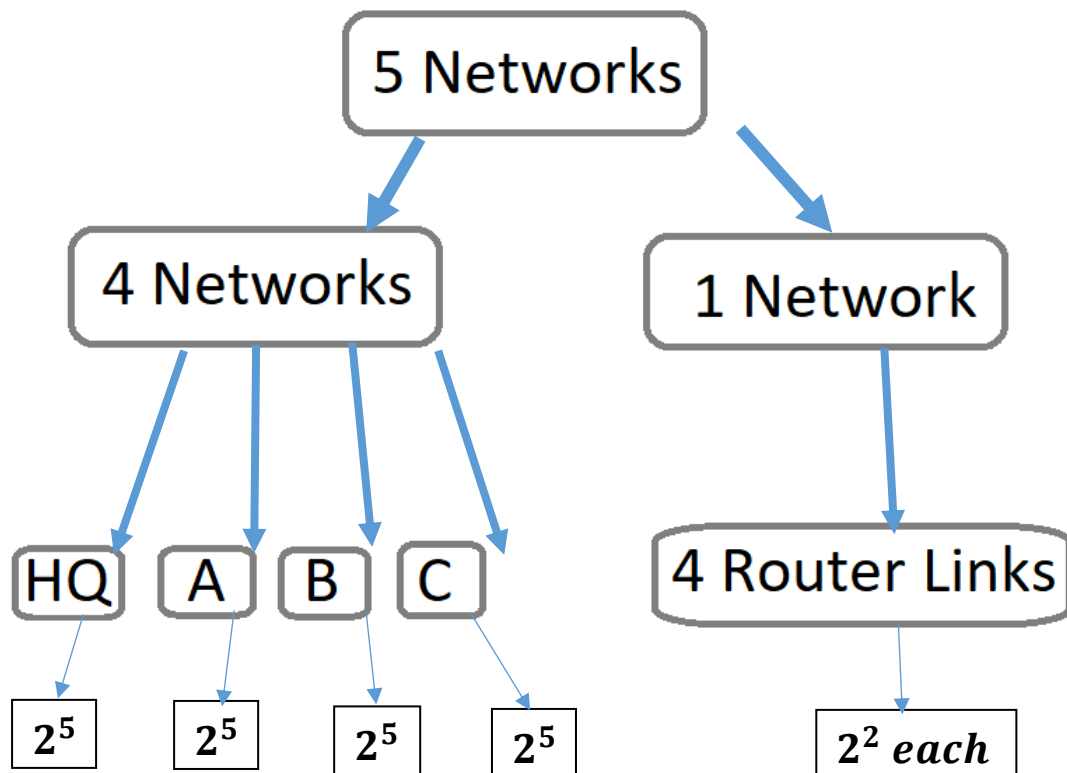
Branch	150.50.25.	xxx	xxxxx	IP Range - /24
HQ	150.50.25	000 000	00000 11111	150.50.25.0 – 150.50.25.31
A	150.50.25	001 001	00000 11111	150.50.25.32 – 150.50.25.63
B	150.50.25	010 010	00000 11111	150.50.25.64 – 150.50.25.95
C	150.50.25	011 011	00000 11111	150.50.25.96 – 150.50.25.127
	150.50.25	100	00000	150.50.25.128

		xxx	xx	IP Range - /30
150.50.25.	**100**	000 000	00 11	150.50.25.128 – 150.50.25.131
	101 - 255	**Waste**		

IPv4 and IPv6 Address Planning - Address Assignment

IPv6 network: 2000:7925::0/48

Branch	IPv6 Network Address/Subnet
HQ	2000:7925:1::0/48
A	2000:7925:2::0/48
B	2000:7925:3::0/48

For NAT Translation

Branch		IPv4 Network Address
	PC 2	160.11.3.2
HQ	Server 2	160.11.3.10

IPv4 network: 150.50.25.0/24

Branch	IPv4 Network Address/Subnet
C	150.50.25.96/27

For NAT Translation

Branch		IPv6 Network Address
	PC 1	2000::960B:302
C	Server 1	2000::960B:310

Address Assignment Table

HQ BRANCH	IP ADDRESS
Allocated Subnet Address and Subnet Mask	2000:7925:1::0/48
Network Address	2000:7925:1::0
Default Gateway Address	2000:7925:1::1
Valid Host Address Range	2000:7925:1::1 – 2000:7925:1:ffff:ffff:ffff:ffff:fffe
Broadcast Address	2000:7925:1:ffff:ffff:ffff:ffff:ffff

BRANCH - A	IP ADDRESS
Allocated Subnet Address and Subnet Mask	2000:7925:2::0/48
Network Address	2000:7925:2::0
Default Gateway Address	2000:7925:2::1
Valid Host Address Range	2000:7925:2::1 - 2000:7925:2:ffff:ffff:ffff:ffff:fffe
Broadcast Address	2000:7925:2:ffff:ffff:ffff:ffff:ffff

BRANCH - B	IP ADDRESS
Allocated Subnet Address and Subnet Mask	2000:7925:3::0/48
Network Address	2000:7925:3::0
Default Gateway Address	2000:7925:3::1
Valid Host Address Range	2000:7925:3::1 – 2000:7925:3:ffff:ffff:ffff:ffff:fffe
Broadcast Address	2000:7925:3:ffff:ffff:ffff:ffff:ffff

BRANCH - C	IP ADDRESS
Allocated Subnet Address and Subnet Mask	150.50.25.96/24
Network Address	150.50.25.96
Default Gateway Address	150.50.25.97
Valid Host Address Range	150.50.25.97 – 150.50.25.126
Broadcast Address	150.50.25.127

## Address Assignment Table - Router IP Addressing Plan

HQ Router	IP ADDRESS
Fa0/0 (to HQ Branch)	2000:7925:1::1/48
S0/0/0 (to Router A)	2000:7925:4::1/48
S0/1/0 (to Router B)	2000:7925:8::2/48
S0/0/1 (to Router C)	150.50.25.130/30

Router A	IP ADDRESS
Fa0/0 (to Branch A)	2000:7925:2::1/48
S0/0/0 (to HQ Router)	2000:7925:4::2/48
S0/0/1 (to Router B)	2000:7925:6::1/48

Router B	IP ADDRESS
Fa0/0 (to Branch B)	2000:7925:3::1/48
S0/0/0 (to HQ Router)	2000:7925:8::1/48
S0/0/1 (to Router A)	2000:7925:6::2/48

Router C	IP ADDRESS
Fa0/0 (to Branch C)	150.50.25.97/27
S0/0/0 (to HQ Router)	150.50.25.129/30

Network Topology Diagram
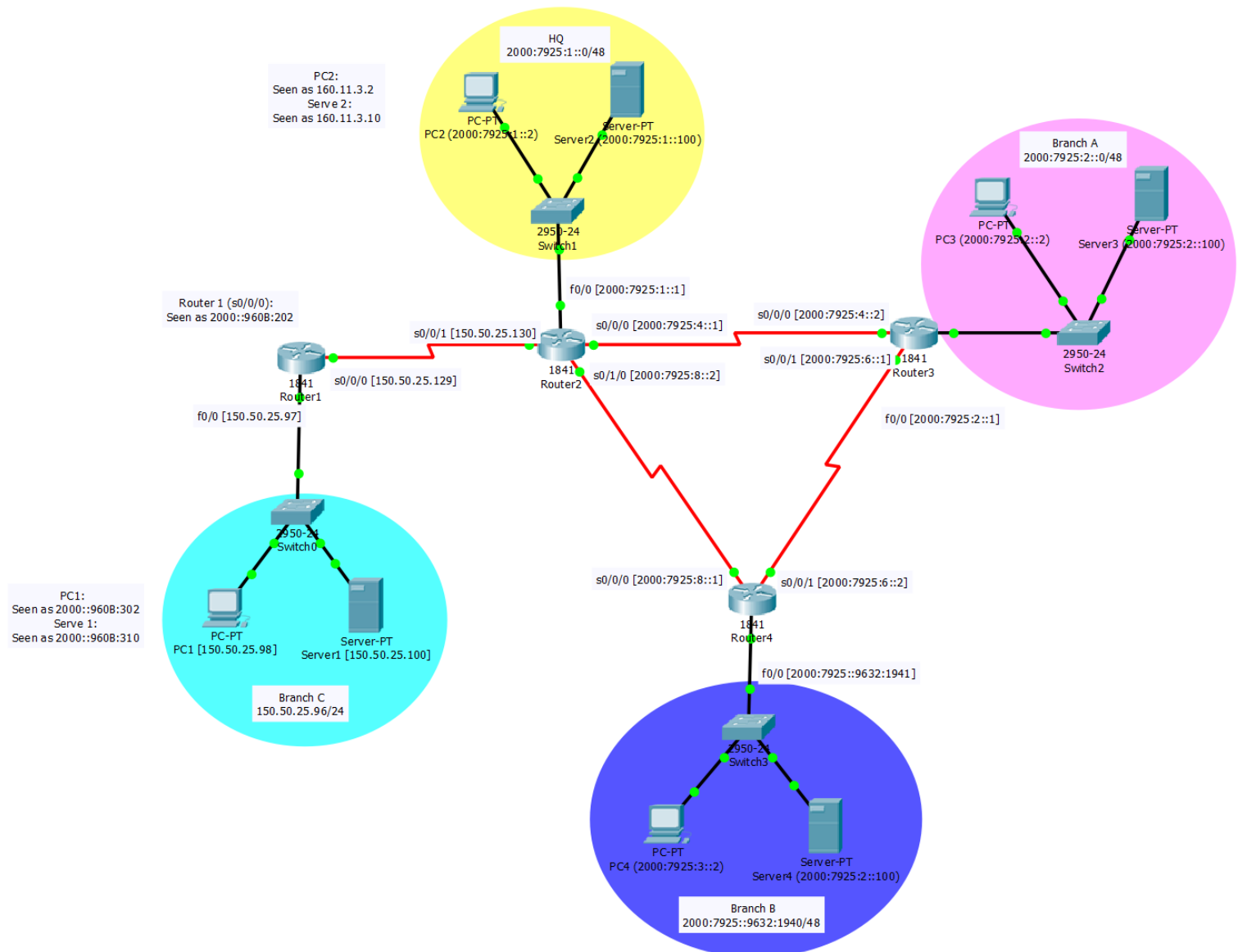
OSPF Configurations – Ipv4 OSPF Configurations (between Branch-C and HQ Router)

<u>Codes</u>

Router 1 (Branch C)	Router 2 (HQ)
EN CONF T HOSTNAME C INT F0/0 IP ADD 150.50.25.97 255.255.255.224 NO SHUT EXIT INT S0/0/1 IP ADD 150.50.25.129 255.255.255.252 NO SHUT EXIT ROUTER OSPF 10 NET 150.50.25.96 0.0.0.255 AREA 10 NET 150.50.25.128 0.0.0.3 AREA 10 EXIT IP ROUTE 0.0.0.0 0.0.0.0 150.50.25.130 EXIT	EN CONF T HOSTNAME HQ INT S0/0/1 IP ADD 150.50.25.130 255.255.255.252 NO SHUT EXIT IP ROUTE 0.0.0.0 0.0.0.0 150.50.25.129150.50.25.130 EXIT

OSPF Configurations – Router Interfaces Configuration

Codes

Router 2 (HQ)

```
EN
CONF T
INT S0/0/0
IPV6 ADD 2000:7925:4::1/48
NO SHUT
EXIT
INT S0/1/0
IPV6 ADD 2000:7925:8::2/48
NO SHUT
EXIT
INT F0/0
IPV6 ADD 2000:7925:1::1/48
NO SHUT
EXIT
```

Router 3 (Branch A)

```
EN
CONF T
HOSTNAME A
INT F0/0
IPV6 ADD 2000:7925:2::1/48
NO SHUT
EXIT
INT S0/0/0
IPV6 ADD 2000:7925:4::2/48
NO SHUT
EXIT
INT S0/0/1
IPV6 ADD 2000:7925:6::1/48
NO SHUT
EXIT
```

Router 4 (Branch B)

```
EN
CONF T
HOSTNAME B
INT F0/0
IPV6 ADD 2000:7925:3::1/48
NO SHUT
INT S0/0/1
IPV6 ADD 2000:7925:6::2/48
NO SHUT
EXIT
INT S0/0/0
IPV6 ADD 2000:7925:8::1/48
NO SHUT
EXIT
```

OSPF Configurations – Ipv6 OSPF Configurations (for the IPv6 network)

Codes

Router 2 (HQ)	Router 3 (Branch A)
EN	EN
CONF T	CONF T
IPV6 UNICAST-ROUTING	IPV6 UNICAST-ROUTING
IPV6 ROUTER OSPF 10	IPV6 ROUTER OSPF 10
ROUTER-ID 1.1.1.1	ROUTER-ID 2.2.2.2
EXIT	EXIT
INT F0/0	INT F0/0
IPV6 OSPF 10 AREA 10	IPV6 OSPF 10 AREA 10
EXIT	EXIT
INT S0/0/0	INT S0/0/0
IPV6 OSPF 10 AREA 10	IPV6 OSPF 10 AREA 10
EXIT	EXIT
INT S0/1/0	INT S0/0/1
IPV6 OSPF 10 AREA 10	IPV6 OSPF 10 AREA 10
EXIT	EXIT

Router 4 (Branch B)
EN
CONF T
IPV6 UNICAST-ROUTING
IPV6 ROUTER OSPF 10
ROUTER-ID 3.3.3.3
EXIT
INT F0/0
IPV6 OSPF 10 AREA 10
EXIT
INT S0/0/0
IPV6 OSPF 10 AREA 10
EXIT
INT S0/0/1
IPV6 OSPF 10 AREA 10
EXIT

IPv4 IPv6 Network NAT-PT

<u>Codes:</u>

Router 1 (HQ)

EN
CONF T
INT S0/0/1
IPV6 NAT
EXIT
INT F0/0
IPV6 NAT
IPV6 NAT V4V6 SOURCE 150.50.25.98 2000::960B:302
IPV6 NAT V4V6 SOURCE 150.50.25.100 2000::960B:310
IPV6 NAT PREFIX 2000::/96
IPV6 NAT V6V4 SOURCE 2000:7925:1::2 160.11.3.2
IPV6 NAT V6V4 SOURCE 2000:7925:1::100 160.11.3.10
EXIT
IPV6 UNICAST-ROUTING
IP ROUTE 0.0.0.0 0.0.0.0 150.50.25.129

Router 1 (Branch C)

IP ROUTE 0.0.0.0 0.0.0.0 150.50.25.130
EXIT

Verification – Ping within the IPv6 Network

Ping from PC2(HQ) to PC3(Branch B)

```
Pinging 2000:7925:3::2 with 32 bytes of data:

Reply from 2000:7925:3::2: bytes=32 time=1ms TTL=126
Reply from 2000:7925:3::2: bytes=32 time=1ms TTL=126
Reply from 2000:7925:3::2: bytes=32 time=2ms TTL=126
Reply from 2000:7925:3::2: bytes=32 time=1ms TTL=126

Ping statistics for 2000:7925:3::2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 2ms, Average = 1ms
```

Ping from PC2(HQ) to Server4(Branch B)

```
Pinging 2000:7925:3::100 with 32 bytes of data:

Reply from 2000:7925:3::100: bytes=32 time=3ms TTL=126
Reply from 2000:7925:3::100: bytes=32 time=2ms TTL=126
Reply from 2000:7925:3::100: bytes=32 time=5ms TTL=126
Reply from 2000:7925:3::100: bytes=32 time=3ms TTL=126

Ping statistics for 2000:7925:3::100:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 2ms, Maximum = 5ms, Average = 3ms
```

Ping from Server3(Branch A) to Server2(HQ)

```
Pinging 2000:7925:1::100 with 32 bytes of data:

Reply from 2000:7925:1::100: bytes=32 time=3ms TTL=126
Reply from 2000:7925:1::100: bytes=32 time=1ms TTL=126
Reply from 2000:7925:1::100: bytes=32 time=1ms TTL=126
Reply from 2000:7925:1::100: bytes=32 time=1ms TTL=126

Ping statistics for 2000:7925:1::100:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 3ms, Average = 1ms
```

Ping from PC3(Branch A) to PC3(Branch B)

```
Pinging 2000:7925:3::2 with 32 bytes of data:

Reply from 2000:7925:3::2: bytes=32 time=1ms TTL=126
Reply from 2000:7925:3::2: bytes=32 time=1ms TTL=126
Reply from 2000:7925:3::2: bytes=32 time=2ms TTL=126
Reply from 2000:7925:3::2: bytes=32 time=1ms TTL=126

Ping statistics for 2000:7925:3::2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 2ms, Average = 1ms
```

Verification – Ping between IPv6 (HQ) and IPv4 (Branch C)

Ping from PC1(Branch C) to Server2(HQ)

```
Pinging 160.11.3.10 with 32 bytes of data:

Reply from 160.11.3.10: bytes=32 time=1ms TTL=126
Reply from 160.11.3.10: bytes=32 time=1ms TTL=126
Reply from 160.11.3.10: bytes=32 time=1ms TTL=126
Reply from 160.11.3.10: bytes=32 time=1ms TTL=126

Ping statistics for 160.11.3.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 1ms, Average = 1ms
```

Ping from Server1(Branch C) to PC2(HQ)

```
Pinging 160.11.3.2 with 32 bytes of data:

Reply from 160.11.3.2: bytes=32 time=2ms TTL=126
Reply from 160.11.3.2: bytes=32 time=1ms TTL=126
Reply from 160.11.3.2: bytes=32 time=1ms TTL=126
Reply from 160.11.3.2: bytes=32 time=1ms TTL=126

Ping statistics for 160.11.3.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 2ms, Average = 1ms
```

Ping from PC2(HQ) to PC1(Branch C)

```
Pinging 2000::960b:302 with 32 bytes of data:

Reply from 2000::960B:302: bytes=32 time=1ms TTL=126
Reply from 2000::960B:302: bytes=32 time<1ms TTL=126
Reply from 2000::960B:302: bytes=32 time=1ms TTL=126
Reply from 2000::960B:302: bytes=32 time<1ms TTL=126

Ping statistics for 2000::960B:302:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

Ping from Server2(HQ) to Server1(Branch C)

```
Pinging 2000::960b:310 with 32 bytes of data:

Reply from 2000::960B:310: bytes=32 time<1ms TTL=126
Reply from 2000::960B:310: bytes=32 time<1ms TTL=126
Reply from 2000::960B:310: bytes=32 time<1ms TTL=126
Reply from 2000::960B:310: bytes=32 time<1ms TTL=126

Ping statistics for 2000::960B:310:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

Verification – Show Command Screenshot (Router 1)

Show ip route:

```
C#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile,
B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter
area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external
type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E -
EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia -
IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is 150.50.25.130 to network 0.0.0.0

     150.50.0.0/16 is variably subnetted, 2 subnets, 2 masks
C       150.50.25.96/27 is directly connected, FastEthernet0/0
C       150.50.25.128/30 is directly connected, Serial0/0/0
S*   0.0.0.0/0 [1/0] via 150.50.25.130
```

Verification – Show Command Screenshot (Router 2)

Show ipv6 route:

```
HQ#show ipv6 route
IPv6 Routing Table - 12 entries
Codes: C - Connected, L - Local, S - Static, R - RIP, B - BGP
       U - Per-user Static route, M - MIPv6
       I1 - ISIS L1, I2 - ISIS L2, IA - ISIS interarea, IS - ISIS
summary
       O - OSPF intra, OI - OSPF inter, OE1 - OSPF ext 1, OE2 -
OSPF ext 2
       ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2
       D - EIGRP, EX - EIGRP external
C   2000:7925:1::/48 [0/0]
     via ::, FastEthernet0/0
L   2000:7925:1::1/128 [0/0]
     via ::, FastEthernet0/0
O   2000:7925:2::/48 [110/65]
     via FE80::230:A3FF:FE63:A201, Serial0/0/0
O   2000:7925:3::/48 [110/65]
     via FE80::201:C9FF:FE7D:5401, Serial0/1/0
O   2000:7925:4::/48 [110/128]
     via FE80::230:A3FF:FE63:A201, Serial0/0/0
O   2000:7925:6::/48 [110/128]
     via FE80::201:C9FF:FE7D:5401, Serial0/1/0
     via FE80::230:A3FF:FE63:A201, Serial0/0/0
O   2000:7925:8::/48 [110/128]
     via FE80::201:C9FF:FE7D:5401, Serial0/1/0
C   2000:9725:4::/48 [0/0]
     via ::, Serial0/0/0
L   2000:9725:4::1/128 [0/0]
     via ::, Serial0/0/0
C   2000:9725:8::/48 [0/0]
     via ::, Serial0/1/0
L   2000:9725:8::2/128 [0/0]
     via ::, Serial0/1/0
L   FF00::/8 [0/0]
     via ::, Null0
```

Show ipv6 nat translations:

```
HQ#show ipv6 nat translations
Prot  IPv4 source            IPv6 source
      IPv4 destination       IPv6 destination
---   ---                    ---
---   150.50.25.100          2000::960B:310

---   160.11.3.10            2000:7925:1::100
---   150.50.25.100          2000::960B:310

---   160.11.3.2             2000:7925:1::2
---   150.50.25.100          2000::960B:310

---   ---                    ---
---   150.50.25.129          2000::960B:202

---   ---                    ---
---   150.50.25.98           2000::960B:302

---   160.11.3.10            2000:7925:1::100
---   150.50.25.98           2000::960B:302

---   160.11.3.2             2000:7925:1::2
---   150.50.25.98           2000::960B:302

---   160.11.3.10            2000:7925:1::100
---   ---                    ---

---   160.11.3.2             2000:7925:1::2
---   ---                    ---
```

Verification – Show Command Screenshot (Router 3)

Show ipv6 route:

```
A#show ipv6 route
IPv6 Routing Table - 12 entries
Codes: C - Connected, L - Local, S - Static, R - RIP, B - BGP
       U - Per-user Static route, M - MIPv6
       I1 - ISIS L1, I2 - ISIS L2, IA - ISIS interarea, IS - ISIS
summary
       O - OSPF intra, OI - OSPF inter, OE1 - OSPF ext 1, OE2 -
OSPF ext 2
       ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2
       D - EIGRP, EX - EIGRP external
O   2000:7925:1::/48 [110/65]
     via FE80::250:FFF:FECC:B101, Serial0/0/0
C   2000:7925:2::/48 [0/0]
     via ::, FastEthernet0/0
L   2000:7925:2::1/128 [0/0]
     via ::, FastEthernet0/0
O   2000:7925:3::/48 [110/65]
     via FE80::201:C9FF:FE7D:5402, Serial0/0/1
C   2000:7925:4::/48 [0/0]
     via ::, Serial0/0/0
L   2000:7925:4::2/128 [0/0]
     via ::, Serial0/0/0
C   2000:7925:6::/48 [0/0]
     via ::, Serial0/0/1
L   2000:7925:6::1/128 [0/0]
     via ::, Serial0/0/1
O   2000:7925:8::/48 [110/128]
     via FE80::201:C9FF:FE7D:5402, Serial0/0/1
O   2000:9725:4::/48 [110/128]
     via FE80::250:FFF:FECC:B101, Serial0/0/0
O   2000:9725:8::/48 [110/128]
     via FE80::250:FFF:FECC:B101, Serial0/0/0
L   FF00::/8 [0/0]
     via ::, Null0
```

Verification – Show Command Screenshot (Router 4)

Show ipv6 route:

```
B#show ipv6 route
IPv6 Routing Table - 12 entries
Codes: C - Connected, L - Local, S - Static, R - RIP, B - BGP
       U - Per-user Static route, M - MIPv6
       I1 - ISIS L1, I2 - ISIS L2, IA - ISIS interarea, IS - ISIS
summary
       O - OSPF intra, OI - OSPF inter, OE1 - OSPF ext 1, OE2 -
OSPF ext 2
       ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2
       D - EIGRP, EX - EIGRP external
O   2000:7925:1::/48 [110/65]
     via FE80::201:43FF:FE22:8A01, Serial0/0/0
O   2000:7925:2::/48 [110/65]
     via FE80::230:A3FF:FE63:A202, Serial0/0/1
C   2000:7925:3::/48 [0/0]
     via ::, FastEthernet0/0
L   2000:7925:3::1/128 [0/0]
     via ::, FastEthernet0/0
O   2000:7925:4::/48 [110/128]
     via FE80::230:A3FF:FE63:A202, Serial0/0/1
C   2000:7925:6::/48 [0/0]
     via ::, Serial0/0/1
L   2000:7925:6::2/128 [0/0]
     via ::, Serial0/0/1
C   2000:7925:8::/48 [0/0]
     via ::, Serial0/0/0
L   2000:7925:8::1/128 [0/0]
     via ::, Serial0/0/0
O   2000:9725:4::/48 [110/128]
     via FE80::201:43FF:FE22:8A01, Serial0/0/0
O   2000:9725:8::/48 [110/128]
     via FE80::201:43FF:FE22:8A01, Serial0/0/0
L   FF00::/8 [0/0]
     via ::, Null0
```

Conclusion

All the codes and screenshots have been included in this report to prove the results of my design. OSPF has be applied to both IPv4 and IPv6 networks and v4v6 NAT has also been integrated in order for Branch C and HQ to communicate. Through this assignment, I have shown the knowledge I have gained during this semester.