Advanced Networking III

Final Project Part I

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Final Project 25

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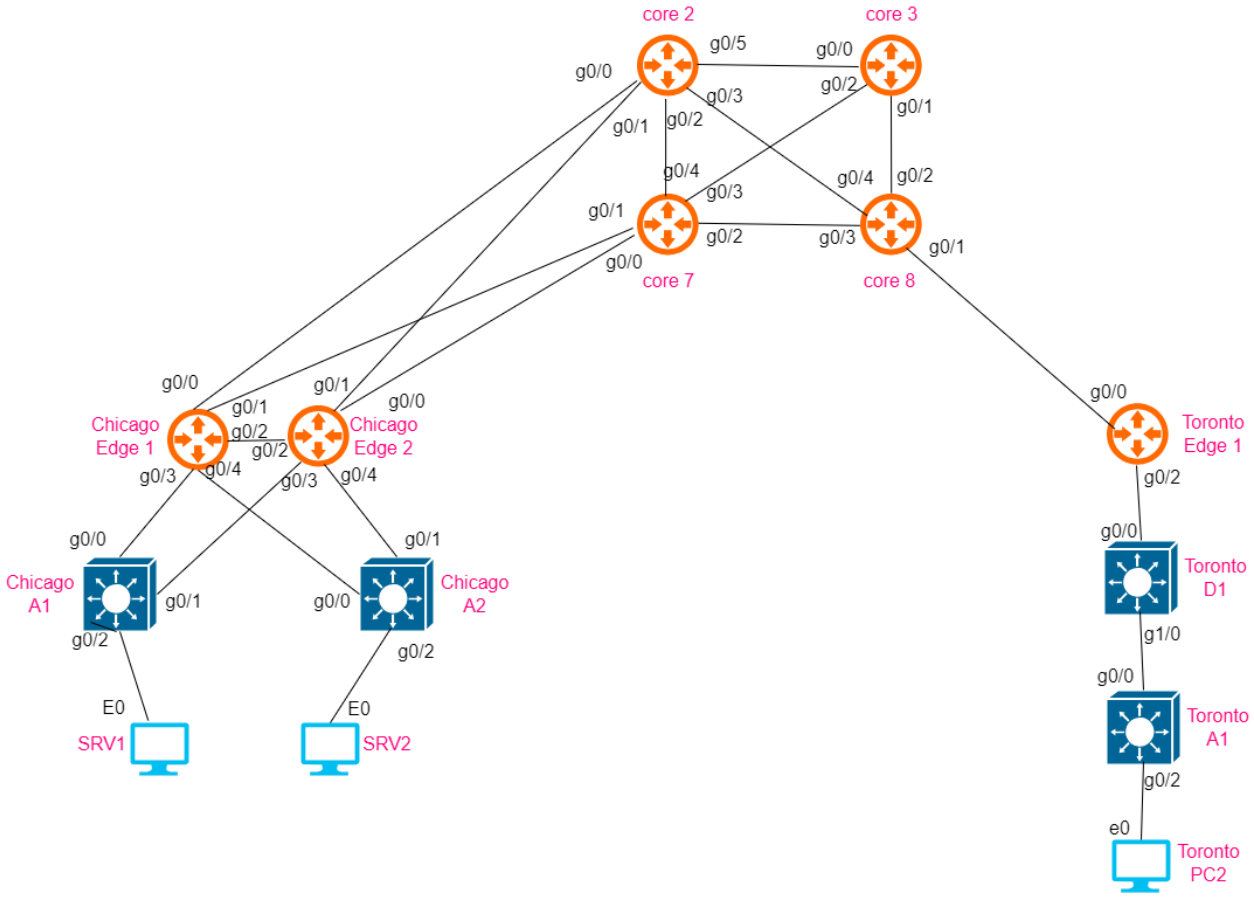
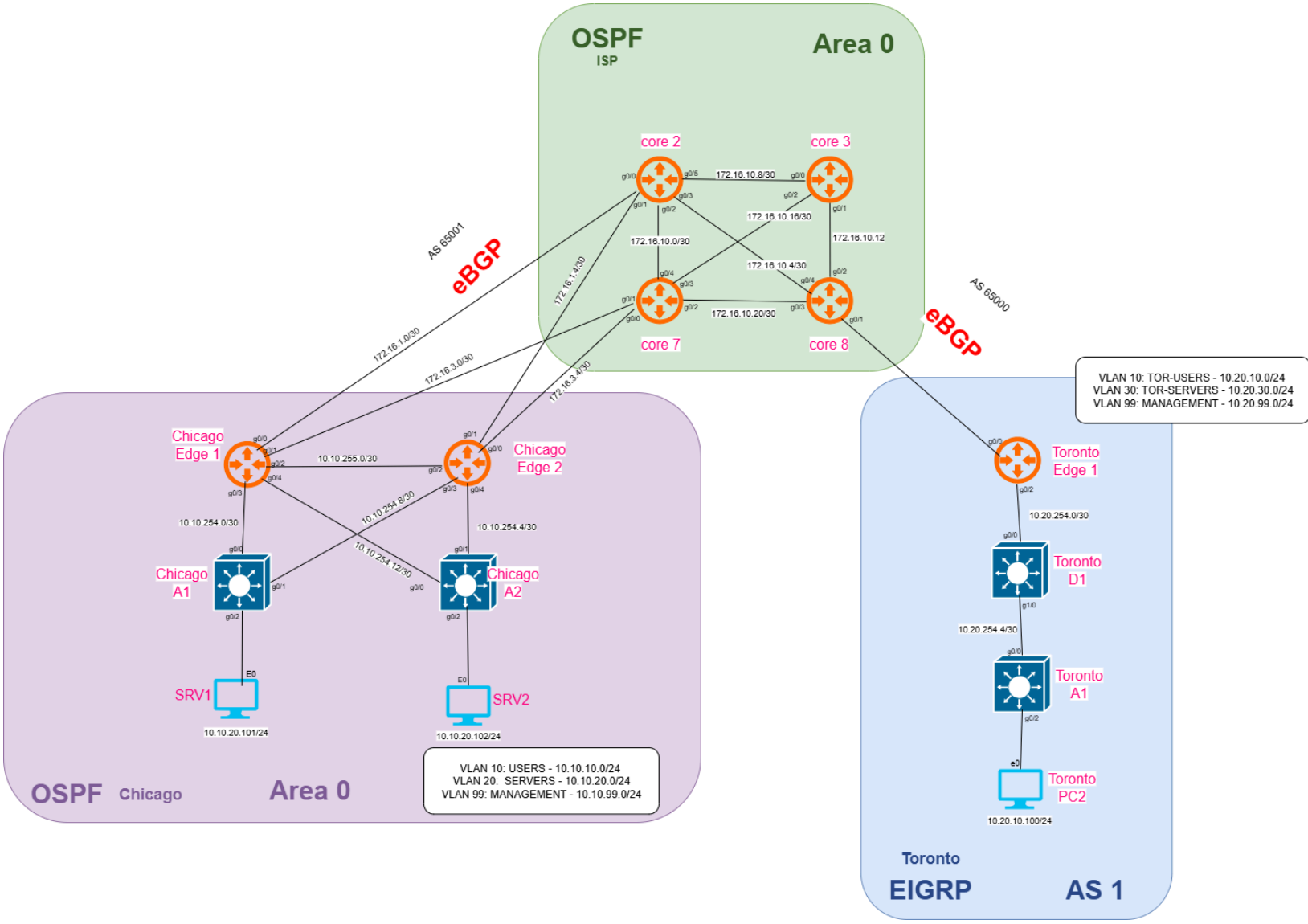
Physical Network Diagram (Topology must be different)



Logical IPv4 Topology



Addressing Table

	Device	Interface	IP Address
Chicago	**SRV1**	e0 (To ChicagoA1)	10.10.20.101/24
	SRV2	e0 (To ChicagoA2)	10.10.20.102/24
	A1	g0/0 (To ChicagoEdge1)	10.10.254.2/30
		g0/1 (To ChicagoEdge2)	10.10.254.9/30
		g0/2 (To ChicagoSRV1)	—
		VLAN 10	10.10.10.1/24
		VLAN 20	10.10.20.1/24
		VLAN 99	10.10.99.1/24
		Loopback0	10.10.0.11/32
	A2	g0/0 (To ChicagoEdge1)	10.10.254.13/30
		g0/1 (To ChicagoEdge2)	10.10.254.6/30
		g0/2 (To ChicagoSRV2)	—
		VLAN 10	10.10.10.2/24
		VLAN 20	10.10.20.2/24
		VLAN 99	10.10.99.2/24
		Loopback0	10.10.0.12/32
	EDGE 1	g0/0 (To Core2)	172.16.1.1/30
		g0/1 (To Core7)	172.16.3.1/30
		g0/2 (To ChicagoEdge2)	10.10.255.1/30

		g0/3 (To ChicagoA1)	10.10.254.1/30
		g0/4 (To ChicagoA2)	10.10.254.14/30
		Loopback0	10.10.0.21/32
	EDGE 2	g0/0 (To Core7)	172.16.3.5/30
		g0/1 (To Core2)	172.16.1.5/30
		g0/2 (To ChicagoEdge1)	10.10.255.2/30
		g0/3 (To ChicagoA1)	10.10.254.10/30
		g0/4 (To ChicagoA2)	10.10.254.5/30
		Loopback0	10.10.0.22/32
ISP	**CORE 2**	g0/0 (To ChicagoEdge1)	172.16.1.2/30
		g0/1 (To ChicagoEdge2)	172.16.1.6/30
		g0/2 (To Core7)	172.16.10.1/30
		g0/3 (To Core8)	172.16.10.5/30
		g0/5 (To Core3)	172.16.10.9/30
		Loopback0	172.16.0.2/32
	CORE 3	g0/0 (To Core2)	172.16.10.10/30
		g0/1 (To Core8)	172.16.10.14/30
		g0/2 (To Core7)	172.16.10.18/30
		Loopback0	172.16.0.3/32
	CORE 7	g0/0 (To ChicagoEdge2)	172.16.3.6/30
		g0/1 (To ChicagoEdge1)	172.16.3.2/30
		g0/2 (To Core8)	172.16.10.22/30

		g0/3 (To Core3)	172.16.10.17/30
		g0/4 (To Core2)	172.16.10.2/30
		Loopback0	172.16.0.7/32
	CORE 8	g0/1 (To TorontoEdge1)	172.16.2.6/30
		g0/2 (To Core3)	172.16.10.13/30
		g0/3 (To Core7)	172.16.10.21/30
		g0/4 (To Core2)	172.16.10.6/30
		Loopback0	172.16.0.8/32
Toronto	**EDGE 1**	g0/0 (To Core8)	172.16.2.5/30
		g0/2 (To D1)	**10.20.254.1/30**
		Loopback0	10.20.0.21/32
	D1	**g0/0 (To TEdge1)**	**10.20.254.2/30**
		g1/0 (To TorontoA1)	**10.20.254.5/30**
		VLAN 10	10.20.10.1/24
		VLAN 30	10.20.30.1/24
		VLAN 99	10.20.99.1/24
		Loopback0	10.20.0.12/32
	A1	g0/0 (To TorontoD1)	**10.20.254.6/30**
		g0/2 (To TorontoPC2)	—
		VLAN 10	10.20.10.2/24
		VLAN 30	10.20.30.2/24
		VLAN 99	10.20.99.2/24
		Loopback0	10.20.0.11/32
	PC2	E0 (To TorontoA1)	10.20.10.100/24

VLAN Assignment Table

A1(Chicago)

VLAN ID	VLAN Name	Ports
10	USERS	—
20	SERVERS	G0/2
99	MANAGEMENT	—

A2(Chicago)

VLAN ID	VLAN Name	Ports
10	USERS	—
20	SERVERS	G0/2
99	MANAGEMENT	—

D1(Toronto)

VLAN ID	VLAN Name	Ports
10	TOR-USERS	—
30	TOR-SERVERS	—
99	MANAGEMENT	—

A1(Toronto)

VLAN ID	VLAN Name	Ports
10	TOR-USERS	G0/2

30	TOR-SERVERS	—
99	MANAGEMENT	—

STP diagrams/tables

ChicagoA1, ChicagoA2, TorontoD1, TorontoA1

Chicago A1

Root ID table

VLAN ID	Priority	Address	Cost	Hello Time; Max Age; Forward Delay
20	32788	5254.0002.d4e4	4	2 sec; 20 sec; 15 sec

Bridge ID table

VLAN ID	Priority	Address	Hello time; Max Age; Forward Delay	Aging Time
20 ROOT BRIDGE	32788 (priority 32768 sys-id-ext 20)	5254.0002.d4e4	2sec; 20 sec; 15 sec	300 sec

Interfaces

VLAN ID	Interface ID	Role	Status	Cost	Priority #	Type
20	Gi0/2	Root	Desg	4	128.3	P2p

Chicago A2

Root ID table

VLAN ID	Priority	Address	Cost	Hello Time; Max Age; Forward Delay
20	32788	5254.00ec.72e0	4	2 sec; 20 sec; 15 sec

Bridge ID table

VLAN ID	Priority	Address	Hello time; Max Age; Forward Delay	Aging Time
20	32788 (priority 32768 sys-id-ext 20)	5254.00ec.72e0	2sec; 20 sec; 15 sec	300 sec

Interfaces

VLAN ID	Interface ID	Role	Status	Cost	Priority #	Type
20	Gi0/2	Desg	FWD	4	128.3	P2p

Toronto A1:

Root ID table

Root bridge = this bridge is the root

VLAN ID	Priority	Address	Cost	Hello Time; Max Age; Forward Delay
1 **ROOT BRIDGE**	32769	5254.000e.ba35	4	2 sec; 20 sec; 15 sec
10 ROOT BRIDGE	32778	5254.000e.ba35	4	2 sec; 20 sec; 15 sec

30 ROOT BRIDGE	32798	5254.000e.ba35	4	2 sec; 20 sec; 15 sec
99 **ROOT BRIDGE**	32867	5254.00f8.4f14	4	2 sec; 20 sec; 15 sec

Bridge ID table

VLAN ID	**Priority**	**Address**	**Hello time; Max Age; Forward Delay**	**Aging Time**
1	32769 (priority 32769 sys-id-ext 1)	5254.000e.ba35	2sec; 20 sec; 15 sec	300 sec
10	32778 (priority 32768 sys-id-ext 10)	5254.000e.ba35	2 sec; 20 sec; 15 sec	300 sec
30	32798 (priority 32768 sys-id-ext 30)	5254.000e.ba35	2 sec; 20 sec; 15 sec	300 sec
99	32867 (priority 32768 sys-id-ext 99)	5254.000e.ba35	2 sec; 20 sec; 15 sec	300 sec

Interfaces

VLAN ID	**Interface ID**	**Role**	**Status**	**Cost**	**Priority #**	**Type**
1	gi0/1	Desg	FWD	4	128.2	P2p
	gi0/3	Desg	FWD	4	128.4	P2p
10	gi0/0	Desg	FWD	4	128.1	P2p
	gi0/2	Desg	FWD	4	128.3	P2p
30	gi0/0	Desg	FWD	4	128.1	P2p
99	gi0/0	Desg	FWD	4	128.1	P2p

Toronto D1

Root ID table

VLAN ID	Priority	Address	Cost	Port	Hello Time; Max Age; Forward Delay
1 ROOT BRIDGE	32769	5254.000e.ba35	-	-	2 sec; 20 sec; 15 sec
10	32778	5254.000e.ba35	4	5 g1/0	2 sec; 20 sec; 15 sec
30	32778	5254.000e.ba35	4	5 g1/0	2 sec; 20 sec; 15 sec
99	32867	5254.000e.ba35	4	5 g1/0	2 sec; 20 sec; 15 sec

Bridge ID table

VLAN ID	Priority	Address	Hello time; Max Age; Forward Delay	Aging Time
1	32769	5254.006c.bad7	2 sec; 20 sec; 15 sec	300 sec
10	32778	5254.006c.bad7	2 sec; 20 sec; 15 sec	300 sec
30	32798	5254.006c.bad7	2 sec; 20 sec; 15 sec	300 sec
99	32867	5254.006c.bad7	2 sec; 20 sec; 15 sec	300 sec

Interfaces

VLAN ID	Interface ID	Role	Status	Cost	Priority #	Type
1	g0/1	Desg	FWD	4	128.2	Edge

	g0/2	Desg	FWD	4	128.3	Edge
	g0/3	Desg	FWD	4	128.4	Edge
	g1/1	Desg	FWD	4	128.6	Edge
10	g1/0	Root	FWD	4	128.5	P2p
30	g1/0	Root	FWD	4	128.5	P2p
99	g1/0	Root	FWD	4	128.5	P2p

Routing Protocols

EIGRP

EIGRP has only been applied on Toronto.

Toronto (Edge1):

- EIGRP process name is Toronto
- AS 1
- EIGRP is advertising these IPv4 networks:
  10.20.254.0/30
  10.20.254.4/30
- Network 10.20.254.0 255.255.255.252
- configure the router-id to be 10.20.0.11

Toronto (D1):

- Configure EIGRP with an AS of 1 (not an interface)
  - Configure the router-id 10.20.0.12
- The same is done on the Vlans 10, 30, 99 with the same AS.
- VRF/address family: EIGRP-IPv4 VR(Toronto)
- Neighbor /gateway: 10.20.254.1
- EIGRP is advertising these IPv4 networks:
  - 10.20.10.0/24
  - 10.20.30.0/24
  - 10.20.99.0/24
  - 10.20.254.0/30
  - 10.20.254.4/30

Toronto (A1):

- Configure EIGRP with an AS of 1 (not an interface).
- AS 1
    - Network 10.20.254.0 255.255.255.252
    - router-id : 10.20.10.2
    - EIGRP is advertising these IPv4 networks:
      10.20.10.0/24
      10.20.30.0/24
      10.20.99.0/24
      10.20.254.4/30

OSPF

OSPF has only been applied on ISP and Chicago.

Core 2:

- OSPF Area 0
- router ospf 100
    - router-id 100.100.100.2
    - passive-interface GigabitEthernet0/0
    - passive-interface GigabitEthernet0/1
    - network 172.16.10.0 0.0.0.3 area 0
    - network 172.16.10.4 0.0.0.3 area 0
    - network 172.16.10.8 0.0.0.3 area 0

Core 3:

- OSPF Area 0
- router ospf 100
    - router-id 100.100.100.3
    - network 172.16.10.8 0.0.0.3 area 0
    - network 172.16.10.12 0.0.0.3 area 0
    - network 172.16.10.16 0.0.0.3 area 0

Core 7:

- OSPF Area 0
- router ospf 100
    - router-id 100.100.100.7
    - passive-interface GigabitEthernet0/0
    - passive-interface GigabitEthernet0/1
    - network 172.16.10.0 0.0.0.3 area 0
    - network 172.16.10.16 0.0.0.3 area 0
    - network 172.16.10.20 0.0.0.3 area 0

Core 8:

- OSPF Area 0
- router ospf 100
    - router-id 100.100.100.8
    - passive-interface GigabitEthernet0/1
    - network 172.16.10.4 0.0.0.3 area 0
    - network 172.16.10.12 0.0.0.3 area 0
    - network 172.16.10.20 0.0.0.3 area 0

Chicago Edge 1:

- OSPF area 0
- router ospf 10
    - router-id 1.1.1.1
    - passive-interface GigabitEthernet0/0
    - passive-interface GigabitEthernet0/1
    - network 10.10.254.0 0.0.0.3 area 0
    - network 10.10.254.12 0.0.0.3 area 0
    - network 10.10.255.0 0.0.0.3 area 0

Chicago Edge 2:

- OSPF area 0
- router ospf 10
- router-id 2.2.2.2
    - passive-interface GigabitEthernet0/0
    - passive-interface GigabitEthernet0/1
    - network 10.10.254.4 0.0.0.3 area 0
    - network 10.10.254.8 0.0.0.3 area 0
    - network 10.10.255.0 0.0.0.3 area 0

Chicago A1:

- OSPF area 0
- router ospf 10
    - router-id 10.10.0.11
    - passive-interface Vlan20
    - network 10.10.20.0 0.0.0.255 area 0
    - network 10.10.254.0 0.0.0.3 area 0
    - network 10.10.254.8 0.0.0.3 area 0

Chicago A2:

- OSPF area 0
- router ospf 10
    - router-id 10.10.0.12
    - passive-interface Vlan20
    - network 10.10.20.0 0.0.0.255 area 0
    - network 10.10.254.4 0.0.0.3 area 0
    - network 10.10.254.12 0.0.0.3 area 0

BGP

EBGP Links:

ISP Core 2:

- AS Number 65000
- Has BGP neighbors 172.16.1.1 and 172.16.1.5
- Router-id 100.100.100.2

ISP Core 7:

- AS Number 65000
- Has BGP neighbors 172.16.3.1 and 172.16.3.5
- Router-id 100.100.100.7

ISP Core 8:

- AS Number 65000
- Has BGP neighbor 172.16.2.5

- Router-id 100.100.100.8

Chicago Edge 1:

- AS Number 65001
- Has BGP neighbors 172.16.1.2 and 172.16.3.2
- Router id: 1.1.1.1

Chicago Edge 2:

- AS Number 65001
- Has BGP neighbors 172.16.1.6 and 172.16.3.6
- Router id: 2.2.2.2

Toronto Edge 1:

- AS Number 65001
- Has BGP neighbors 172.16.2.6
- Router id: 20.20.20.2

Additional features implemented and where (just two)

FHRPs (active/standby devices, group #'s, etc)

HSRP has been applied on the switches TorontoD1 and TorontoA1

TorontoD1:

Interface	Group	Priority	P (preemption)	state	active	standby	Virtual IP
vlan10	10	110	P	active	local	10.20.10.2	10.20.10.254
vlan30	30	110	P	active	local	10.20.30.2	10.20.30.254
vlan99	99	110	P	active	local	10.20.99.2	10.20.99.254

TorontoA1:

Interface	Group	Priority	P	state	active	standby	Virtual IP

			(preemption)				
vlan10	10	100	P	standby	10.20.10.1	local	10.20.10.254
vlan30	30	100	P	standby	10.20.30.1	local	10.20.30.254
vlan99	99	100	P	standby	10.20.99.1	local	10.20.99.254

DHCP

Devices	**Pool**	**IP Address Range**	**Excluded Addresses**
Toronto Edge 1	TOR-VLAN10	10..20.10.1 - 10.20.10.254	10.20.10.1
	TOR-VLAN30	10.20.30.1 - 10.20.30.254	10.20.30.1
	TOR-VLAN99	10.20.99.254	10.20.99.1
Core 2	CHI1-WAN	172.16.1..1 - 172.16.1.2	172.16.1.2
	CHI2-WAN	172.16..1.5 - 172.16.1.6	172.16.1.6
Core 7	CHI1-WAN-Core 7	172.16.3.1 - 172.16.3.2	172.16.3.2
	CHI2-WAN-Core 7	172.16.3.5 - 172.16.3.6	172.16.3.6
Core 8	TOR-WAN-Core8	172.16.2.5 - 172.16.2.6	172.16.2.6

Security features implemented and where (just two)

BPDU Guard

- spanning-tree mode rapid-pvst
- spanning-tree portfast default
- spanning-tree portfast bpduguard default

ACLs/Security configurations

ACL

Standard IP access list 1

ChicagoEdge1

10 permit 10.10.0.0, wildcard bits 0.0.255.255
Extended IP access list EDGE-INBOUND-FILTER
10 deny ip any 10.0.0.0 0.255.255.255
20 permit ip any any (404 matches)

Chicago Edge2

Standard IP access list 1
10 permit 10.10.0.0, wildcard bits 0.0.255.255
Extended IP access list EDGE-INBOUND-FILTER
10 deny ip any 10.0.0.0 0.255.255.255
20 permit ip any any (411 matches)

Chicago A1

Standard IP access list MANAGEMENT-FILTER
10 permit 10.10.99.0, wildcard bits 0.0.0.255
20 permit 10.20.99.0, wildcard bits 0.0.0.255
30 deny any
Extended IP access list CISCO-CWA-URL-REDIRECT-ACL
100 deny udp any any eq domain
101 deny tcp any any eq domain
102 deny udp any eq bootps any
103 deny udp any any eq bootpc
104 deny udp any eq bootpc any
105 permit tcp any any eq www
Extended IP access list preauth_ipv4_acl (per-user)
10 permit udp any any eq domain
20 permit tcp any any eq domain
30 permit udp any eq bootps any
40 permit udp any any eq bootpc
50 permit udp any eq bootpc any
60 deny ip any any
IPv6 access list preauth_ipv6_acl (per-user)
permit udp any any eq domain sequence 10
permit tcp any any eq domain sequence 20
permit icmp any any nd-ns sequence 30
permit icmp any any nd-na sequence 40
permit icmp any any router-solicitation sequence 50
permit icmp any any router-advertisement sequence 60
permit icmp any any redirect sequence 70

permit udp any eq 547 any eq 546 sequence 80
permit udp any eq 546 any eq 547 sequence 90
deny ipv6 any any sequence 100

Chicago A2

Standard IP access list MANAGEMENT-FILTER
10 permit 10.10.99.0, wildcard bits 0.0.0.255
20 permit 10.20.99.0, wildcard bits 0.0.0.255
30 deny any
Extended IP access list CISCO-CWA-URL-REDIRECT-ACL
100 deny udp any any eq domain
101 deny tcp any any eq domain
102 deny udp any eq bootps any
103 deny udp any any eq bootpc
104 deny udp any eq bootpc any
105 permit tcp any any eq www
Extended IP access list preauth_ipv4_acl (per-user)
10 permit udp any any eq domain
20 permit tcp any any eq domain
30 permit udp any eq bootps any
40 permit udp any any eq bootpc
50 permit udp any eq bootpc any
60 deny ip any any
IPv6 access list preauth_ipv6_acl (per-user)
permit udp any any eq domain sequence 10
permit tcp any any eq domain sequence 20
permit icmp any any nd-ns sequence 30
permit icmp any any nd-na sequence 40
permit icmp any any router-solicitation sequence 50
permit icmp any any router-advertisement sequence 60
permit icmp any any redirect sequence 70
permit udp any eq 547 any eq 546 sequence 80
permit udp any eq 546 any eq 547 sequence 90
deny ipv6 any any sequence 100

Toronto A1

Standard IP access list MANAGEMENT-FILTER
10 permit 10.10.99.0, wildcard bits 0.0.0.255
20 permit 10.20.99.0, wildcard bits 0.0.0.255 (3861 matches)
30 deny any
Extended IP access list CISCO-CWA-URL-REDIRECT-ACL
100 deny udp any any eq domain
101 deny tcp any any eq domain
102 deny udp any eq bootps any
103 deny udp any any eq bootpc

104 deny udp any eq bootpc any
105 permit tcp any any eq www
Extended IP access list preauth_ipv4_acl (per-user)
10 permit udp any any eq domain
20 permit tcp any any eq domain
30 permit udp any eq bootps any
40 permit udp any any eq bootpc
50 permit udp any eq bootpc any
60 deny ip any any
IPv6 access list preauth_ipv6_acl (per-user)
permit udp any any eq domain sequence 10
permit tcp any any eq domain sequence 20
permit icmp any any nd-ns sequence 30
permit icmp any any nd-na sequence 40
permit icmp any any router-solicitation sequence 50
permit icmp any any router-advertisement sequence 60
permit icmp any any redirect sequence 70
permit udp any eq 547 any eq 546 sequence 80
permit udp any eq 546 any eq 547 sequence 90
deny ipv6 any any sequence 100

Toronto D1

Standard IP access list MANAG
Standard IP access list MANAGEMENT-FILTER
10 permit 10.10.99.0, wildcard bits 0.0.0.255
20 permit 10.20.99.0, wildcard bits 0.0.0.255 (5083 matches)
30 deny any
Extended IP access list CISCO-CWA-URL-REDIRECT-ACL
100 deny udp any any eq domain
101 deny tcp any any eq domain
102 deny udp any eq bootps any
103 deny udp any any eq bootpc
104 deny udp any eq bootpc any
105 permit tcp any any eq www
Extended IP access list preauth_ipv4_acl (per-user)
10 permit udp any any eq domain
20 permit tcp any any eq domain
30 permit udp any eq bootps any
40 permit udp any any eq bootpc
50 permit udp any eq bootpc any
60 deny ip any any
IPv6 access list preauth_ipv6_acl (per-user)
permit udp any any eq domain sequence 10
permit tcp any any eq domain sequence 20
permit icmp any any nd-ns sequence 30

permit icmp any any nd-na sequence 40
permit icmp any any router-solicitation sequence 50
permit icmp any any router-advertisement sequence 60
permit icmp any any redirect sequence 70
permit udp any eq 547 any eq 546 sequence 80
permit udp any eq 546 any eq 547 sequence 90
deny ipv6 any any sequence 100

Toronto Edge 1

Standard IP access list 1
10 permit 10.20.0.0, wildcard bits 0.0.255.255
Extended IP access list EDGE-INBOUND-FILTER
10 deny ip any 10.0.0.0 0.255.255.255
20 permit ip any any (412 matches)