Project 1

CCNAv7 Enterprise Networking, Security, and Automation
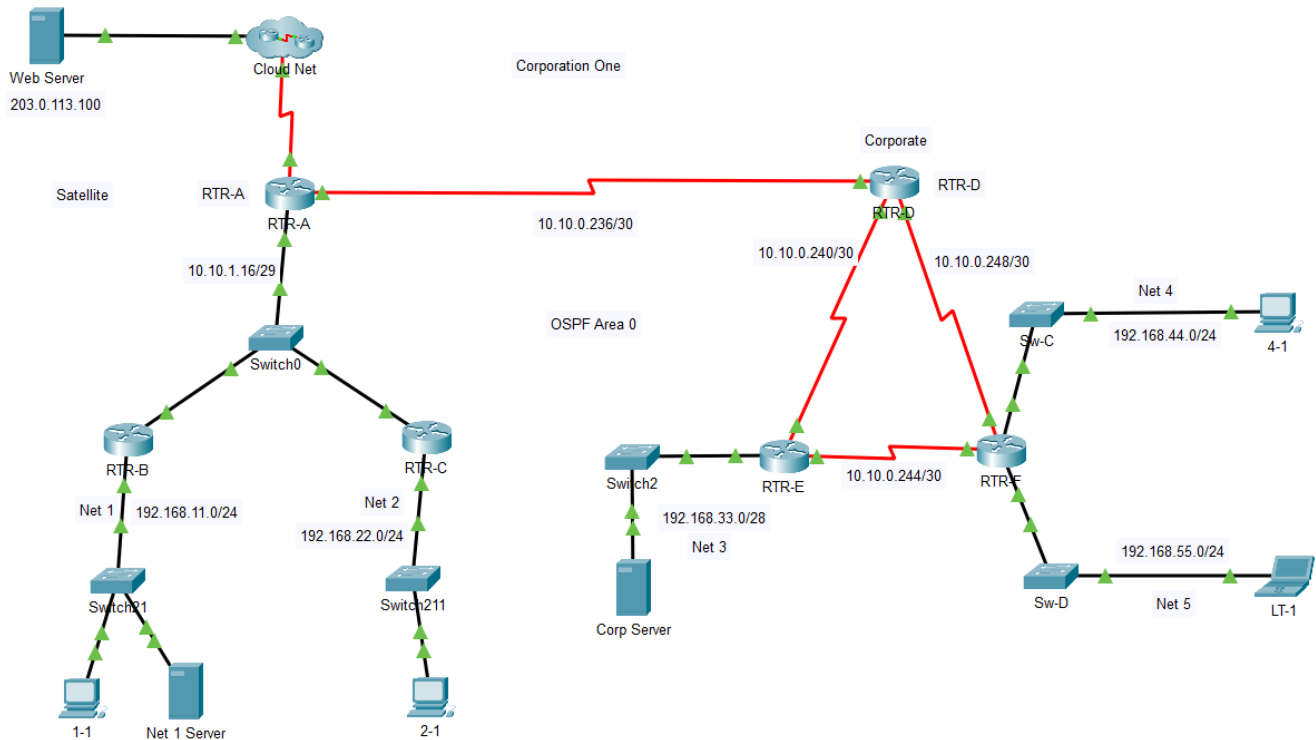
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Topology

Addressing Table

Device Name	G0/0/0	10.10.1.17/29
BD-1	G0/0/0	10.10.1.17/29
	S0/1/0	10.10.0.237/30
	S0/1/1	192.0.2.113/29
BD-2	G0/0/0	192.168.11.1/24
	G0/0/1	10.10.1.18/29
BD-3	G0/0/0	192.168.22.1/24
	G0/0/1	10.10.1.19/29
PP-1	S0/1/0	10.10.0.249/30
	S0/1/1	10.10.0.241/30
	S0/2/0	10.10.0.238/30
PP-2	G0/0/0	192.168.33.1/28
	S0/1/0	10.10.0.245/30
	S0/1/1	10.10.0.242/30
PP-3	G0/0/0	192.168.44.1/24
	G0/0/1	192.168.55.1/24
	S0/1/0	10.10.0.250/30
	S0/1/1	10.10.0.246/30
PC-1	NIC	192.168.11.11/24
PC-2	NIC	192.168.22.22/24
PC-3	NIC	192.168.44.44/24
Admin Server	NIC	192.168.33.14/28
Internal Server	NIC	192.168.11.100

| Laptop | NIC | 192.168.55.55/24 |
| Internet Server | NIC | 203.0.113.100 |

Introduction

You are completing the configuration of the **Ocisc LLC** network.

You are not required to configure host addressing.

You will practice and be assessed on the following skills:

- Configuration of OSPFv2 routing
- Customization of OSPF.
- Configuration of static NAT.
- Configuration of dynamic NAT with PAT.
- Configuration of various types of ACLs.
- Configuration of a router with NTP as a system time source.
- Backing up an IOS image to a TFTP server.

Instructions

Part 1: Configure OSPF

Step 1: Activate OSPF.

Use process ID **10** for OSPF activation on all routers.
a. Activate OSPF by configuring the interfaces of the network devices in
the **Eastern** network, where required.

```
--R1--
BD-1(config)#router ospf 10
BD-1(config-router)#exit
BD-1(config)#
BD-1(config)#interface g0/0/0
BD-1(config-if)#ip ospf 10 area 0
BD-1(config-if)#interface s0/1/0
BD-1(config-if)#ip ospf 10 area 0
BD-1(config-if)#exit

--R2--
BD-2(config)#router ospf 10
BD-2(config-router)#exit
BD-2(config)#
BD-2(config)#interface g0/0/0
BD-2(config-if)#ip ospf 10 area 0
BD-2(config-if)#interface g0/0/1
BD-2(config-if)#ip ospf 10 area 0
```

```
BD-2(config-if)#exit

--R3--
BD-3(config)#router ospf 10
BD-3(config-router)#exit
BD-3(config)#
BD-3(config)#interface g0/0/0
BD-3(config-if)#ip ospf 10 area 0
BD-3(config-if)#interface g0/0/1
BD-3(config-if)#ip ospf 10 area 0
BD-3(config-if)#exit
```

b. Activate OSPF using network statements and inverse masks on the routers in the **Central** Network network.

Note: For the purposes of this assessment, please enter the network statements in the following order:

1) On Router 4 (PP-1)
- the Serial0/1/1 network
- the Serial0/2/0 network
- the Serial0/1/0 network

2) On Router 5 (PP-2)
- the Serial0/1/1 network
- the Serial0/1/0 network
- the GigabitEthernet0/0/0 network

3) On Router 6 (PP-3)
- the Serial0/1/0 network
- the Serial0/1/1 network
- the GigabitEthernet0/0/0 network
- the GigabitEthernet0/0/1 network

```
--R4--
PP-1(config)#router ospf 10
PP-1(config-router)#network 10.10.0.240 0.0.0.3 area 0
PP-1(config-router)#network 10.10.0.236 0.0.0.3 area 0
PP-1(config-router)#network 10.10.0.248 0.0.0.3 area 0
PP-1(config-router)#exit

--R5--
PP-2(config)#router ospf 10
PP-2(config-router)#network 10.10.0.240 0.0.0.3 area 0
PP-2(config-router)#network 10.10.0.244 0.0.0.3 area 0
PP-2(config-router)#network 192.168.33.0 0.0.0.15 area 0
PP-2(config-router)#exit

--R6--
PP-3(config)#router ospf 10
```

[4]

```
PP-3(config-router)#network 10.10.0.248 0.0.0.3 area 0
PP-3(config-router)#network 10.10.0.244 0.0.0.3 area 0
PP-3(config-router)#network 192.168.44.0 0.0.0.255 area 0
PP-3(config-router)#network 192.168.55.0 0.0.0.255 area 0
PP-3(config-router)#exit
```

Step 2: Configure router IDs.

Configure router IDs on the multiaccess network routers as follows:

- BD-1: **9.9.9.9**
- BD-2: **8.8.8.8**
- BD-3: **7.7.7.7**

```
--R1--
BD-1(config)#router ospf 10
BD-1(config-router)#router-id 9.9.9.9
BD-1(config-router)#exit


--R2--
BD-2(config)#router ospf 10
BD-2(config-router)#router-id 8.8.8.8
BD-2(config-router)#exit


--R3--
BD-3(config)#router ospf 10
BD-3(config-router)#router-id 7.7.7.7
BD-3(config-router)#exit
```

Step 3: Customize OSPF operation.

- a. Configure router BD-1 with the highest OSPF interface priority so that it will always be the designated router of the multiaccess network.

```
--R1--
BD-1(config)#int g0/0/0
BD-1(config-if)#ip ospf priority 255
BD-1(config-if)#exit
```

b. On router BD-1, configure a default route to the ISP cloud using the exit interface command argument.

```
--R1--
BD-1(config)#ip route 0.0.0.0 0.0.0.0 s0/1/1
```

c. Automatically distribute the default route to all routers in the network.

```
--R1--
BD-1(config)#router ospf 10
BD-1(config-router)#default-information originate
BD-1(config-router)#exit
```

d. Configure the hello and dead timer values on the interfaces that connect BD-1 and PP-1 to be twice the default values.

```
--R1--
BD-1(config)#int s0/1/0
BD-1(config-if)#ip ospf hello-interval 20
BD-1(config-if)#ip ospf dead-interval 80
BD-1(config-if)#exit


--R4--
PP-1(config)#int s0/2/0
PP-1(config-if)#ip ospf hello-interval 20
PP-1(config-if)#ip ospf dead-interval 80
PP-1(config-if)#exit
```

e. Configure the OSPF routers so that the default cost value for all Gigabit Ethernet interfaces will be **10** and the cost value for Fast Ethernet will be **100**.

```
--All routers (Router1-2-3-4-5-6)--
Routers1-6(config)#router ospf 10
Routers1-6(config-router)#auto-cost reference-bandwidth 10000
Routers1-6(config-router)#exit
```

f. Configure the OSPF cost value of PP-1 interface Serial0/1/1 to **50**.

```
--R4--
PP-1(config)#int s0/1/1
PP-1(config-if)#ip ospf cost 50
PP-1(config-if)#exit
```

g. Configure OSPF so that routing updates are not sent into networks where OSPF updates are not required.

```
--R1--
BD-1(config)#router ospf 10
BD-1(config-router)#passive-interface s0/1/1
BD-1(config-router)#exit


--R2--
BD-2(config)#router ospf 10
BD-2(config-router)#passive-interface g0/0/0
BD-2(config-router)#exit


--R3--
BD-3(config)#router ospf 10
BD-3(config-router)#passive-interface g0/0/0
BD-3(config-router)#exit
R4
PP-1(config)#router ospf 10
PP-1(config-router)#passive-interface g0/0/0
PP-1(config-router)#exit
```

```
--R5--
PP-2(config)#router ospf 10
PP-2(config-router)#passive-interface g0/0/0
PP-2(config-router)#exit


--R6--
PP-3(config)#router ospf 10
PP-3(config-router)#passive-interface g0/0/0
PP-3(config-router)#passive-interface g0/0/1
PP-3(config-router)#exit
```

Part 2: Configure NAT

In this part of the practice skills assessment, you will configure static and dynamic NAT at the network edge.

Step 1: Configure static NAT

Configure static NAT to translate the address of the **Internal Server** on LAN-1 to the public address of **192.0.2.115**. Verify that the translations are occurring.

```
--R1--
BD-1(config)#ip nat inside source static 192.168.11.100
192.0.2.115
BD-1(config)#int s0/1/1
BD-1(config-if)#ip nat outside
BD-1(config-if)#int g0/0/0
BD-1(config-if)#ip nat inside
BD-1(config-if)#exit
```

Step 2: Configure dynamic PAT.

a. Create access list **1** to allow all addresses in the **192.168.0.0/16** network to be translated.

b. Create a NAT pool named **POOL-1**. It should use address in the range **192.0.2.116 - 192.0.2.118**.

c. Configure NAT to dynamically use the addresses in the pool for all traffic entering and exiting the company network. Remember that it is likely that more than three hosts will be accessing traffic on the Internet.

```
--R1--
BD-1(config)#access-list 1 permit 192.168.0.0 0.0.255.255
BD-1(config)#ip nat pool POOL-1 192.0.2.116 192.0.2.118
netmask 255.255.255.248
BD-1(config)#ip nat inside source list 1 pool POOL-1 overload
BD-1(config)#int s0/1/0
BD-1(config-if)#ip nat inside
BD-1(config-if)#exit
```

Part 3: Configure ACLs

Configure access control lists to meet the following requirements.

Note: Use **host** and **any** keywords whenever possible. Always explicitly configure the default deny condition when it is to be used as part of the ACL functionality so that it can be logged when the condition is met. You do not need to specify the default deny condition if it is counteracted with **permit ip any any** for this assessment. All ACLs should be placed in the most efficient location possible according to the guidelines specified in the curriculum.

a. Create a named standard access list to explicitly prevent all external traffic accessing the telnet lines on RTR-1. Name the list **VTY-BLOCK**. All addresses on the 192.168.0.0/16 network only should be allowed to access the VTY lines. Verify that the list works as specified.

```
--R1--
BD-1(config)#ip access-list standard VTY-BLOCK
BD-1(config-std-nacl)#permit 192.168.0.0 0.0.255.255
BD-1(config-std-nacl)#deny any
BD-1(config-std-nacl)#exit
BD-1(config)#line vty 0 4
BD-1(config-line)#access-class VTY-BLOCK in
BD-1(config-line)#exit
```

b. Create a numbered standard ACL to prevent all hosts on LAN 1 from accessing LAN 2. Use **10** as the number for the list.

```
--R3--
BD-3(config)#access-list 10 deny 192.168.11.0 0.0.0.255
BD-3(config)#access-list 10 permit any
BD-3(config)#int g0/0/1
BD-3(config-if)#ip access-group 10 in
BD-3(config-if)#exit
```

c. Create an extended numbered ACL that will prevent traffic from the LAN 4 network from accessing the HTTP service that is running on **Admin Server**. All other traffic from LAN 4 hosts should be able to access the network. Number the list **101**.

```
--R6--
```

```
PP-3(config)#access-list 101 deny tcp any host 192.168.33.14 eq
www
PP-3(config)#access-list 101 permit ip any any
PP-3(config)#int g0/0/0
PP-3(config-if)#ip access-group 101 in
```

Part 4: Manage Network Devices

Step 1: Configure NTP

Configure router PP-2 to use Admin Server as its time source.

```
--R5--
PP-2(config)#ntp server 192.168.33.14
PP-2(config)#exit
```

Step 2: Backup IOS to Server

Backup the IOS image file on router PP-2 to **Admin Server**.

```
--R5--
PP-2#show flash:

System flash directory:
File   Length    Name/status
  3    486899872 isr4300-universalk9.03.16.05.S.155-3.S5-ext.SPA.bin
  2    28282     sigdef-category.xml
  1    227537    sigdef-default.xml
[487155691 bytes used, 2761893909 available, 3249049600 total]
3.17338e+06K bytes of processor board System flash (Read/Write)

PP-2#copy flash tftp
Source filename []? isr4300-universalk9.03.16.05.S.155-3.S5-
ext.SPA.bin
Address or name of remote host []? 192.168.33.14
Destination filename [isr4300-universalk9.03.16.05.S.155-3.S5-
ext.SPA.bin]? [Press Enter]
```

Answers Script:

Router 1 possible names: BD-1; RTR-1; RTR-A

```
enable

configure ter

router ospf 10
```

```
exit

interface g0/0/0
ip ospf 10 area 0
interface s0/1/0
ip ospf 10 area 0
exit

router ospf 10
router-id 9.9.9.9
exit

int g0/0/0
ip ospf priority 255
exit
ip route 0.0.0.0 0.0.0.0 s0/1/1
router ospf 10
default-information originate
exit

int s0/1/0
ip ospf hello-interval 20
ip ospf dead-interval 80
exit

router ospf 10
auto-cost reference-bandwidth 10000
```

```
exit


router ospf 10

passive-interface s0/1/1

exit


ip nat inside source static 192.168.11.100 192.0.2.115

int s0/1/1

ip nat outside

int g0/0/0

ip nat inside

exit


access-list 1 permit 192.168.0.0 0.0.255.255

ip nat pool POOL-1 192.0.2.116 192.0.2.118 netmask
255.255.255.248

ip nat inside source list 1 pool POOL-1 overload

int s0/1/0

ip nat inside

exit


ip access-list standard VTY-BLOCK

permit 192.168.0.0 0.0.255.255

deny any

exit

line vty 0 4

access-class VTY-BLOCK in
```

```
exit

end

copy running-config startup-config
```

Router 2 possible names: BD-2; RTR-2; RTR-B

```
enable

configure terminal

router ospf 10

exit


interface g0/0/0

ip ospf 10 area 0

interface g0/0/1

ip ospf 10 area 0

exit


router ospf 10

router-id 8.8.8.8

exit


router ospf 10

auto-cost reference-bandwidth 10000

exit


router ospf 10

passive-interface g0/0/0

exit
```

```
end

copy running-config startup-config
```

Router 3 possible names: BD-3; RTR-3; RTR-C

```
enable

configure terminal

router ospf 10

exit


interface g0/0/0

ip ospf 10 area 0

interface g0/0/1

ip ospf 10 area 0

exit


router ospf 10

router-id 7.7.7.7

exit


router ospf 10

auto-cost reference-bandwidth 10000

exit


router ospf 10

passive-interface g0/0/0

exit
```

```
access-list 10 deny 192.168.11.0 0.0.0.255

access-list 10 permit any

int g0/0/1

ip access-group 10 in

exit


end

copy running-config startup-config
```

Router 4 possible names: PP-1; RTR-4; RTR-D

```
enable

configure terminal

router ospf 10

network 10.10.0.240 0.0.0.3 area 0

network 10.10.0.236 0.0.0.3 area 0

network 10.10.0.248 0.0.0.3 area 0

exit


int s0/2/0

ip ospf hello-interval 20

ip ospf dead-interval 80

exit


router ospf 10

auto-cost reference-bandwidth 10000

exit


int s0/1/1
```

```
ip ospf cost 50

exit


router ospf 10

passive-interface g0/0/0

exit


end

copy running-config startup-config
```

Router 5 possible names: PP-2; RTR-5; RTR-E

```
enable

configure terminal

router ospf 10

network 10.10.0.240 0.0.0.3 area 0

network 10.10.0.244 0.0.0.3 area 0

network 192.168.33.0 0.0.0.15 area 0

exit


router ospf 10

auto-cost reference-bandwidth 10000

exit


router ospf 10

passive-interface g0/0/0

exit


ntp server 192.168.33.14
```

```
exit


copy running-config startup-config
```

Router 6 possible names: PP-3; RTR-6; RTR-F

```
enable

configure terminal

router ospf 10

network 10.10.0.248 0.0.0.3 area 0

network 10.10.0.244 0.0.0.3 area 0

network 192.168.44.0 0.0.0.255 area 0

network 192.168.55.0 0.0.0.255 area 0

exit


router ospf 10

auto-cost reference-bandwidth 10000

exit


router ospf 10

passive-interface g0/0/0

passive-interface g0/0/1

exit


access-list 101 deny tcp any host 192.168.33.14 eq www

access-list 101 permit ip any any

int g0/0/0

ip access-group 101 in
```

```
end

copy running-config startup-config
```

Part 4, step 2 (Router 5 possible names: PP-2; RTR-5; RTR-E)

Note: IOS image file (.bin file) name may be different

```
PP-2>enable

PP-2#show flash:

System flash directory:
File   Length    Name/status
   3    486899872isr4300-universalk9.03.16.05.S.155-3.S5-ext.SPA.bin
   2    28282     sigdef-category.xml
   1    227537    sigdef-default.xml
[487155691 bytes used, 2761893909 available, 3249049600 total]
3.17338e+06K bytes of processor board System flash (Read/Write)

PP-2#copy flash tftp
Source filename []? isr4300-universalk9.03.16.05.S.155-3.S5-
ext.SPA.bin
Address or name of remote host []? 192.168.33.14
Destination filename [isr4300-universalk9.03.16.05.S.155-3.S5-
ext.SPA.bin]? [Press Enter]
```