IT&C 247 Lab 7 (Dynamic Routing)

Introduction

Now that you've had some exposure to OSPF from a conceptual standpoint, we're going to have a chance to implement an OSPF architecture. You now understand how static routes work and can appreciate why it would be hard to run an operational network on JUST static routes. OSPF is a dynamic routing protocol, it is redundant and self-healing, and it provides some level of authentication to make sure you are not getting bad routes.

Overview

For this lab:

- Remove all static routes
- Wire each distribution switch to each core router
- Create Area 0 with the core routers and distribution switches
- Create Area 1 on the top distribution switch and Area 2 on the bottom one

Instructions

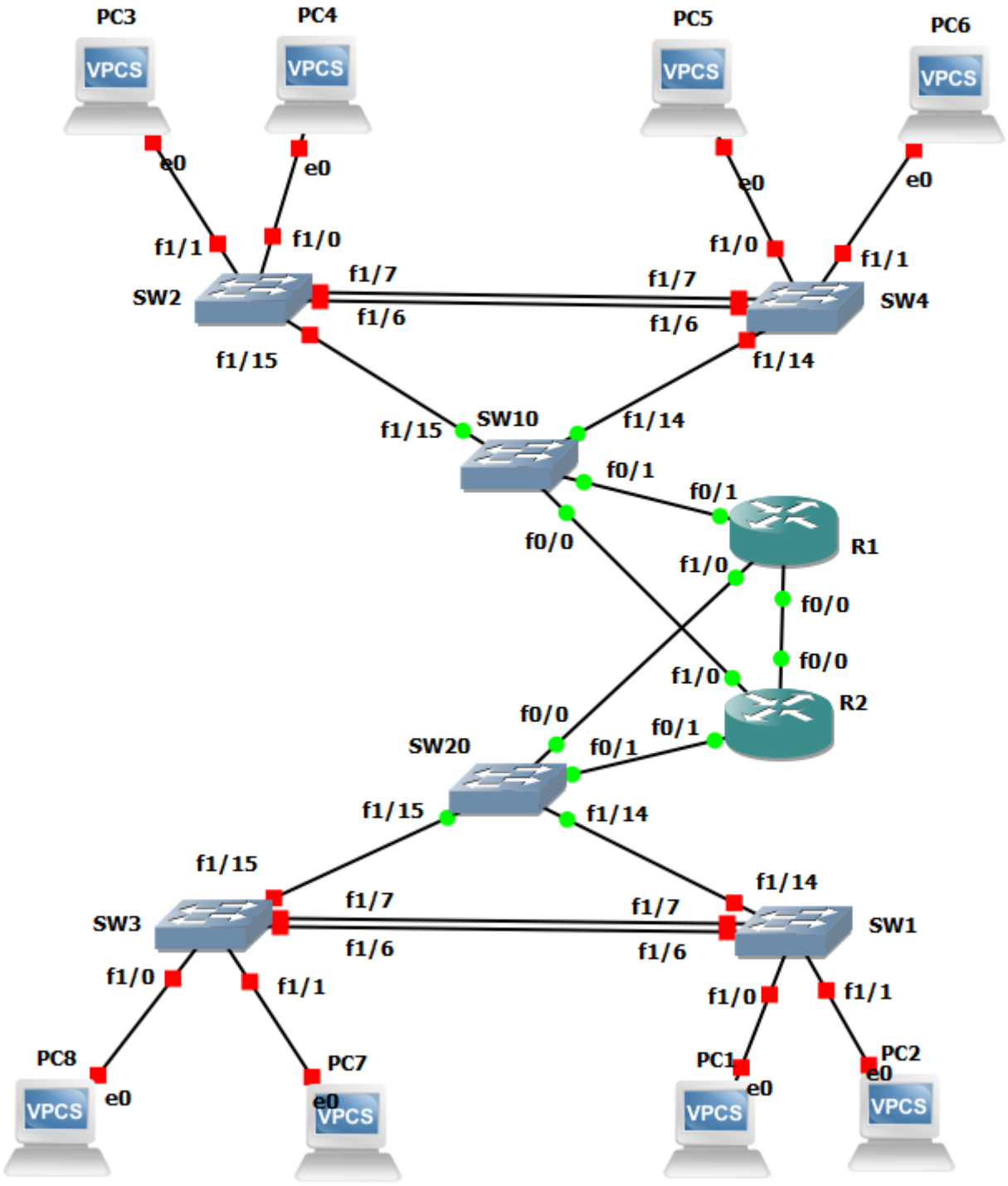
Getting started

Create a new Lab 7 by opening Lab 6 part 2, then clicking the File menu, then click "Save As" and name it something sensible.

Log into each Layer 3 device (there are four of them) and remove all static routes. The command is:

```
no ip route [DESTINATION NETWORK ID] [SUBNET MASK] [NEXT HOP IP ADDRESS]
```

Add connections from the distribution switches to the routers they were not previously connected to (connect f0/0 on each switch to the f1/0 interface on the router). It should look like this:



Be sure to assign IP address to the new interfaces (and enable them):

- For the ESW10 f0/0 to R2 f1/0 connection, use the 10.10.10.12/30 network and assign the lowest address to the switch
- For the ESW20 f0/0 to R1 f1/0 connection, use the 10.10.10.16/30 network and assign the lowest address to the switch

Building Area 0

In order to create an OSPF network, you want to do the following:

- Create a loopback address

- Do a "show ip route" and take a screen capture from each of your Layer 3 devices (should only show directly connected networks)
- Enable the OSPF process
- Configure neighbor authentication
- Assign connected networks to the OSPF process

Commands

If you see something in square brackets then that is something that you must enter (user configurable).

Loopback address

```
R1# conf t
R1(config)# interface loopback 1
R1(config-if)# ip address 1.1.1.1 255.255.255.255
```

Note: you can use "loopback 1" on all devices but you will need to assign a different IP address to each one, I would suggest that you just go sequentially through your network and assign each Layer 3 device the next number in the sequence

Enable OSPF on router

`Router(config)# router ospf 1` <---- the "1" is the process-id

Note: You can use whatever number you want here for the process-id, but that number specifies which OSPF routing table this is (it should be consistent across all your Layer 3 devices)

Configure authentication

```
Router(config-if)# ip ospf authentication message-digest
Router(config-if)# ip ospf message-digest-key 1 md5 [SOME PASSWORD]
```

Note: The key number (1 in this example) can stay the same, the last value in the command is the actual password (which must be the same for all devices on your network). You will need to configure this for each of your interfaces that connect to another Layer 3 device (consider using the range command). Also, the password cannot be longer than 16 characters

Assign connected networks to the OSPF process

```
Router(config)# router ospf 1
Router(config-router)# network [NETWORK ID] [SUBNET MASK] area 0
```

Note: This command is specifically for area 0, if you want to assign a network to a different area, you need to change the area # at the end. You will need to repeat the above command for each connected network

Building Areas 1 and 2

- Enter the OSPF configuration prompt (by entering "router ospf 1")
- When adding networks to the OSPF procces, simply assign them to area 1 (or 2 as the case may be). Here is an example:

  ```
  ESW10(config)# router ospf 1
  ESW10(config-router)# network 10.0.10.0 255.255.255.0 area 1
  ```

Be sure to save all of your configs!

Once all of your Layer 3 devices are configured with OSPF and authentication, you should be able to ping from PC 8 to PC1, PC3, and PC5

Troubleshooting

General

General helpful commands for seeing your interfaces:

```
show int status
show int summary
show vlan-switch
show ip int brie
```

Checking Routing Tables

Some helpful commands with troubleshooting routing issues:

```
show ip route
```

Note: should show 'c x.x.x.x is directly connected'

Checking OSPF Tables and Routing

Some helful commands with troubleshooting ospf issues:

```
show ip ospf neighbors
show ip protocols
show ip ospf interface
```

Testing dynamic routing

1. Have PC8 do a traceroute to PC5 and note the path it takes
2. Remove the link between R2 and ESW10
3. Do another traceroute from PC8 to PC5 and notice the different path

Pass-off

- A screenshot from each Layer 3 device showing you have removed your old statics routes (should only show directly connected routes)
- A screenshot of your final topology
- A screenshot of the ping command from PC 8 to PC1, PC3, and PC5
- A screenshot from each Layer 3 device showing the routing table and the ospf neighbors
- A screenshot showing the original traceroute from PC8 to PC5
- A screenshot showing the updated traceroute from PC8 to PC5
- Answer the questions:
    - why is authenticating OSPF neighbors a good idea? What can happen if you don't?

    - what type of router in the OSPF architecture are ESW10 and ESW20?
    - what is the purpose of having multiple areas in an OSPF architecture?

Resources

- https://networkel.com/advanced-ospf-configuration-example/
- https://networklessons.com/cisco/ccna-routing-switching-icnd2-200-105/ospf-multi-area-configuration/