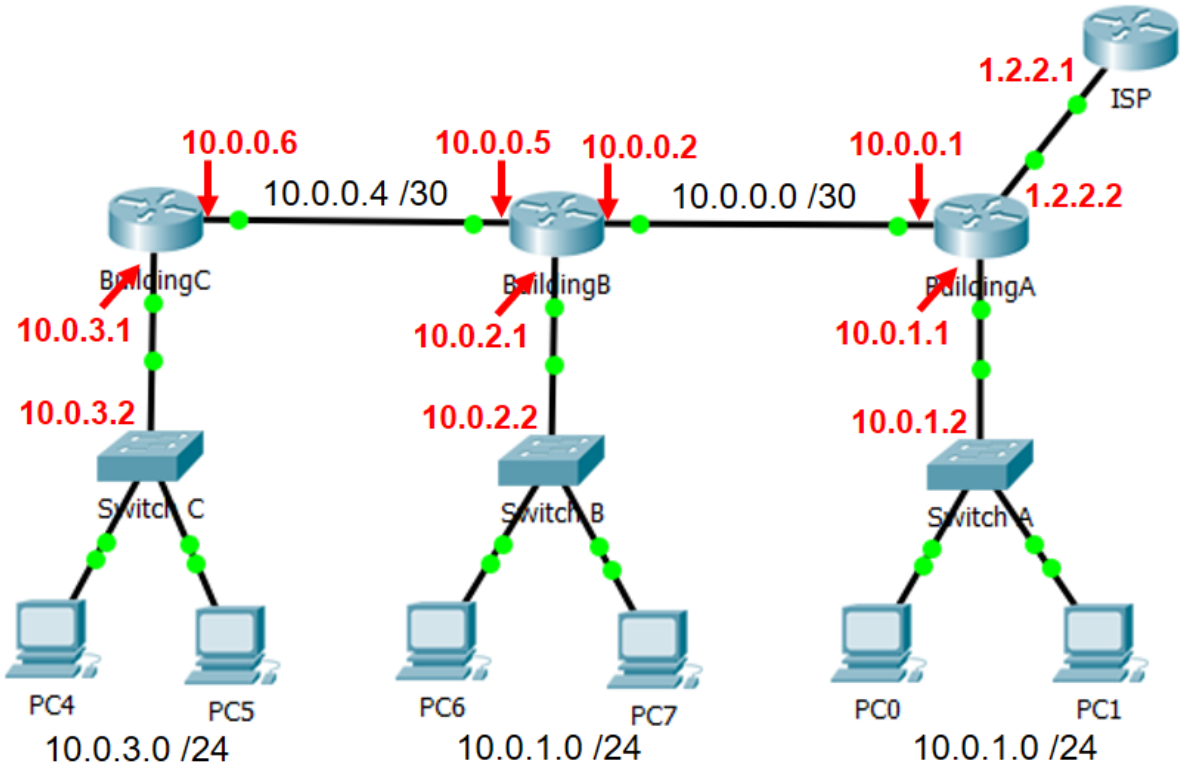
Assignment 6-5 Static Routing

Name: _____

Objective

In this lab, we demonstrate working with static routing using the topology below from the last lab. We basically need to create static and default routes so that every device can reach every other on as well as out to the ISP.

Lab Topology



Task 1 – Getting Started

This topology assumes that you completed and saved the last exercise as ***yourname*6-4-2** as a starting point. If for any reason you do not have that you can download **Class6-5-1** from the assignment page. Either way immediately save your open file as ***yourname*6-5-1**.

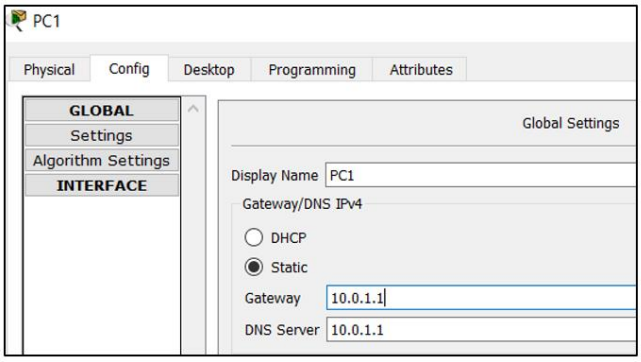
Task 2 – Test your connectivity

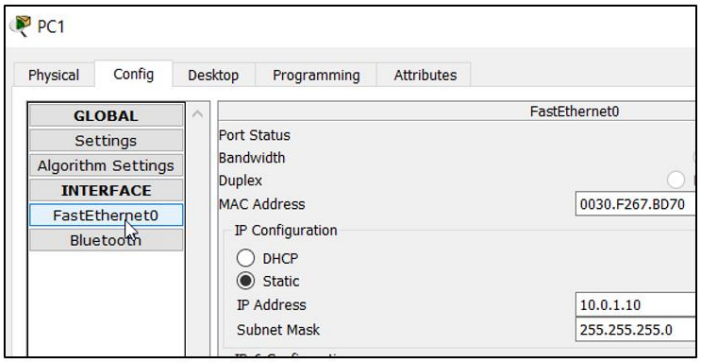
In the last assignment, we should have discovered that we have incomplete connectivity in our network. We got the following results from our pings.

- Each host should be able to ping its LAN switch and router.
- Each router should be able to ping their LAN switch and any directly connected router.
- No other devices should be able to ping yet.

We could configure IP addresses on each of the computers if you want but for our purposes we only need one configured.

1. Select one of the Building A hosts and configure it with the address 10.0.1.10 /24 and the default gateway for that network.



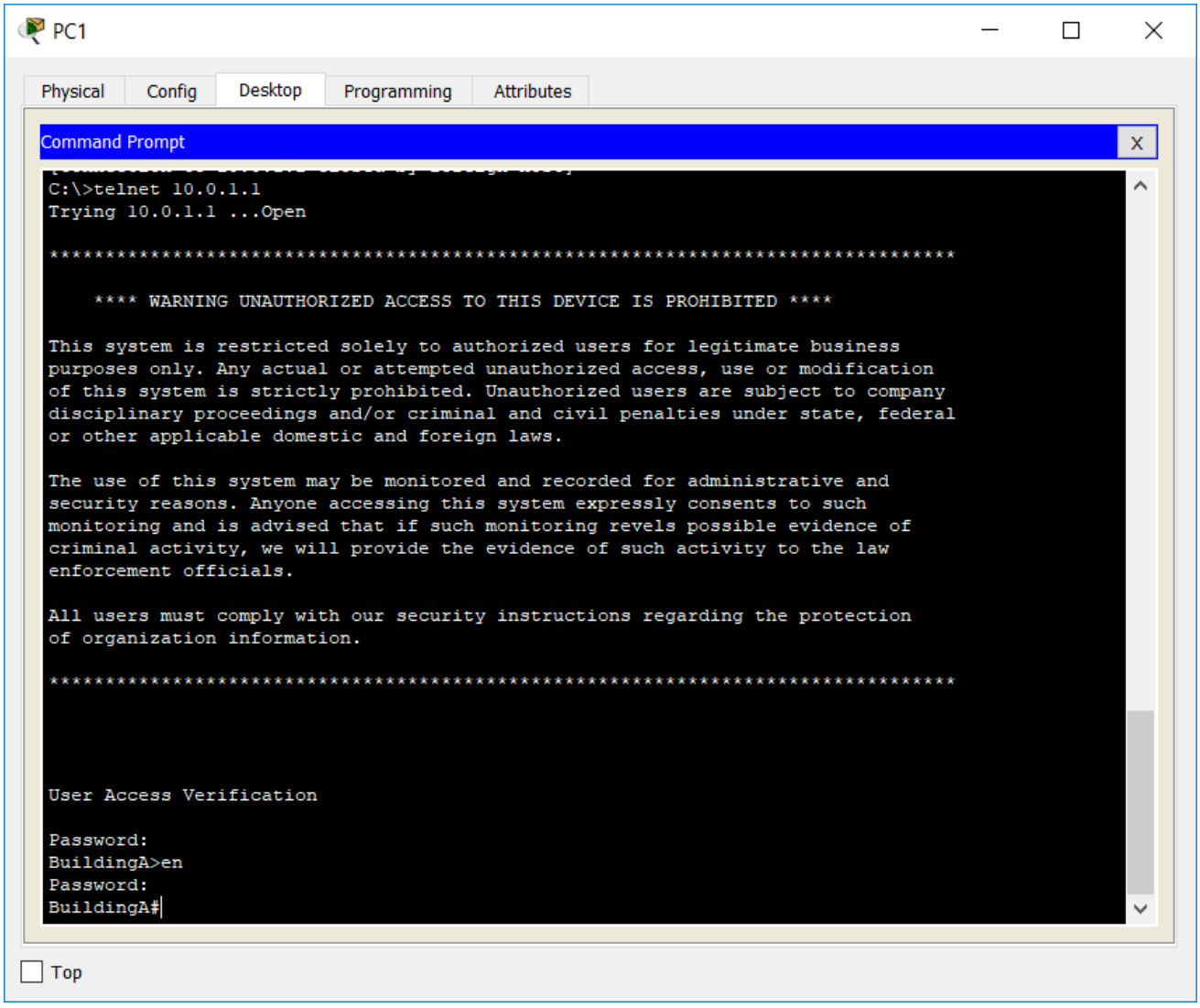


2. Confirm that host can ping the three interfaces on the BuildingA router but no further. Technically it can also ping the ISP at 1.2.2.1 and BuildingB router at 10.0.0.2 but they don't know where to send the replies.

   Confirm that you **can't** Telnet to BuildingC (10.0.06). That will be important later.

Task 3 – Set up Telnet Connections to the BuildingA router

1. Setup a Telnet connection to BuildingA router from one the configured host PC using the Desktop | Command Prompt tool.



2. Confirm it can ping 1.2.2.1 and 10.0.0.2 because it shares a link with both, but it can't ping any further (like 10.0.0.5).

3. Using the telnet session, run a **show ip route** command.

```
BuildingA#show ip route
 ~~Header omitted~~
Gateway of last resort is not set

     1.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       1.2.2.0/30 is directly connected, GigabitEthernet0/0
L       1.2.2.2/32 is directly connected, GigabitEthernet0/0
     10.0.0.0/8 is variably subnetted, 4 subnets, 3 masks
C       10.0.0.0/30 is directly connected, GigabitEthernet0/2
L       10.0.0.1/32 is directly connected, GigabitEthernet0/2
C       10.0.1.0/24 is directly connected, GigabitEthernet0/1
L       10.0.1.1/32 is directly connected, GigabitEthernet0/1

BuildingA#
```

The problem is the router doesn't know about the other networks in our LAN.

4. We can solve that with static routes to the networks in Building B and C. to LAN C on Router B. To do that we use the ip route command for each route identifying the network and the **next hop** router needed to get there. In each case the next hop would be 10.0.0.2 on BuildingB router.

   The commands would be:

   ip route 10.0.2.0 255.255.255.0 10.0.0.2
   ip route 10.0.3.0 255.255.255.0 10.0.0.2
   ip route 10.0.0.4 255.255.255.252 10.0.0.2

   The last one is the link between BuildingB and BuildingC – an easy one to overlook but necessary to include. Run the code and look at your route table again.The **S** preceding them means they were statically configured.

```
BuildingA(config)#ip route 10.0.2.0 255.255.255.0 10.0.0.2
BuildingA(config)#ip route 10.0.3.0 255.255.255.0 10.0.0.2
BuildingA(config)#ip route 10.0.0.4 255.255.255.252 10.0.0.2
BuildingA(config)#
BuildingA(config)#^Z
BuildingA#show ip route
~~Header omitted~~
Gateway of last resort is not set

     1.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       1.2.2.0/30 is directly connected, GigabitEthernet0/0
L       1.2.2.2/32 is directly connected, GigabitEthernet0/0
     10.0.0.0/8 is variably subnetted, 7 subnets, 3 masks
C       10.0.0.0/30 is directly connected, GigabitEthernet0/2
L       10.0.0.1/32 is directly connected, GigabitEthernet0/2
S       10.0.0.4/30 [1/0] via 10.0.0.2
C       10.0.1.0/24 is directly connected, GigabitEthernet0/1
L       10.0.1.1/32 is directly connected, GigabitEthernet0/1
S       10.0.2.0/24 [1/0] via 10.0.0.2
S       10.0.3.0/24 [1/0] via 10.0.0.2
BuildingA#
```

   We still can't ping those networks, but when we add routes to BuildingA in the Building B and C routers, the traffic will know how to find its way back.

5. Before we Telnet over to Building B and fix its rout table, we need to deal with the Internet. Obviously, we can't list every route in the world, but there is a special static route called a Default Route that basically says for any unknown (or remaining) routes, send the traffic to the ISP – our gateway to the Internet.

   The commands would be:

   ip route 0.0.0.0 0.0.0.0 1.2.2.1

   The first 0.0.0.0 means any network and the second means with any mask. Run the code and look at your route table again.

```
BuildingA#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
BuildingA(config)#ip route 0.0.0.0 0.0.0.0 1.2.2.1
BuildingA(config)#
BuildingA#show ip route
~~Header omitted~~
Gateway of last resort is 1.2.2.1 to network 0.0.0.0

     1.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       1.2.2.0/30 is directly connected, GigabitEthernet0/0
L       1.2.2.2/32 is directly connected, GigabitEthernet0/0
     10.0.0.0/8 is variably subnetted, 7 subnets, 3 masks
C       10.0.0.0/30 is directly connected, GigabitEthernet0/2
L       10.0.0.1/32 is directly connected, GigabitEthernet0/2
S       10.0.0.4/30 [1/0] via 10.0.0.2
C       10.0.1.0/24 is directly connected, GigabitEthernet0/1
L       10.0.1.1/32 is directly connected, GigabitEthernet0/1
S       10.0.2.0/24 [1/0] via 10.0.0.2
S       10.0.3.0/24 [1/0] via 10.0.0.2
S*   0.0.0.0/0 [1/0] via 1.2.2.1
BuildingA#
```

6. Be sure to save your changes on the router with a **copy run start** or **write** command.

7. From the BuildingA router we can Telnet to BuildingB's router because we share a link. From that we can see that BuildingB only knows its connected networks.

```
BuildingA#Telnet 10.0.0.2
Trying 10.0.0.2 ...Open

BuildingB#show ip route
  ~~Header omitted~~

Gateway of last resort is not set

     10.0.0.0/8 is variably subnetted, 6 subnets, 3 masks
C       10.0.0.0/30 is directly connected, GigabitEthernet0/0
L       10.0.0.2/32 is directly connected, GigabitEthernet0/0
C       10.0.0.4/30 is directly connected, GigabitEthernet0/2
L       10.0.0.5/32 is directly connected, GigabitEthernet0/2
C       10.0.2.0/24 is directly connected, GigabitEthernet0/1
L       10.0.2.1/32 is directly connected, GigabitEthernet0/1

BuildingB#
```

Which routes need to be added is easier than you might think.

Towards BuildingC is a dead-end, there is nothing beyond it and the only network we are not connected to is BuildingC's LAN (10.0.3.0 /24) which can be reached through 10.0.0.6.

Everything else, including the Internet goes through BuildingA (10.0.0.1).

This means we only need to add two routes to our table. Add them and then look at your route table.

8. Since everything we can't reach has to go through Router A, we could put a default route on Router B pointing everything unknown at Router A. Try it on your own and show your route table.

```
BuildingB(config)#ip route 10.0.3.0 255.255.255.0 10.0.0.6
BuildingB(config)#ip route 0.0.0.0 0.0.0.0 10.0.0.1
BuildingB(config)#^Z
BuildingB#show ip route
   ~~Header omitted~~
Gateway of last resort is 10.0.0.1 to network 0.0.0.0

     10.0.0.0/8 is variably subnetted, 7 subnets, 3 masks
C       10.0.0.0/30 is directly connected, GigabitEthernet0/0
L       10.0.0.2/32 is directly connected, GigabitEthernet0/0
C       10.0.0.4/30 is directly connected, GigabitEthernet0/2
L       10.0.0.5/32 is directly connected, GigabitEthernet0/2
C       10.0.2.0/24 is directly connected, GigabitEthernet0/1
L       10.0.2.1/32 is directly connected, GigabitEthernet0/1
S       10.0.3.0/24 [1/0] via 10.0.0.6
S*   0.0.0.0/0 [1/0] via 10.0.0.1

BuildingB#
```

9. Confirm that BuilingB's router can now ping all interfaces on BuildingA router, its switch, and even the host that we configured.

```
BuildingB#ping 1.2.2.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 1.2.2.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/1 ms

BuildingB#ping 10.0.1.10

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.1.10, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/2/10 ms

BuildingB#
```

10. Be sure to save your changes on the router with a **copy run start** or **write** command.
11. Show the route table on Router A. It doesn't know anything about LAN B or C. We can't do a default route to Router B because we already have a default route pointing out to the Internet. The default route is the route of last resort – there can only be one on each router. Entering another one would overwrite the existing one.

```
BuildingB#telnet 10.0.0.6
```

```
Trying 10.0.0.6 ...Open
BuildingC#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
BuildingC(config)#ip route 0.0.0.0 0.0.0.0 10.0.0.5
BuildingC(config)#^Z
BuildingC#wri
Building configuration...
[OK]
BuildingC#ping 10.0.1.10

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.1.10, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/2/10 ms
BuildingC#
```

12. Be sure to save your changes on the router with a **copy run start** or **write** command.
13. Before we leave BuildingC, recall that at the beginning of the exercise you could not Telnet to BuildingC and yet here you are via Telnet. Remember that just because you can't reach clear across your network, you may be able to do it one hop at a time. Telnet to your router and then Telnet to the next adjacent (directly connected) router. We did a little work along the way, but we could have hopped here and started from this end.

    Exit will close the Telnet session to BuildingC. You will probably have to do it twice more to back clear out – one hop at a time.
14. Confirm from the host that you can ping the switch in BuildingC. In theory if you can do that, then you can ping anything in between and Telnet to there as well.

    Note that you still can't ping the ISP (1.2.2.1). Your pings will get there, but the router doesn't know where to send them. The real world solution is to put NAT on the BuildingA router, but that is beyond the scope of this assignment. The only other alternative would be to add routes to our network on the ISP router. That would never happen with a network using private addresses.

Reflection

Well, that was a lot of work and with only three routers and LANs. Imagine if we had six or ten.

What if we added even one more router to our network now, we might have to reconfigure every router.

The bottom line is that static routes work, but they don't scale well, and they don't deal with change well. Could there be any other problems?

1. Since static routing relies on humans, it is possible that we could forget or overlook a route – the direct links between two routers for example. The network would still work but some devices could not ping or Telnet to the interfaces on those links.

Save your work.

Experiment as much as you like.

Save your device configurations if you haven't already.

Save Packet Tracer as **yourname6-5-2**.