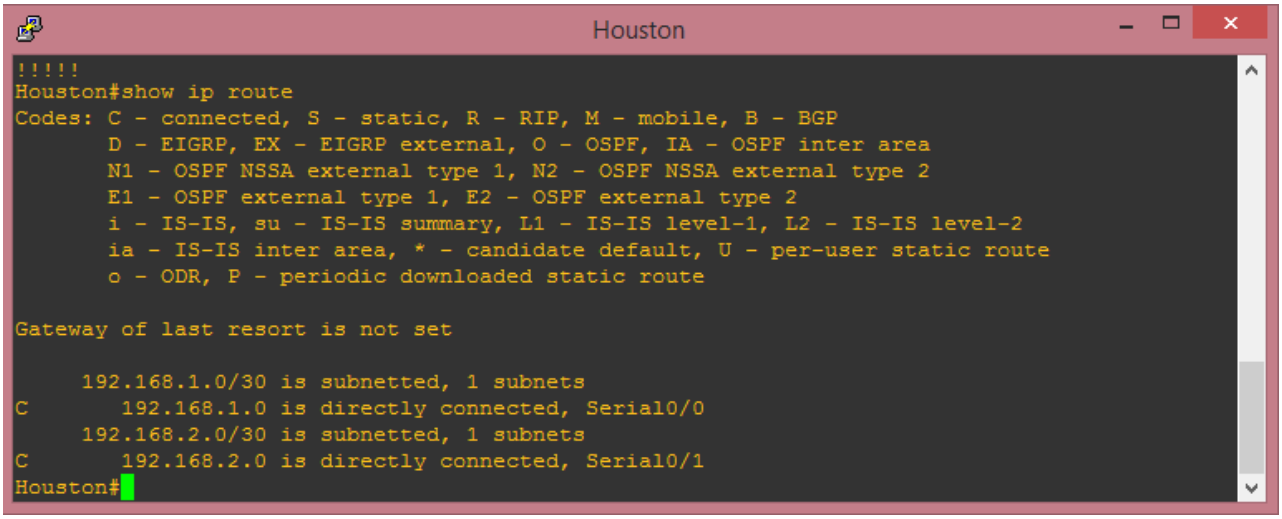
1 Overview: Static Routing

The objective of this GNS3 lab study is to demonstrate how data packets are routed in a network using a static routing protocol. A static route is an IP address to which data traffic can be forwarded and has been manually entered into a router's routing table.

The most common static route used in a host computer is the default gateway. The default gateway specifies where the data traffic is to be sent when the destination address for the data is not in the same LAN or is unknown. The default route is specified in the routing table by a 0.0.0.0 network address entry with a subnet mask of 0.0.0.0. The 0.0.0.0 indicates that, if the destination address is unknown and the subnet mask is unknown, then send the data packet to the gateway.

A loopback interface is a virtual interface that resides on a router. It is not connected to any other device. Loopback interfaces are very useful because they will never go down, unless the entire router goes down. This helps in managing routers because there will always be at least one active interface on the routers, the loopback interface.

You are a member of a team of network engineers. One of your customers has 2 dedicated links to connect their Houston site to the Austin site. You are not allowed to use dynamic routing protocols because of various reasons. Please keep in mind that the routing address entry into the routing table can be verified by entering the command show ip route from the router's # prompt. You need to use this command many times.



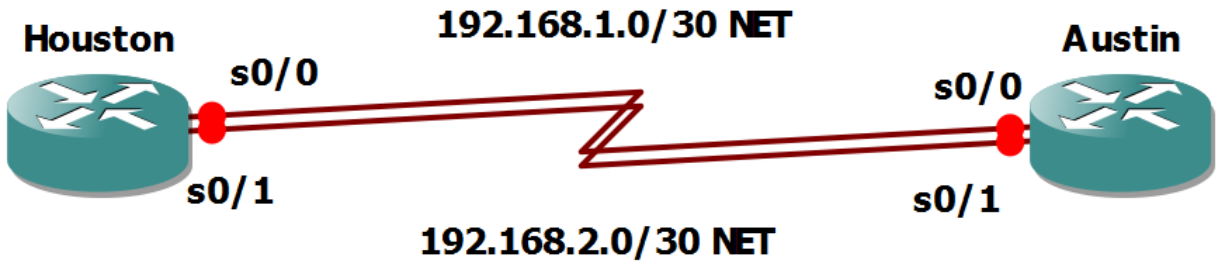
The output after the topology below is implemented (before the static routing setup)

2 Network Topology: Devices, Cabling and IP Assignments

In this in lab study, you will use the following image file c3640-jk9s-mz.124-16.bin, which corresponds to Cisco 3600 Series, Chassis 3640 Router. Please install 4-Port Sync Serial Network Module (NM-4T) into Slot 0. Please read the previous GNS3 lab studies if you need further information.

Cisco NM-4T Module Rear View

Your first goal is to implement the network topology shown below.



The routes between the routers will be via either 192.168.1.0/30 NET or 192.168.2.0/30 NET.

192.168.1.0/30 NET: Router Houston connection to Router Austin

192.168.2.0/30 NET: Router Austin connection to Router Houston

First of all, please assign the IP addresses provided below to the corresponding serial interfaces using the commands you learned in the previous studies.

Houston

- Serial0/0 192.168.1.1/30
- Serial0/1 192.168.2.1/30

Austin

- Serial0/0 192.168.1.2/30
- Serial0/1 192.168.2.2/30

Please configure the loopback interfaces below. You should use the commands interface type number and ip address ip-address mask. The loopback interface acts as a placeholder for the static IP address and provides default routing information.

- Loopback0 interface on the **Houston** router: IP Address 1.1.1.1/30.
- Loopback0 interface on the **Austin** router: IP Address 2.2.2.2/30.

```
Houston#enable
Houston#configure terminal
Houston(config)#interface Loopback 0
Houston(config-if)#ip address 1.1.1.1 255.255.255.252
Houston(config-if)#exit
Houston(config)#end
```

You can enter the show interface loopback number command to verify that you have properly configured the loopback interface

Please configure the Loopback0 interface on the Austin router.

Please test if Houston router is able to ping the Loopback0 interface on the Austin router.

```
Houston#ping 2.2.2.2
```

Please test if Austin router is able to ping the Loopback0 interface on the Houston router.

```
Austin#ping 1.1.1.1
```

Please take screen shot of the ENTIRE SCREEN for Houston router and Austin router, where we can see the result of the ping. Please DO NOT MAXIMIZE the console screen and allow your background to be seen in the image. Otherwise, your grade for this image will be zero. The file name must be as follows; otherwise, your grade for this image will be zero.

Ping1.Hou.FirstName.LastName.png
Ping1.Aus.FirstName.LastName.png

3 Static Routing

Please configure static routing. The static route information is entered from the router's configure terminal prompt (config)# using the ip route command.

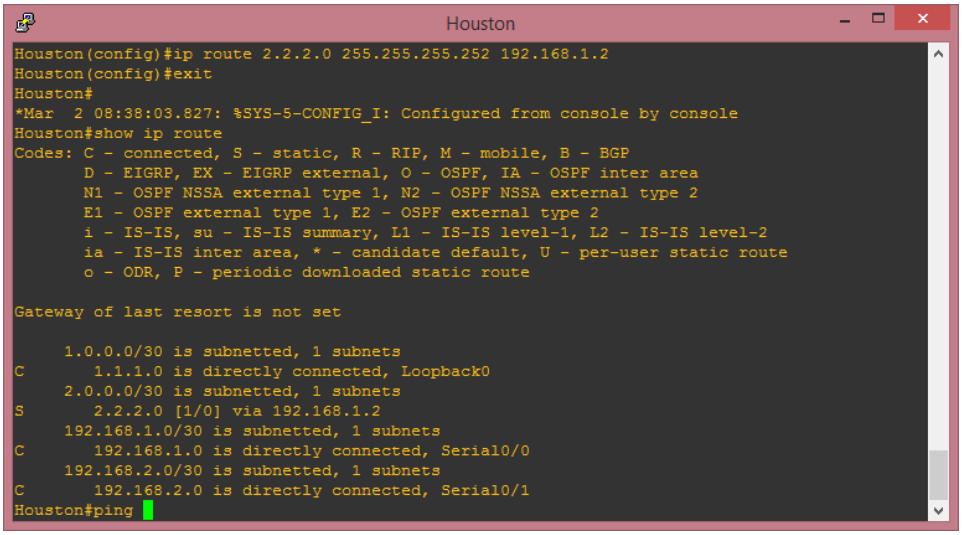
```
Router(config)#ip route destinationNetwork subnet-mask next-hop
```

where the destination is the network's destination IP address (NET), the subnet mask is what has been defined for the subnets, and the next hop is the IP address of the next router interface in the link. Each static route can use a different subnet mask. This is called variable length subnet masking.

Houston: Please create a static route pointing to the Loopback0 network on Austin, traffic should pass via the 192.168.1.0/30 NET.

```
Houston#enable
Houston#configure terminal
Houston(config)#ip route 2.2.2.0 255.255.255.252 192.168.1.2
Houston(config)#end
```

The routing address entry into the routing table can be verified by entering the command show ip route from the router's # prompt.



Please take screen shot of the ENTIRE SCREEN for Houston router, where we can see the result of the show ip route. Please DO NOT MAXIMIZE the console screen and allow your background to be seen in the image. Otherwise, your grade for this image will be zero. The file name must be as follows; otherwise, your grade for this image will be zero.

Show1.Hou.FirstName.LastName.png

Please test if Houston router is able to ping the Loopback0 interface on the Austin router.

```
Houston#ping 2.2.2.2
```

Please take screen shot of the ENTIRE SCREEN for Houston router, where we can see the result of the ping. Please DO NOT MAXIMIZE the console screen and allow your background to be seen in the image. Otherwise, your grade for this image will be zero. The file name must be as follows; otherwise, your grade for this image will be zero.

Ping2.Hou.FirstName.LastName.png

Austin: Please create a default route pointing to the Loopback0 network on Houston, traffic should pass the 192.168.2.0 NET. Please remember that the default route is specified in the routing table by a 0.0.0.0 network address entry with a subnet mask of 0.0.0.0. The 0.0.0.0 indicates that, if the destination address is unknown and the subnet mask is unknown, then send the data packet to the gateway.

```
Austin#enable
Austin#configure terminal
Austin(config)#ip route 0.0.0.0 0.0.0.0 192.168.2.1
Austin(config)#end
```

The routing address entry into the routing table can be verified by entering the command show ip route from the router's # prompt.

Please take screen shot of the ENTIRE SCREEN for Austin router, where we can see the result of the show ip route. Please DO NOT MAXIMIZE the console screen and allow your background to be seen in the image. Otherwise, your grade for this image will be zero. The file name must be as follows; otherwise, your grade for this image will be zero.

Show1.Aus.FirstName.LastName.png

Please note that you should see a 0.0.0.0 entry (i.e., S*) in the routing table.

Please test if Austin router is able to ping the Loopback0 interface on the Houston router.

```
Austin#ping 1.1.1.1
```

Please take screen shot of the ENTIRE SCREEN for Austin router, where we can see the result of the ping. Please DO NOT MAXIMIZE the console screen and allow your background to be seen in the image. Otherwise, your grade for this image will be zero. The file name must be as follows; otherwise, your grade for this image will be zero.

Ping2.Aus.FirstName.LastName.png

The Administrative Distance (AD) is the number used to determine the preferability of the static routes. The AD ranges from 0–255, where the lower the AD number, the more preferred the route. By default, a static route already has the lower AD of 1.

Houston: Please use the other interface on the Austin router and create a backup static route pointing to the Loopback0 network on Austin, administrative distance should be 100.

```
Houston#enable
Houston#configure terminal
Houston(config)#ip route 2.2.2.0 255.255.255.252 192.168.2.2 100
Houston(config)#end
```

The routing address entry into the routing table can be verified by entering the command show ip route from the router's # prompt. You will not see the back route because the former static router has the default administrative distance value of 0. The backup route will be displayed on the routing table if the first route fails. There is no need to take screenshot at this stage

Austin: Please change the default route so it stays in the routing table even when the interface goes down.

Optional keyword permanent specifies that the route will not be removed, even if the interface shuts down.

```
Austin#enable
Austin#configure terminal
Austin(config)#ip route 0.0.0.0 0.0.0.0 192.168.2.1 permanent
Austin(config)#end
```

4 Grading

Please DO NOT MAXIMIZE the console screen and allow your background to be seen in the image. Otherwise, your grade for this image will be zero.

The file name must be as follows; otherwise, your grade for this image will be zero.

Ping1.Hou.FirstName.LastName.png	15 points
Ping1.Aus.FirstName.LastName.png	15 points
Show1.Hou.FirstName.LastName.png	20 points
Ping2.Hou.FirstName.LastName.png	15 points
Show1.Aus.FirstName.LastName.png	20 points
Ping2.Aus.FirstName.LastName.png	15 points

5 References

[1] A Practical Guide to Advanced Networking, 3rd Edition, Jeffrey S. Beasley and Piyasat Nilkaew, Pearson, 2012, CourseSmart
[2] http://www.vology.com/img/Cisco/Cisco_NM-4T_front2.7bfc93a1307c0af17dbf01c909be186b.jpg
[3] http://www.cisco.com/c/en/us/support/docs/routers/3600-series-multiservice-platforms/7264-hw-4t.html
[4] http://www.informit.com/library/content.aspx?b=CCNA_Practical_Studies&seqNum=45
[5] http://www.cisco.com/c/en/us/td/docs/routers/access/1900/software/configuration/guide/Software_Configuration/routconf.html#pgfId-1071327
[6] http://www.cisco.com/c/en/us/td/docs/ios/12_2/iproute/command/reference/fiprrp_r/1rfindp1.html