

Network II Lab 06 Static Routing

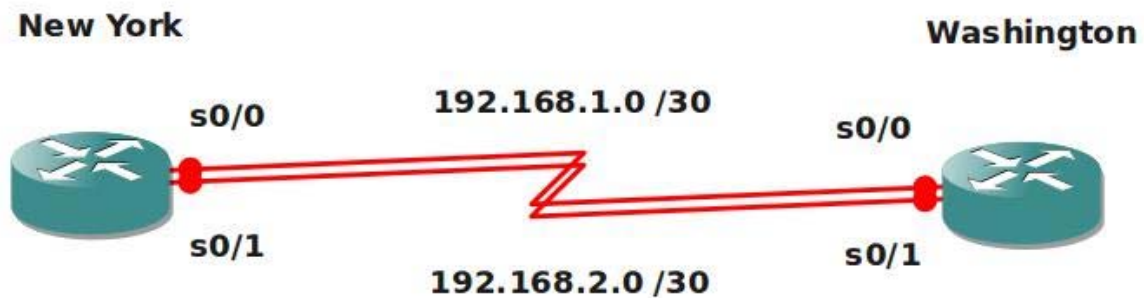
Scenario:

You are working as a networking specialist at a company called "Networks4All". One of their customers has 2 dedicated links to connect their New York site to the Washington site. You are not allowed to use routing protocols because they are paying for every single bit that's sent on these links. You need to do use static routing to get the job done and keep the customer happy

Goal:

- All IP addresses are preconfigured as shown in the topology picture.
- There is a Loopback0 interface on the Washington router: IP Address 2.2.2.2/30.
- There is a Loopback0 interface on the New York router: IP Address 1.1.1.1/30.
- New York: create a static route pointing to the Loopback0 network on Washington, traffic should pass the 192.168.1.0 network.
- Washington: create a default route pointing to the Loopback0 network on New York, traffic should pass the 192.168.2.0 network. In the routing table you should see a 0.0.0.0 entry.
- New York: create a backup static route pointing to the Loopback0 network on Washington, administrative distance should be 100.
- Washington: change the default route so it stays in the routing table even when the interface goes down

Topology:





Steps

1. Configure New York router serial interfaces

The screenshot shows the configuration window for the Serial2/0 interface. The 'Config' tab is active, and the 'CLI' sub-tab is selected. The interface settings are as follows:

- Port Status: On
- Clock Rate: 4000000
- Duplex: Full Duplex
- IP Address: 192.168.1.1
- Subnet Mask: 255.255.255.252
- Tx Ring Limit: 10

The 'Equivalent IOS Commands' section shows the following commands:

```

Router(config)#interface fastEthernet0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial2/0
Router(config-if)#
    
```

The screenshot shows the configuration window for the Serial3/0 interface. The 'Config' tab is active, and the 'CLI' sub-tab is selected. The interface settings are as follows:

- Port Status: On
- Clock Rate: 4000000
- Duplex: Full Duplex
- IP Address: 192.168.2.1
- Subnet Mask: 255.255.255.252
- Tx Ring Limit: 10

The 'Equivalent IOS Commands' section shows the following commands:

```

Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial3/0
Router(config-if)#ip address 192.168.2.1 255.255.255.252
Router(config-if)#
    
```

CLI	configure terminal interface Serial2/0 ip address 192.168.1.1 255.255.255.252 interface Serial0/1 ip address 192.168.2.1 255.255.255.252
-----	--

2. Configure Washington router serial interfaces



The screenshot shows the configuration page for the Serial2/0 interface. The left sidebar has 'Serial2/0' selected under the 'INTERFACE' section. The main area shows the following settings:

- Port Status: On
- Clock Rate: 4000000
- Duplex: Full Duplex
- IP Address: 192.168.1.2
- Subnet Mask: 255.255.255.252
- Tx Ring Limit: 10

Equivalent IOS Commands:

```

Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial2/0
Router(config-if)#ip address 192.168.1.2 255.255.255.252
Router(config-if)#
  
```



The screenshot shows the configuration page for the Serial3/0 interface. The left sidebar has 'Serial3/0' selected under the 'INTERFACE' section. The main area shows the following settings:

- Port Status: On
- Clock Rate: Not Set
- Duplex: Full Duplex
- IP Address: 192.168.2.2
- Subnet Mask: 255.255.255.252
- Tx Ring Limit: 10

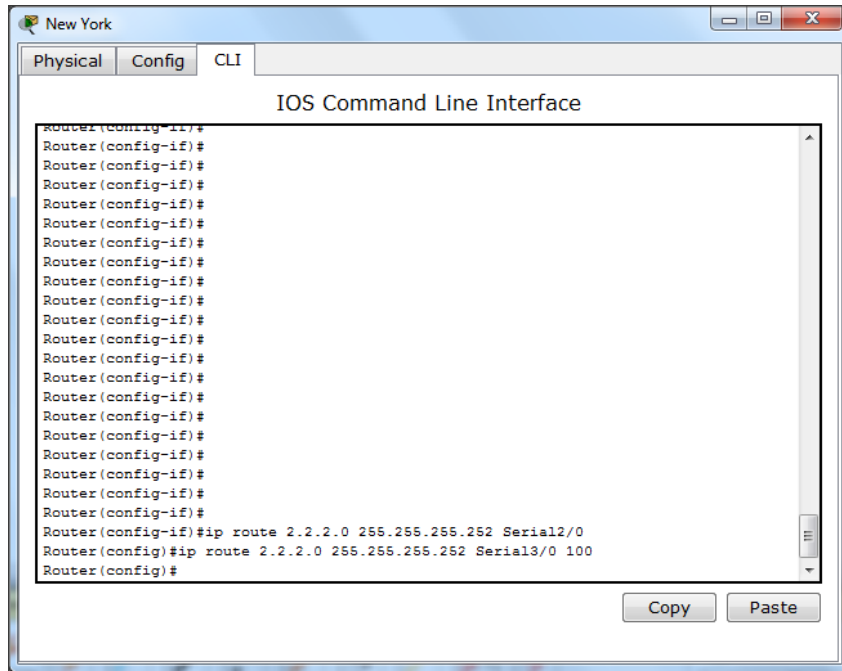
Equivalent IOS Commands:

```

Router(config-if)#ip address 192.168.2.2 255.255.255.252
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial3/0
Router(config-if)#
  
```

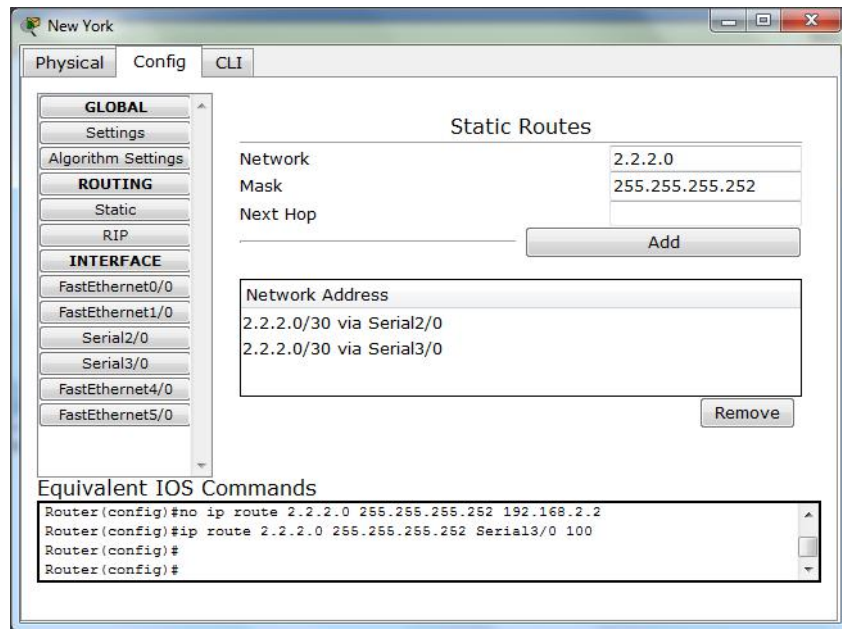
CLI	configure terminal interface Serial2/0 ip address 192.168.1.2 255.255.255.252 interface Serial3/0 ip address 192.168.2.2 255.255.255.252
-----	--

7. Build routing table of New York router

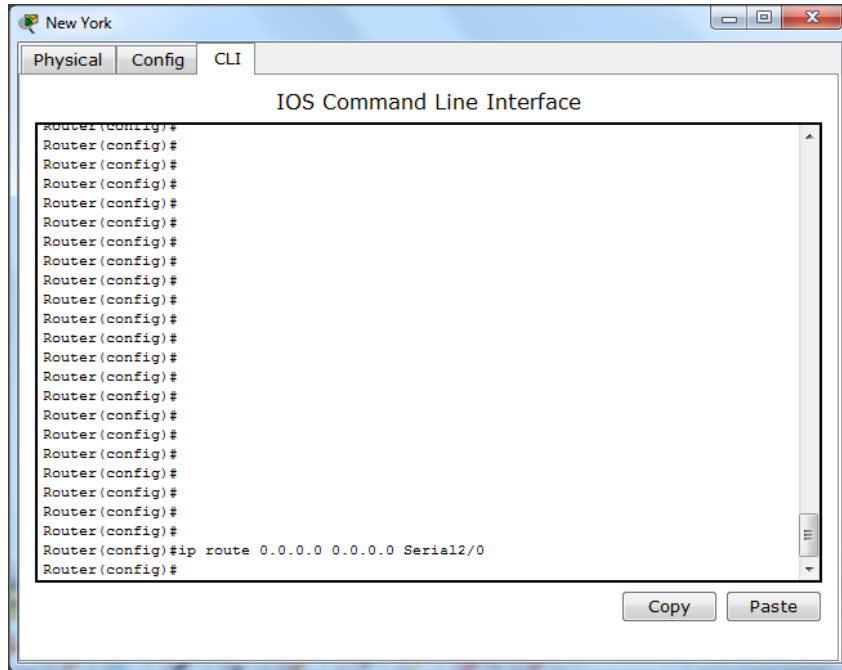


CLI	ip route 2.2.2.0 255.255.255.252 Serial2/0 ip route 2.2.2.0 255.255.255.252 Serial3/0 100
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8. Open config/Routing/static

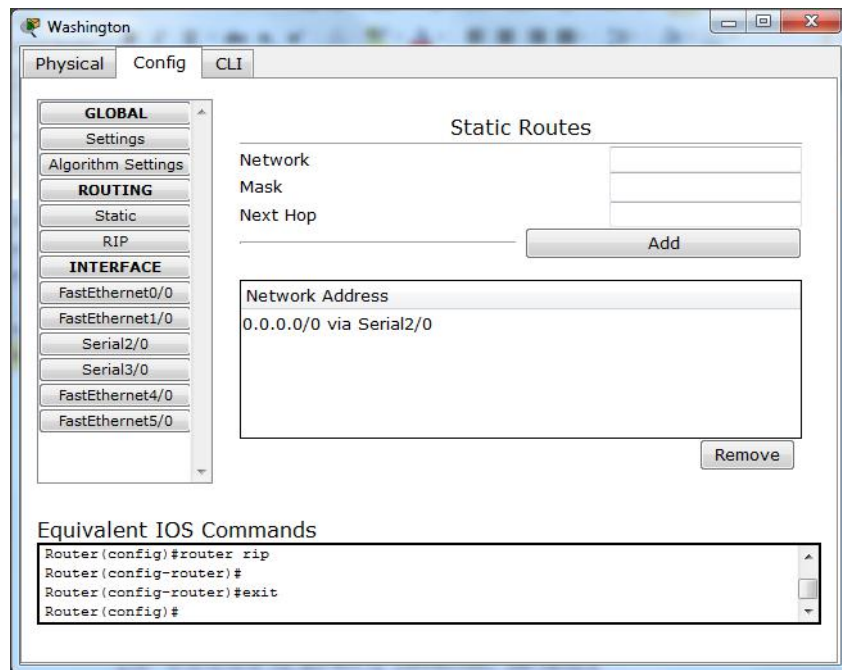


9. Build static routing for Washington router



CLI	ip route 0.0.0.0 0.0.0.0 Serial2/0
-----	------------------------------------

10. check config/Routing/static





11. exit configuration mode, show ip route command for each routers

```

New York
Physical Config CLI
IOS Command Line Interface
Router#show ip route
% Invalid input detected at '^' marker.

Router#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

  1.0.0.0/30 is subnetted, 1 subnets
C       1.1.1.0 is directly connected, Loopback2
  2.0.0.0/30 is subnetted, 1 subnets
S       2.2.2.0 is directly connected, Serial2/0
 192.168.1.0/30 is subnetted, 1 subnets
C       192.168.1.0 is directly connected, Serial2/0
 192.168.2.0/30 is subnetted, 1 subnets
C       192.168.2.0 is directly connected, Serial3/0
Router#
Copy Paste

```

```

Washington
Physical Config CLI
IOS Command Line Interface
%S13-S-Config-1: Configured from console by console
show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

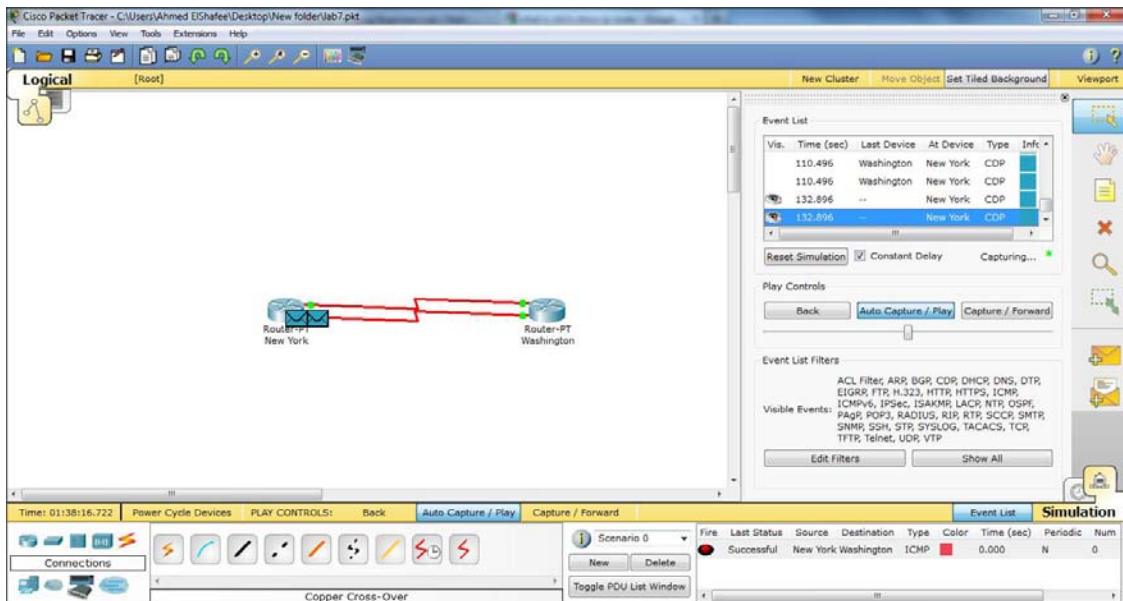
Gateway of last resort is 0.0.0.0 to network 0.0.0.0

  2.0.0.0/30 is subnetted, 1 subnets
C       2.2.2.0 is directly connected, Loopback1
 192.168.1.0/30 is subnetted, 1 subnets
C       192.168.1.0 is directly connected, Serial2/0
 192.168.2.0/30 is subnetted, 1 subnets
C       192.168.2.0 is directly connected, Serial3/0
S*    0.0.0.0/0 is directly connected, Serial2/0
Router#
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
Router(config)#
Copy Paste

```

CLI	ctrl/Z show ip Route
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12. send ping from each router, trace it using simulation mode



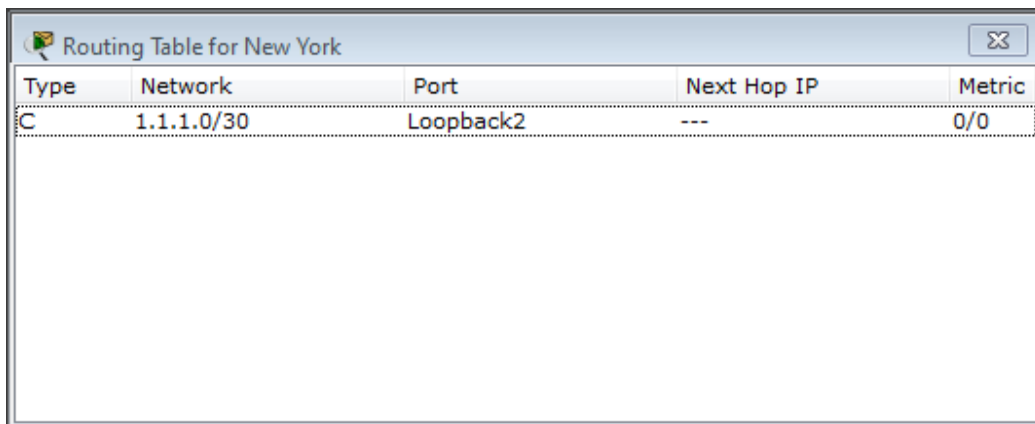
The screenshot shows the Cisco Packet Tracer interface. In the center, two routers are connected: 'Router-PT New York' and 'Router-PT Washington'. The 'Event List' on the right side of the window displays a table of network events:

Vis.	Time (sec)	Last Device	At Device	Type	Info
	110.496	Washington	New York	COP	
	110.496	Washington	New York	COP	
	132.896	---	New York	COP	
	132.896	---	New York	COP	

Below the table, there are buttons for 'Reset Simulation', 'Constant Delay', and 'Capturing...'. The 'Play Controls' section includes 'Back', 'Auto Capture / Play', and 'Capture / Forward' buttons. The 'Event List Filters' section lists various protocols like ACL, BGP, DHCP, DNS, etc. At the bottom, the 'Simulation' window shows a table of simulation events:

Fire	Last Status	Source	Destination	Type	Color	Time (sec)	Periodic	Num
	Successful	New York	Washington	ICMP	Red	0.000	N	0

13. check routing table of each router using inspection tool



The screenshot shows the 'Routing Table for New York' window. It contains a table with the following data:

Type	Network	Port	Next Hop IP	Metric
C	1.1.1.0/30	Loopback2		0/0



Terminologies:

Loopback: is a virtual interface on a router that really doesn't go "down." There's no such thing as a physical circuit failure for something for which there is no physical presence. So, this makes loopback interfaces quite reliable.

Administrative Distance: Administrative distance is the feature that routers use in order to select the best path when there are two or more different routes to the same destination from two different routing protocols. Administrative distance defines the reliability of a routing protocol. Each routing protocol is prioritized in order of most to least reliable (believable) with the help of an administrative distance value.

Note: The smaller the administrative distance value, the more reliable the protocol.

For example, if a router receives a route to a certain network from both Open Shortest Path First (OSPF) (default administrative distance - 110) and Interior Gateway Routing Protocol (IGRP) (default administrative distance - 100), the router chooses IGRP because IGRP is more reliable. This means the router adds the IGRP version of the route to the routing table.

Default Distance Value Table

Route Source	Default Distance Values
Connected interface	0
Static route	1
Enhanced Interior Gateway Routing Protocol (EIGRP) summary route	5
External Border Gateway Protocol (BGP)	20
Internal EIGRP	90
IGRP	100
OSPF	110
Intermediate System-to-Intermediate System (IS-IS)	115
Routing Information Protocol (RIP)	120
Exterior Gateway Protocol (EGP)	140
On Demand Routing (ODR)	160
External EIGRP	170
Internal BGP	200
Unknown*	255



CDP: Cisco Discovery Protocol: was developed by Cisco Systems. It's primarily used to obtain the protocol addresses of neighboring devices and also to discover the platform of those devices. It can also be used to show information about the interfaces your router uses. CDP is media and protocol-independent, and runs on all Cisco-manufactured equipment including routers, bridges, access servers, and switches. CDP runs only over the data link layer enabling two systems that support different network-layer protocols to learn about each other. CDP Version-2 (CDPv2) is the most recent release of the protocol and provides more intelligent device tracking features.

Default route: A default route, also known as the gateway of last resort, is the network route used by a router when no other known route exists for a given IP packet's destination address. All the packets for destinations not known by the router's routing table are sent to the default route. This route generally leads to another router, which treats the packet the same way: If the route is known, the packet will get forwarded to the known route. If not, the packet is forwarded to the default-route of that router which generally leads to another router. And so on. Each router traversal adds a one-hop distance to the route.

Once the router with a known route to a host destination is reached, the router determines which route is valid by finding the "most specific match". The network with the longest subnet mask that matches the destination IP address wins.

The default route in IPv4 (in CIDR notation) is 0.0.0.0/0, often called the quad-zero route. Since the subnet mask given is /0, it effectively specifies no network, and is the "shortest" match possible. A route lookup that doesn't match anything will naturally fall back onto this route.

Ex:

```
ip route 0.0.0.0 0.0.0.0 serial 0/0
```