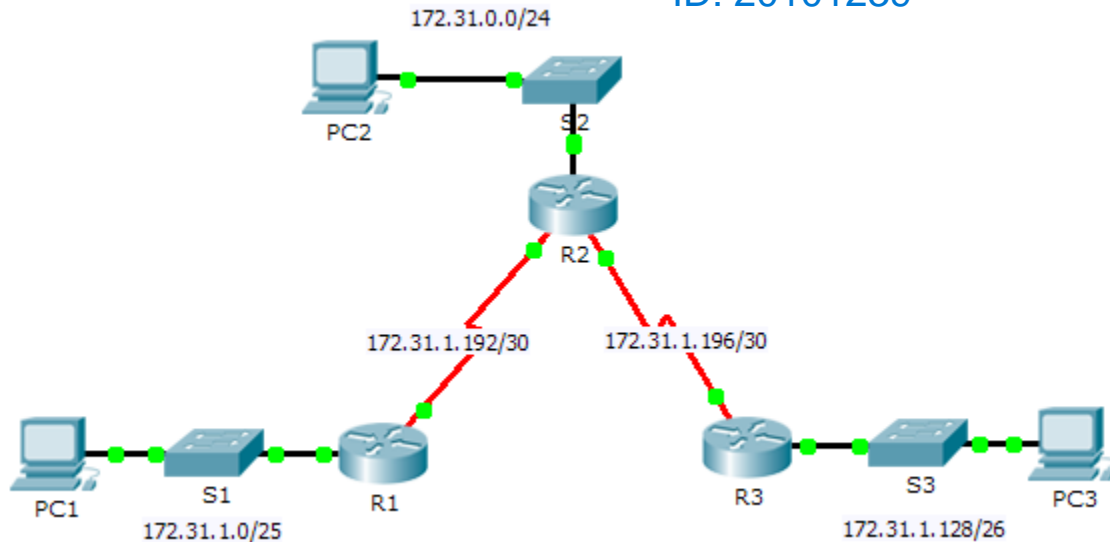


# Packet Tracer - Configuring IPv4 Static and Default Routes

## Topology

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## Addressing Table

Device	Interface	IPv4 Address	Subnet Mask	Default Gateway
R1	G0/0	172.31.1.1	255.255.255.128	N/A
	S0/0/0	172.31.1.194	255.255.255.252	N/A
R2	G0/0	172.31.0.1	255.255.255.0	N/A
	S0/0/0	172.31.1.193	255.255.255.252	N/A
	S0/0/1	172.31.1.197	255.255.255.252	N/A
R3	G0/0	172.31.1.129	255.255.255.192	N/A
	S0/0/1	172.31.1.198	255.255.255.252	N/A
PC1	NIC	172.31.1.126	255.255.255.128	172.31.1.1
PC2	NIC	172.31.0.254	255.255.255.0	172.31.0.1
PC3	NIC	172.31.1.190	255.255.255.192	172.31.1.129

## Objectives

**Part 1: Examine the Network and Evaluate the Need for Static Routing**

**Part 2: Configure Static and Default Routes**

**Part 3: Verify Connectivity**

### Background

In this activity, you will configure static and default routes. A static route is a route that is entered manually by the network administrator to create a reliable and safe route. There are four different static routes that are used in this activity: a recursive static route, a directly attached static route, a fully specified static route, and a default route.

### Part 1: Examine the Network and Evaluate the Need for Static Routing

- Looking at the topology diagram, how many networks are there in total? **5**
- How many networks are directly connected to R1, R2, and R3? **2, 3, 2**
- How many static routes are required by each router to reach networks that are not directly connected?  
**R1 > 3, R2 > 2, R3 > 3**
- Test connectivity to the R2 and R3 LANs by pinging PC2 and PC3 from PC1.  
Why were you unsuccessful? **Because we did not configure the remote networks yet.**

### Part 2: Configure Static and Default Routes

#### Step 1: Configure recursive static routes on R1.

- What is recursive static route?  
**A recursive static route is a routing configuration where a static route points to the next-hop address of another router, rather than directly to the destination network.**
- Why does a recursive static route require two routing table lookups?  
**Because the router first looks up the next-hop address specified in the static route, and then looks up the destination address based on the information learned from the first lookup.**
- Configure a recursive static route to every network not directly connected to R1, including the WAN link between R2 and R3.
- Test connectivity to the R2 LAN and ping the IP addresses of PC2 and PC3.  
Why were you unsuccessful?  
**Because PC2 and PC3 didn't acknowledge the packets that were sent.**

#### Step 2: Configure directly attached static routes on R2.

- How does a directly attached static route differ from a recursive static route?  
**A directly attached static route points directly to the destination network, while a recursive static route points to the next-hop address of another router.**
- Configure a directly attached static route from R2 to every network not directly connected.
- Which command only displays directly connected networks? **show ip route connected**
- Which command only displays the static routes listed in the routing table? **show ip route static**
- When viewing the entire routing table, how can you distinguish between a directly attached static route and a directly connected network?  
**A directly attached static route will have an "S" flag in the route type field, while a directly connected network will have a "C" flag.**

### Step 3: Configure a default route on R3.

- a. How does a default route differ from a regular static route?

A default route with the destination network 0.0.0.0/0 matches all packets and is used by a router when there is no other more specific route in the routing table for a given destination network. This is also known as the "default gateway" or "gateway of last resort".

- b. Configure a default route on R3 so that every network not directly connected is reachable.
- c. How is a static route displayed in the routing table? A static route is marked with "S".

### Step 4: Document the commands for fully specified routes.

**Note:** Packet Tracer does not currently support configuring fully specified static routes. Therefore, in this step, document the configuration for fully specified routes.

- a. Explain a fully specified route.

A fully specified route specifies both the exit interface and the next hop IP address.

- b. Which command provides a fully specified static route from R3 to the R2 LAN?

`ip route 172.31.0.0 255.255.255.0 s0/0/1 172.31.1.197`

- c. Write a fully specified route from R3 to the network between R2 and R1. Do not configure the route; just calculate it.

`ip route 172.31.1.192 255.255.255.252 s0/0/1 172.31.1.197`

- d. Write a fully specified static route from R3 to the R1 LAN. Do not configure the route; just calculate it.

`ip route 172.31.1.0 255.255.255.128 s0/0/1 172.31.1.197`

### Step 5: Verify static route configurations.

Use the appropriate **show** commands to verify correct configurations.

Which **show** commands can you use to verify that the static routes are configured correctly?

`show ip route static`

## Part 3: Verify Connectivity

Every device should now be able to ping every other device. If not, review your static and default route configurations.

### Suggested Scoring Rubric

Activity Section	Question Location	Possible Points	Earned Points
Part 1: Examine the Network and Evaluate the Need for Static Routing	a - d	10	
<b>Part 1 Total</b>		<b>10</b>	
Part 2: Configure Static and Default Routes	Step 1	7	
	Step 2	7	
	Step 3	3	
	Step 4	10	
	Step 5	3	
<b>Part 2 Total</b>		<b>30</b>	
<b>Packet Tracer Score</b>		<b>60</b>	
<b>Total Score</b>		<b>100</b>	