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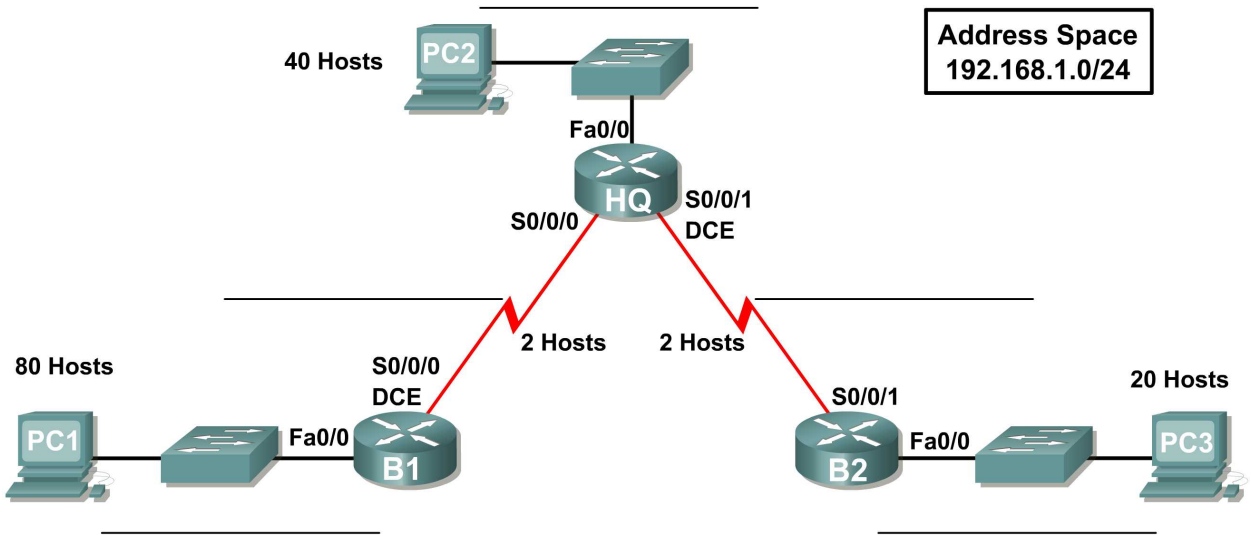
CCNA Exploration 4.0.5.0

Routing Protocols and Concepts
Student Packet Tracer Lab Manual

Ch1 - Packet Tracer Skills Integration Instructions

Topology Diagram



Addressing Table

Device	Interface	IP Address	Subnet Mask	Default Gateway
HQ	Fa0/0			N/A
	S0/0/0			N/A
	S0/0/1			N/A
B1	Fa0/0			N/A
	S0/0/0			N/A
B2	Fa0/0			N/A
	S0/0/1			N/A
PC1	NIC			
PC2	NIC			
PC3	NIC			

Objectives

- Design and document an addressing scheme based on requirements.
- Select appropriate equipment and cable the devices.
- Apply a basic configuration to the devices.
- Verify full connectivity between all devices in the topology.
- Identify layer 2 and layer 3 addresses used to switch packets.

Task 1: Design and document an addressing scheme.

Step 1: Design an addressing scheme.

Based on the network requirements shown in the topology, design an appropriate addressing scheme.

- Starting with the largest LAN, determine the size of each subnet you will need for the given host requirement.
- After the addresses have been determined for all the LAN subnets, assign the first available address space to the WAN link between B1 and HQ.
- Assign the second available address space to the WAN link between HQ and B2.

(**Note:** Remember that the interfaces of network devices are also host IP addresses and are included in the above addressing requirements.)

Step 2: Document the addressing scheme.

- Use the blank spaces on the topology to record the network addresses in dotted-decimal/slash format.
- Use the table provided in the printed instructions to document the IP addresses, subnet masks and default gateway addresses.
    - For the LANs, assign the first IP address to the router interface. Assign the last IP address to the PC
    - For the WAN links, assign the first IP address to HQ.

Task 2: Select equipment and cable devices.

Step 1: Select the necessary equipment.

Select the remaining devices you will need and add them to the working space inside Packet Tracer. Use the labels as a guide as to where to place the devices.

Step 2: Finish cabling the devices.

Cable the networks according to the topology taking care that interfaces match your documentation in Task 1.

Task 3: Apply a basic configuration.

Step 1: Configure the routers.

Using your documentation, configure the routers with basic configurations including addressing. Use **cisco** as the line passwords and **class** as the secret password. Use 64000 as the clock rate.

Step 2: Configure the PCs.

Using your documentation, configure the PCs with an IP address, subnet mask, and default gateway.

Task 4: Test connectivity and examine the configuration.

Step 1: Test connectivity.

RIP routing has already been configured for you. Therefore, you should have end-to-end connectivity.

- Can PC1 ping PC2? _____

- Can PC1 ping PC3? _____
- Can PC3 ping PC2? _____

Troubleshoot until pings are successful.

Step 2: Examine the configuration.

Use verification commands to make sure your configurations are complete.

Task 5: Identify layer 2 and layer 3 addresses used to switch packets.

Step 1: Create a simple PDU ping packet

- Enter Simulation Mode.
- Use the Add Simple PDU button to create a ping from PC1 to PC3.
- Change “Edit Filters” so that only ICMP is simulated.

Step 2: Addresses at PC1

Record the addresses used by PC1 to send the ping packet to B1:

Layer 3 Source: _____

Layer 3 Destination: _____

Layer 2 Source: _____

Layer 2 Destination: _____

Step 3: Addresses at B1

Record the addresses used by B1 to switch the ping packet to HQ:

Layer 3 Source: _____

Layer 3 Destination: _____

Layer 2 Source: _____

Layer 2 Destination: _____

Step 4: Addresses at HQ

Record the addresses used by HQ to switch the ping packet to B2:

Layer 3 Source: _____

Layer 3 Destination: _____

Layer 2 Source: _____

Layer 2 Destination: _____

Step 5: Addresses at B2

Record the addresses used by B2 to switch the ping packet to PC3:

Layer 3 Source: _____

Layer 3 Destination: _____

Layer 2 Source: _____

Layer 2 Destination: _____

Ch2 - Packet Tracer Skills Integration Challenge

Introduction:

This activity focuses on basic device configurations and static routing. The addressing scheme has already been determined. Once you have configured all devices, you will test for end-to-end connectivity and examine your configuration.

Learning Objectives

- Cable the devices.
- Apply a basic configuration to the devices.
- Configure static and default routing.
- Test connectivity and examine the configuration.

Addressing Table:

Device	Interface	IP Address	Subnet Mask	Default Gateway
HQ	S0/0/0			N/A
	S0/0/1			N/A
	Fa0/0			N/A
	Fa0/1			N/A
B1	S0/0/0			N/A
	Fa0/0			N/A
	Fa0/1			N/A
	Fa1/0			N/A
	Fa1/1			N/A
B2	S0/0/0			N/A
	Fa0/0			N/A
	Fa0/1			N/A
	Fa1/0			N/A
	Fa1/1			N/A
PC1	NIC			
PC2	NIC			
PC3	NIC			
PC4	NIC			
PC5	NIC			
PC6	NIC			

Device	Interface	IP Address	Subnet Mask	Default Gateway
PC7	**NIC**			
PC8	**NIC**			
PC9	**NIC**			
PC10	**NIC**			

Task 1: Cable the devices.

Cable the WAN. HQ s0/0/0 connects to B1 S0/0/0 and HQ s0/0/01 connects to B2 s0/0/0. HQ is the DCE side of both WAN links.

Task 2: Apply a basic configuration.

Configure the routers with basic configurations including addressing.

- For the WAN links, assign the first address to HQ and the second address to the other router.
- For the LANs, assign the first address to the router interface. Make sure to also configure hostnames.
- Assign the .10 address to the PCs. Make sure to include the default gateway.
- Use **cisco** as the line passwords and **class** as the secret password.
- Use 64000 as the clock rate.

Task 3: Configure static and default routing.

- Configure HQ with exactly two static routes using the local interface.
- Configure B1 and B2 with exactly one default route using the local interface.

Task 4: Test connectivity and examine the configuration.

Step 1: Test connectivity.

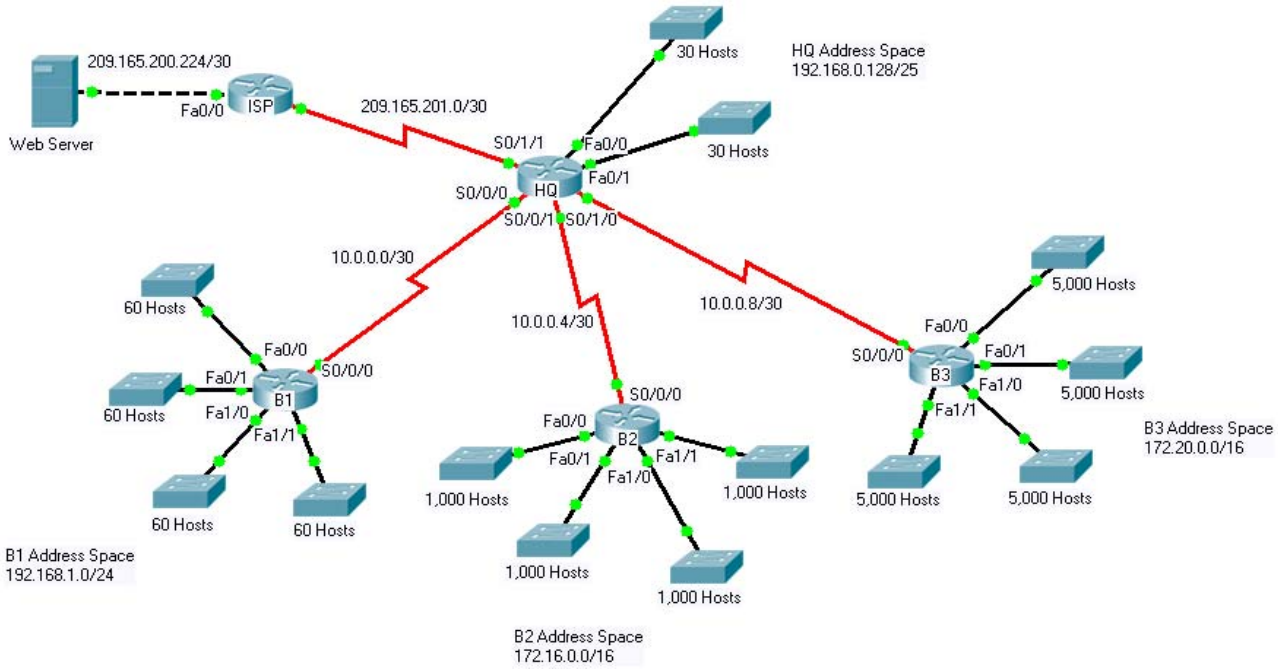
- You should now have end-to-end connectivity. Use ping to test connectivity across the network.
- Troubleshoot until pings are successful.

Step 2: Examine the configuration.

Use verification commands to make sure your configurations are complete.

Ch3 - Packet Tracer Skills Integration Challenge

Topology Diagram



Introduction:

This activity focuses on subnetting skills, basic device configurations and static routing. Once you have configured all devices, you will test for end to end connectivity and examine your configuration.

Addressing Table

Device	Interface	IP Address	Subnet Mask
HQ	Fa0/0		
	Fa0/1		
	S0/0/0	10.0.0.1	255.255.255.252
	S0/0/1	10.0.0.5	255.255.255.252
	S0/1/0	10.0.0.9	255.255.255.252
	S0/1/1	209.165.201.2	255.255.255.252
B1	Fa0/0		
	Fa0/1		
	Fa1/0		
	Fa1/1		
	S0/0/0	10.0.0.2	255.255.255.252
B2	Fa0/0		
	Fa0/1		
	Fa1/0		
	Fa1/1		
	S0/0/0	10.0.0.6	255.255.255.252
B3	Fa0/0		
	Fa0/1		
	Fa1/0		
	Fa1/1		
	S0/0/0	10.0.0.10	255.255.255.252
ISP	S0/0/0	209.165.201.1	255.255.255.252
	Fa0/0	209.165.200.225	255.255.255.252
Web Server	NIC	209.165.200.226	255.255.255.252

Objectives

- Design and document an addressing scheme based on requirements.
- Select appropriate equipment and cable the devices.
- Apply a basic configuration to the devices.
- Configure static and default routing.

- Verify full connectivity between all devices in the topology.

Task 1: Design and document an addressing scheme.

Step 1: Design an addressing scheme.

Based on the network requirements shown in the topology, design an appropriate addressing scheme.

- The HQ, B1, B2, and B3 routers each have an address space. Subnet the address space based on the host requirements.
- For each address space, assign subnet zero to the Fa0/0 LAN, subnet 1 to the Fa0/1, and so on.

Step 2: Document the addressing scheme.

- Document the IP addresses and subnet masks. Assign the first IP address to the router interface.
- For the WAN links, assign the first IP address to HQ.

Task 2: Apply a basic configuration.

Using your documentation, configure the routers with basic configurations including addressing and hostnames. Use **cisco** as the line passwords and **class** as the secret password. Use 64000 as the clock rate. ISP is the DCE in its WAN link to HQ. HQ is the DCE for all other WAN links.

Task 3: Configure static and default routing

Configure static and default routing using the exit interface argument.

- HQ should have three static routes and one default route.
- B1, B2, and B3 should have one default route.
- ISP should have seven static routes. This will include the three WAN links between HQ and the branch routers B1, B2, and B3.

Task 5: Test connectivity and examine the configuration.

Step 1: Test connectivity.

- You should now have end-to-end connectivity. Use ping to test connectivity across the network. Each router should be able to ping all other router interfaces and the Web Server.
- Use extended ping to test LAN connectivity to the Web Server. For example, the test the Fa0/0 interface on B1, you would do the following:

```
B1#ping
Protocol [ip]:
Target IP address: 209.165.200.226
Repeat count [5]:
Datagram size [100]:
Timeout in seconds [2]:
Extended commands [n]: yes
Source address or interface: 192.168.1.1
Type of service [0]:
Set DF bit in IP header? [no]:
Validate reply data? [no]:
Data pattern [0xABCD]:
Loose, Strict, Record, Timestamp, Verbose[none]:
Sweep range of sizes [n]:
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 209.165.200.226, timeout is 2 seconds:
Packet sent with a source address of 192.168.1.1
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 67/118/138 ms
```

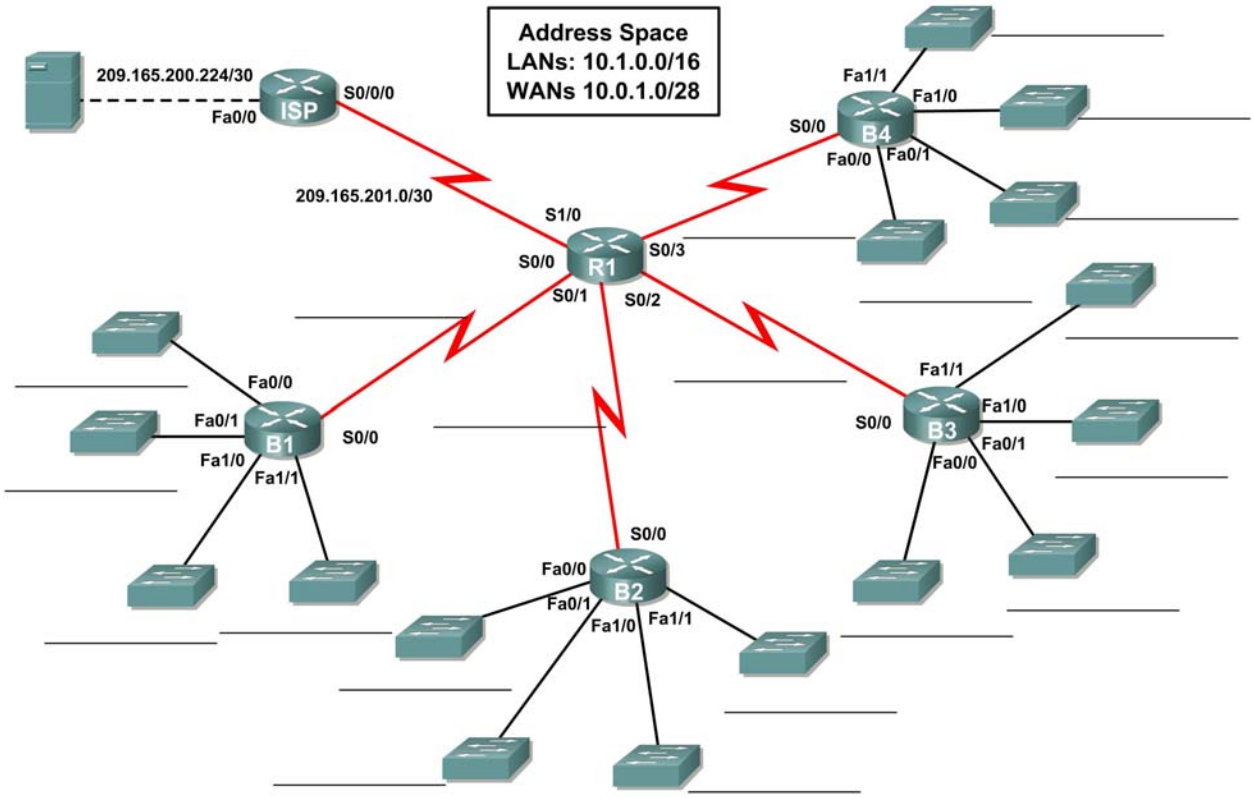
- Troubleshoot until pings are successful.

Step 2: Examine the configuration.

Use verification commands to make sure your configurations are complete.

Ch4 - Packet Tracer Skills Integration Challenge

Topology Diagram



Addressing Table

Device	Interface	IP Address	Subnet Mask
R1	S0/0		
	S0/1		
	S0/2		
	S0/3		
	S1/0	209.165.201.2	255.255.255.252
B1	Fa0/0		
	Fa0/1		
	Fa1/0		
	Fa1/1		
	S0/0		
B2	Fa0/0		
	Fa0/1		
	Fa1/0		
	Fa1/1		
	S0/0		
B3	Fa0/0		
	Fa0/1		
	Fa1/0		
	Fa1/1		
	S0/0		
B4	Fa0/0		
	Fa0/1		
	Fa1/0		
	Fa1/1		
	S0/0		
ISP	S0/0	209.165.201.1	255.255.255.252
	Fa0/0	209.165.200.225	255.255.255.252
Web Server	NIC	209.165.200.226	255.255.255.252

Introduction:

This activity focuses on subnetting skills, basic device configurations and static routing. Once you have configured all devices, you will test for end-to-end connectivity and examine your configuration.

Objectives

- Design and document an addressing scheme based on requirements.
- Apply a basic configuration to the devices.
- Configure static and default routing.
- Verify full connectivity between all devices in the topology.

Task 1: Design and document an addressing scheme.

Step 1: Design an addressing scheme.

Using the topology and the following requirements, design an addressing scheme:

- The WAN link between R1 and ISP is already configured.
- For the WAN links between R1 and the branch routers (B1, B2, B3 and B4), subnet the address space 10.0.1.0/28 to provide the necessary WAN subnets. Assign the subnets using the following guidelines:
  - Subnet 0: R1 <--> B1 _____
  - Subnet 1: R1 <--> B2 _____
  - Subnet 2: R1 <--> B3 _____
  - Subnet 3: R1 <--> B4 _____
- For the LANs attached to the branch routers, divide the address space 10.1.0.0/16 into four equal subnets. Assign the subnets using the following guidelines:
  - Subnet 0: B1 LANs _____
  - Subnet 1: B2 LANs _____
  - Subnet 2: B3 LANs _____
  - Subnet 3: B4 LANs _____
- For each branch router, divide that router's LAN subnet into four equal subnets. Assign the subnets using the following guidelines:
- B1 LANs
  - Subnet 0: B1 Fa0/0 _____
  - Subnet 1: B1 Fa0/1 _____
  - Subnet 2: B1 Fa1/0 _____
  - Subnet 3: B1 Fa1/1 _____
- B2 LANs
  - Subnet 0: B2 Fa0/0 _____
  - Subnet 1: B2 Fa0/1 _____
  - Subnet 2: B2 Fa1/0 _____
  - Subnet 3: B2 Fa1/1 _____
- B3 LANs
  - Subnet 0: B3 Fa0/0 _____
  - Subnet 1: B3 Fa0/1 _____
  - Subnet 2: B3 Fa1/0 _____

- Subnet 3: B3 Fa1/1 _____
- B4 LANs
  - Subnet 0: B4 Fa0/0 _____
  - Subnet 1: B4 Fa0/1 _____
  - Subnet 2: B4 Fa1/0 _____
  - Subnet 3: B4 Fa1/1 _____

Step 2: Document the addressing scheme.

- Document the IP addresses and subnet masks. Assign the first IP address to the router interface.
- For the WAN links, assign the first IP address to R1.

Task 2: Apply a basic configuration.

Using your documentation, configure the routers with basic configurations including addressing and hostnames. Use **cisco** as the line passwords and **class** as the secret password. Use 64000 as the clock rate. ISP is the DCE to HQ and HQ is the DCE to all the B routers.

Task 4: Configure static and default routing

Configure static and default routing using the exit interface argument.

- R1 should have four static routes and one default route.
- B1, B2, B3, and B4 should have one default route each.
- ISP should have two static routes: one for the WAN address space and one for the LAN address space.

Task 4: Test connectivity and examine the configuration.

Step 1: Test connectivity.

- You should now have end-to-end connectivity. Use ping to test connectivity across the network. Each router should be able to ping all other router interfaces and the Web Server.
- Use extended ping to test LAN connectivity to the Web Server. For example, the test the Fa0/0 interface on B1, you would do the following:

```
B1#ping
Protocol [ip]:
Target IP address: 209.165.200.226
Repeat count [5]:
Datagram size [100]:
Timeout in seconds [2]:
Extended commands [n]: yes
Source address or interface: 10.1.0.1
Type of service [0]:
Set DF bit in IP header? [no]:
Validate reply data? [no]:
Data pattern [0xABCD]:
Loose, Strict, Record, Timestamp, Verbose[none]:
```



```
Sweep range of sizes [n]:
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 209.165.200.226, timeout is 2 seconds:
Packet sent with a source address of 10.1.0.1
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 67/118/138 ms
```

- Troubleshoot until pings are successful.

Step 2: Examine the configuration.

Use verification commands to make sure your configurations are complete.

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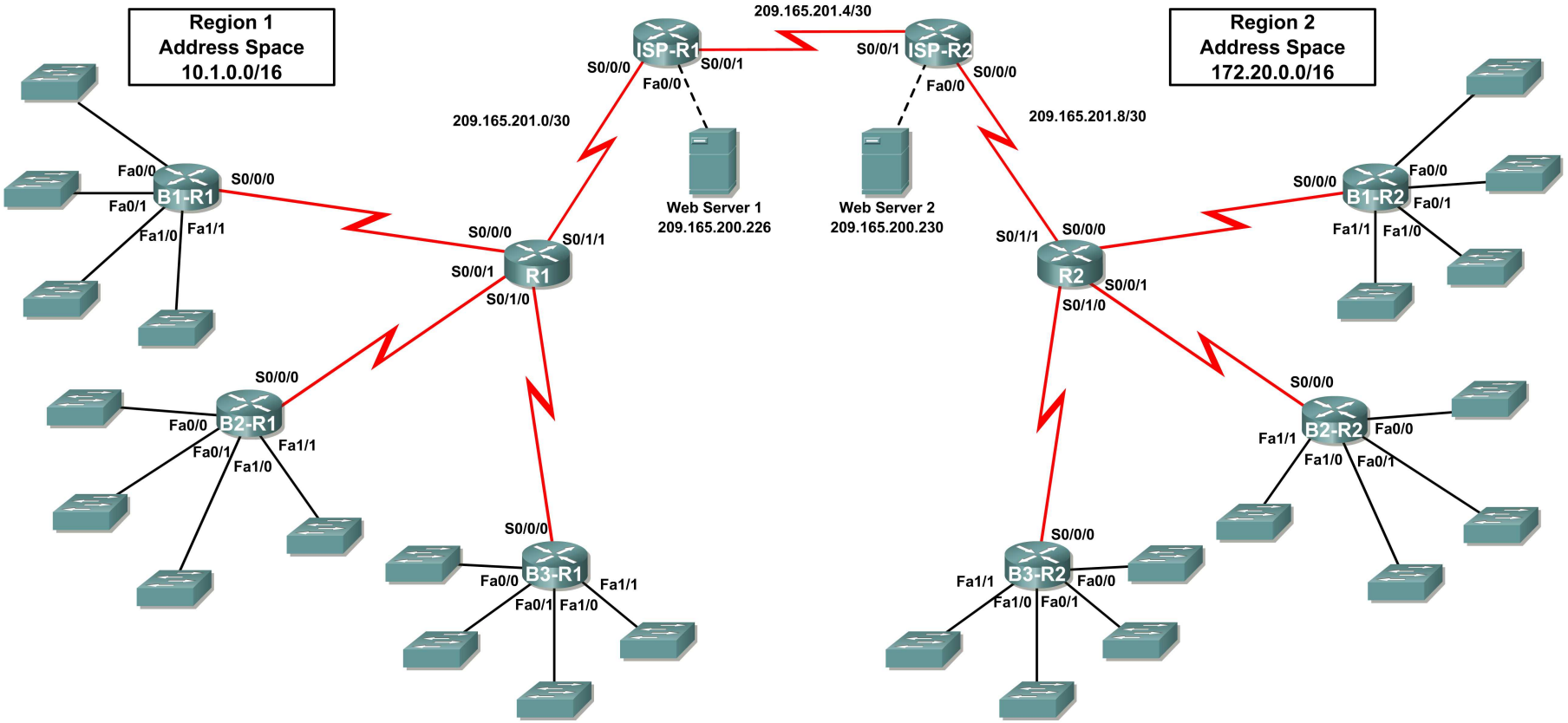
Ch5 - Packet Tracer Skills Integration Instructions

Topology Diagram



Addressing Table for R1

Device	Interface	IP Address	Subnet Mask
R1	S0/0/0		
	S0/0/1		
	S0/1/0		
	S0/1/1	209.165.201.2	255.255.255.252
B1-R1	Fa0/0		
	Fa0/1		
	Fa1/0		
	Fa1/1		
	S0/0/0		
B2-R1	Fa0/0		
	Fa0/1		
	Fa1/0		
	Fa1/1		
	S0/0/0		
B3-R1	Fa0/0		
	Fa0/1		
	Fa1/0		
	Fa1/1		
	S0/0/0		
ISP-R1	S0/0/0	209.165.201.1	255.255.255.252
	S0/0/1	209.165.201.5	255.255.255.252
	Fa0/0	209.165.200.225	255.255.255.252
Web Server 1	NIC	209.165.200.226	255.255.255.252

Addressing Table for R2

Device	Interface	IP Address	Subnet Mask
R2	S0/0/0		
	S0/0/1		
	S0/1/0		
	S0/1/1	209.165.201.10	255.255.255.252
B1-R2	Fa0/0		
	Fa0/1		
	Fa1/0		
	Fa1/1		
	S0/0/0		
B2-R2	Fa0/0		
	Fa0/1		
	Fa1/0		
	Fa1/1		
	S0/0/0		
B3-R2	Fa0/0		
	Fa0/1		
	Fa1/0		
	Fa1/1		
	S0/0/0		
ISP-R2	S0/0/0	209.165.201.6	255.255.255.252
	S0/0/1	209.165.201.9	255.255.255.252
	Fa0/0	209.165.200.229	255.255.255.252
Web Server 2	NIC	209.165.200.230	255.255.255.252

Introduction:

This activity focuses on subnetting skills, basic device configurations, static routing and RIP routing. Once you have configured all devices, you will test for end-to-end connectivity and examine your configuration.

Objectives

- Design and document an addressing scheme based on requirements.
- Apply a basic configuration to the devices.
- Configure static routing between ISP routers.
- Configure RIPv1 routing in Region 1 and Region 2.
- Disable RIP updates on appropriate interfaces.
- Configure default routes and redistribute through RIP.

- Verify full connectivity between all devices in the topology.

Task 1: Design and document an addressing scheme.

Step 1: Design an addressing scheme.

Using the topology and the following requirements, design an addressing scheme:

- The WAN links between R1 and R2 and their respective ISP routers are already configured. Also, the links between the ISPs and the Web Servers are already configured.
- Since RIPv1 is a classful routing protocol, you cannot implement Variable Length Subnet Masks (VLSM). Subnet each region's address space using the following guidelines:
  - The largest subnet in Region 1's address space is 1,000 hosts. What is the subnet mask you should use for the 10.1.0.0/16 address space? _____
  - The largest subnet in Region 2's address space is 500 hosts. What is the subnet mask you should use for the 172.20.0.0/16 address space? _____
- For the LANs in Region 1, assign subnet 0 to the LAN attached to FastEthernet 0/0 on B1-R1. Continue to assign LANs in sequence. Subnet 1 is assigned to the LAN attached to FastEthernet 0/1 on B1-R1; Subnet 2 to FastEthernet 1/0; Subnet 3 to FastEthernet 1/1 and so on.
- For the WANs in Region 1, assign the last subnet to the link between R1 and B3-R1, the second to last subnet to the link between R1 and B2-R1 and the third to the last subnet to link between R1 and B1-R1.
- Record the Region 1 subnet assignments in the following table:

Router	Subnet Number	Subnet Address
B1-R1 Fa0/0	**0**	
B1-R1 Fa0/1	**1**	
B1-R1 Fa1/0	**2**	
B1-R1 Fa1/1	**3**	
B2-R1 Fa0/0	**4**	
B2-R1 Fa0/1	**5**	
B2-R1 Fa1/0	**6**	
B2-R1 Fa1/1	**7**	
B3-R1 Fa0/0	**8**	
B3-R1 Fa0/1	**9**	
B3-R1 Fa1/0	**10**	
B3-R1 Fa1/1	**11**	
B1-R1 <--> R1	**3rd to Last**	
B2-R1 <--> R1	**2nd to Last**	
B3-R1 <--> R1	**Last**	

- For the LANs in Region 2, following the same format for assigning subnets that you used for Region 1: Subnet 0 to the Fa0/0 interface on B1-R2; Subnet 1 to Fa0/1, and so on.
- For the WANs in Region 2, assign the last subnet to the link between R2 and B3-R2, the second to last subnet to the link between R2 and B2-R2 and the third to the last subnet to link between R2 and B1-R2.
- Record the Region 2 subnet assignments in the following table:

Router	Subnet Number	Subnet Address
B1-R2 Fa0/0	**0**	
B1-R2 Fa0/1	**1**	
B1-R2 Fa1/0	**2**	
B1-R2 Fa1/1	**3**	
B2-R2 Fa0/0	**4**	
B2-R2 Fa0/1	**5**	
B2-R2 Fa1/0	**6**	
B2-R2 Fa1/1	**7**	
B3-R2 Fa0/0	**8**	
B3-R2 Fa0/1	**9**	
B3-R2 Fa1/0	**10**	
B3-R2 Fa1/1	**11**	
B1-R2 <--> R2	**3rd to Last**	
B2-R2 <--> R2	**2nd to Last**	
B3-R2 <--> R2	**Last**	

Step 2: Document the addressing scheme.

- Document the IP addresses and subnet masks. Assign the first IP address to the router interface.
- For the WAN links, assign the first IP address to R1 and R2 for links to each router's respective B1, B2, and B3 routers.

Task 3: Apply a basic configuration.

Using your documentation, configure the routers with basic configurations including addressing. Use **cisco** as the line passwords and **class** as the secret password. Use 64000 as the clock rate. ISP routers are the DCE when connecting to R1 and R2. R1 and R2 are the DCEs when connecting to the branch routers.

Task 4: Configure static routing between ISP routers.

Each ISP router already has two static routes to the other ISP router's directly connected WANs. Implement static routing on each ISP router to insure connectivity between the two regions using the local interface argument.

Task 5: Configure RIPv1 routing in Region 1 and Region 2.

Configure RIP routing on all regional routers. Remember, the ISP routers are only using static routing.

Task 6: Disable RIP updates on appropriate interfaces.

RIP updates do not need to be sent out all the router interfaces. Disable RIP updates on appropriate interfaces.

Task 7: Configure default routes and redistribute through RIP.

Determine which routers need a default route. Then configure that router to redistribute the default route to other routers in the region.

Task 8: Verify full connectivity between all devices in the topology.

Step 1: Test connectivity.

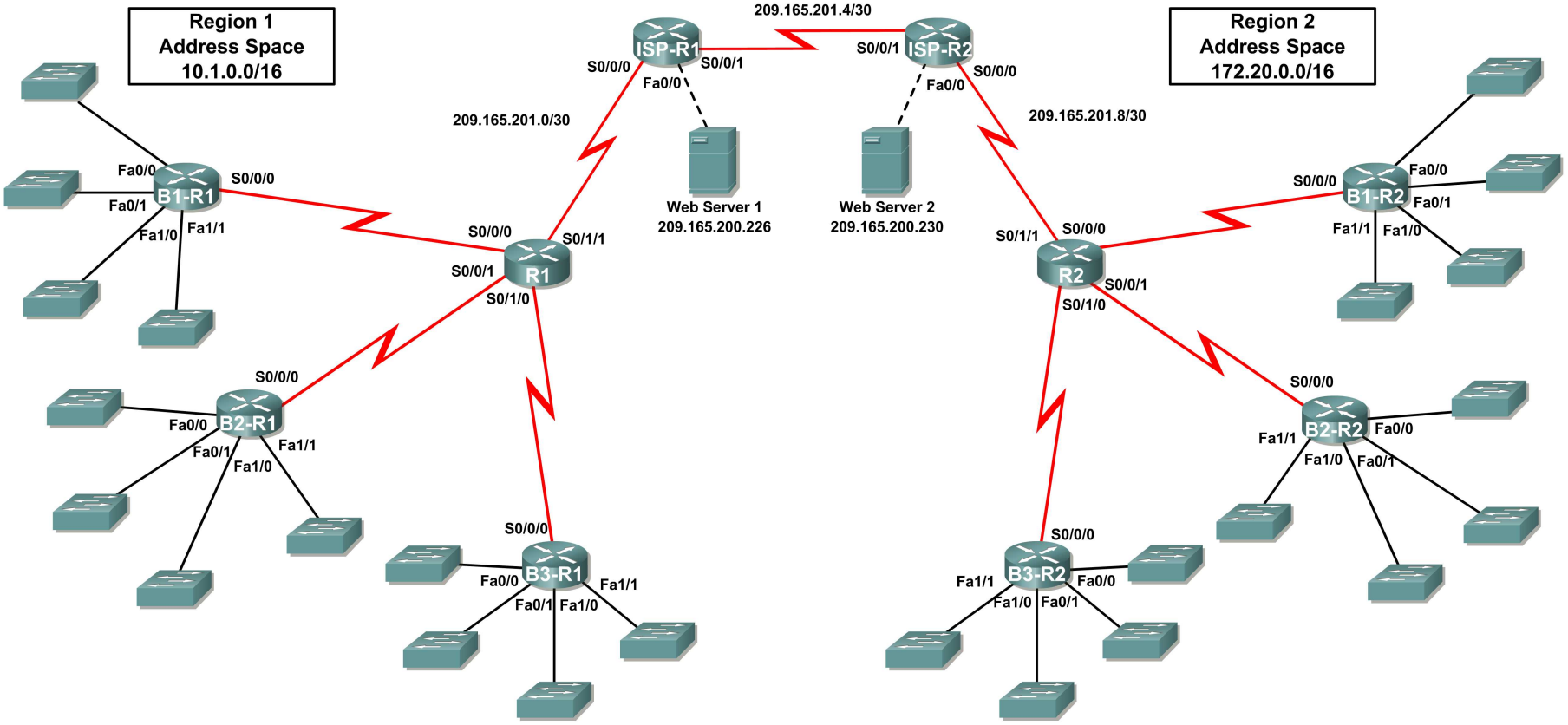
- You should now have end-to-end connectivity. Use ping to test connectivity across the network. Each router should be able to ping all other router interfaces and both Web Servers.
- Troubleshoot until pings are successful.

Step 2: Examine the configuration.

Use verification commands to make sure your configurations are complete.

Ch5 - Packet Tracer Skills Integration Challenge

Topology Diagram



Addressing Table for R1

Device	Interface	IP Address	Subnet Mask
R1	S0/0/0		
	S0/0/1		
	S0/1/0		
	S0/1/1	209.165.201.2	255.255.255.252
B1-R1	Fa0/0		
	Fa0/1		
	Fa1/0		
	Fa1/1		
	S0/0/0		
B2-R1	Fa0/0		
	Fa0/1		
	Fa1/0		
	Fa1/1		
	S0/0/0		
B3-R1	Fa0/0		
	Fa0/1		
	Fa1/0		
	Fa1/1		
	S0/0/0		
ISP-R1	S0/0/0	209.165.201.1	255.255.255.252
	S0/0/1	209.165.201.5	255.255.255.252
	Fa0/0	209.165.200.225	255.255.255.252
Web Server 1	NIC	209.165.200.226	255.255.255.252

Addressing Table for R2

Device	Interface	IP Address	Subnet Mask
R2	S0/0/0		
	S0/0/1		
	S0/1/0		
	S0/1/1	209.165.201.10	255.255.255.252
B1-R2	Fa0/0		
	Fa0/1		
	Fa1/0		
	Fa1/1		
	S0/0/0		
B2-R2	Fa0/0		
	Fa0/1		
	Fa1/0		
	Fa1/1		
	S0/0/0		
B3-R2	Fa0/0		
	Fa0/1		
	Fa1/0		
	Fa1/1		
	S0/0/0		
ISP-R2	S0/0/0	209.165.201.6	255.255.255.252
	S0/0/1	209.165.201.9	255.255.255.252
	Fa0/0	209.165.200.229	255.255.255.252
Web Server 2	NIC	209.165.200.230	255.255.255.252

Introduction:

This activity focuses on subnetting skills, basic device configurations, static routing and RIP routing. Once you have configured all devices, you will test for end-to-end connectivity and examine your configuration.

Objectives

- Design and document an addressing scheme based on requirements.
- Apply a basic configuration to the devices.
- Configure static routing between ISP routers.
- Configure RIPv1 routing in Region 1 and Region 2.
- Disable RIP updates on appropriate interfaces.

- Configure default routes and redistribute through RIP.
- Verify full connectivity between all devices in the topology.

Task 1: Design and document an addressing scheme.

Step 1: Design an addressing scheme.

Using the topology and the following requirements, design an addressing scheme:

- The WAN links between R1 and R2 and their respective ISP routers are already configured. Also, the links between the ISPs and the Web Servers are already configured.
- Since RIPv1 is a classful routing protocol, you cannot implement Variable Length Subnet Masks (VLSM). Subnet each region's address space using the following guidelines:
  - The largest subnet in Region 1's address space is 1,000 hosts. What is the subnet mask you should use for the 10.1.0.0/16 address space? _____
  - The largest subnet in Region 2's address space is 500 hosts. What is the subnet mask you should use for the 172.20.0.0/16 address space? _____
- For the LANs in Region 1, assign subnet 0 to the LAN attached to FastEthernet 0/0 on B1-R1. Continue to assign LANs in sequence. Subnet 1 is assigned to the LAN attached to FastEthernet 0/1 on B1-R1; Subnet 2 to FastEthernet 1/0; Subnet 3 to FastEthernet 1/1 and so on.
- For the WANs in Region 1, assign the last subnet to the link between R1 and B3-R1, the second to last subnet to the link between R1 and B2-R1 and the third to the last subnet to link between R1 and B1-R1.
- Record the Region 1 subnet assignments in the following table:

Router	Subnet Number	Subnet Address
B1-R1 Fa0/0	**0**	
B1-R1 Fa0/1	**1**	
B1-R1 Fa1/0	**2**	
B1-R1 Fa1/1	**3**	
B2-R1 Fa0/0	**4**	
B2-R1 Fa0/1	**5**	
B2-R1 Fa1/0	**6**	
B2-R1 Fa1/1	**7**	
B3-R1 Fa0/0	**8**	
B3-R1 Fa0/1	**9**	
B3-R1 Fa1/0	**10**	
B3-R1 Fa1/1	**11**	
B1-R1 <--> R1	**3rd to Last**	
B2-R1 <--> R1	**2nd to Last**	
B3-R1 <--> R1	**Last**	

- For the LANs in Region 2, following the same format for assigning subnets that you used for Region 1: Subnet 0 to the Fa0/0 interface on B1-R2; Subnet 1 to Fa0/1, and so on.
- For the WANs in Region 2, assign the last subnet to the link between R2 and B3-R2, the second to last subnet to the link between R2 and B2-R2 and the third to the last subnet to link between R2 and B1-R2.
- Record the Region 2 subnet assignments in the following table:

Router	Subnet Number	Subnet Address
B1-R2 Fa0/0	**0**	
B1-R2 Fa0/1	**1**	
B1-R2 Fa1/0	**2**	
B1-R2 Fa1/1	**3**	
B2-R2 Fa0/0	**4**	
B2-R2 Fa0/1	**5**	
B2-R2 Fa1/0	**6**	
B2-R2 Fa1/1	**7**	
B3-R2 Fa0/0	**8**	
B3-R2 Fa0/1	**9**	
B3-R2 Fa1/0	**10**	
B3-R2 Fa1/1	**11**	
B1-R2 <--> R2	**3rd to Last**	
B2-R2 <--> R2	**2nd to Last**	
B3-R2 <--> R2	**Last**	

Step 2: Document the addressing scheme.

- Document the IP addresses and subnet masks. Assign the first IP address to the router interface.
- For the WAN links, assign the first IP address to R1 and R2 for links to each router's respective B1, B2, and B3 routers.

Task 3: Apply a basic configuration.

Using your documentation, configure the routers with basic configurations including addressing. Use **cisco** as the line passwords and **class** as the secret password. Use 64000 as the clock rate. ISP routers are the DCE when connecting to R1 and R2. R1 and R2 are the DCEs when connecting to the branch routers.

Task 4: Configure static routing between ISP routers.

Each ISP router already has two static routes to the other ISP router's directly connected WANs. Implement static routing on each ISP router to insure connectivity between the two regions using the local interface argument.

Task 5: Configure RIPv1 routing in Region 1 and Region 2.

Configure RIP routing on all regional routers. Remember, the ISP routers are only using static routing.

Task 6: Disable RIP updates on appropriate interfaces.

RIP updates do not need to be sent out all the router interfaces. Disable RIP updates on appropriate interfaces.

Task 7: Configure default routes and redistribute through RIP.

Determine which routers need a default route. Then configure that router to redistribute the default route to other routers in the region.

Task 8: Verify full connectivity between all devices in the topology.

Step 1: Test connectivity.

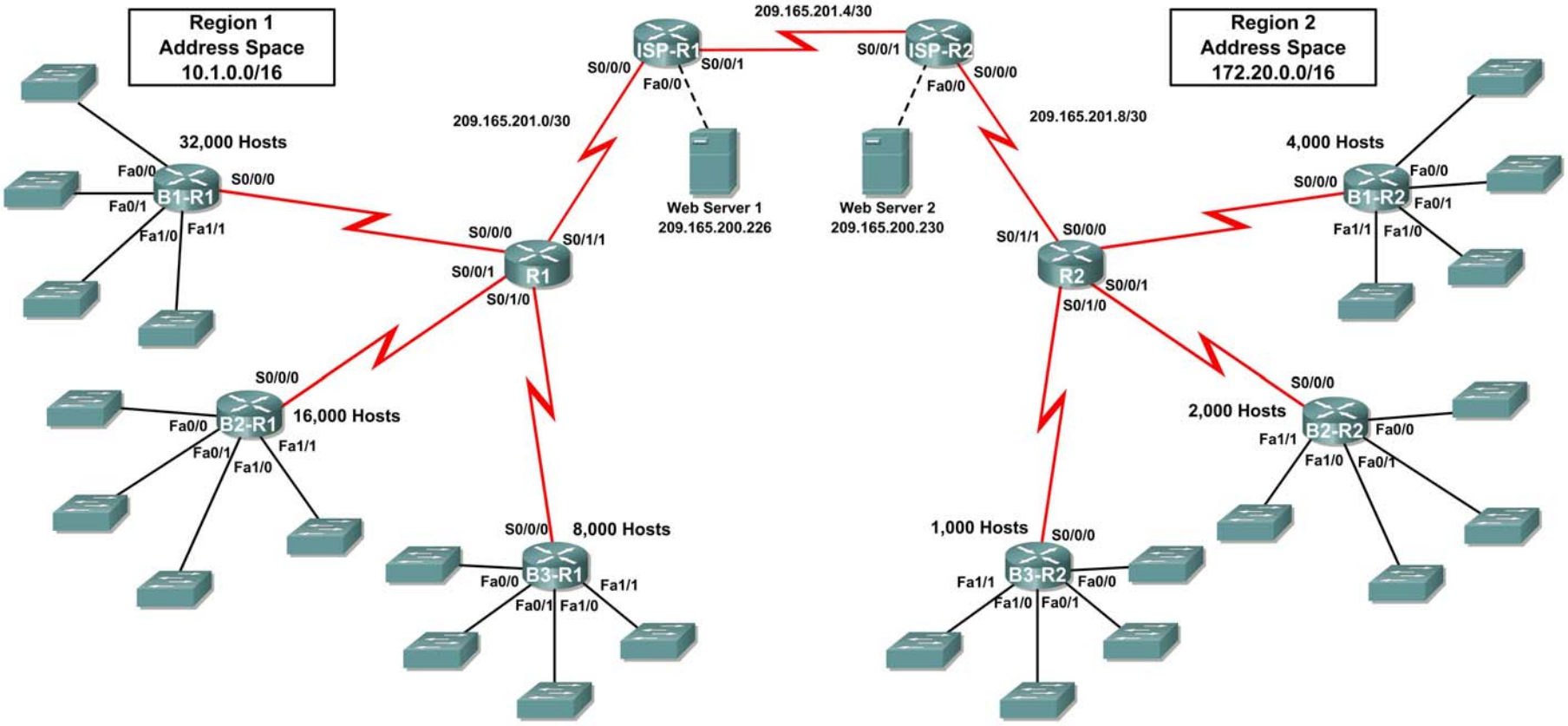
- You should now have end-to-end connectivity. Use ping to test connectivity across the network. Each router should be able to ping all other router interfaces and both Web Servers.
- Troubleshoot until pings are successful.

Step 2: Examine the configuration.

Use verification commands to make sure your configurations are complete.

Ch6 – Packet Tracer Skills Integration Challenge

Topology Diagram



Addressing Table for R1

Device	Interface	IP Address	Subnet Mask
R1	S0/0/0		
	S0/0/1		
	S0/1/0		
	S0/1/1	209.165.201.2	255.255.255.252
B1-R1	Fa0/0		
	Fa0/1		
	Fa1/0		
	Fa1/1		
	S0/0/0		
B2-R1	Fa0/0		
	Fa0/1		
	Fa1/0		
	Fa1/1		
	S0/0/0		
B3-R1	Fa0/0		
	Fa0/1		
	Fa1/0		
	Fa1/1		
	S0/0/0		
ISP-R1	S0/0/0	209.165.201.1	255.255.255.252
	S0/0/1	209.165.201.5	255.255.255.252
	Fa0/0	209.165.200.225	255.255.255.252
Web Server 1	NIC	209.165.200.226	255.255.255.252

Addressing Table for R2

Device	Interface	IP Address	Subnet Mask
R2	S0/0/0		
	S0/0/1		
	S0/1/0		
	S0/1/1	209.165.201.10	255.255.255.252
B1-R2	Fa0/0		
	Fa0/1		
	Fa1/0		
	Fa1/1		
	S0/0/0		
B2-R2	Fa0/0		
	Fa0/1		
	Fa1/0		
	Fa1/1		
	S0/0/0		
B3-R2	Fa0/0		
	Fa0/1		
	Fa1/0		
	Fa1/1		
	S0/0/0		
ISP-R2	S0/0/0	209.165.201.6	255.255.255.252
	S0/0/1	209.165.201.9	255.255.255.252
	Fa0/0	209.165.200.229	255.255.255.252
Web Server 2	NIC	209.165.200.230	255.255.255.252

Introduction:

This activity focuses on subnetting skills with VLSM, basic device configurations, static routing and RIP routing. Once you have configured all devices, you will test for end to end connectivity and examine your configuration.

Objectives

- Design and document an addressing scheme based on requirements.
- Apply a basic configuration to the devices.
- Configure static routing between ISP routers.
- Configure RIPv2 routing in Region 1 (commands provided) and static routing Region 2

- Disable RIP updates on appropriate interfaces
- Configure default routes and redistribute through RIP
- Verify full connectivity between all devices in the topology.

Task 1: Design and document an addressing scheme.

Step 1: Design an addressing scheme.

Using the topology and the following requirements, design an addressing scheme:

- The WAN links between R1 and R2 and their respective ISP routers are already configured. Also, the links between the ISPs and the Web Servers are already configured.
- The address space for Region 1 is 10.1.0.0/16. Each branch router (B1-R1, B2-R1, and B3-R1) should be allotted address space based on the following requirements. Starting with the largest requirement, assign address space to each router
  - B1-R1 needs space for 32,000 hosts _____
  - B2-R1 needs space for 16,000 hosts _____
  - B3-R1 needs space for 8,000 hosts _____
- Divide the address space for each branch router into four equal subnets. Record the subnets in the table below.

Router	Subnet Number	Subnet Address
B1-R1 Fa0/0	**0**	
B1-R1 Fa0/1	**1**	
B1-R1 Fa1/0	**2**	
B1-R1 Fa1/1	**3**	

Router	Subnet Number	Subnet Address
B2-R1 Fa0/0	**0**	
B2-R1 Fa0/1	**1**	
B2-R1 Fa1/0	**2**	
B2-R1 Fa1/1	**3**	

Router	Subnet Number	Subnet Address
B3-R1 Fa0/0	**0**	
B3-R1 Fa0/1	**1**	
B3-R1 Fa1/0	**2**	
B3-R1 Fa1/1	**3**	

- For the WANs in Region 1, subnet the address space 10.1.255.240/28. B1-R1 to R1 uses the first subnet, B2-R1 to R1 uses the second and B3-R1 to R1 the third. Record the subnets in the table below.

Router	Subnet Number	Subnet Address
B1-R1 <--> R1	**0**	
B2-R1 <--> R1	**1**	
B3-R1 <--> R1	**2**	

- The address space for Region 2 is 172.20.0.0/16. Each branch router (B1-R2, B2-R2, and B3-R2) should be allotted address space based on the following requirements. Starting with the largest requirement, assign address space to each router
  - B1-R2 needs space for 4,000 hosts _____
  - B2-R2 needs space for 2,000 hosts _____
  - B3-R2 needs space for 1,000 hosts _____
- Divide the address space for each branch router into four equal subnets. Record the subnets in the table below.

Router	Subnet Number	Subnet Address
B1-R2 Fa0/0	**0**	
B1-R2 Fa0/1	**1**	
B1-R2 Fa1/0	**2**	
B1-R2 Fa1/1	**3**	

Router	Subnet Number	Subnet Address
B2-R2 Fa0/0	**0**	
B2-R2 Fa0/1	**1**	
B2-R2 Fa1/0	**2**	
B2-R2 Fa1/1	**3**	

Router	Subnet Number	Subnet Address
B3-R2 Fa0/0	**0**	
B3-R2 Fa0/1	**1**	
B3-R2 Fa1/0	**2**	
B3-R2 Fa1/1	**3**	

- For the WANs in Region 2, subnet the address space 172.20.255.240/28. B1-R2 to R2 uses the first subnet, B2-R2 to R2 uses the second and B3-R2 to R2 the third. Record the subnets in the table below.

Router	Subnet Number	Subnet Address

Router	Subnet Number	Subnet Address
B1-R2 <--> R2	**0**	
B2-R2 <--> R2	**1**	
B3-R2 <--> R2	**2**	

Step 2: Document the addressing scheme.

- Document the IP addresses and subnet masks. Assign the first IP address to the router interface.
- For the WAN links, assign the first IP address to R1 and R2 for links to each router's perspective B1, B2, and B3 routers.

Task 2: Apply a basic configuration.

Using your documentation, configure the routers with basic configurations including addressing and hostnames. Use **cisco** as the line passwords and **class** as the secret password. Use 64000 as the clock rate.

Task 3: Configure static routing between ISP routers.

Each ISP router already has two static routes to the other ISP router's directly connected WANs. Implement static routing on each ISP router to insure connectivity between the two regions.

Task 4: Configure RIPv2 routing in Region 1 and static routing Region 2.

Step 1: Configure RIPv2 routing in Region 1.

Configure all routers in Region 1 (R1, B1-R1, B2-R1, and B3-R1) with RIP as the dynamic routing protocol. In order to fully appreciate the implementation of your VLSM design in a dynamic routing environment, add the following two commands to your RIP configurations:

```
Router(config-router)#version 2
Router(config-router)#no auto-summary
```

The **`version 2`** command enables RIPv2 which includes the sending of subnet mask information in routing updates. By default, RIPv2 summarizes updates at classful boundaries just like RIPv1. The **`no auto-summary`** command disables. These two commands will be fully explained in the next chapter.

Step 2: Configure static routing Region 2.

Region 2 is not using a dynamic routing protocol. Configure the routers with the necessary static and default routes to insure full end-to-end connectivity.

- R2 should have three static routes and one default route.
- B1-R2, B2-R2, and B3-R2 should have one default route each.

Task 5: Disable RIP updates on appropriate interfaces.

RIP updates do not need to be sent out all the router interfaces. Disable RIP updates on appropriate interfaces.

Task 6: Configure default routes and redistribute through RIP.

In Region 1, determine which router needs a default route. Then configure that router to redistribute the default route to other routers in the region.

Task 7: Verify full connectivity between all devices in the topology.

Step 1: Test connectivity.

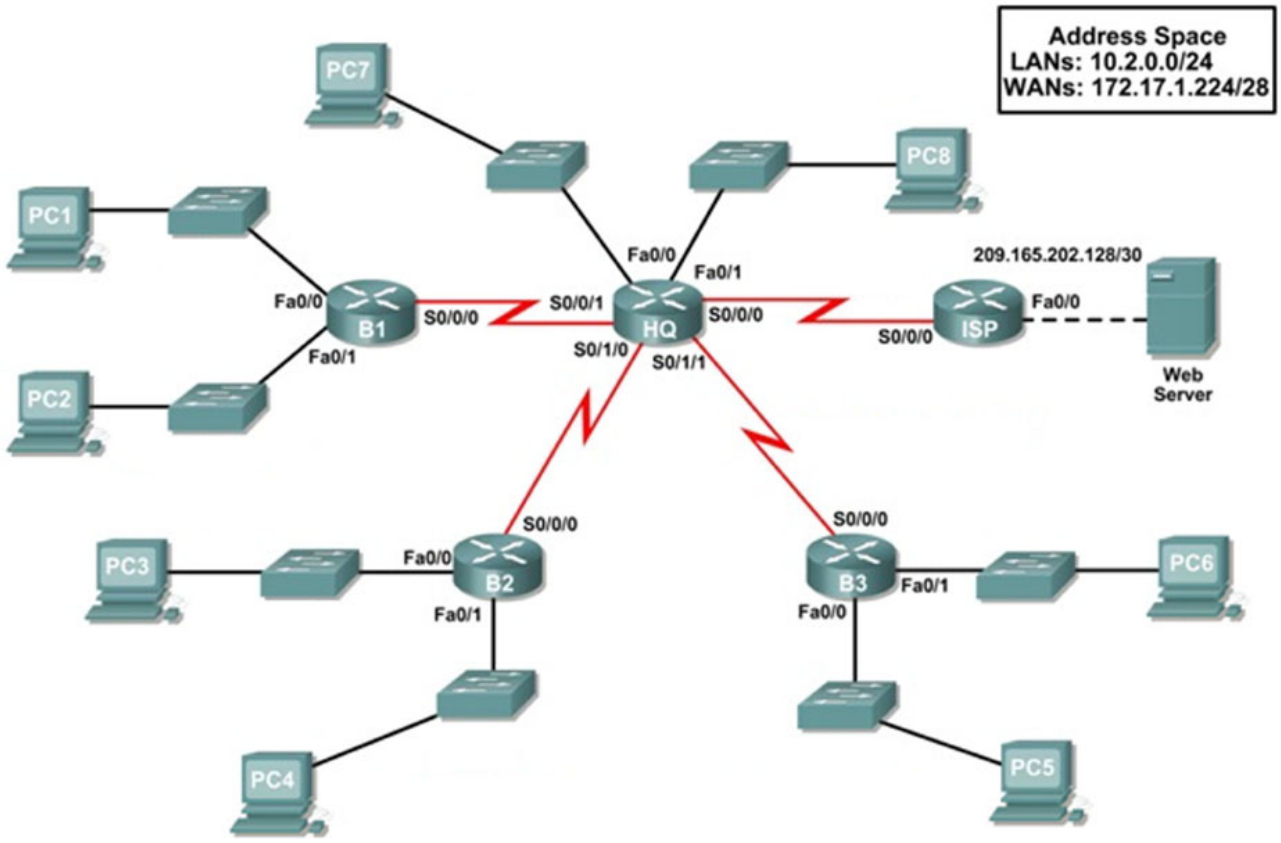
- You should now have end-to-end connectivity. Use ping to test connectivity across the network. Each router should be able to ping all other router interfaces and both Web Servers.
- Troubleshoot until pings are successful.

Step 2: Examine the configuration.

Use verification commands to make sure your configurations are complete.

Ch7 - Packet Tracer Skills Integration Challenge

Topology Diagram



Addressing Table

Device	Interface	IP Address	Subnet Mask	Default Gateway
HQ	Fa0/0			N/A
	Fa0/1			N/A
	S0/0/0	209.165.201.2	255.255.255.252	N/A
	S0/0/1			N/A
	S0/1/0			N/A
	S0/1/1			N/A
B1	Fa0/0			N/A
	Fa0/1			N/A
	S0/0/0			N/A
B2	Fa0/0			N/A
	Fa0/1			N/A
	S0/0/0			N/A
B3	Fa0/0			N/A
	Fa0/1			N/A
	S0/0/0			N/A
ISP	Fa0/0	209.165.202.129	255.255.255.252	N/A
	S0/0/0	209.165.201.1	255.255.255.252	N/A
Web Server	NIC	209.165.202.130	255.255.255.252	209.165.202.129
PC1	NIC			
PC2	NIC			
PC3	NIC			
PC4	NIC			
PC5	NIC			
PC6	NIC			
PC7	NIC			
PC8	NIC			

Introduction:

This Packet Tracer Skills Integration Challenge Activity is very similar to the activities you have created in prior chapters. To allow you to better practice your skills, the scenario is slightly different. In this activity, you build a network from the ground up. Starting with a given address space and network requirements, you must implement a network design that satisfies the specifications. Next, you implement an effective RIPv2 routing configuration with static and default routing for Internet access.

Objectives

- Design and document an addressing scheme based on requirements.
- Select appropriate equipment and cable the devices.
- Apply a basic configuration to the devices.
- Test connectivity between directly connected devices.
- Configure RIPv2 routing.
- Configure static and default routing for Internet access.
- Verify full connectivity between all devices in the topology.

Task 1: Design and document an addressing scheme.

Step 1: Design an addressing scheme.

Based on the network requirements shown in the topology, design an appropriate addressing scheme.

- Address the LANs in order starting with LAN 1, then LAN 2, etc. Use the first address for the router interface and the last address for the PC.
- The addressing requirements for the LANs are:
    - Router B1 interface Fa0/0 supports 60 hosts.
    - Router B1 interface Fa0/1 supports 60 hosts.
    - Router B2 interface Fa0/0 supports 30 hosts.
    - Router B2 interface Fa0/1 supports 30 hosts.
    - Router B3 interface Fa0/0 supports 10 hosts.
    - Router B3 interface Fa0/1 supports 10 hosts.
    - Router HQ interface Fa0/0 supports 5 hosts.
    - Router HQ interface Fa0/1 supports 5 hosts.
- Address the WANs in order starting with WAN 1, then WAN 2, etc. HQ is the first usable address in all WAN links, with the exception of the link to ISP. For the ISP link, HQ uses the second usable address.
    - WAN 1 is the link between HQ and B1.
    - WAN 2 is the link between HQ and B2.
    - WAN 3 is the link between HQ and B3.

Step 2: Document the addressing scheme.

- Record the network addresses in dotted-decimal/slash format.
- Document the IP addresses, subnet masks and default gateway addresses.

Task 2: Apply a basic configuration.

Step 1: Configure the routers.

Using your documentation, configure the routers with basic configurations, including addressing and hostnames. Use **cisco** as the line passwords (console and Telnet). Use **class** as the enable secret password.

Step 2: Configure the PCs.

Using your documentation, configure the PCs with an IP address, subnet mask, and default gateway.

Task 3: Test connectivity.

Before continuing, make sure that each device can ping its directly connected neighbor.

Task 4: Configure and verify RIPv2 routing.

Step 1: Configure RIPv2.

Configure all devices with RIPv2 routing. In your configuration, make sure you include the following:

- Disable automatic summarization.
- Stop routing updates on interfaces that are not connected to RIP neighbors.
- Set a default route from HQ to ISP using the next-hop IP address.
- Configure static routes on the ISP using the outbound interface.
- Redistribute default route from HQ.

Step 2: Verify RIPv2.

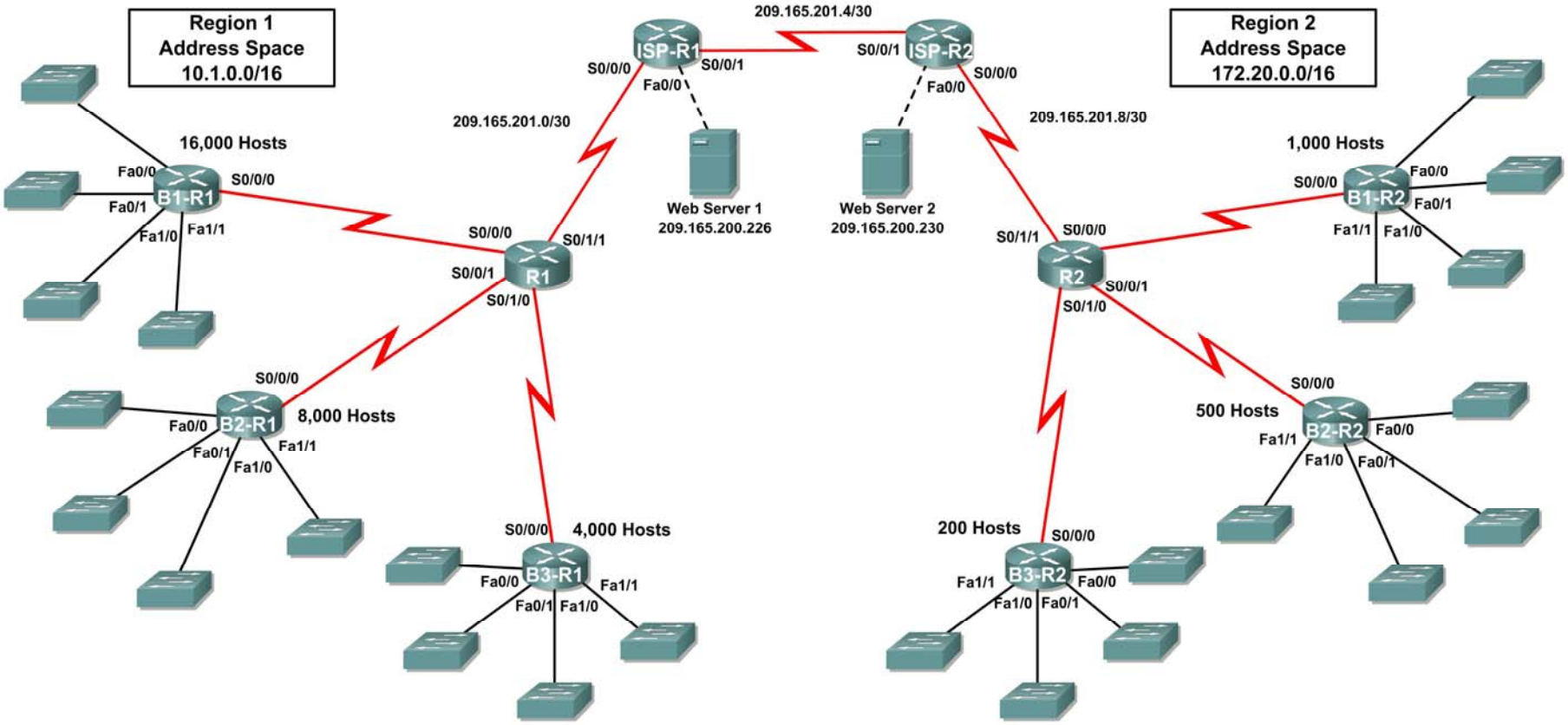
Use verification commands to check your configuration. All routers should be converged on all the 10.2.0.0/24 and 172.17.1.224/28 subnets.

Task 5: Test connectivity and examine the configuration.

Test connectivity and examine the configuration.

Ch8 - Packet Tracer Skills Integration Challenge

Topology Diagram



Addressing Table for R1

Device	Interface	IP Address	Subnet Mask
R1	S0/0/0		
	S0/0/1		
	S0/1/0		
	S0/1/1	209.165.201.2	255.255.255.252
B1-R1	Fa0/0		
	Fa0/1		
	Fa1/0		
	Fa1/1		
	S0/0/0		
B2-R1	Fa0/0		
	Fa0/1		
	Fa1/0		
	Fa1/1		
	S0/0/0		
B3-R1	Fa0/0		
	Fa0/1		
	Fa1/0		
	Fa1/1		
	S0/0/0		
ISP-R1	S0/0/0	209.165.201.1	255.255.255.252
	S0/0/1	209.165.201.5	255.255.255.252
	Fa0/0	209.165.200.225	255.255.255.252
Web Server 1	NIC	209.165.200.226	255.255.255.252

Addressing Table for R2

Device	Interface	IP Address	Subnet Mask
R2	S0/0/0		
	S0/0/1		
	S0/1/0		
	S0/1/1	209.165.201.10	255.255.255.252
B1-R2	Fa0/0		
	Fa0/1		
	Fa1/0		
	Fa1/1		
	S0/0/0		
B2-R2	Fa0/0		
	Fa0/1		
	Fa1/0		
	Fa1/1		
	S0/0/0		
B3-R2	Fa0/0		
	Fa0/1		
	Fa1/0		
	Fa1/1		
	S0/0/0		
ISP-R2	S0/0/0	209.165.201.6	255.255.255.252
	S0/0/1	209.165.201.9	255.255.255.252
	Fa0/0	209.165.200.229	255.255.255.252
Web Server 2	NIC	209.165.200.230	255.255.255.252

Introduction:

This activity focuses on subnetting skills with VLSM, basic device configurations, RIPv2 routing and static routing. Once you have configured all devices, you will test for end to end connectivity and examine your configuration.

Objectives

- Design and document an addressing scheme based on requirements.
- Apply a basic configuration to the devices.
- Configure static routing between ISP routers.
- Configure RIPv2 routing in both regions.Disable RIP updates on appropriate interfaces.

- Configure default routes and redistribute through RIP.
- Verify full connectivity between all devices in the topology.

Task 1: Design and document an addressing scheme.

Step 1: Design an addressing scheme.

Using the topology and the following requirements, design an addressing scheme:

- The WAN links between R1 and R2 and their respective ISP routers are already configured. Also, the links between the ISPs and the Web Servers are already configured.
- The address space for Region 1 is 10.1.0.0/16. Each branch router (B1-R1, B2-R1, and B3-R1) should be allotted address space based on the following requirements. Starting with the largest requirement, assign address space to each router.
  - B1-R1 needs space for 16,000 hosts _____
  - B2-R1 needs space for 8,000 hosts _____
  - B3-R1 needs space for 4,000 hosts _____
- Divide the address space for each branch router into four equal subnets. Record the subnets in the table below.

Router	Subnet Number	Subnet Address
B1-R1 Fa0/0	**0**	
B1-R1 Fa0/1	**1**	
B1-R1 Fa1/0	**2**	
B1-R1 Fa1/1	**3**	

Router	Subnet Number	Subnet Address
B2-R1 Fa0/0	**0**	
B2-R1 Fa0/1	**1**	
B2-R1 Fa1/0	**2**	
B2-R1 Fa1/1	**3**	

Router	Subnet Number	Subnet Address
B3-R1 Fa0/0	**0**	
B3-R1 Fa0/1	**1**	
B3-R1 Fa1/0	**2**	
B3-R1 Fa1/1	**3**	

- For the WANs in Region 1, subnet the address space 10.1.128.0/28. Assign B1-R1 to R1 the first subnet, B2-R1 to R1, the second and B3-R1 to R1 the third. Record the subnets.

Router	Subnet Number	Subnet Address
B1-R1 <--> R1	**0**	
B2-R1 <--> R1	**1**	
B3-R1 <--> R1	**2**	

- The address space for Region 2 is 172.20.0.0/16. Each branch router (B1-R2, B2-R2, and B3-R2) should be allotted address space based on the following requirements. Starting with the largest requirement, assign address space to each router.
  - B1-R2 needs space for 1,000 hosts _____
  - B2-R2 needs space for 500 hosts _____
  - B3-R2 needs space for 200 hosts _____
- Divide the address space for each branch router into four equal subnets. Record the subnets in the table below.

Router	Subnet Number	Subnet Address
B1-R2 Fa0/0	**0**	
B1-R2 Fa0/1	**1**	
B1-R2 Fa1/0	**2**	
B1-R2 Fa1/1	**3**	

Router	Subnet Number	Subnet Address
B2-R2 Fa0/0	**0**	
B2-R2 Fa0/1	**1**	
B2-R2 Fa1/0	**2**	
B2-R2 Fa1/1	**3**	

Router	Subnet Number	Subnet Address
B3-R2 Fa0/0	**0**	
B3-R2 Fa0/1	**1**	
B3-R2 Fa1/0	**2**	
B3-R2 Fa1/1	**3**	

- For the WANs in Region 2, subnet the address space 172.20.8.0/28. Assign B1-R2 to R2 the first subnet, B2-R2 to R2, the second and B3-R2 to R2 the third. Record the subnets in the table below.

Router	Subnet Number	Subnet Address
B1-R2 <--> R2	0	
B2-R2 <--> R2	1	
B3-R2 <--> R2	2	

Step 2: Document the addressing scheme.

- Document the IP addresses and subnet masks. Assign the first IP address to the router interface.
- For the WAN links, assign the first IP address to R1 and R2 for links to each router's perspective B1, B2, and B3 routers.

Task 2: Apply a basic configuration.

Using your documentation, configure the routers with basic configurations including addressing and hostnames. Use **cisco** as the line passwords and **class** as the secret password. Use 64000 as the clock rate.

Task 3: Configure static routing between ISP routers.

Each ISP router already has two static routes to the other ISP router's directly connected WANs. Implement static routing on each ISP router to insure connectivity between the two regions.

Task 4: Configure RIPv2 routing in both regions.

Configure all routers in both regions with RIPv2 as the dynamic routing protocol. Disable automatic summarization.

Task 5: Disable RIP updates on appropriate interfaces.

RIP updates do not need to be sent out all the router interfaces. Disable RIP updates on appropriate interfaces.

Task 6: Configure default routes and redistribute through RIP.

- In Region 1, determine which router needs a default route. Configure a default route on that router and then configure that router to redistribute the default route to other routers in the region.
- In Region 2, determine which router needs a default route. Configure a default route on that router and then configure that router to redistribute the default route to other routers in the region.

Task 7: Verify full connectivity between all devices in the topology.

Step 1: Test connectivity.

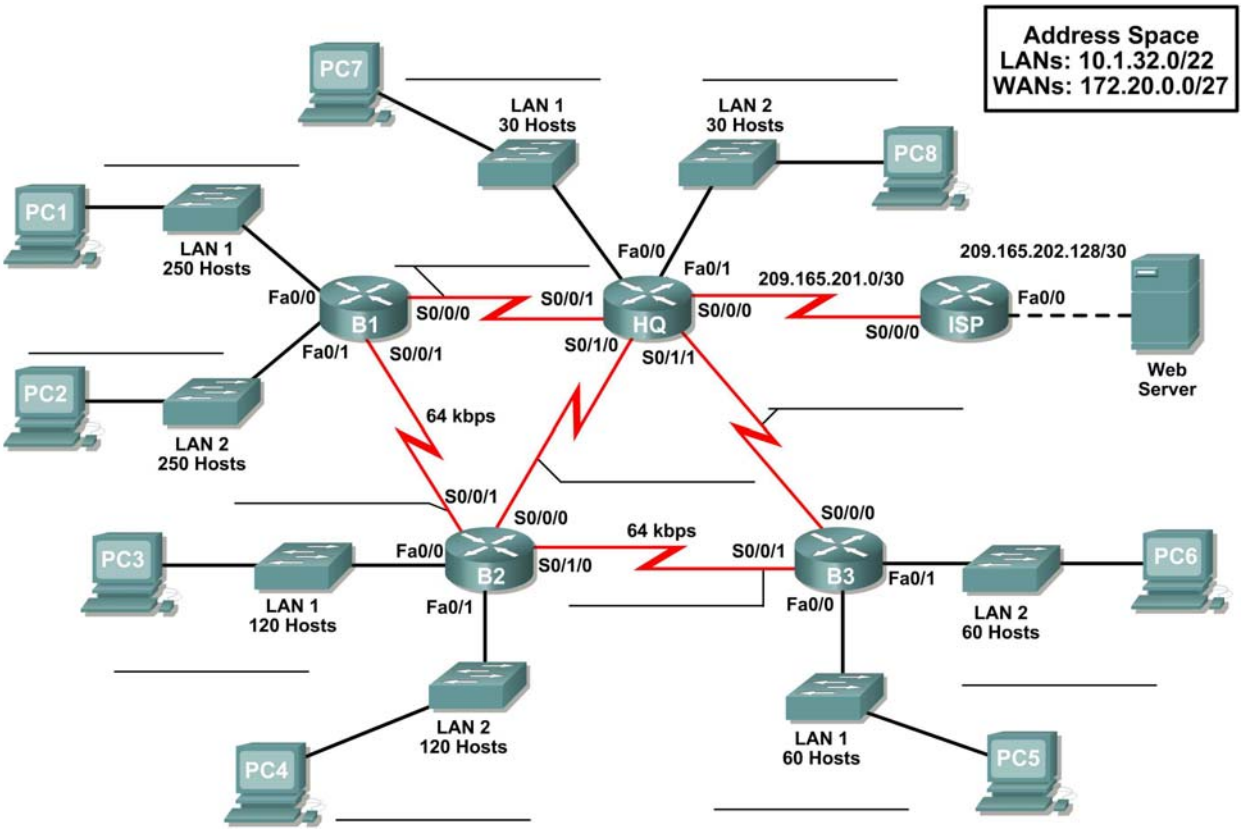
- You should now have end-to-end connectivity. Use ping to test connectivity across the network. Each router should be able to ping all other router interfaces and both Web Servers.
- Troubleshoot until pings are successful.

Step 2: Examine the configuration.

Use verification commands to make sure your configurations are complete.

Ch9 - Packet Tracer Skills Integration Challenge

Topology Diagram



Introduction:

This Packet Tracer Skills Integration Challenge Activity is similar to the activities you created for Chapter 7, "RIPv2". The scenario is slightly different, to allow you to better practice your skills. In this activity, you build a network from the ground up. Starting with a given address space and network requirements, you must implement a network design that satisfies the specifications. Then implement an effective EIGRP routing configuration, manually summarize routes, fine-tune EIGRP metrics and timers, and configure static and default routing for Internet access.

Objectives:

- Design and document an addressing scheme based on requirements.
- Apply a basic configuration to the devices.
- Test connectivity between directly connected devices.
- Configure and verify EIGRP routing.
- Configure EIGRP summary routes.
- Fine-tune EIGRP.
- Configure static and default routing for Internet access.
- Verify full connectivity between all devices in the topology.

Addressing Table

Device	Interface	IP Address	Subnet Mask	Default Gateway
HQ	Fa0/0			N/A
	Fa0/1			N/A
	S0/0/0	209.165.201.2	255.255.255.252	N/A
	S0/0/1			N/A
	S0/1/0			N/A
	S0/1/1			N/A
B1	Fa0/0			N/A
	Fa0/1			N/A
	S0/0/0			N/A
	S0/0/1			N/A
B2	Fa0/0			N/A
	Fa0/1			N/A
	S0/0/0			N/A
	S0/0/1			N/A
	S0/1/0			N/A
B3	Fa0/0			N/A
	Fa0/1			N/A
	S0/0/0			N/A
	S0/0/1			N/A
ISP	Fa0/0	209.165.202.129	255.255.255.252	N/A
	S0/0/0	209.165.201.1	255.255.255.252	N/A
Web Server	NIC	209.165.202.130	255.255.255.252	209.165.202.129
PC1	NIC			
PC2	NIC			
PC3	NIC			
PC4	NIC			
PC5	NIC			
PC6	NIC			
PC7	NIC			
PC8	NIC			

Task 1: Design and Document an Addressing Scheme.

Step 1: Design an addressing scheme.

Based on the network requirements shown in the topology, design an appropriate addressing scheme.

- For the LANs, use the address space 10.1.32.0/22. Starting with the largest subnets requirements on B1, assign subnets in order throughout the topology. LAN 1 first, then LAN 2.
- For the WANs, use the address space 172.20.0.0/27. Assign WAN subnets according to the following specifications:
  - Subnet 0 to the WAN link between HQ and B1
  - Subnet 1 to the WAN link between HQ and B2
  - Subnet 2 to the WAN link between HQ and B3
  - Subnet 3 to the WAN link between B1 and B2
  - Subnet 4 to the WAN link between B2 and B3

Step 2: Document the addressing scheme.

- Record the network addresses in dotted-decimal/slash format.
- Document the IP addresses, subnet masks and default gateway addresses.
  - For LANs, assign the first address to the router interface. Assign the last address to the PC.
  - For WAN links to HQ, assign the first address to the HQ router.
  - For WAN links between branch routers:
    - Assign the first address to B1 for the link between B1 and B2.
    - Assign the first address to B2 for the link between B2 and B3.

Task 2: Apply a Basic Configuration.

Step 1: Configure the routers.

Using your documentation, configure the routers with basic configurations, including addressing and hostnames. Use **class** for the enable secret password and **cisco** for the line passwords. HQ is the DCE connection to the Branch routers and the ISP is the DCE connection to HQ.

Step 2: Configure the PCs.

Using your documentation, configure the PCs with an IP address, subnet mask, and default gateway.

Task 3: Test Connectivity.

Before continuing, make sure that each device can ping its directly connected neighbor.

Task 4: Configure and Verify EIGRP Routing.

Step 1: Configure EIGRP.

Configure all devices with EIGRP routing in Autonomous System 1. In your configuration, make sure you include the following:

- Disable automatic summarization.
- Stop routing updates on interfaces that are not connected to EIGRP neighbors.

Step 2: Verify EIGRP.

Use verification commands to check your configuration. All routers should be converged on all the 10.1.32.0/22 and 172.20.0.0/27 subnets.

Step 3: Summarize the routes.

Manually summarize routes advertised for the LANs, on all routers except ISP, using an administrative distance of 5, so that only one route is sent via EIGRP.

NOTE: The current version of Packet Tracer allows the configuration of the summary command. However, the routing tables will still display as if summarization has not been configured. This is a known bug that will be addressed in a future release.

Task 6: Fine-tune EIGRP.

Step 1: Adjust bandwidth values used to calculate metrics.

The links between the branch routers (B1 to B2 and B2 to B3) are for backup purposes only. Configure the bandwidth values to 64 kbps so that EIGRP does not equal-cost load across the T1 links to HQ and the backup links to the neighboring branch router.

Step 2: Adjust hello intervals for the slower links.

Change the hello intervals for the 64 kbps links to 60 seconds.

Task 7: Configure Static and Default Routing.

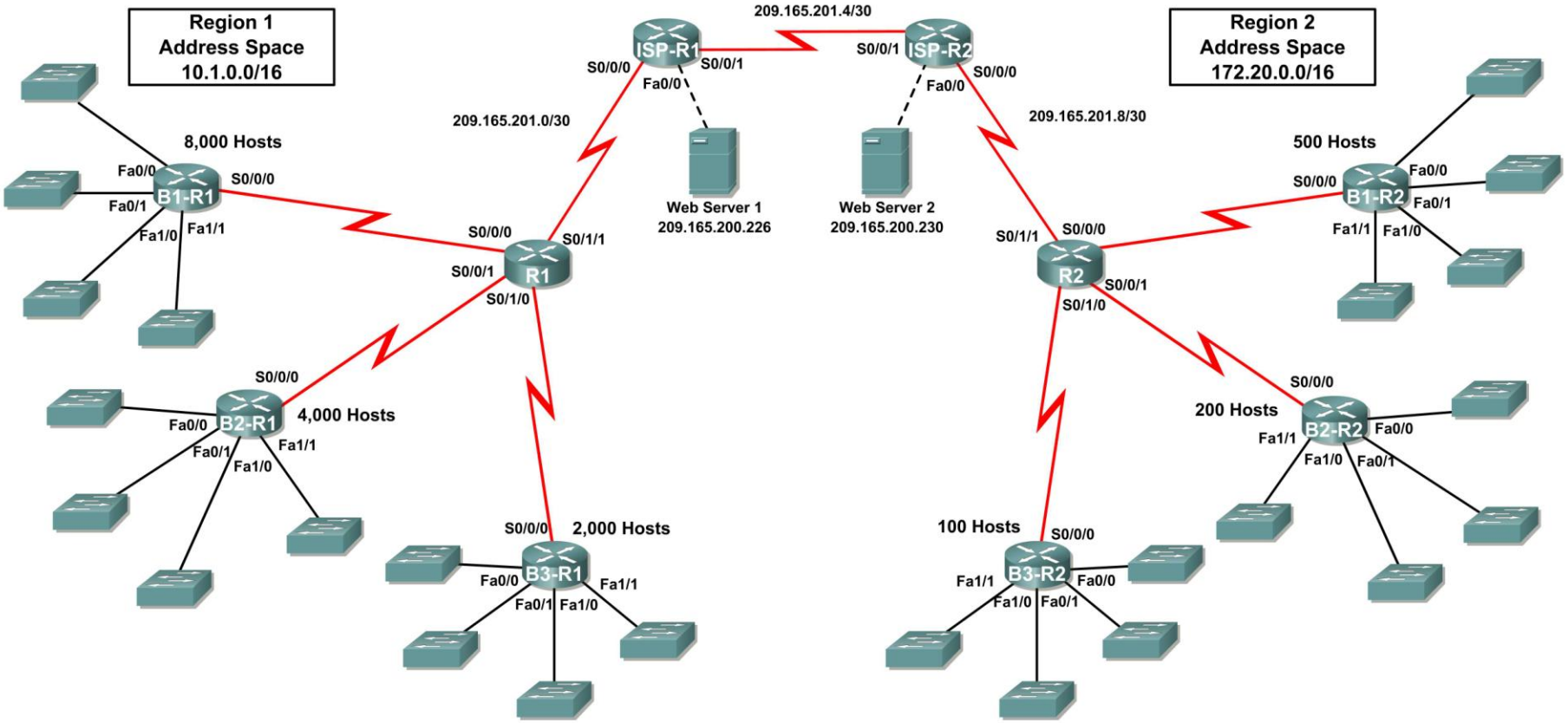
Since Packet Tracer does not support redistribution of default routes, all routers except ISP will need a default route configured.

Task 8: Test Connectivity and Examine the Configuration.

Test connectivity and examine the configuration.

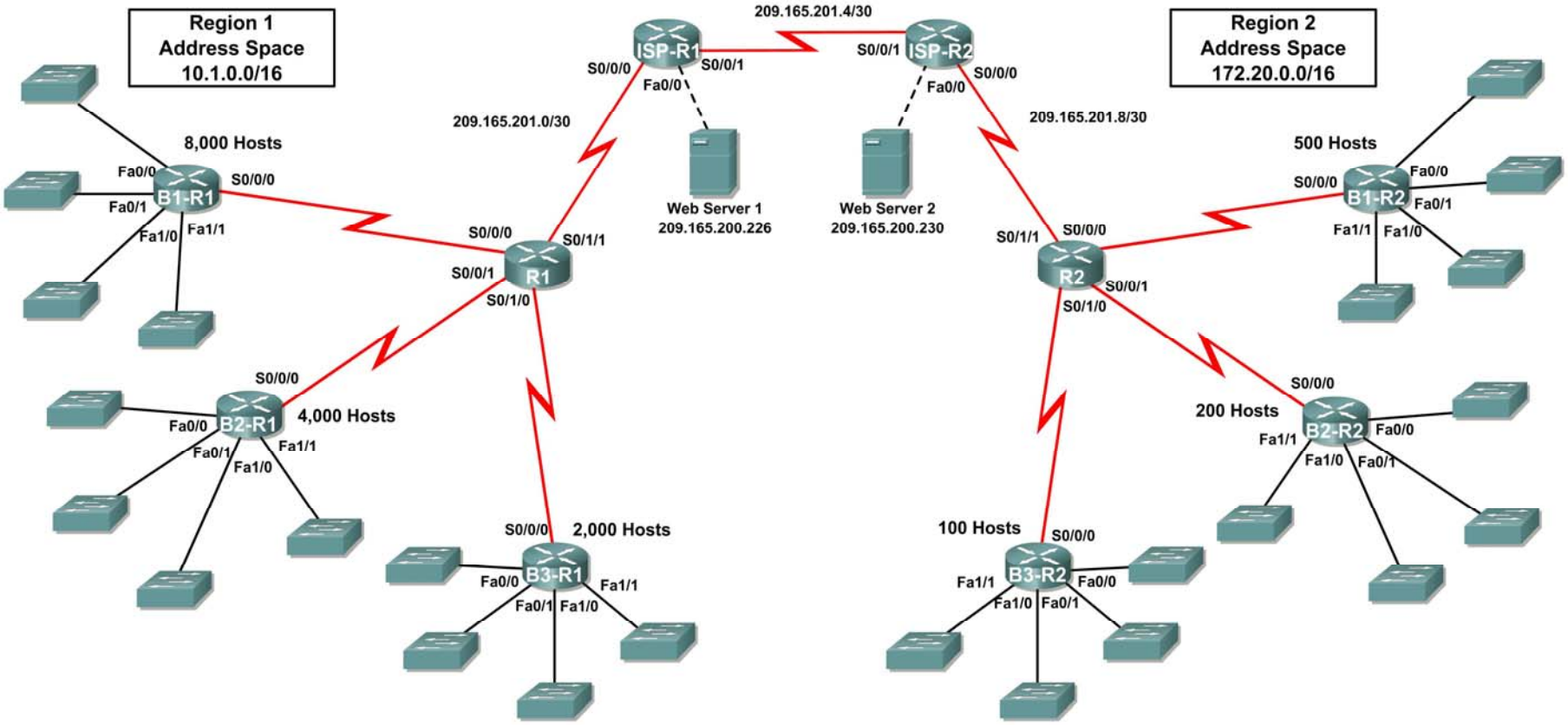
10.3.1: Packet Tracer Skills Integration Challenge Activity

Topology Diagram



Ch10 - Packet Tracer Skills Integration Challenge

Topology Diagram



Addressing Table for R1

Device	Interface	IP Address	Subnet Mask
R1	S0/0/0		
	S0/0/1		
	S0/1/0		
	S0/1/1	209.165.201.2	255.255.255.252
B1-R1	Fa0/0		
	Fa0/1		
	Fa1/0		
	Fa1/1		
	S0/0/0		
B2-R1	Fa0/0		
	Fa0/1		
	Fa1/0		
	Fa1/1		
	S0/0/0		
B3-R1	Fa0/0		
	Fa0/1		
	Fa1/0		
	Fa1/1		
	S0/0/0		
ISP-R1	S0/0/0	209.165.201.1	255.255.255.252
	S0/0/1	209.165.201.5	255.255.255.252
	Fa0/0	209.165.200.225	255.255.255.252
Web Server 1	NIC	209.165.200.226	255.255.255.252

Addressing Table for R2

Device	Interface	IP Address	Subnet Mask
R2	S0/0/0		
	S0/0/1		
	S0/1/0		
	S0/1/1	209.165.201.10	255.255.255.252
B1-R2	Fa0/0		
	Fa0/1		
	Fa1/0		
	Fa1/1		
	S0/0/0		
B2-R2	Fa0/0		
	Fa0/1		
	Fa1/0		
	Fa1/1		
	S0/0/0		
B3-R2	Fa0/0		
	Fa0/1		
	Fa1/0		
	Fa1/1		
	S0/0/0		
ISP-R2	S0/0/0	209.165.201.6	255.255.255.252
	S0/0/1	209.165.201.9	255.255.255.252
	Fa0/0	209.165.200.229	255.255.255.252
Web Server 2	NIC	209.165.200.230	255.255.255.252

Objectives

- Design and document an addressing scheme based on requirements.
- Apply a basic configuration to the devices.
- Configure static routing between ISP routers.
- Configure EIGRP routing in Region 1 and RIPv2 routing Region 2.
- Disable routing updates on appropriate interfaces.
- Configure and redistribute default routes.
- Verify full connectivity between all devices in the topology.

Task 1: Design and Document an Addressing Scheme.

Step 1: Design an addressing scheme.

Using the topology and the following requirements, design an addressing scheme:

- The WAN links between R1 and R2 and their respective ISP routers are already configured. Also, the links between the ISPs and the Web Servers are already configured.
- The address space for Region 1 is 10.1.0.0/16. Each branch router (B1-R1, B2-R1, and B3-R1) should be allotted address space based on the following requirements. Starting with the largest requirement, assign address space to each router
  - B1-R1 needs space for 8,000 hosts _____
  - B2-R1 needs space for 4,000 hosts _____
  - B3-R1 needs space for 2,000 hosts _____
- Divide the address space for each branch router into four equal subnets. Record the subnets in the table below.

Router	Subnet Number	Subnet Address
B1-R1 Fa0/0	**0**	
B1-R1 Fa0/1	**1**	
B1-R1 Fa1/0	**2**	
B1-R1 Fa1/1	**3**	

Router	Subnet Number	Subnet Address
B2-R1 Fa0/0	**0**	
B2-R1 Fa0/1	**1**	
B2-R1 Fa1/0	**2**	
B2-R1 Fa1/1	**3**	

Router	Subnet Number	Subnet Address
B3-R1 Fa0/0	**0**	
B3-R1 Fa0/1	**1**	
B3-R1 Fa1/0	**2**	
B3-R1 Fa1/1	**3**	

- For the WANs in Region 1, subnet the address space 10.1.64.0/28. Record the subnets in the table below.

Router	Subnet Number	Subnet Address
B1-R1 <--> R1	**0**	
B2-R1 <--> R1	**1**	
B3-R1 <--> R1	**2**	

- The address space for Region 2 is 172.20.0.0/16. Each branch router (B1-R2, B2-R2, and B3-R2) should be allotted address space based on the following requirements. Starting with the largest requirement, assign address space to each router
  - B1-R2 needs space for 500 hosts _____
  - B2-R2 needs space for 200 hosts _____
  - B3-R2 needs space for 100 hosts _____
- Divide the address space for each branch router into four equal subnets. Record the subnets in the table below.

Router	Subnet Number	Subnet Address
B1-R2 Fa0/0	**0**	
B1-R2 Fa0/1	**1**	
B1-R2 Fa1/0	**2**	
B1-R2 Fa1/1	**3**	

Router	Subnet Number	Subnet Address
B2-R2 Fa0/0	**0**	
B2-R2 Fa0/1	**1**	
B2-R2 Fa1/0	**2**	
B2-R2 Fa1/1	**3**	

Router	Subnet Number	Subnet Address
B3-R2 Fa0/0	**0**	
B3-R2 Fa0/1	**1**	
B3-R2 Fa1/0	**2**	
B3-R2 Fa1/1	**3**	

- For the WANs in Region 2, subnet the address space 172.20.4.0/28. B1-R2 to R2 receives the first subnet, B2-R2 to R2, the second subnet, and B3-R2 the third, Record the subnets.

Router	Subnet Number	Subnet Address
B1-R2 <--> R2	**0**	
B2-R2 <--> R2	**1**	
B3-R2 <--> R2	**2**	

Step 2: Document the addressing scheme.

- Optional: On the topology, label each subnet. To save space, use only the last two octets since only these octets change.
- Use the table provided in the printed instructions to document the IP addresses and subnet masks. Assign the first IP address to the router interface.
- For the WAN links, assign the first IP address to R1 and R2 for links to each router's perspective B1, B2, and B3 routers.

Task 2: Apply a Basic Configuration.

Using your documentation, configure the routers with basic configurations including addressing. Use **cisco** as the line passwords and **class** as the secret password. Use 64000 as the clock rate.

Task 3: Configure Static Routing Between ISP Routers.

Each ISP router already has two static routes to the other ISP router's directly connected WANs. Implement static routing on each ISP router to insure connectivity between the two regions.

Task 4: Configure EIGRP Routing in Region 1 and RIPv2 Routing Region 2.

Step 1: Configure EIGRP routing in Region 1.

Configure all routers in Region 1 (R1, B1-R1, B2-R1, and B3-R1) with EIGRP as the dynamic routing protocol.

- Use 1 as the process ID for EIGRP
- Disable automatic summarization
- Manually summarize routes advertised by the branch routers to R1 so that only one route is sent (NOTE: The current version of Packet Tracer allows the configuration of the summary command. However, the routing tables will still display as if summarization has not been configured. This is a known bug that will be addressed in a future release.)
- Configure the hello intervals on the branch routers to 30 seconds.

Step 2: Configure RIPv2 routing Region 2.

Configure all routers in Region 2 (R2, B1-R2, B2-R2, and B3-R2) with RIPv2 as the dynamic routing protocol. Disable automatic summarization.

Task 5: Disable Routing Updates on Appropriate Interfaces.

Routing updates do not need to be sent out all the router interfaces. Disable routing updates on appropriate interfaces.

Task 6: Configure and Redistribute Default Routes.

- Packet Tracer does not yet support the redistribution of a static default routes with EIGRP. Therefore, you must configure all routers in Region 1 with a default route. Use the exit interface argument.
- Configure the appropriate router in Region 2 with a default route. Then configure that router to redistribute the default route to all other routers in the region.

Task 7: Verify Full Connectivity Between all Devices in the Topology.

Step 1: Test connectivity.

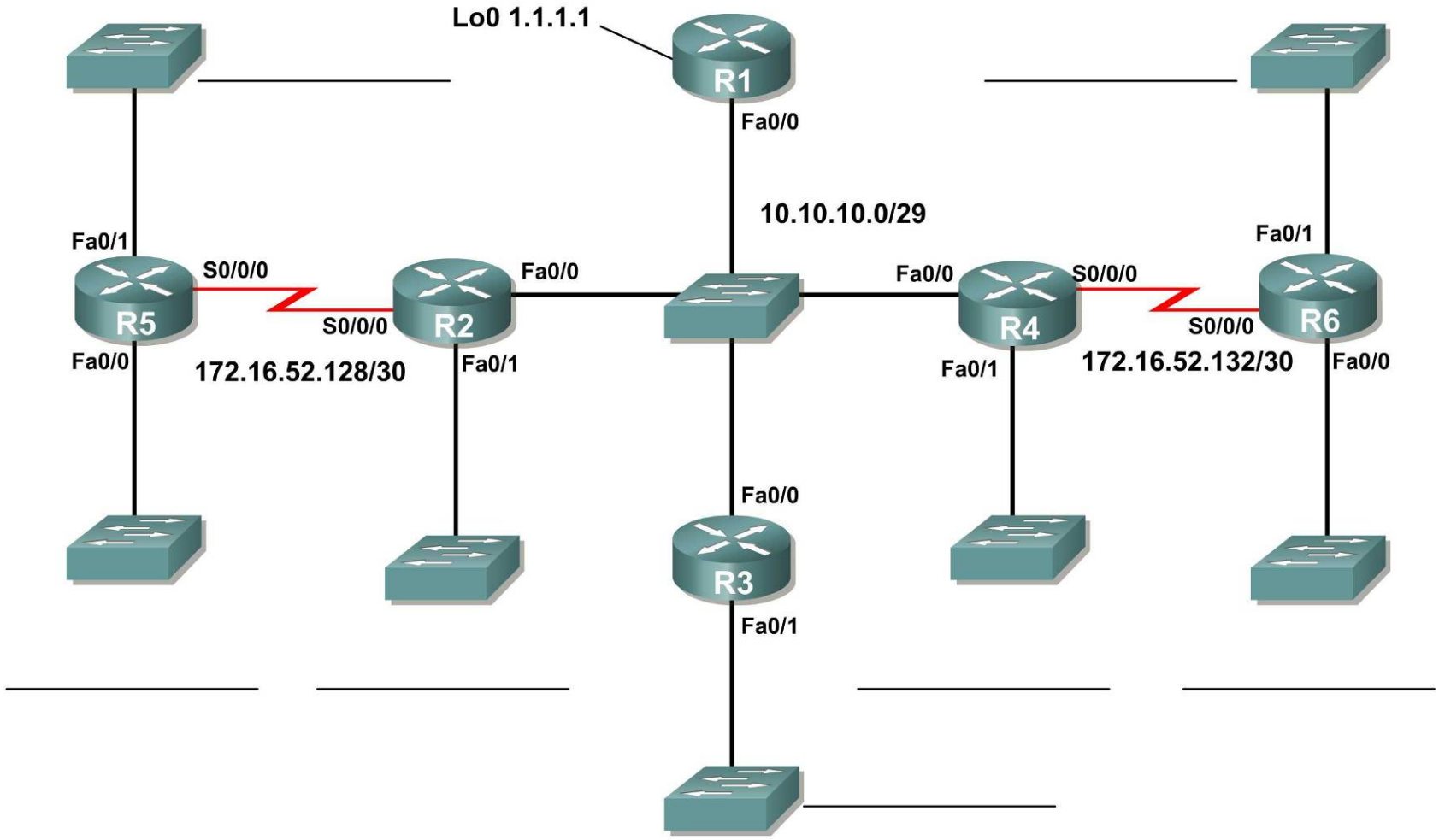
- You should now have end-to-end connectivity. Use ping to test connectivity across the network. Each router should be able to ping all other router interfaces and both Web Servers.
- Troubleshoot until pings are successful.

Step 2: Examine the configuration.

Use verification commands to make sure your configurations are complete.

Ch11 - Packet Tracer Skills Integration Challenge

Topology Diagram



Addressing Table

Device	Interface	IP Address	Subnet Mask
R1	**Fa0/0**	10.10.10.1	255.255.255.248
	Loopback0	1.1.1.1	255.255.255.255
R2	**Fa0/0**	10.10.10.2	255.255.255.248
	Fa0/1		
	S0/0/0		
R3	**Fa0/0**	10.10.10.3	255.255.255.248
	Fa0/1		
R4	**Fa0/0**	10.10.10.4	255.255.255.248
	Fa0/1		
	S0/0/0	172.16.52.133	255.255.255.252
R5	**Fa0/0**		
	Fa0/1		
	S0/0/0	172.16.52.129	255.255.255.252
R6	**Fa0/0**		
	Fa0/1		
	S0/0/0	172.16.52.134	255.255.255.252

Learning Objectives:

- Design and document an addressing scheme based on requirements.
- Apply a basic configuration to the devices.
- Configure a Routers Priority and RID's
- Configure OSPF routing
- Disable routing updates on appropriate interfaces.
- Verify full connectivity between all devices in the topology.

Task 1: Design and document an addressing scheme

Use the 172.16.0.0/16 to create an efficient addressing scheme that meets the following requirements: (Start with the largest network and move to the smallest. Address the WAN link from R5 to R2 first, then the link between R4 to R6.)

Hostname	Interface	Number of Hosts
R2	**Fa0/1**	1000
R3	**Fa0/1**	400
R4	**Fa0/1**	120
R5	**Fa0/1**	6000
R5	**Fa0/0**	800
R6	**Fa0/1**	2000
R6	**Fa0/0**	500

NOTE: Interface Fa0/0 has been preconfigured on R1, R2, R3, and R4.

Task 2: Apply a basic configuration.

On each router use the following chart to complete the basic router configurations. Also, be sure to configure addressing and hostnames. The first IP for each subnet should be assigned to the router interface. (R5 gets the first IP in its link with R2 (DCE). R4 (DCE) gets the first IP in its link with R6.)

Console Password	VTY Password	Enable Secret Password	Clock rate (if applicable)
cisco	cisco	cisco	56000

Task 3: Configure Single-Area OSPF routing

Step 1: Configure OSPF (process ID 1) routing on each Router.
Step 2: Verify that all routes were learned.

Task 4: Fine-tuning OSPF

Step 1: Use the following guidelines to set the OSPF priority:

- R1 will never participate in a DR/BDR election.
- R2 will always become the DR
- R3 and R4 will both have the same priority of 100.
- R4 Should always become the BDR

NOTE: ALL PRIORITIES SHOULD BE SET ON FA0/0

Step 2: Use Shutdown/No Shutdown on interfaces to force a BR/DR election.

Task 5: Configure a Loopback

Step 1: On R1 configure a loopback with a 1.1.1.1/32 address.
Step 2: Create a default route to the loopback using the local interface argument.
Step 3: Propagate the route within OSPF updates.

Task 6: View OSPF updates

Step 1: Enter Simulation mode
Step 2: Select only OSPF in the filter.
Step 3: View the updates

Note: There is a bug in Packet Tracer v5.1 that ignores the wildcard mask for both scoring this activity and routing via OSPF. On actual routers, using an incorrect wildcard mask when configuring OSPF creates routing problems.

