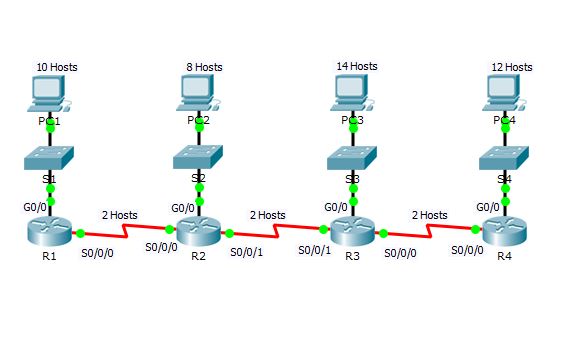
**Subnetting**



**Figure: Subnetting**

**Subnetting Addressing Table**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Device** | **Interface** | **IP Address** | **Subnet Mask** | **Default Gateway** |
| R1 | G0/0 | 172.31.1.1 | 255.255.255.240 |  |
| S0/0/0 | 172.31.1.65 | 255.255.255.240 |  |
| R2 | G0/0 | 172.31.1.17 | 255.255.255.240 |  |
| S0/0/0 | 172.31.1.78 | 255.255.255.240 |  |
| S0/0/1 | 172.31.1.81 | 255.255.255.240 |  |
| R3 | G0/0 | 172.31.1.33 | 255.255.255.240 |  |
| S0/0/0 | 172.31.1.97 | 255.255.255.240 |  |
| S0/0/1 | 172.31.1.94 | 255.255.255.240 |  |
| R4 | G0/0 | 172.31.1.49 | 255.255.255.240 |  |
| S0/0/0 | 172.31.1.110 | 255.255.255.240 |  |
| S1 | VLAN1 | 172.31.1.2 | 255.255.255.240 | 172.31.1.1 |
| S2 | VLAN1 | 172.31.1.18 | 255.255.255.240 | 172.31.1.17 |
| S3 | VLAN1 | 172.31.1.34 | 255.255.255.240 | 172.31.1.33 |
| S4 | VLAN1 | 172.31.1.50 | 255.255.255.240 | 172.31.1.49 |
| PC1 | VLAN1 | 172.31.1.14 | 255.255.255.240 | 172.31.1.1 |
| PC2 | VLAN1 | 172.31.1.30 | 255.255.255.240 | 172.31.1.17 |
| PC3 | VLAN1 | 172.31.1.46 | 255.255.255.240 | 172.31.1.33 |
| PC4 | VLAN1 | 172.31.1.62 | 255.255.255.240 | 172.31.1.49 |

**Objectives**

**Part 1: Design an IP Addressing Scheme**

**Part 2: Assign IP Addresses to Network Devices and Verify Connectivity**

**Scenario**

In this activity, you are given the network address of 172.31.1.0 /24 to subnet and provide the IP addressing for the network shown in the Topology. The required host addresses for each WAN and LAN link are labeled in the topology.

**Part 1:**     **Design an IP Addressing Scheme**

**Step 1:**     **Subnet the 172.31.1.0/24 network based on the maximum number of hosts required by the largest subnet.**

a.     Based on the topology, how many subnets are needed?

**Ans: 7 subnets**

b.    How many bits must be borrowed to support the number of subnets in the topology table?

**Ans: 3 bits**

c.     How many subnets does this create?

**Ans: 8**

d.    How many usable host addresses does this create per subnet?

**Note:** If your answer is less than the 14 maximum hosts required for the R3 LAN, then you borrowed too many bits.

**Ans:** **14**

e.     Calculate the binary value for the first five subnets. Subnet zero is already shown.

Net 0: 172 . 31 . 1 . 0 0 0 0 0 0 0 0

Net 1: 172 . 31 . 1 . \_0\_ \_\_0\_ \_0\_\_ \_1\_\_ \_0\_\_ \_0\_\_ \_0\_\_ \_0\_\_

Net 2: 172 . 31 . 1 . \_\_0\_ \_\_0\_ \_1\_\_ \_\_0\_ \_0\_\_ \_0\_\_ 0\_\_\_ 0\_\_\_

Net 3: 172 . 31 . 1 . \_\_0\_ \_\_0\_ \_\_1\_ \_1\_\_ \_0\_\_ \_0\_\_ \_\_0 \_0\_\_

Net 4: 172 . 31 . 1 . \_0\_\_ \_\_1\_ \_0\_\_ \_\_0\_ \_\_0\_ \_\_0\_ \_0\_\_ \_0\_\_

f.     Calculate the binary and decimal value of the new subnet mask.

11111111.11111111.11111111. \_1\_\_ 1\_\_\_ \_\_1\_ \_\_1\_ \_0\_\_ \_0\_\_ \_0\_\_ \_0\_\_

255 . 255 . 255 . \_\_\_240\_\_\_

g.    Complete the **Subnet Table**,listing all available subnets, the first and last usable host address, and the broadcast address. The first subnet is done for you. Repeat until all addresses are listed.

**Note**: You may not need to use all rows.

**Subnet Table**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Subnet Number** | **Subnet IP** | **First Usable Host IP** | **Last Usable Host IP** | **Broadcast Address** |
| 0 | 172.31.1.0 | 172.31.1.1 | 172.31.1.14 | 172.31.1.15 |
| **1** | 172.31.1.16 | 172.31.1.17 | 172.31.1.30 | 172.31.1.31 |
| **2** | 172.31.1.32 | 172.31.1.33 | 172.31.1.46 | 172.31.1.47 |
| **3** | 172.31.1.48 | 172.31.1.49 | 172.31.1.62 | 172.31.1.63 |
| **4** | 172.31.1.64 | 172.31.1.65 | 172.31.1.78 | 172.31.1.79 |
| **5** | 172.31.1.80 | 172.31.1.81 | 172.31.1.94 | 172.31.1.95 |
| **6** | 172.31.1.96 | 172.31.1.97 | 172.31.1.110 | 172.31.1.111 |
| **7** | 172.31.1.112 | 172.31.1.113 | 172.31.1.126 | 172.31.1.127 |
| **8** | 172.31.1.128 | 172.31.1.129 | 172.31.1.142 | 172.31.1.143 |
| **9** | 172.31.1.144 | 172.31.1.145 | 172.31.1.158 | 172.31.1.159 |
| **10** | 172.31.1.160 | 172.31.1.161 | 172.31.1.174 | 172.31.1.175 |
| **11** | 172.31.1.176 | 172.31.1.177 | 172.31.1.190 | 172.31.1.191 |
| **12** | 172.31.1.192 | 172.31.1.193 | 172.31.1.206 | 172.31.1.207 |
| **13** | 172.31.1.208 | 172.31.1.209 | 172.31.1.222 | 172.31.1.223 |
| **14** | 172.31.1.224 | 172.31.1.225 | 172.31.1.238 | 172.31.1.239 |
| **15** | 172.31.1.240 | 172.31.1.241 | 172.31.1.254 | 172.31.1.255 |

**Step 2:**     **Assign the subnets to the network shown in the topology.**

When assigning the subnets, keep in mind that routing is necessary to allow information to be sent throughout the network.

1. Assign Subnet 0 to the R1 LAN:

**Ans: 172.31.1.1**

1. Assign Subnet 1 to the R2 LAN:

**Ans : 172.31.1.17**

1. Assign Subnet 2 to the R3 LAN:

**Ans :172.31.1.33**

1. Assign Subnet 3 to the R4 LAN:

**Ans: 172.31.1.49**

1. Assign Subnet 4 to the link between R1 And R2

**Ans: 172.31.1.65**

1. Assign Subnet 5 to the link between R2 And R3

**Ans : 172.31.1.81**

1. Assign Subnet 6 to the link between R3 And R4

**Ans: 172.31.1.97**

**Step 3:**     **Document the addressing scheme.**

Complete the **Addressing Table** using the following guidelines:

1. Assign the first usable IP addresses to routers for each of the LAN links.

**Ans**: **R1** -**172.31.1.1**

**R2- 172.31.1.17**

**R3- 172.31.1.33**

**R4 -172.31.1.49**

b.    Use the following method to assign WAN link IP addresses:

         For the WAN link between R1 and R2, assign the first usable IP address to R1 and last usable IP address R2.

**Ans: R1 - S0/0/0 - 172.31.1.65**

**R2 - S0/0/0- 172.31.1.78**

         For the WAN link between R2 and R3, assign the first usable IP address to R2 and last usable IP address R3.

**R2 - S0/0/1 - 172.31.1.81**

**R3 - S0/0/1- 172.31.1.94**

         For the WAN link between R3 and R4, assign the first usable IP address to R3 and last usable IP address R4.

**R3 - S0/0/0 - 172.31.1.97**

**R4 - S0/0/0- 172.31.1.110**

1. Assign the second usable IP addresses to the switches.

**S1- 172.31.1.2**

**S2- 172.31.1.18**

**S3- 172.31.1.34**

**S4- 172.31.1.50**

1. Assign the last usable IP addresses to the hosts.

**PC1- 172.31.1.14**

**PC2- 172.31.1.30**

**PC3- 172.31.1.46**

**PC4- 172.31.1.62**

**Part 2:**     **Assign IP Addresses to Network Devices and Verify Connectivity**

Most of the IP addressing is already configured on this network. Implement the following steps to complete the addressing configuration.

**Step 1:**     **Configure IP addressing on R1 and R2 LAN interfaces.**

**Step 2:**     **Configure IP addressing on S3, including the default gateway.**

**Step 3:**     **Configure IP addressing on PC4, including the default gateway.**

**Step 4:**     **Verify connectivity.**

