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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Device** | **Interface** | **IP Address** | **Subnet Mask** | **Default Gateway** |
| R1 | G0/0 | 192.168.100.1 | 255.255.255.224 |  |
|  | G0/1 | 192.168.100.33 | 255.255.255.224 |  |
|  | S0/0/0 | 192.168.100.129 | 255.255.255.252 |  |
| R2 | G0/0 | 192.168.100.65 | 255.255.255.224 |  |
|  | G0/1 | 192.168.100.97 | 255.255.255.224 |  |
|  | S0/0/0 | 192.168.100.158 | 255.255.255.252 |  |
| S1 | VLAN 1 | 192.168.100.2 | 255.255.255.224 |  |
| S2 | VLAN 1 | 192.168.100.34 | 255.255.255.224 |  |
| S3 | VLAN 1 | 192.168.100.66 | 255.255.255.224 |  |
| S4 | VLAN 1 | 192.168.100.98 | 255.255.255.224 |  |
| PC1 | NIC | 192.168.100.30 | 255.255.255.224 |  |
| PC2 | NIC | 192.168.100.62 | 255.255.255.224 |  |
| PC3 | NIC | 192.168.100.94 | 255.255.255.224 |  |
| PC4 | NIC | 192.168.100.126 | 255.255.255.224 |  |

Make sure you work out the answers for the questions below for practice, but you do not need to submit the  
answers.  
**Step 1: Subnet the 192.168.100.0/24 network into the appropriate number of subnets.**a. Based on the topology, how many subnets are needed? 5  
b. How many bits must be borrowed to support the number of subnets in the topology table? 3  
c. How many subnets does this create? 8  
d. How many usable hosts does this create per subnet? 32 – 2 = 30  
**Note:** If your answer is less than the 25 hosts required, then you borrowed too many bits.  
e. Calculate the binary value for the first five subnets. The first subnet is already shown.  
Net 0: 192 . 168 . 100 . 0 0 0 0 0 0 0 0

|  |  |
| --- | --- |
| 192 . 168 . 100  192 . 168 . 100  192 . 168 . 100  192 . 168 . 100 | . . . . |

f. Calculate the binary and decimal value of the new subnet mask.  
11111111.11111111.11111111.00000000  
255 . 255 . 255 . 0  
g. Fill in the **Subnet Table**, listing the decimal value of all available subnets, the first and last usable host  
address, and the broadcast address. Repeat until all addresses are listed.  
**Note:** You may not need to use all rows.  
**Subnet Table:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Subnet Number** | **Subnet Address** | **First Usable Host Address** | **Last Usable Host Address** | **Broadcast Address** |
| 0 |  |  |  |  |
| **1** |  |  |  |  |
| **2** |  |  |  |  |
| **3** |  |  |  |  |
| **4** |  |  |  |  |
| **5** |  |  |  |  |
| **6** |  |  |  |  |
| **7** |  |  |  |  |
| **8** |  |  |  |  |

|  |  |  |
| --- | --- | --- |
| Net | 1: | 192 |
| Net | 2: | 192 |
| Net | 3: | 192 |
| Net | 4: | 192 |

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Packet Tracer - Subnetting Scenario 1  
Step 2: Assign the subnets to the network shown in the topology.**a. Assign Subnet 0 to the LAN connected to the GigabitEthernet 0/0 interface of R1: 192.168.100.0/27  
b. Assign Subnet 1 to the LAN connected to the GigabitEthernet 0/1 interface of R1: 192.168.100.32/27  
c. Assign Subnet 2 to the LAN connected to the GigabitEthernet 0/0 interface of R2: 192.168.100.64/27  
d. Assign Subnet 3 to the LAN connected to the GigabitEthernet 0/1 interface of R2: 192.168.100.96/27  
e. Assign Subnet 4 to the WAN link between R1 to R2: 192.168.100.128  
**Step 3: Document the addressing scheme.**Fill in the **Addressing Table** using the following guidelines:  
a. Assign the first usable IP addresses to R1 for the two LAN links and the WAN link. 192.168.100.1, 192.168.100.33, 192.168.100.129  
b. Assign the first usable IP addresses to R2 for the LANs links. Assign the last usable IP address for the  
WAN link..192.168.100.65, 192.168.100.158  
c. Assign the second usable IP addresses to the switches.   
d. Assign the last usable IP addresses to the hosts.  
**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 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.**You can only verify connectivity from R1, S3, and PC4. However, you should be able to ping every IP address  
listed in the **Addressing Table**.  
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**Packet Tracer – Subnetting Exercise 2  
Before start:**1. Download from Learnonline course website (**Computer Practical-Week 11** folder) the Packet  
Tracer activity file: wk11-computer-prac-PKA-b-subnetting-exercise-2.pka  
2. Open the Packet Tracer activity file downloaded and set your User Profile.  
3. Follow the instruction given below to complete this Packet Tracer activity  
**Topology  
Addressing Table**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Device** | **Interface** | **IP Address** | **Subnet Mask** | **Default Gateway** |
| CustomerRouter | G0/0 | 192.168.0.1 | 255.255.255.192 | N/A |
|  | G0/1 | 192.168.0.65 | 255.255.255.192 | N/A |
|  | S0/1/0 | 209.165.201.2 | 255.255.255.252 | N/A |
| LAN-A Switch | VLAN1 | 192.168.0.2 | 255.255.255.192 | 192.168.0.1 |
| LAN-B Switch | VLAN1 | 192.168.0.66 | 255.255.255.192 | 192.168.0.65 |
| PC-A | NIC | 192.168.0.62 | 255.255.255.192 | 192.168.0.1 |
| PC-B | NIC | 192.168.0.126 | 255.255.255.192 | 192.168.0.65 |
| ISPRouter | G0/0 | 209.165.200.225 | 255.255.255.224 | N/A |
|  | S0/1/0 | 209.165.201.1 | 255.255.255.252 | N/A |
| ISPSwitch | VLAN1 | 209.165.200.226 | 255.255.255.224 | 209.165.200.225 |
| ISP Workstation | NIC | 209.165.200.235 | 255.255.255.224 | 209.165.200.225 |
| ISP Server | NIC | 209.165.200.240 | 255.255.255.224 | 209.165.200.225 |

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**Packet Tracer – Subnetting Exercise 2  
Objectives  
Part 1: Design an IPv4 Network Subnetting Scheme  
Part 2: Configure the Devices  
Part 3: Test and Troubleshoot the Network  
Background / Scenario**In this activity, you will subnet the Customer network into multiple subnets. The subnet scheme should be  
based on the number of host computers required in each subnet, as well as other network considerations, like  
future network host expansion.  
After you have created a subnetting scheme and completed the table by filling in the missing host and  
interface IP addresses, you will configure the host PCs, switches and router interfaces.  
After the network devices and host PCs have been configured, you will use the **ping** command to test for  
network connectivity.  
**Part 1: Subnet the Assigned Network  
Step 1: Create a subnetting scheme that meets the required number of subnets and required  
number of host addresses.**In this scenario, you are a network technician assigned to install a new network for a customer. You must  
create multiple subnets out of the 192.168.0.0/24 network address space to meet the following requirements:  
a. The first subnet is the LAN-A network. You need a minimum of 50 host IP addresses.  
b. The second subnet is the LAN-B network. You need a minimum of 40 host IP addresses.  
c. You also need at least two additional unused subnets for future network expansion.  
**Note**: Variable length subnet masks will not be used. All of the device subnet masks should be the same  
length.  
d. Answer the following questions to help create a subnetting scheme that meets the stated network  
requirements:  
How many host addresses are needed in the largest required subnet?  
What is the minimum number of subnets required?  
The network that you are tasked to subnet is 192.168.0.0/24. What is the /24 subnet mask in binary?  
e. The subnet mask is made up of two portions, the network portion, and the host portion. This is  
represented in the binary by the ones and the zeros in the subnet mask.  
In the network mask, what do the ones represent?  
In the network mask, what do the zeros represent?  
f. To subnet a network, bits from the host portion of the original network mask are changed into subnet bits.  
The number of subnet bits defines the number of subnets.  
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**Packet Tracer – Subnetting Exercise 2**Given each of the possible subnet masks depicted in the following binary format, how many subnets and  
how many hosts are created in each example?  
**Hint**: Remember that the number of host bits (to the power of 2) defines the number of hosts per subnet  
(minus 2), and the number of subnet bits (to the power of two) defines the number of subnets. The subnet  
bits (shown in bold) are the bits that have been borrowed beyond the original network mask of /24. The  
/24 is the prefix notation and corresponds to a dotted decimal mask of 255.255.255.0.  
1) (/25) 11111111.11111111.11111111.**1**0000000  
Dotted decimal subnet mask equivalent:  
Number of subnets? Number of hosts?  
2) (/26) 11111111.11111111.11111111.**11**000000  
Dotted decimal subnet mask equivalent:  
Number of subnets? Number of hosts?  
3) (/27) 11111111.11111111.11111111.**111**00000  
Dotted decimal subnet mask equivalent:  
Number of subnets? Number of hosts?  
4) (/28) 11111111.11111111.11111111.**1111**0000  
Dotted decimal subnet mask equivalent:  
Number of subnets? Number of hosts?  
5) (/29) 11111111.11111111.11111111.**11111**000  
Dotted decimal subnet mask equivalent:  
Number of subnets? Number of hosts?  
6) (/30) 11111111.11111111.11111111.**111111**00  
Dotted decimal subnet mask equivalent:  
Number of subnets? Number of hosts?  
Considering your answers above, which subnet masks meet the required number of minimum host  
addresses?  
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**Packet Tracer – Subnetting Exercise 2**Considering your answers above, which subnet masks meets the minimum number of subnets  
required?  
Considering your answers above, which subnet mask meets both the required minimum number of  
hosts and the minimum number of subnets required?  
When you have determined which subnet mask meets all of the stated network requirements, derive each  
of the subnets. List the subnets from first to last in the table. Remember that the first subnet is  
192.168.0.0 with the chosen subnet mask.

|  |  |  |
| --- | --- | --- |
| **Subnet Address** | **Prefix** | **Subnet Mask** |

**Step 2: Fill in the missing IP addresses in the Addressing Table**Assign IP addresses based on the following criteria: Use the ISP Network settings as an example.  
a. Assign the first subnet to LAN-A.  
1) Use the first host address for the CustomerRouter interface connected to LAN-A switch.  
2) Use the second host address for the LAN-A switch. Make sure to assign a default gateway address  
for the switch.  
3) Use the last host address for PC-A. Make sure to assign a default gateway address for the PC.  
b. Assign the second subnet to LAN-B.  
1) Use the first host address for the CustomerRouter interface connected to LAN-B switch.  
2) Use the second host address for the LAN-B switch. Make sure to assign a default gateway address  
for the switch.  
3) Use the last host address for PC-B. Make sure to assign a default gateway address for the PC.  
**Part 2: Configure the Devices**Configure basic settings on the PCs, switches, and router. Refer to the Addressing Table for device names  
and address information.  
**Step 1: Configure CustomerRouter.  
a.** Set the enable secret password on CustomerRouter to **Class123**b. Set the console login password to **Cisco123**.  
c. Configure **CustomerRouter** as the hostname for the router.  
d. Configure the G0/0 and G0/1 interfaces with IP addresses and subnet masks, and then enable them.  
e. Save the running configuration to the startup configuration file.  
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**Packet Tracer – Subnetting Exercise 2  
Step 2: Configure the two customer LAN switches.**Configure the IP addresses on interface VLAN 1 on the two customer LAN switches. Make sure to configure  
the correct default gateway on each switch.  
**Step 3: Configure the PC interfaces.**Configure the IP address, subnet mask, and default gateway settings on **PC-A** and **PC-B**.  
**Part 3: Test and Troubleshoot the Network**In Part 3, you will use the **ping** command to test network connectivity.  
a. Determine if PC-A can communicate with its default gateway. Do you get a reply?  
b. Determine if PC-B can communicate with its default gateway. Do you get a reply?  
c. Determine if PC-A can communicate with PC-B. Do you get a reply?  
If you answered “no” to any of the preceding questions, then you should go back and check your IP address  
and subnet mask configurations, and ensure that the default gateways have been correctly configured on PCA and PC-B.  
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Packet Tracer - Designing and Implementing a VLSM Addressing  
Scheme (Optional computer practical task)  
Note:**1. Download from Learnonline course website (**Computer Practical-Week 11** folder) the Packet  
Tracer activity file: wk11-computer-prac-PKA-c-VLSM.pka  
2. Open the Packet Tracer activity file downloaded and set your User Profile.  
3. Follow the instruction given inside the .pka file to complete this activity  
4. This activity is optional and it is not assessed, and you are not required to submit the completed .pka  
file, but please feel free to do so, and you are encouraged to contact teaching staff if you need any  
help with this activity