CMIT 351 Network Design -p. II

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**Course: CMIT 351**

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**Part 1: Design the Local Area Network**

**A diagram of a computer

Description automatically generated**

**Part 2: Create the basic switch and router configurations**

**2.1 Cable the network**

Describe in a few sentences which devices connect to which other devices using what specific kind of cable and on which specific interfaces.

**Source Device**: PC-A

**Source Port**: FastEthernet 0

**Destination Device**: S1

**Destination Port**: FastEthernet 0/4

**Cable Type**: Ethernet Straight-Through

**Description**: Connect port FastEthernet 0 of PC-A to port FastEthernet 0/4 of S1 using a straight-through Ethernet cable

**Source Device**: PC-B

**Source Port**: FastEthernet 0

**Destination Device**: S1

**Destination Port**: FastEthernet 0/6

**Cable Type**: Ethernet Straight-Through

**Description**: Connect port FastEthernet 0 of PC-A to port FastEthernet 0/6 of S1 using a straight-through Ethernet cable

**Source Device**: PC-C

**Source Port**: FastEthernet 0

**Destination Device**: S1

**Destination Port**: FastEthernet 0/11

**Cable Type**: Ethernet Straight-Through

**Description**: Connect port FastEthernet 0 of PC-A to port FastEthernet 0/11 of S1 using a straight-through Ethernet cable

**Source Device**: PC-D

**Source Port**: FastEthernet 0

**Destination Device**: S1

**Destination Port**: FastEthernet 0/13

**Cable Type**: Ethernet Straight-Through

**Description**: Connect port FastEthernet 0 of PC-A to port FastEthernet 0/13 of S1 using a straight-through Ethernet cable.

**Source Device**: S1

**Source Port**: GigabitEthernet 0/1

**Destination Device**: R1

**Destination Port**: GigabitEthernet 0/0/1

**Cable Type**: Ethernet Straight-Through

**Description**: Connect port GigabitEthernet 0/1 of S1 to GigabitEthernet 0/0/1 of R1 using a straight-through Ethernet cable

**2.2. Configure the basic switch and router functions**

In the table below, describe the basic switch and router configuration as if you are entering the commands into the devices.

*Note: Add as many table rows as you need to complete the configuration. Delete the example configuration from the table before adding your commands.*

| Device Name | | Cisco IOS Command | | Describe what the command does | |
| --- | --- | --- | --- | --- | --- |
| S1/R1 | | **enable** | | enter enable mode | |
| S1/R1 | | **configure terminal** | | enter configuration terminal | |
| S1/R1 | | **hostname S1** | | set hostname for the first switch as S1 | |
| S1/R1 | | **ip domain-name tri-ho.edu** | | set domain name as tri-ho.edu | |
| S1/R1 | | **banner motd #Unauthorized access is strictly prohibited#** | | set message of the day as “Unauthorized access is strictly prohibited” | |
| S1/R1 | | **service password-encryption** | | encrypt all clear text password | |
| S1/R1 | | **enable secret class** | | set password for enable mode as “class” | |
| S1/R1 | | **line console 0** | | enter console configuration mode | |
| S1/R1 | | **password cisco** | | set console password as “cisco” | |
| S1/R1 | | **login** | | enable console password using a simple password | |
| S1/R1 | | **logging synchronous** | | tell IOS to synchronize the syslog message display in console | |
| S1/R1 | | **exit** | | exit console configuration mode | |
| S1/R1 | | **line vty 0 15** | | enter vty configuration mode | |
| S1/R1 | | **password CMIT-351** | | set vty password as “CMIT-351” | |
| S1/R1 | | **login** | | Enable VTY password using simple password | |
| S1/R1 | | **logging synchronous** | | tell IOS to synchronize the syslog message display in VTY | |
| S1/R1 | | **crypto key generate rsa** | | generate SSH encryption keys | |
| S1/R1 | | **How many bits in the modulus [512]: 2048** | | Set 2048 bit for modulus | |
| S1/R1 | | **transport input SSH** | | set vty line to only support SSH | |
| S1/R1 | | **exit** | | Exit VTY configuration mode | |
| S1/R1 | | **enable** | | Enter enable mode | |
| S1/R1 | | **show running-config** | | Verify that configuration is correctly implemented | |

**2.3 Configure the computers**

Using the template below, document and describe the configuration you enter into each computer.

*Note: Use the format below to document computer configuration (delete the example and repeat as many times as necessary):*

**Device Name**: *Example Computer A*

**Interface type**: *Ethernet*

**IP Address**: *192.168.1.2*

**Subnet Mask**: *255.255.255.0*

**Default Gateway**: *192.168.1.1*

**Description**: *I added an ip address of 192.168.1.2 with a subnet mask of 255.255.255.0 and a gateway of 192.168.1.1 to the wired Ethernet interface on computer A.*

**Device Name**: PC-A

**Interface type**: FastEthernet

**IP Address**: 192.168.10.3

**Subnet Mask**: 255.255.255.0

**Default Gateway**: 192.168.10.1

**Description**: Add 192.168.10.3 as a static IPv4 address for PC-A with subnet mask 255.255.255.0 and a gateway of 192.168.10.1 to the wired FastEthernet interface on PC-A

**Device Name**: PC-B

**Interface type**: FastEthernet

**IP Address**: 192.168.10.4

**Subnet Mask**: 255.255.255.0

**Default Gateway**: 192.168.20.1

**Description**: Add 192.168.10.4 as a static IPv4 address for PC-A with subnet mask 255.255.255.0 and a gateway of 192.168.20.1 to the wired FastEthernet interface on PC-B

**Device Name**: PC-C

**Interface type**: FastEthernet

**IP Address**: 192.168.30.5

**Subnet Mask**: 255.255.255.0

**Default Gateway**: 192.168.30.1

**Description**: Add 192.168.30.5 as a static IPv4 address for PC-A with subnet mask 255.255.255.0 and a gateway of 192.168.30.1 to the wired FastEthernet interface on PC-C

**Device Name**: PC-D

**Interface type**: FastEthernet

**IP Address**: 192.168.40.6

**Subnet Mask**: 255.255.255.0

**Default Gateway**: 192.168.40.1

**Description**: Add 192.168.40.6 as a static IPv4 address for PC-A with subnet mask 255.255.255.0 and a gateway of 192.168.40.1 to the wired FastEthernet interface on PC-D

**2.4 Test and Validate Connectivity**

Describe how you test and validate that the above configuration functions correctly per the project specifications.

*Note: Use the format below to document the connectivity test (delete the example and reuse the template t as many times as necessary):*

**Source device**: PC-A

**Destination device**: PC-B

**Test command**: ping 192.168.20.4

**Expected results**: Unsuccess

**Describe what this test means and how it validates connectivity**: By pinging the IP address of PC-B, we test the connection between the host that connects to S1. However, at this phase, no VLAN is created on both S1 and R1. Additionally, PC-A and PC-B are not different subnets. Therefore, the host cannot ping each other.

**Source device**: PC-A

**Destination device**: PC-C

**Test command**: ping 192.168.30.5

**Expected results**: Unsuccess.

**Describe what this test means and how it validates connectivity**: By pinging the IP address of PC-C, we test the connection between the host that connects to S1. However, at this phase, no VLAN is created on both S1 and R1. Additionally, PC-A and PC-C are not different subnets. Therefore, the host cannot ping each other.

**Source device**: PC-A

**Destination device**: PC-D

**Test command**: ping 192.168.40.6

**Expected results**: Unsuccess.

**Describe what this test means and how it validates connectivity**: By pinging the IP address of PC-D, we test the connection between the host that connects to S1. However, at this phase, no VLAN is created on both S1 and R1. Additionally, PC-A and PC-D are not different subnets. Therefore, the host cannot ping each other.

**Source device**: PC-B

**Destination device**: PC-C

**Test command**: ping 192.168.30.5

**Expected results**: Unsuccess.

**Describe what this test means and how it validates connectivity**: By pinging the IP address of PC-C, we test the connection between the host that connects to S1. However, at this phase, no VLAN is created on both S1 and R1. Additionally, PC-B and PC-C are not different subnets. Therefore, the host cannot ping each other.

**Source device**: PC-B

**Destination device**: PC-D

**Test command**: ping 192.168.40.6

**Expected results**: Unsuccess.

**Describe what this test means and how it validates connectivity**: By pinging the IP address of PC-C, we test the connection between the host that connects to S1. However, at this phase, no VLAN is created on both S1 and R1. Additionally, PC-B and PC-D are not different subnets. Therefore, the host cannot ping each other.

**Source device**: PC-C

**Destination device**: PC-D

**Test command**: ping 192.168.40.6

**Expected results**: Unsuccess.

**Describe what this test means and how it validates connectivity**: By pinging the IP address of PC-C, we test the connection between the host that connects to S1. However, at this phase, no VLAN is created on both S1 and R1. Additionally, PC-C and PC-D are not different subnets. Therefore, the host cannot ping each other.

**Part 3: Define the VLANs**

In the table below, describe how you configure VLANs on the switches and assign proper VLANs to interfaces. Be sure to explain how you test and validate the VLAN implementation.

*Note: Add as many table rows as you need to complete the configuration.*

|  |  |  |
| --- | --- | --- |
| Device Name | Cisco IOS Command | Describe what the command does |
| S1 | **enable** | enter enable mode, enter password: “class” |
| S1 | **configure terminal** | enter configuration terminal |
| S1 | **vlan 10** | make VLAN 10 |
| S1 | **name Students** | name VLAN 10 as Students |
| S1 | **vlan 20** | in global configuration mode, make VLAN 20 |
| S1 | **name Faculty** | name VLAN 20 as Faculty |
| S1 | **vlan 30** | make VLAN 30 in global configuration mode |
| S1 | **name Management** | name VLAN 30 as Management |
| S1 | **vlan 40** | make VLAN 40 in global configuration mode |
| S1 | **Name Isolated** | name VLAN 40 as Isolated |
| S1 | **Vlan 99** | make VLAN 99 in global configuration mode |
| S1 | **name Containment** | name VLAN 99 as Unused |
| S1 | **exit** | exit VLAN configuration mode |
| S1 | **interface fastethernet 0/4** | Assign interface FastEthernet 0/4 of S1 to VLAN 10 |
| S1 | **switchport access vlan 10** | Specify the next command apply to VLAN 10 only |
| S1 | **switchport mode access** | Enable access mode on all interface in VLAN 10 that on S1 |
| S1 | **no shutdown** | Enable interface FastEthernet 0/4 |
| S1 | **description Connect to PC-A** | Include the plain text description “Connect to PC-A” for interface Fa0/4 |
| S1 | **exit** | exit interface configuration for Fa0/4 |
| S1 | **interface fastethernet 0/6** | Assign interface FastEthernet 0/6 of S1 to VLAN 20 |
| S1 | **switchport access vlan 20** | Specify the next command apply to VLAN 20 only |
| S1 | **switchport mode access** | Enable access mode on all interface in VLAN 20 that on S1 |
| S1 | **no shutdown** | Enable interface FastEthernet 0/6 |
| S1 | **description Connect to PC-B** | Include the plain text description “Connect to PC-” for interface Fa0/6 |
| S1 | **exit** | exit interface configuration for Fa0/6 |
| S1 | **interface fastethernet 0/11** | Assign interface FastEthernet 0/11 of S1 to VLAN 30 |
| S1 | **switchport access vlan 30** | Specify the next command apply to VLAN 30 only |
| S1 | **switchport mode access** | Enable access mode on all interface in VLAN 30 that on S1 |
| S1 | **no shutdown** | Enable interface FastEthernet 0/11 |
| S1 | **description Connect to PC-C** | Include the plain text description “Connect to PC-C” for interface Fa0/11 |
| S1 | **exit** | exit interface configuration for Fa0/11 |
| S1 | **interface fastethernet 0/13** | Assign interface FastEthernet 0/13 of S1 to VLAN 40 |
| S1 | **switchport access vlan 40** | Specify the next command apply to VLAN 40 only |
| S1 | **switchport mode access** | Enable access mode on all interface in VLAN 40 that on S1 |
| S1 | **no shutdown** | Enable interface FastEthernet 0/13 |
| S1 | **description Connect to PC-D** | Include the plain text description “Connect to PC-D” for interface Fa0/13 |
| S1 | **exit** | exit interface configuration for Fa0/13 |
| S1 | **interface range fastethernet 0/1 – 3, fastethernet 0/7 – 10, fastethernet 0/14 – 24, fastethernet 0/5, fastethernet 0/12** | Identify a range of interfaces on S1 to which the following command applies; expressly excluded Fa 0/4, Fa 0/6, Fa 0/11, Fa 0/13 |
| S1 | **switchport access vlan 99** | Assign the range of interface above to VLAN 99 |
| S1 | **switchport mode access** | Configure all interfaces in VLAN 99 as access ports |
| S1 | **description Not in Use** | Include a plain text description “Not in Use” for all interfaces in VLAN 99 |
| S1 | **shutdown** | disable all the interfaces in VLAN 99 |
| S1 | **exit** | exit interface range configuration mode |
| S1 | **interface vlan 30** | Enter vlan 30 configuration mode |
| S1 | **ip address 192.168.30.2 255.255.255.0 192.168.30.1** | Assign IP address 192.168.30.2, subnet mask 255.255.255.0 and gateway |
| S1 | **exit** | exit configuration mode |
| S1 | **show running-config** | Verify that all configuration on S1 is in-place |

**Part3b: Define the Router Sub-interfaces**

In the table below, describe the router sub-interface configurations. Be sure to explain how you test and validate the sub-interface implementations.

|  |  |  |
| --- | --- | --- |
| Device Name | Cisco IOS Command | Describe what the command does |
| R1 | **enable** | Enter enable mode |
| R1 | **Configure terminal** | Enter configure terminal |
| R1 | **Int g0/0/1** | Enter interface G0/0/1 |
| R1 | **No shut** | Enable interface G0/0/1 |
| R1 | **Int g0/0/1.10** | Enter sub interface 10 of G0/0/1 interface |
| R1 | **encapsulation dot1q 10** | Configure 802.1Q encapsulation for subinterface 10 |
| R1 | **description VLAN 10 sub interface** | Add plain text description “VLAN 10 subinterface” |
| R1 | **ip address 192.168.10.1 255.255.255.0** | Assign IPv4 192.168.10.1 and subnet mask 255.255.255.0 to the subinterface 10 |
| R1 | **no shut** | enable this subinterface |
| R1 | **exit** | Exit out of this subinterface |
| R1 | **Int g0/0/1.20** | Enter subinterface 20 of G0/0/1 interface |
| R1 | **encapsulation dot1q 20** | Configure 802.1Q encapsulation for subinterface 20 |
| R1 | **description VLAN 20 sub interface** | Add plain text description “VLAN 20 subinterface” |
| R1 | **ip address 192.168.20.1 255.255.255.0** | Assign IPv4 192.168.20.1 and subnet mask 255.255.255.0 to the subinterface 10 |
| R1 | **no shut** | enable this subinterface |
| R1 | **exit** | Exit out of this subinterface |
| R1 | **Int g0/0/1.30** | Enter subinterface 30 of G0/0/1 interface |
| R1 | **encapsulation dot1q 20** | Configure 802.1Q encapsulation for subinterface 30 |
| R1 | **description VLAN 30 sub interface** | Add plain text description “VLAN 30 subinterface” |
| R1 | **ip address 192.168.30.1 255.255.255.0** | Assign IPv4 192.168.30.1 and subnet mask 255.255.255.0 to the subinterface 30 |
| R1 | **no shut** | enable this subinterface |
| R1 | **exit** | Exit out of this subinterface |

**Part 4: Implement VLAN Trunking**

In the table below, describe the VLAN trunking switch and router configurations. Be sure to explain how you test and validate the VLAN trunking implementation.

*Note: Add as many table rows as you need to complete the configuration.*

|  |  |  |
| --- | --- | --- |
| Device Name | Cisco IOS Command | Describe what the command does |
| S1 | **configure terminal** | enter global configuration mode on S1 |
| S1 | **interface gi0/1** | define interface GigabitEthernet 0/1 on S1 |
| S1 | **switchport mode trunk** | configure perma trunking mode |
| S1 | **switchport trunk native vlan 30** | set VLAN 30 as the native VLAN for all untagged traffic between S1 and S2 |
| S1 | **switchport trunk allowed vlan 10,20,30,40,99** | allow all VLANs (10,20,30,40,99) to be able to pass through trunk port |
| S1 | **switchport nonegotiate** | disable DTP on S1 |
| S1 | **end** | exit interface configuration mode |
| S1 | **show interfaces trunk** | verify that trunk port is configured on GigabitEthernet 0/1; also verify all VLANs that allow to pass data via trunk port |
| R1 | **enable** | enter enable mode on R1 |
| R1 | **configure terminal** | enter configuration mode |
| R1 | **int g0/0/1.30** | enter subinterface configuration mode of G0/0/1.30 |
| R1 | **Encapsulation dot1q 30 natives** | 802.1Q encapsulation for subinterface 30 and make it a native VLAN |
| R1 | **exit** | Exit configuration mode |

**4.2 Test and Validate Trunking Configuration**

Describe how you test and validate that the above configuration functions correctly per the project specifications. *Use templates from the previous sections to document your results.*

|  |  |  |
| --- | --- | --- |
| Device Name | Cisco IOS Command | Describe what the command does |
| S1 | **configure terminal** | enter global configuration mode on S1 |
| S1 | **enable** | enter enable mode |
| S1 | **show running config** | verified all configurations are accurate for every interface |
| S1 | **show vlan** | verify the naming protocol and associate interface is correct for each vlan |
| R1 | **configure terminal** | enter global configuration mode on R1 |
| R1 | **enable** | enter enable mode |
| R1 | **show ip interface brief** | verified connection status and sub-interfaces are configured |
| R1 | **show running-config** | verify encapsulation and interface/subinterface configuration |
| R1 | **Ping 192.168.10.3** | Verifying connectivity to VLAN 10, host PC-A |
| R1 | **Ping 192.168.20.4** | Verifying connectivity to VLAN 20, host PC-B |
| R1 | **Ping 192.168.30.5** | Verifying connectivity to VLAN 30, host PC-C |
| R1 | **Ping 192.168.40.6** | Verifying no connection to VLAN 40, host PC-D due to no subinterface configured in R1 |

**Source device**: PC-A

**Destination device**: PC-B

**Test command**: ping 192.168.20.4

**Expected results**: Success

**Describe what this test means and how it validates connectivity**: we are able to ping PC-B because the router R1 has subinterface 10 and 20 configured with IP addresses and recognize the traffic from these two VLANs.

**Source device**: PC-A

**Destination device**: PC-C

**Test command**: ping 192.168.30.5

**Expected results**: Success.

**Describe what this test means and how it validates connectivity**: we are able to ping PC-C because the router R1 has subinterface 10 and 30 configured with IP addresses and recognize the traffic from these two VLANs.

**Source device**: PC-A

**Destination device**: PC-D

**Test command**: ping 192.168.40.6

**Expected results**: Unuccess.

**Describe what this test means and how it validates connectivity**: we are unable to ping PC-D because the router R1 only has subinterface 10 configured. PC-D has no associated subonterface configured; therefore R1 does not process data transmitted to PC-D.

**Source device**: PC-B

**Destination device**: PC-C

**Test command**: ping 192.168.30.5

**Expected results**: Ssuccess.

**Describe what this test means and how it validates connectivity**: we are able to ping PC-C because the router R1 has subinterface 30 and 20 configured with IP addresses and recognize the traffic from these two VLANs.

**Source device**: PC-B

**Destination device**: PC-D

**Test command**: ping 192.168.40.6

**Expected results**: Unsuccess.

**Describe what this test means and how it validates connectivity**: we are unable to ping PC-D because the router R1 only has subinterface 10 configured. PC-D has no associated subonterface configured; therefore, R1 does not process data transmitted to PC-D.

**Source device**: PC-C

**Destination device**: PC-D

**Test command**: ping 192.168.40.6

**Expected results**: Unsuccess.

**Describe what this test means and how it validates connectivity**: we are unable to ping PC-D because the router R1 only has subinterface 10 configured. PC-D has no associated subinterface configured; therefore, R1 does not process data transmitted to PC-D.