FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGIES

FALL 2023

CA EXAMINATION

NAME: NDE HURICH DILAN

MATRICULE:ICTU20223351

EMAIL: nde.dilan@ictuniversity.edu.cm

TEL:+237694525931

CCNA CA

1-configure router1 with the hostname R1

```
Router>en
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname R1
R1(config)#do show running-conf
Building configuration...

Current configuration : 549 bytes
!
version 12.4
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname R1
!
!
```

2-configure router 2 with the hostname R2

```
Router>en
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname R2
R2(config)#do show running-conf
Building configuration...

Current configuration : 549 bytes
!
version 12.4
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname R2
!
!
```

3-Configure switch with the hostname SW1

```
Switch>en
Switch#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#hostname SW1
SW1(config)#do show running-conf
Building configuration...

Current configuration : 1077 bytes
!
version 12.2
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname SW1
!
```

4-Configure the ip address of R1 according to the topology on the figure

```
R1(config)#in f0/0
R1(config-if)#ip address 10.10.10.1 255.0.0.0
R1(config-if)#do show ip interface brief
Interface              IP-Address      OK? Method Status                Protocol
FastEthernet0/0        10.10.10.1      YES manual administratively down down
FastEthernet0/1        unassigned      YES unset  administratively down down
Vlan1                  unassigned      YES unset  administratively down down
R1(config-if)#no shutdown

R1(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

R1(config-if)#do show ip interface brief
Interface              IP-Address      OK? Method Status                Protocol
FastEthernet0/0        10.10.10.1      YES manual up                    up
FastEthernet0/1        unassigned      YES unset  administratively down down
Vlan1                  unassigned      YES unset  administratively down down
R1(config-if)#
```

5-Configure the ip address of R2 according to the topology on the figure

```
R2(config)#in f0/0
R2(config-if)#do show ip interface brief
Interface              IP-Address      OK? Method Status                Protocol
FastEthernet0/0        unassigned      YES unset  administratively down down
FastEthernet0/1        unassigned      YES unset  administratively down down
Vlan1                  unassigned      YES unset  administratively down down
R2(config-if)#ip address 10.10.10.2 255.0.0.0
R2(config-if)#no shutdown

R2(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

R2(config-if)#do show ip interface brief
Interface              IP-Address      OK? Method Status                Protocol
FastEthernet0/0        10.10.10.2      YES manual up                    up
FastEthernet0/1        unassigned      YES unset  administratively down down
Vlan1                  unassigned      YES unset  administratively down down
R2(config-if)#
```

6-Give SW1 the management IP address 10.10.10.10/24:

```
SW1(config-if)#interface vlan 1
SW1(config-if)#ip address 10.10.10.10 255.0.0.0
SW1(config-if)#do show ip inte brief
Interface              IP-Address      OK? Method Status                Protocol
FastEthernet0/1        unassigned      YES manual up                    up
FastEthernet0/2        unassigned      YES manual up                    up
FastEthernet0/3        unassigned      YES manual down                  down
FastEthernet0/4        unassigned      YES manual down                  down
FastEthernet0/5        unassigned      YES manual down                  down
FastEthernet0/6        unassigned      YES manual down                  down
FastEthernet0/7        unassigned      YES manual down                  down
FastEthernet0/8        unassigned      YES manual down                  down
FastEthernet0/9        unassigned      YES manual down                  down
FastEthernet0/10       unassigned      YES manual down                  down
FastEthernet0/11       unassigned      YES manual down                  down
FastEthernet0/12       unassigned      YES manual down                  down
FastEthernet0/13       unassigned      YES manual down                  down
FastEthernet0/14       unassigned      YES manual down                  down
FastEthernet0/15       unassigned      YES manual down                  down
FastEthernet0/16       unassigned      YES manual down                  down
FastEthernet0/17       unassigned      YES manual down                  down
FastEthernet0/18       unassigned      YES manual down                  down
FastEthernet0/19       unassigned      YES manual down                  down
FastEthernet0/20       unassigned      YES manual down                  down
FastEthernet0/21       unassigned      YES manual down                  down
FastEthernet0/22       unassigned      YES manual down                  down
FastEthernet0/23       unassigned      YES manual down                  down
FastEthernet0/24       unassigned      YES manual down                  down
GigabitEthernet0/1     unassigned      YES manual down                  down
GigabitEthernet0/2     unassigned      YES manual down                  down
Vlan1                  10.10.10.10     YES manual administratively down down
SW1(config-if)#
SW1(config-if)#no shutdown
```

7-The switch should have connectivity to other IP subnets via R2:

```
SW1(config)#ip default-gateway 10.10.10.2
SW1(config)#
```

8-Verify that the switch can ping its default gateway:

```
SW1(config)#exit
SW1#
%SYS-5-CONFIG_I: Configured from console by console

SW1#ping 10.10.10.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.10.10.2, timeout is 2 seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 0/2/10 ms

SW1#ping 10.10.10.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.10.10.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms

SW1#
```

9-Configure suitable descriptions for the connected devices

```
SW1(config)#in f0/1
SW1(config-if)#description ## Connected to R1##
SW1(config-if)#in f0/0
%Invalid interface type and number
SW1(config)#in f0/2
SW1(config-if)#description ## Connected to R2##
```

Let's see configure one by one

Let's see those descriptions

```
SW1$show interface
FastEthernet0/1 is up, line protocol is
  Hardware is Lance, address is 00e0.8f
  Description: ## Connected to R1##
```

```
FastEthernet0/2 is up, line protocol is
  Hardware is Lance, address is 00e0.8f
  Description: ## Connected to R2##
```

10-Verify that the link to R1 is on a full duplex mode and that the speed is set to 100Mbs

```
SW1$show interface
FastEthernet0/1 is up, line protocol is up (connected)
  Hardware is Lance, address is 00e0.8fd6.8901 (bia 00e0.8fd6.8901)
  Description: ## Connected to R1##
 BW 100000 Kbit, DLY 1000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive set (10 sec)
  Full-duplex, 100Mb/s
```

From here we can see the duplex and speed settings for f0/1 which is linked to R1

11-Manually configure full duplex and FastEthernet speed on the link to R2:

```
SW1>en
SW1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
SW1(config)#in f0/2
SW1(config-if)#duplex full
SW1(config-if)#
%LINK-3-UPDOWN: Interface FastEthernet0/2, changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2, changed state to down

SW1(config-if)#speed 100
```

After everything is don ewe can check the results

```
SW1$show in status
Port      Name               Status       Vlan       Duplex  Speed Type
Fa0/1     ## Connected to R1 connected    1          auto    auto  10/100BaseTX
Fa0/2     ## Connected to R2 notconnect   1          a-full  a-100 10/100BaseTX
```

12-Which version of IOS is you Cisco device using?

It seems like it's version 12.2

```
SW1#show version | include IOS
Cisco IOS Software, C2960 Software (C2960-LANBASE-M), Version 12.2(25)FX, RELEASE
SOFTWARE (fc1)
SW1#
```

13-Verify the directly attached Cisco neighbors using Cisco Discovery Protocol (CDP):

```
SW1#show cdp neighbors
Capability Codes: R - Router, T - Trans Bridge, B - Source Route Bridge
                  S - Switch, H - Host, I - IGMP, r - Repeater, P - Phone
Device ID    Local Intrfce   Holdtme    Capability   Platform    Port ID
R1           Fas 0/1          121           R       C2800       Fas 0/0
SW1#
```

14-Prevent R1 from accessing information on SW1 via CDP

```
R2(config-if)#in f0/0
R2(config-if)#no cdp enable
R2(config-if)#
```

Let's disable Cisco discovery protocol on the link between R2 and SW1

15-Flush the CDP cache on R1:

```
R1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#no cdp run
R1(config)#cdp run
R1(config)#
```

As shown below SW1 is no longer there.

16-Verify that R1 cannot see SW1 via CDP:

```
R1#show cdp neighbors
Capability Codes: R - Router, T - Trans Bridge, B - Source Route Bridge
                  S - Switch, H - Host, I - IGMP, r - Repeater, P - Phone
Device ID    Local Intrfce   Holdtme    Capability   Platform    Port ID
R1#
```

17-Let's verify the status of the switch port connected to R2 with the **show ip interface brief** command.

```
SW1#en
SW1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
SW1(config)#int f0/2
SW1(config-if)#do show ip interface brief
Interface              IP-Address      OK? Method Status                Protocol
FastEthernet0/1        unassigned      YES manual up                    up
FastEthernet0/2        unassigned      YES manual up                    up
FastEthernet0/3        unassigned      YES manual down                  down
FastEthernet0/4        unassigned      YES manual down                  down
```

18-Shut down the interface connected to R2 and issue a show ip interface brief command again.

```
R2(config-if)#in f0/0
R2(config-if)#shutdown

R2(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to administratively down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to down

R2(config-if)#do show ip interface brief
Interface              IP-Address      OK? Method Status                Protocol
FastEthernet0/0        unassigned      YES manual administratively down down
FastEthernet0/1        10.10.10.2      YES manual up                    down
Vlan1                  unassigned      YES unset  administratively down down
R2(config-if)#
```

19) Bring the interface up again:

```
R2(config-if)#do show ip interface brief
Interface              IP-Address      OK? Method Status                Protocol
FastEthernet0/0        unassigned      YES unset  administratively down down
FastEthernet0/1        unassigned      YES unset  up                    down
Vlan1                  unassigned      YES unset  administratively down down
R2(config-if)#int f0/0
R2(config-if)#no shutdown

R2(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

R2(config-if)#do show ip interface brief
Interface              IP-Address      OK? Method Status                Protocol
FastEthernet0/0        unassigned      YES unset  up                    up
FastEthernet0/1        unassigned      YES unset  up                    down
Vlan1                  unassigned      YES unset  administratively down down
R2(config-if)#
```

20) and 21) Set the duplex to half on Switch 1 and verify the state of the interface:

```
SW1(config-if)#duplex half
SW1(config-if)#
%LINK-3-UPDOWN: Interface FastEthernet0/1, changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to down

%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up

SW1(config-if)#do show interface status
Port      Name               Status       Vlan       Duplex  Speed Type
Fa0/1                        connected    1          a-half  auto  10/100BaseTX
Fa0/2                        connected    1          auto    auto  10/100BaseTX
```

22-23) Set the duplex back to full duplex and set the speed to 10 Mbps:

```
SW1(config-if)#in f0/2
SW1(config-if)#duplex half
SW1(config-if)#
%LINK-3-UPDOWN: Interface FastEthernet0/2, changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2, changed state to down

%LINK-5-CHANGED: Interface FastEthernet0/2, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2, changed state to up

SW1(config-if)#speed 10
SW1(config-if)#do show ip interface brief
Interface              IP-Address      OK? Method Status                Protocol
FastEthernet0/1        unassigned      YES manual down                  down
FastEthernet0/2        unassigned      YES manual up                    up
```

24) Check if the interface is still operational:

```
SW1(config-if)#do show ip interface brief
Interface              IP-Address      OK? Method Status                Protocol
FastEthernet0/1        unassigned      YES manual down                  down
FastEthernet0/2        unassigned      YES manual up                    up
```

25) Check if the interface is operational on R2

```
R2(config)#do show ip interface brief
Interface              IP-Address      OK? Method Status                Protocol
FastEthernet0/0        unassigned      YES unset  up                    up
```

The status is up/up

SLIDE 14 QUESTION 1-5

1-You have been given the 172.30.0.0/16 network. Your company requires 100 subnets with at least 500 hosts per subnet. What prefix length should you use?

To find the prefix length we should use, let's find the number of borrowed bits.

We know that $2^x = number\ of\ subnets$ where x is the number of borrowed bits. So, we have $2^x = 100\ then\ x = \frac{\ln(100)}{\ln(2)}\ which\ give\ us\ x \approx 7$

$$so\ we\ need\ to\ borrow\ 7\ bits\ and\ we\ will\ have\ 128\ subnets\ which\ are\ more\ than\ sufficient\ and\ the\ number\ of\ host\ is\ 2^9 - 2\ which\ is\ 510\ host$$

And since we borrow 7bits, we will have a prefix length of 16+7=23.

2-What subnet does host 172.21.111.201/20 belong to?

To find the subnet it belongs to, we just need to find the network address of that subnet and to do that we can convert everything to binary and we will have :

10101100.00010101.01101111.11001001 since it's a /20 it means that we have borrowed 4 bits so the last 12 bits are for the host, let's make them all 0

10101100.00010101.01100000.00000000

Now if we convert it back, we will have 172.21.96.0 Which is what we are looking for. **So, the subnet mask is 172 . 21 . 96 .0**

3-What is the broadcast address of the network 192.168.91.78/26 belongs to?

It's the same process as the last one but instead of turning all the host bits to **0** we will turn them into **1**.

So, we have 11000000.10101000.01011011.01001110 and then

11000000.10101000.01011011.01111111 (note that the number of borrowed bits was 2)

Converting it back to decimal give us 192.168.91.127/26

4- You divide the 172.16.0.0/16 network into 4 subnets of equal size. Identify the network and broadcast addresses of the second subnet

To complete the task, we need to find the network address of the first network and then deduce.

First, we know that they are 4 subnets so 2 bits were borrowed, converting the address into binary give us : **10101100.00010000.00000000.00000000 (1st network address)**

to have the second network address we just add a 64 after 172.16 and in binary we get :

10101100.00010000.01000000.00000000 (2nd network address) In decimal it gives us 172 . 16 . 64 . 0

From there now we just turn the host part all to 1 to find the broadcast address, so in the end of the day the broadcast address is **10101100.00010000.01111111.11111111**

which in decimal give 172 . 16 . 127 . 255.

So, the network and broadcast addresses of the second subnet are **172 . 16 . 64 . 0** and **172 . 16 . 127 . 255**

5- You divide the 172.30.0.0/16 network into subnets of 1000 hosts each. How many subnets are you able to make?

We know that we have 1000 hosts and the formula is

$$2^n - 2 = number\ of\ host => n = \frac{\ln(1000+2)}{\ln(2)}$$

So $n \approx 10$.

We have $2^{10} - 2 = 1022$ *which large enough*.

And 64 subnets.

Study the slide of day 15 and do a summary of it:

The day 15's document outlines the subnetting process for Class A and Class B networks, with a specific task of creating 2000 subnets for the 10.0.0.0/8 network. The use of a /19 prefix length is recommended for Class B networks, providing 8190 usable host addresses per subnet. Subnetting Class A networks is exemplified through the IP address 10.217.182.223/11, demonstrating the determination of network and broadcast addresses, as well as the range of usable addresses.

A crucial concept introduced is Variable-Length Subnet Masks (VLSM), highlighting its efficiency in optimizing network address utilization. The VLSM implementation process involves assigning the largest subnet first and then proceeding with subsequent subnets.

An illustrative example showcases VLSM in action, dividing subnets for Tokyo LAN A, Tokyo LAN B,

Toronto LAN A, and Toronto LAN B. Each subnet's network and broadcast addresses, along with the range of usable addresses, are meticulously calculated. The scenario concludes by emphasizing the effectiveness of VLSM in creating various subnets with different prefix lengths, thereby maximizing the efficient use of address space.

```
R1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#int g0/1
R1(config-if)#ip address 192.168.5.126 255.255.255.128
R1(config-if)#do show ip interface g0/1
GigabitEthernet0/1 is administratively down, line protocol is down (disabled)
  Internet address is 192.168.5.126/25
  Broadcast address is 255.255.255.255
  Address determined by setup command
```

Summary Of The Implementation

In this lab focused on Variable Length Subnet Masking (VLSM), the primary objective was to implement VLSM for a given IP address (192.168.5.0/24) to accommodate addressing requirements for various LANs, including the point-to-point network. Determining the first and last usable addresses posed no challenges when the network ID and broadcast ID were readily available.

The more intricate aspect of the exercise involved configuring static routes on each router. Through this, I gained insight into the importance of establishing reachability by configuring the next hop for different routers. The 'ip route' command was instrumental in achieving this configuration, emphasizing the significance of routing in network setups.