ACTIVITY 1 - Basic Router Security Configuration 1

- Set the hostnames according to the network diagram (R1 and R2)

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname R2
```

- Set the enable password on the router to 'cisco'

```
R2(config)#enable password cisco
```

- View the password in the running configuration. Is it encrypted?

```
R2(config)#exit
R2#
%SYS-5-CONFIG_I: Configured from console by console

R2#show running-config
Building configuration...
Current configuration : 644 bytes
!
version 15.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname R2
!
enable password cisco
```

- Enable password encryption on a router

```
R2#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#service password-encryption
```

- View the encrypted password in the running configuration.

```
R2(config)#do show running-config
Building configuration...
version 15.1
...
service password-encryption
!
hostname R2
!
enable password 7 0822455D0A16
```

- Disable password encryption on each router but the previous password stays encrypted

```
R2(config)#no service password-encryption
```

ACTIVITY 2: Basic Router Security Configuration 2-done

- Set the enable password of the router to 'cisco'

```
R2(config)#enable password cisco
```

- Set the enable secret of each router to 'ccna'

R2(config)#enable secret ccna

- Exit back to exec mode and try to enter privileged exec mode. Which password do you have to use?

R2>enable
Password:
Password:
R2#
---→ I had to use the secret

- View the running configuration. Which of the passwords is encrypted?

R2#show running-config
Building configuration...
...
no service password-encryption
hostname R2
enable secret 5 1mERr$Bok4KDfVutXOJolNq009M/
enable password cisco
----> The secret is encrypted

- Enable password encryption on the router, and view the running configuration. What has changed?

R2(config)#service password-encryption
R2(config)#do show running-config
Building configuration...
…
service password-encryption
hostname R2
enable secret 5 1mERr$Bok4KDfVutXOJolNq009M/
enable password 7 0822455D0A16

- Save the configuration and reload the router to confirm.

--- First copy the running config to the startup-config

R2#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]

--- Or the following:

R2#write
Building configuration...
[OK]
R2#

--- Then, reload the router

R2#reload

Proceed with reload? [confirm]
System Bootstrap, Version 15.1(4)M4, RELEASE SOFTWARE (fc1)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 2010 by cisco Systems, Inc.
Total memory size = 512 MB - On-board = 512 MB, DIMM0 = 0 MB
CISCO1941/K9 platform with 524288 Kbytes of main memory
Main memory is configured to 64/-1(On-board/DIMM0) bit mode with ECC disabled

ACTIVITY 3: Basic Router Security Configuration 3

- Set the enable secret of R1 to 'cisco'.

```
R1(config)#enable secret cisco
```

- Set the console password to 'ccna', and make it required to connect to R1 by the console port.

```
R1(config)#line console 0
R1(config-line)#password ccna
R1(config-line)#login
```

- Check the runing configuration. Is the password encrypted?

```
R1(config-line)#end

R1#
%SYS-5-CONFIG_I: Configured from console by console

R1#show running-config

Building configuration…

….

no service password-encryption

!
hostname R1
!
enable secret 5 $1$mERr$hx5rVt7rPNoS4wqbXKX7m0
….
line con 0
password ccna
login
```

- Enable password encryption on R1. Verify by checking the running configuration, and then save your configurations.

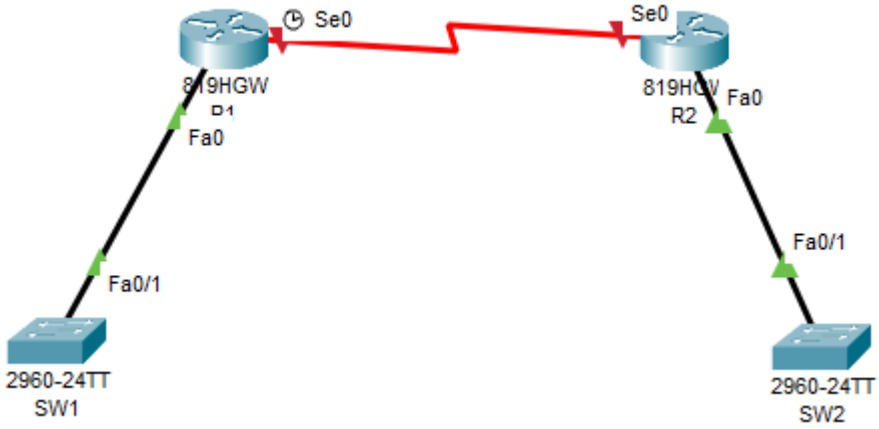
```
R1(config)#service password-encryption
R1(config)#do show running-config
Building configuration…
...
line con 0
password 7 08224F4008
login
…
R1#write
Building configuration...
[OK]
R1#
```

- Verify it by entering ‘ccna’ as user access password and ‘cisco’ as to enter user privileged mode

```
R1#exit
```

User Access Verification
Password:
R1>
R1>enable
Password:
R1#

ACTIVITY 4: Basic Serial Connection Configuration



1. Use CDP to discover which interfaces are used to connect the routers and switches.

```
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          131            R       C810         Fas 0
```

```
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
SW1           Fas 0            125            S       2960         Fas 0/1
```

- R1 only shows SW1 so let's enable the interfaces on both of the routers.

```
R1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#interface s0
R1(config-if)#no shutdown
%LINK-5-CHANGED: Interface Serial0, changed state to down

R2#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#interface s0
R2(config-if)#no shutdown
R2(config-if)#
%LINK-5-CHANGED: Interface Serial0, changed state to up
```

- Now let's test it

```
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
SW1           Fas 0            165            S       2960         Fas 0/1
R2            Ser 0            144            R       C810         Ser 0
```

```
R2#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
SW2           Fas 0            158            S       2960         Fas 0/1
R1            Ser 0            129            R       C810         Ser 0
```

2. Identify which end of the serial cable attaching R1 and R2 is DCE and which is DTE.

R1#show controllers s0
Interface Serial0
Hardware is PowerQUICC MPC860
DCE V.35, clock rate 2000000
idb at 0x81081AC4, driver data structure at 0x81084AC0

R2#show controllers s0
Interface Serial0
Hardware is PowerQUICC MPC860
DTE V.35 TX and RX clocks detected
idb at 0x81081AC4, driver data structure at 0x81084AC0

- So, R1 is DCE and R2 is DTE.

3. Set the clock rate on the DCE end to 64 Kb/s.

R1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#interface s0
R1(config-if)#clock rate 64000
R1(config-if)#end
R1#
%SYS-5-CONFIG_I: Configured from console by console
R1#show controllers s0
Interface Serial0
Hardware is PowerQUICC MPC860
DCE V.35, clock rate 64000

4. Set the IP addresses of the serial interfaces of R1 and R2 to 192.168.0.1/24 and 192.168.0.2/24, respectively.

R1(config)#interface s0
R1(config-if)#ip address 192.168.0.1 255.255.255.0

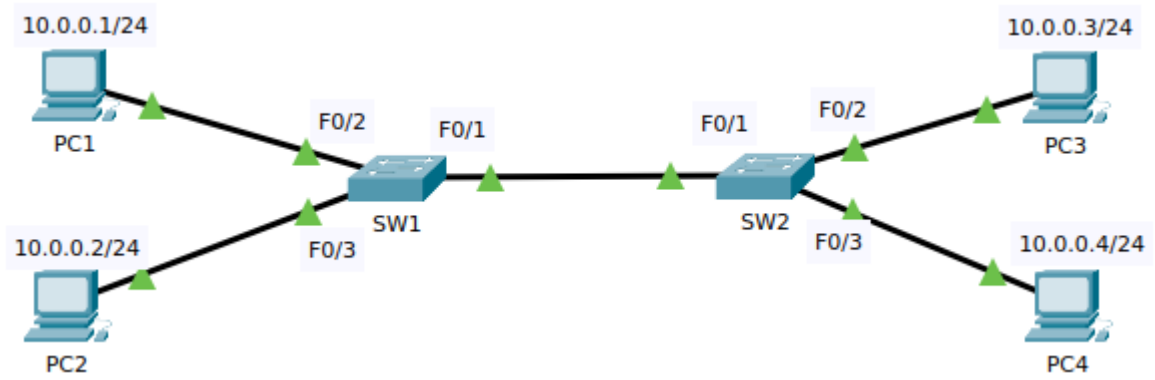
R2(config)#interface s0
R2(config-if)#ip address 192.168.0.2 255.255.255.0

5. Ping between the routers to test connectivity.

```
R1#ping 192.168.0.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.0.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 6/14/18 ms
```

```
R2#ping 192.168.0.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.0.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 6/14/19 ms
```

ACTIVITY 5 : VLAN configuration



1. Ping between the computers to test connectivity.

From PC1

```
C:\>ping 10.0.0.2

Pinging 10.0.0.2 with 32 bytes of data:

Reply from 10.0.0.2: bytes=32 time<1ms TTL=128

Ping statistics for 10.0.0.2:
    Packets: Sent = 1, Received = 1, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

Control-C
^C
C:\>ping 10.0.0.3

Pinging 10.0.0.3 with 32 bytes of data:

Reply from 10.0.0.3: bytes=32 time<1ms TTL=128
Reply from 10.0.0.3: bytes=32 time<1ms TTL=128

Ping statistics for 10.0.0.3:
    Packets: Sent = 2, Received = 2, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

Control-C
^C
C:\>ping 10.0.0.4

Pinging 10.0.0.4 with 32 bytes of data:

Reply from 10.0.0.4: bytes=32 time<1ms TTL=128

Ping statistics for 10.0.0.4:
    Packets: Sent = 1, Received = 1, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

2. Assign PC1 and PC3 to VLAN1, and PC2 and PC4 to VLAN2.

```
SW1(config)#interface f0/2
SW1(config-if)#switchport mode access
SW1(config-if)#switchport access vlan 1
SW1(config-if)#exit
SW1(config)#interface f0/3
SW1(config-if)#switchport mode access
```

```
SW1(config-if)#switchport access vlan 2
% Access VLAN does not exist. Creating vlan 2
SW1(config-if)#

SW2(config)#interface f0/2
SW2(config-if)#switchport mode access
SW2(config-if)#switchport access vlan 1
SW2(config-if)#exit
SW2(config)#interface f0/3
SW2(config-if)#switchport mode access
SW2(config-if)#switchport access vlan 2
% Access VLAN does not exist. Creating vlan 2
SW2(config-if)#
```

3. Attempt to ping between PC1 and PC3, and then PC2 and PC4. Why does the ping between PC1 and PC3 work, but the ping between PC2 and PC4 doesn't?

- The ping between PC1 and PC3 work because they are in VLAN 1 which is native and forward packets.

- The ping between PC2 and PC4 doesn’t because they need a trunk.

4. Configure the interfaces connecting SW1 and SW2 as trunk interfaces.

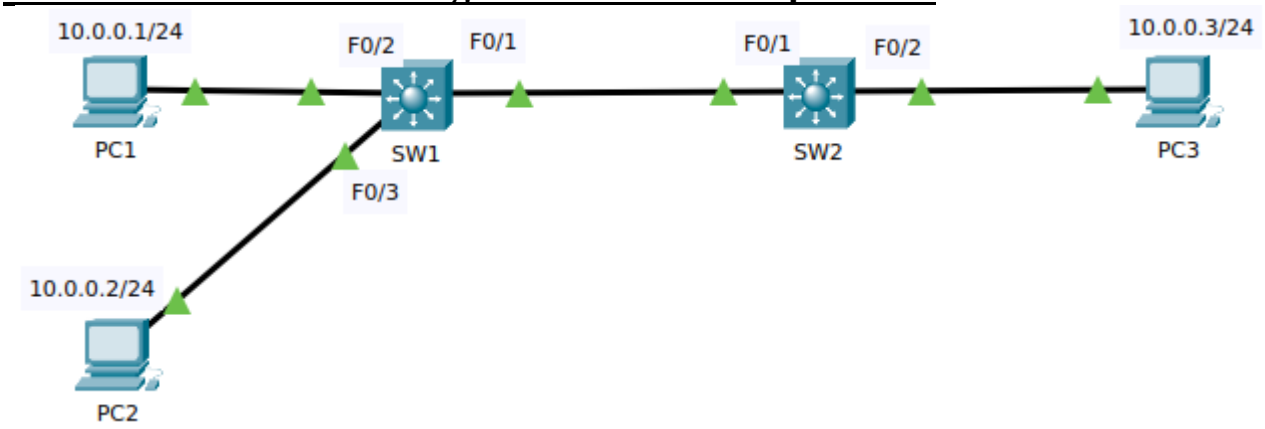
```
SW1(config)#interface f0/1
SW1(config-if)#switchport mode trunk
SW1(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to down
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up
SW1(config-if)#

SW2(config)#interface f0/1
SW2(config-if)#switchport mode trunk
SW2(config-if)#
```

5. Ping between the computers again. Which pings fail, and which pings succeed?

The ping from PC2 to PC4 works :

```
C:\>ping 10.0.0.4

Pinging 10.0.0.4 with 32 bytes of data:

Reply from 10.0.0.4: bytes=32 time<1ms TTL=128
Reply from 10.0.0.4: bytes=32 time=12ms TTL=128

Ping statistics for 10.0.0.4:
    Packets: Sent = 2, Received = 2, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 12ms, Average = 6ms
```

ACTIVITY 6 : VLAN Configuration Trunk Encapsulation



1. Ping between the PCs to test connectivity.

From PC1

```
C:\>ping 10.0.0.2

Pinging 10.0.0.2 with 32 bytes of data:

Reply from 10.0.0.2: bytes=32 time<1ms TTL=128

Ping statistics for 10.0.0.2:
    Packets: Sent = 1, Received = 1, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

Control-C
^C
C:\>ping 10.0.0.3

Pinging 10.0.0.3 with 32 bytes of data:

Reply from 10.0.0.3: bytes=32 time<1ms TTL=128

Ping statistics for 10.0.0.3:
    Packets: Sent = 1, Received = 1, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

2. Assign PC2 and PC3 to VLAN 2.

SW1(config)#interface f0/3
SW1(config-if)#switchport mode access
SW1(config-if)#switchport access vlan 2
% Access VLAN does not exist. Creating vlan 2

SW2(config)#interface f0/2
SW2(config-if)#switchport mode access
SW2(config-if)#switchport access vlan 2
% Access VLAN does not exist. Creating vlan 2

3. Create a trunk between SW1 and SW2.

SW2(config)#interface f0/1
SW2(config-if)#switchport mode trunk
Command rejected: An interface whose trunk encapsulation is "Auto" can not be configured to "trunk" mode.

---> Does not work as it's a layer 3 switch, we need an encapsulation before the trunking.

```
SW2(config-if)#switchport trunk encapsulation dot1q
SW2(config-if)#switchport mode trunk
SW2(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to down
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up
```

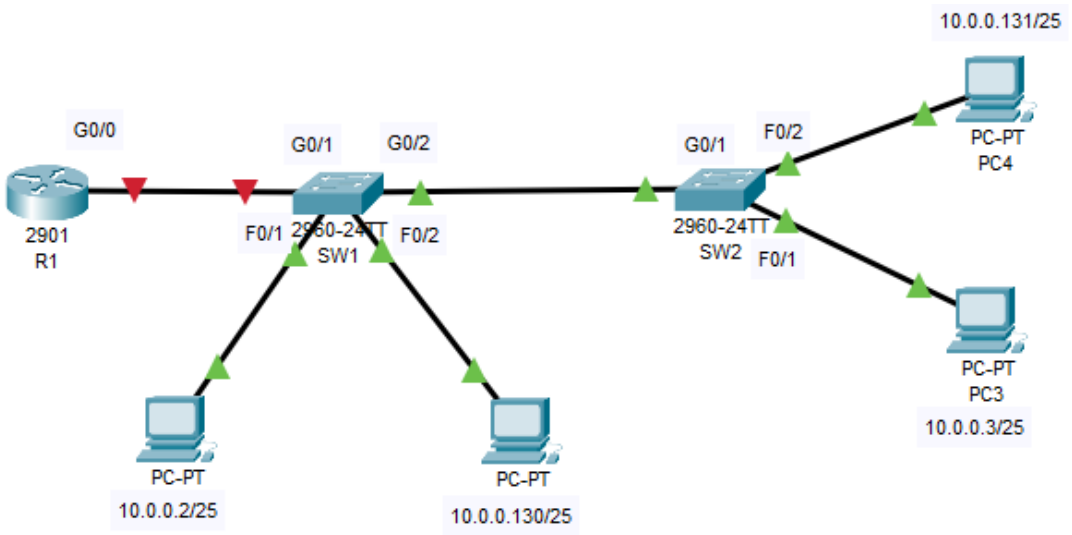
- Let's do the same thing in SW1:

```
SW1(config)#interface f0/1
SW1(config-if)#switchport trunk encapsulation dot1q
SW1(config-if)#switchport mode trunk
```

4. Ping between the PCs to test connectivity.

```
C:\>ping 10.0.0.1

Pinging 10.0.0.1 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.

Ping statistics for 10.0.0.1:
    Packets: Sent = 3, Received = 0, Lost = 3 (100% loss),

Control-C
^C
C:\>ping 10.0.0.3

Pinging 10.0.0.3 with 32 bytes of data:

Reply from 10.0.0.3: bytes=32 time<1ms TTL=128
Reply from 10.0.0.3: bytes=32 time<1ms TTL=128

Ping statistics for 10.0.0.3:
    Packets: Sent = 2, Received = 2, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

ACTIVITY 7 : Inter-VLAN Routing (ROAS)



1. Ping between the PCs. Which pings succeed?

-> PC1 can ping PC3. PC2 can ping PC4

2. Assign PC1 and PC3 to VLAN 13, and PC2 and PC4 to VLAN 24.

```
SW1(config)#interface f0/1
SW1(config-if)#switchport mode access
SW1(config-if)#switchport access vlan 13
% Access VLAN does not exist. Creating vlan 13
SW1(config-if)#exit
SW1(config)#interface f0/2
SW1(config-if)#switchport mode access
SW1(config-if)#switchport access vlan 24
% Access VLAN does not exist. Creating vlan 24

SW2(config)#interface f0/1
SW2(config-if)#switchport mode access
SW2(config-if)#switchport access vlan 13
% Access VLAN does not exist. Creating vlan 13
SW2(config-if)#exit
SW2(config)#interface f0/2
SW2(config-if)#switchport mode access
SW2(config-if)#switchport access vlan 24
% Access VLAN does not exist. Creating vlan 24
```

3. Create a trunk link between SW1 and SW2.

```
SW1(config)#interface g0/2
SW1(config-if)#switchport mode trunk

SW2(config)#interface g0/1
SW2(config-if)#switchport mode trunk
```

4. Configure inter-VLAN routing by using subinterfaces on R1's G0/0 interface. Use an address of 10.0.0.1/25 for VLAN 13 and 10.0.0.129/25 for VLAN 24.

```
R1(config)#interface g0/0
R1(config-if)#no shutdown
R1(config-if)#interface g0/0.13
R1(config-subif)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0.13, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0.13, changed state to
up
R1(config-subif)#encapsulation dot1Q 13
R1(config-subif)#ip address 10.0.0.1 255.255.255.128
R1(config-subif)#exit
R1(config)#interface g0/0.24
R1(config-subif)#
R1(config-subif)#encapsulation dot1q 24
R1(config-subif)#ip address 10.0.0.129 255.255.255.128

SW1(config)#interface g0/1
SW1(config-if)#switchport mode trunk
```

5. Test connectivity by pinging between PCs.
PC1 can now ping PC2 and PC4.

```
C:\>ping 10.0.0.131

Pinging 10.0.0.131 with 32 bytes of data:

Request timed out.
Reply from 10.0.0.131: bytes=32 time<1ms TTL=127
Reply from 10.0.0.131: bytes=32 time<1ms TTL=127
Reply from 10.0.0.131: bytes=32 time<1ms TTL=127

Ping statistics for 10.0.0.131:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 10.0.0.130

Pinging 10.0.0.130 with 32 bytes of data:

Request timed out.
Reply from 10.0.0.130: bytes=32 time<1ms TTL=127
Reply from 10.0.0.130: bytes=32 time<1ms TTL=127

Ping statistics for 10.0.0.130:
    Packets: Sent = 3, Received = 2, Lost = 1 (34% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

PC2 can ping PC1 and PC3.

```
C:\>ping 10.0.0.2

Pinging 10.0.0.2 with 32 bytes of data:

Reply from 10.0.0.2: bytes=32 time<1ms TTL=127
Reply from 10.0.0.2: bytes=32 time<1ms TTL=127

Ping statistics for 10.0.0.2:
    Packets: Sent = 2, Received = 2, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

Control-C
^C
C:\>ping 10.0.0.3

Pinging 10.0.0.3 with 32 bytes of data:

Request timed out.
Reply from 10.0.0.3: bytes=32 time<1ms TTL=127
Reply from 10.0.0.3: bytes=32 time<1ms TTL=127
Reply from 10.0.0.3: bytes=32 time<1ms TTL=127

Ping statistics for 10.0.0.3:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

ACTIVITY 8: Inter-VLAN Routing (ROAS) Troubleshooting 1

VLAN 13: PC1, PC3
VLAN 24: PC2, PC4
After configuring inter-VLAN routing, computers in different VLANs are still unable to communicate. There is one misconfiguration. Troubleshoot the problem and fix it. You have successfully completed the lab when all PCs can ping each other, without changing VLAN membership.

- The ping between PC1 and PC3 works.
- PC1 cannot ping PC2 and PC4.
- The ping between PC2 and PC4 works.
- PC2 cannot ping PC1 and PC3.
- PC3 cannot ping PC4.

-> Here, the VLAN works, maybe the problem is the router. Let’s find out.

- The two IP addresses on G0/0 of the router are correct after ip interface brief

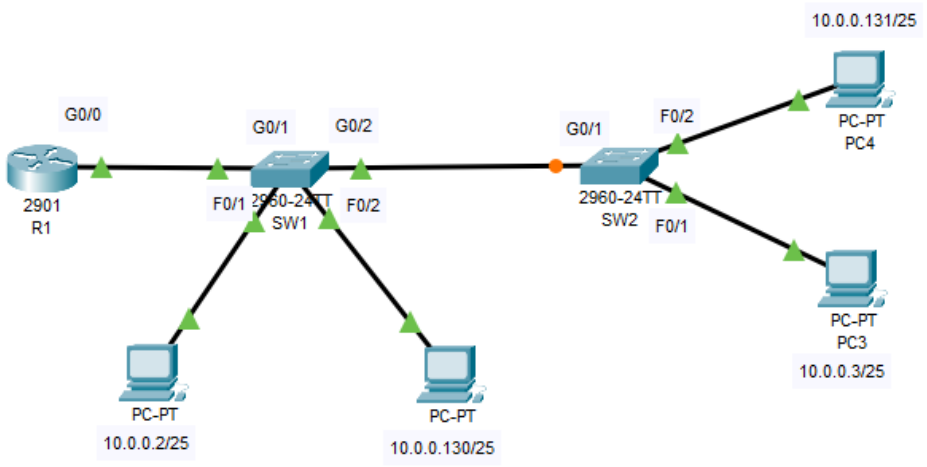
```
R1#show interface g0/0.13
GigabitEthernet0/0.13 is up, line protocol is up (connected)
Hardware is PQUICC_FEC, address is 0040.0bed.ae01 (bia 0040.0bed.ae01)
Internet address is 10.0.0.1/25
MTU 1500 bytes, BW 100000 Kbit, DLY 100 usec,
reliability 255/255, txload 1/255, rxload 1/255
Encapsulation 802.1Q Virtual LAN, Vlan ID 13
ARP type: ARPA, ARP Timeout 04:00:00,
Last clearing of "show interface" counters never
R1#show interface g0/0.24
GigabitEthernet0/0.24 is up, line protocol is up (connected)
Hardware is PQUICC_FEC, address is 0040.0bed.ae01 (bia 0040.0bed.ae01)
Internet address is 10.0.0.129/25
MTU 1500 bytes, BW 100000 Kbit, DLY 100 usec,
reliability 255/255, txload 1/255, rxload 1/255
Encapsulation 802.1Q Virtual LAN, Vlan ID 14
ARP type: ARPA, ARP Timeout 04:00:00,
Last clearing of "show interface" counters never
```

➔ The VLAN number for G0/0.24 is incorrect. Let's correct it

```
R1(config)#interface g0/0.24
R1(config-subif)#encapsulation dot1q 24
```

➔ Now all PCs can ping one another.

ACTIVITY 9: Inter-VLAN Routing (ROAS) Troubleshooting 2



VLAN 13: PC1, PC3
VLAN 24: PC2, PC4
PC1's user has reported that they are unable to communicate with other PCs on the network. There is one misconfiguration per networking device. Troubleshoot the problems and fix them. You have successfully completed the lab when all PC1 can ping each other PC in the network.

- None of the PCs can ping one another. So, the VLAN doesn't work. Let's find if the VLANs are not misconfigured.

```
SW1#show vlan brief

VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
1    default                          active    Fa0/3, Fa0/4, Fa0/5, Fa0/6
                                                Fa0/7, Fa0/8, Fa0/9, Fa0/10
                                                Fa0/11, Fa0/12, Fa0/13, Fa0/14
                                                Fa0/15, Fa0/16, Fa0/17, Fa0/18
                                                Fa0/19, Fa0/20, Fa0/21, Fa0/22
                                                Fa0/23, Fa0/24
12   VLAN0012                         active    Fa0/1
13   VLAN0013                         active
24   VLAN0024                         active    Fa0/2
1002 fddi-default                     active
1003 token-ring-default               active
1004 fddinet-default                  active
1005 trnet-default                    active
```

- We see that in SW1, the VLAN 13 is not on F0/1. Let's correct it.

SW1(config)#interface f0/1
SW1(config-if)#switchport mode access
SW1(config-if)#switchport access vlan 13

- Even after this, the PCs still can't ping one another. Let's see for SW2.

The VLANs are correct on SW2. Let's see the trunk on SW2.

SW2#show interfaces trunk

SW2#

➔ As we can see it, there is no trunk on SW2. So, let's make one on G0/1

SW2(config)#interface g0/1
SW2(config-if)#switchport mode trunk

➔ Now, PC1 and PC3 can ping but cannot ping PC2 and PC4. The same, PC2 and PC4 can ping but not to PC1 and PC3. So, the problem is with gateway.

```
R1#show ip interface brief
Interface              IP-Address      OK? Method Status                Protocol
GigabitEthernet0/0     unassigned      YES unset  up                    up
GigabitEthernet0/0.13  10.0.0.11       YES manual up                    up
GigabitEthernet0/0.24  10.0.0.129      YES manual up                    up
GigabitEthernet0/1     unassigned      YES unset  administratively down down
Vlan1                  unassigned      YES unset  administratively down down
```

➔ As we can see the IP address on g0/0.13 is incorrect. Let's correct it.

R1(config)#interface g0/0.13
R1(config-subif)#ip address 10.0.0.1 255.255.255.128

➔ Now, the PCs can ping one another.

ACTIVITY 10: Local Username-Password Database

- Create the following users on R1:

username: ccna / password: cisco
username: ccnp / password: CISCO

R1(config)#username ccna password cisco
R1(config)#username ccnp password CISCO

- Configure the console line to use the local user database to authenticate users.

R1(config)#line console 0
R1(config-line)#login local
R1(config-line)#end

- Logout of the router, and login again with each account. Are the passwords case-sensitive?

R1#logout

User Access Verification

Username: ccna
Password:
R1>

- See the users in the running-config

R1#show running-config

username ccna password 0 cisco
username ccnp password 0 CISCO

- Create a third user on R1:

username: CCNA / password: router

R1(config)#username CCNA password router

R1#show running-config

username ccna password 0 router
username ccnp password 0 CISCO

- Do not forget to write on startup-config with #wr

----> Usernames are not case sensitive.
----> Passwords are case sensitive.