

COMPUTER NETWORK
NETWORK CONFIGURATION

Networking Lab 1

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1 Router configuration using virtual console and virtual line interface

1.1 Display the running configuration of the router

- enable allow us to pass in priviledged mode, so we have more access
- show running-config show the current operating system

1.2 Q1.2

- config t (conf t) allow us to configure the router

We have our ethernet connection on the ethernet port : FastEthernet0/0 (fa0/0) So to configure it we do interface fa0/0, now we can configure the ip address like : ip address 192.168.10.1 255.255.255.0

then we need to configure the pc that need to communicate with the router, so we set : ip address 192.168.10.2 mask 255.255.255.0 and default gateway 192.168.10.1 so it sends all it's packets to the router (which has this ip (192.168.10.1)

So if we try to ping the router from the pc ping 192.168.10.1 we have a reply from the router so it works

1.3 Q1.3

conf t hostname R1

```
R1# copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
```

Figure 1: R1 config

Current configuration : 696 bytes ! version 12.2 no service timestamps log datetime msec no service timestamps debug datetime msec no service password-encryption ! hostname R1 ! ip cef no ipv6 cef ! interface FastEthernet0/0 ip address 192.168.10.1 255.255.255.0 duplex auto speed auto !

1.4 Q1.4

There is 6 network interfaces

line console 0 password root exit * 2 copy running-config startup-config to save reload

1.5 Q1.5

conf t line vty 0 4 password toor

1.6 Q1.6

```
!  
interface FastEthernet0/0  
 ip address 192.168.10.1 255.255.255.0  
 duplex auto  
 speed auto  
!  
interface FastEthernet1/0  
 no ip address  
 duplex auto  
 speed auto  
 shutdown  
!  
interface Serial2/0  
 no ip address  
 clock rate 2000000  
 shutdown  
!  
interface Serial3/0  
 no ip address  
 clock rate 2000000  
 shutdown  
!  
interface FastEthernet4/0  
 no ip address  
 shutdown  
!  
interface FastEthernet5/0  
 no ip address  
 shutdown  
!  
ip classless  
!  
ip flow-export version 9  
!  
!  
!  
!  
!  
!  
!  
line con 0  
 password root  
!  
line aux 0  
!  
line vty 0 4  
 password toor  
 login  
!
```

Figure 2: R1 passwords

1.7 Q1.7

PC2 : 192.168.0.2 255.255.255.240 default gateway 192.168.0.1

```
C:\>ping 192.168.0.1

Pinging 192.168.0.1 with 32 bytes of data:

Reply from 192.168.0.1: bytes=32 time<1ms TTL=255
Reply from 192.168.0.1: bytes=32 time<1ms TTL=255
Reply from 192.168.0.1: bytes=32 time<1ms TTL=255
Reply from 192.168.0.1: bytes=32 time<1ms TTL=255

Ping statistics for 192.168.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

Figure 3: Ping

1.8 Q1.8

The right password to use with Telnet is the one in vty

In order to enable with the use of telnet, there need to be a password set for enable So in the router enable conf t enable password password (set the password to password)

Then can ask to enable from telnet and use password to gain access.

```
C:\>
C:\>
C:\>telnet 192.168.0.1
Trying 192.168.0.1 ...Open

User Access Verification

Password:
R1>?
Exec commands:
<1-99>      Session number to resume
connect      Open a terminal connection
disable      Turn off privileged commands
disconnect   Disconnect an existing network connection
enable       Turn on privileged commands
exit         Exit from the EXEC
logout       Exit from the EXEC
ping         Send echo messages
resume       Resume an active network connection
show         Show running system information
ssh          Open a secure shell client connection
telnet       Open a telnet connection
terminal     Set terminal line parameters
traceroute   Trace route to destination
R1>|
```

Figure 4: R1 passwords

2 Sub-netting

2.1 Subnet mask

Address space 192.168.2.0/24 so netmask is 255.255.255.0

To have 8 subnets :

The subnet needs to range from 0 - 7 so in binary from 000 to 111. So it uses 3 bits. $24 + 3 = 27$. So new network mask is /27 so 255.255.255.224. So we have 5 bits left, so $2^5 = 32 - 2 = 30$, so each subnet will have 30 hosts.

2.2 Sub-network ids

/27 – 8 Subnets – 30 Hosts/Subnet

Network IP Range Broadcast

.0 .1-.30 .31
.32 .33-.62 .63
.64 .65-.94 .95
.96 .97-.126 .127
.128 .129-.158 .159
.160 .161-.190 .191

.192 .193-.222 .223
.224 .225-.254 .255

2.3 PCs and Routers IP address

Network X :

- R0, FastEthernet 0/0:
 - IP : 192.168.2.33
 - Netmask : 255.255.255.224
- PC0, FastEthernet 0:
 - IP : 192.168.2.34
 - Netmask : 255.255.255.244
 - Default Gateway : 192.168.2.33

Network Y :

- R0, Serial 2/0 :
 - IP : 192.168.2.65
 - Netmask : 255.255.255.224
- R1, Serial 2/0 :
 - IP : 192.168.2.66
 - Netmask : 255.255.255.224

Network Z :

- R1, FastEthernet 0/0 :
 - IP : 192.168.2.97
 - Netmask : 255.255.255.224
- PC1, FastEthernet 0 :
 - IP : 192.168.2.98
 - Netmask : 255.255.255.224
 - Default Gateway : 192.168.2.97

2.4 Ping R0 on network X from PC0

It works ! Which is normal since we are pinging the router on the same network.

```
C:\>ping 192.168.2.34

Pinging 192.168.2.34 with 32 bytes of data:

Reply from 192.168.2.34: bytes=32 time=18ms TTL=128
Reply from 192.168.2.34: bytes=32 time=4ms TTL=128
Reply from 192.168.2.34: bytes=32 time=2ms TTL=128
Reply from 192.168.2.34: bytes=32 time=4ms TTL=128

Ping statistics for 192.168.2.34:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 18ms, Average = 7ms
```

Figure 5: Ping R0 on network X from PC0

2.5 Ping R0 on network Y from PC0

It doesn't work ! Which is normal since they are not on the same network and we haven't configured static routing.

```
C:\>ping 192.168.2.65

Pinging 192.168.2.65 with 32 bytes of data:

Request timed out.
Request timed out.
```

Figure 6: Ping R0 on network Y from PC0

2.6 Ping R1 on network Z from PC0

Same as previous : It doesn't work ! Which is normal since they are not on the same network and we haven't configured static routing.


```
C:\>ping 192.168.2.97

Pinging 192.168.2.97 with 32 bytes of data:

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

Ping statistics for 192.168.2.97:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

Figure 7: Ping R1 on network Z from PC0

2.7 Static Routing : Configuration of routers

In order to achieve a way for network X to communicate with network Z we need to configure the routers to redirect the information. We are signaling a router that if the information is destined for another subnet it should reroute it a certain way.

If in the network X we want to ping something on network Z, we need to say to R0 that everything in the subnet Z (ip : 192.168.2.96, netmask : 255.255.255.224) will need to pass by R1 address on network Y (192.168.2.66) :

```
ip route 192.168.2.96 255.255.255.224 192.168.2.66
```

In the same way: if in the network Z we want to ping something on network X, we need to say to R1 that everything in the subnet X (ip : 192.168.2.32, netmask : 255.255.255.224) will need to pass by R0 address on network Y (192.168.2.65) :

```
ip route 192.168.2.32 255.255.255.224 192.168.2.65
```

2.8 Static Routing : Pings

2.8.1 PC0 pinging PC1

```
C:\>ping 192.168.2.98

Pinging 192.168.2.98 with 32 bytes of data:

Reply from 192.168.2.98: bytes=32 time=2ms TTL=126
Reply from 192.168.2.98: bytes=32 time=2ms TTL=126
Reply from 192.168.2.98: bytes=32 time=1ms TTL=126
Reply from 192.168.2.98: bytes=32 time=2ms TTL=126

Ping statistics for 192.168.2.98:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 2ms, Average = 1ms
```

Figure 8: PC0 -> PC1

2.8.2 PC1 pinging PC0

```
C:\>ping 192.168.2.34

Pinging 192.168.2.34 with 32 bytes of data:

Reply from 192.168.2.34: bytes=32 time=1ms TTL=126
Reply from 192.168.2.34: bytes=32 time=1ms TTL=126
Reply from 192.168.2.34: bytes=32 time=1ms TTL=126
Reply from 192.168.2.34: bytes=32 time=1ms TTL=126

Ping statistics for 192.168.2.34:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 1ms, Average = 1ms
```

Figure 9: PC1 -> PC0

3 Network Extension

3.1 Fifth subnet

This fifth subnet use the next possible network available which is : 192.168.2.128 255.255.255.224, also written 192.168.2.128/27.

3.2 Configuration

- R0, FastEthernet 1/0 :
 - IP : 192.168.2.129
 - Netmask : 255.255.255.224
- PC2, FastEthernet 0 :
 - IP : 192.168.2.130
 - Netmask : 255.255.255.224
 - Default Gateway : 192.168.2.129
- PC3, FastEthernet 0 :
 - IP : 192.168.2.129
 - Netmask : 255.255.255.224
 - Default Gateway : 192.168.2.129

3.3 Ping PC0 from PC2

It works ! Which is normal since we are pinging a sub-network on the same router.

```

C:\>ping 192.168.2.34

Pinging 192.168.2.34 with 32 bytes of data:

Reply from 192.168.2.34: bytes=32 time<1ms TTL=127
Reply from 192.168.2.34: bytes=32 time<1ms TTL=127
Reply from 192.168.2.34: bytes=32 time=1ms TTL=127
Reply from 192.168.2.34: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.2.34:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

```

Figure 10: PC2 -> PC0

3.4 Updating the routing table

If right now we try to ping between PC1 and PC2 or PC3, we have a problem :

```

C:\>ping 192.168.2.130

Pinging 192.168.2.130 with 32 bytes of data:

Reply from 192.168.2.97: Destination host unreachable.
Reply from 192.168.2.97: Destination host unreachable.
Reply from 192.168.2.97: Destination host unreachable.
Request timed out.

Ping statistics for 192.168.2.130:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

```

Figure 11: Before Update

In order to be able to ping from the network Z to the fifth network we need to configure the router 1. We will add a static route setting that every information that needs to go to the fifth sub-network with ip : 192.168.2.128, and netmask : 255.255.255.224 (192.168.2.128/27) needs to be retouted to router 0 on network Y (192.168.2.65).

We write : ip route 192.168.2.128 255.255.255.224 192.168.2.65

3.5 PC1 pinging PC3

It works ! Which is normal since we have added a static route to R1.

```
C:\>ping 192.168.2.131

Pinging 192.168.2.131 with 32 bytes of data:

Request timed out.
Reply from 192.168.2.131: bytes=32 time=1ms TTL=126
Reply from 192.168.2.131: bytes=32 time=2ms TTL=126
Reply from 192.168.2.131: bytes=32 time=1ms TTL=126

Ping statistics for 192.168.2.131:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 2ms, Average = 1ms
```

Figure 12: PC1 -> PC3