Guru Gobind Singh Indraprastha University

University School of Information,Communication and Technology

MAJOR PROJECT REPORT

Designing and configuring a medium level enterprise network having DHCP for each site and executives will get same IP address irrespective of site with the help of CISCO packet tracer.

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Course : B-Tech (ECE) 4th Yr.

ACKNOWLEDGEMENT

The success and final outcome of this project required a lot of guidance and assistance from our mentor and I am extremely privileged to have got this all along the completion of my project.
All that I have done is only due to such supervision and assistance I would not forget to thank her.
I am also grateful to entire faculty for their guidance and help throughout my project. It is not without their help I could have been able to complete my project report. I would like to express my deep satisfaction and gratitude for their support for their kind help extended during the entire period of semester.

I respect and thank **Prof. Udayan Ghose**, Professor of USICT for providing me an opportunity to do the project work by giving us all support and guidance.
GUIDE's SIGNATURE:

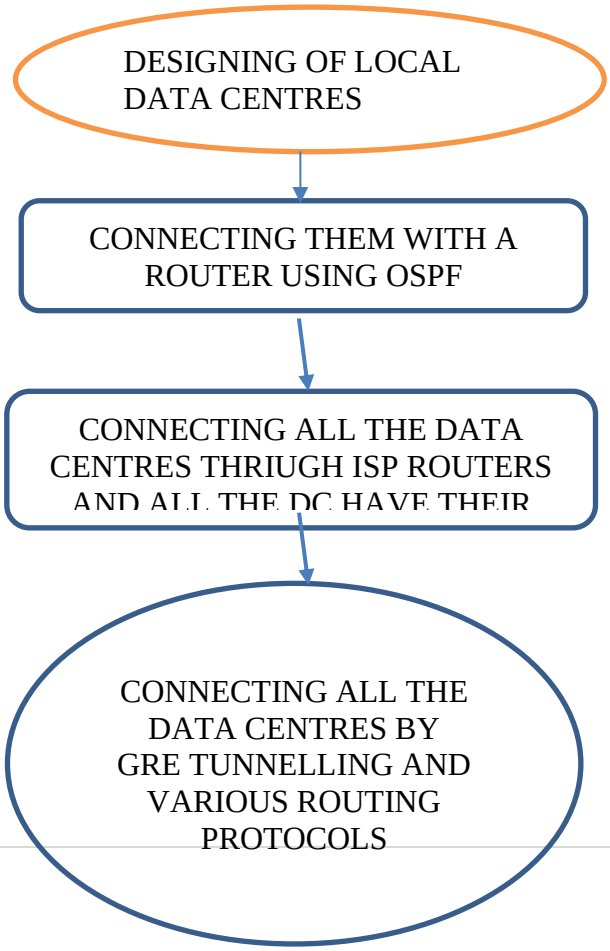
INDEX

TOPIC:- Designing and configuring a medium level enterprise network with the help of CISCO packet tracer. Designing and configuring a medium level enterprise network having DHCP for each site and executives will get same IP address irrespective of site with the help of CISCO packet tracer.

REALIZATION:-In this project we are going to design and configure a medium level enterprise network which will have 4 sites/Data centres. Users belonging to different departments like HR/management/executives/production/sales,they are connected through **GRE,**GRE will run over ISP network having DHCP for each site.

REALIZING MEDIUM:- Cisco packet tracer.

FLOW CHART



WHAT IS GRE?

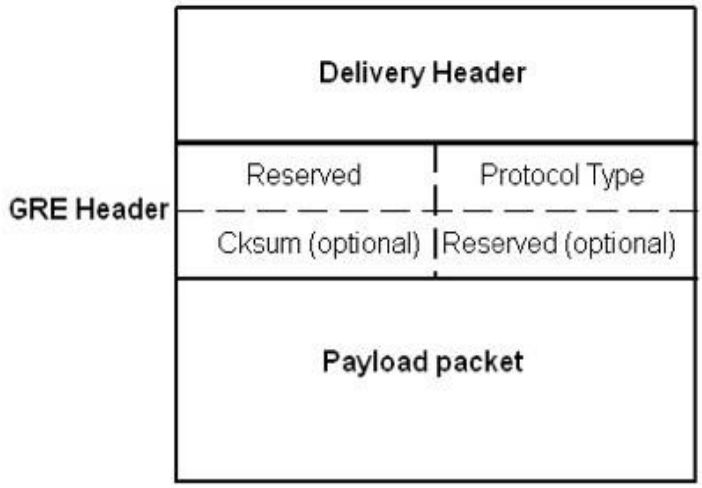
A number of different proposals [RFC 1234, RFC 1226] currently exist for the encapsulation of one protocol over another protocol. Other types of encapsulations [RFC 1241, SDRP, RFC 1479] have been proposed for transporting IP over IP for policy purposes. This memo describes a protocol which is very similar to, but is more general than, the above proposals. In attempting to be more general, many protocol specific nuances have been ignored. The result is that this proposal is may be less suitable for a situation where a specific "X over Y" encapsulation has been described. It is the attempt of this protocol to provide a simple, general purpose mechanism which is reduces the problem of encapsulation from its current O(n^2) problem to a more manageable state. This proposal also attempts to provide a lightweight encapsulation for use in policy based routing. This memo explicitly does not address the issue of when a packet should be encapsulated. This memo acknowledges, but does not address problems with mutual encapsulation [RFC 1326]. In the most general case, a system has a packet that needs to be encapsulated and routed. We will call this the payload packet. The payload is first encapsulated in a GRE packet, which possibly also includes a route. The resulting GRE packet can then be encapsulated in some other protocol and then forwarded. We will call this outer protocol the delivery protocol. The algorithms for processing this packet are discussed later.

Overall packet

The entire encapsulated packet would then have the form:

Generic Routing Encapsulation (GRE)

- Structure of a GRE encapsulated packet

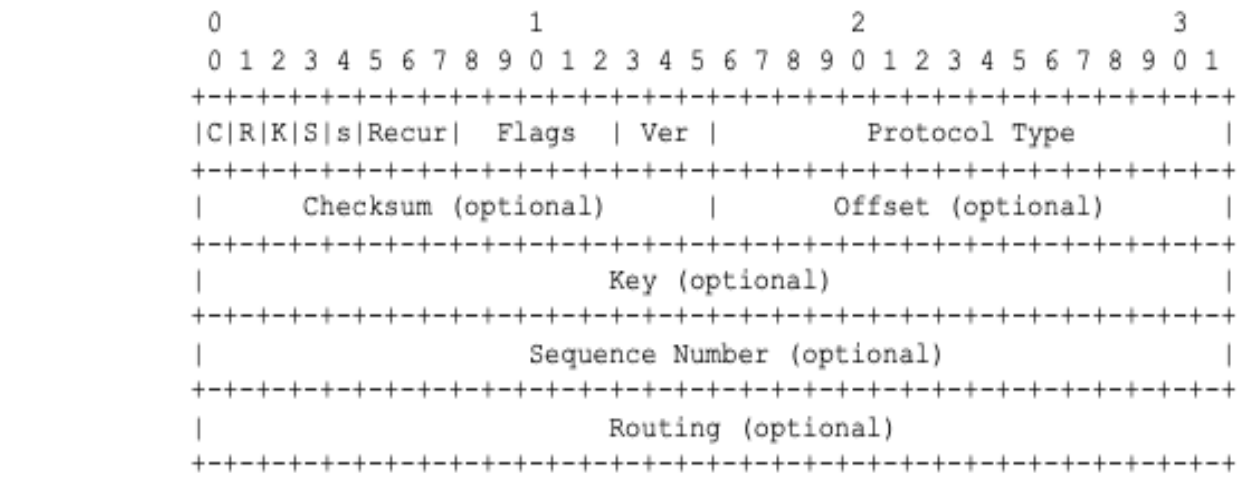


Packet header

The GRE packet header has the form:

Packet header

The GRE packet header has the form:



Flags and version (2 octets)

The GRE flags are encoded in the first two octets. Bit 0 is the most significant bit, bit 15 is the least significant bit. Bits 13 through 15 are reserved for the Version field. Bits 5 through 12 are reserved for future use and MUST be transmitted as zero.

Checksum Present (bit 0)

If the Checksum Present bit is set to 1, then the Checksum field is present and contains valid information. If either the Checksum Present bit or the Routing Present bit are set, BOTH the Checksum and Offset fields are present in the GRE packet.

Routing Present (bit 1) If the Routing Present bit is set to 1, then it indicates that the Offset and Routing fields are present and contain valid information. If either the Checksum Present bit or the Routing Present bit are set, BOTH the Checksum and Offset fields are present in the GRE packet.

Key Present (bit 2) If the Key Present bit is set to 1, then it indicates that the Key field is present in the GRE header. Otherwise, the Key field is not present in the GRE header.

Sequence Number Present (bit 3) If the Sequence Number Present bit is set to 1, then it indicates that the Sequence Number field is present. Otherwise, the Sequence Number field is not present in the GRE header.

Strict Source Route (bit 4) The meaning of the Strict Source route bit is defined in other documents. It is recommended that this bit only be set to 1 if all of the the Routing Information consists of Strict Source Routes.

Recursion Control (bits 5-7) Recursion control contains a three bit unsigned integer which contains the number of additional encapsulations which are permissible. This SHOULD default to zero.

Version Number (bits 13-15) The Version Number field MUST contain the value 0. Other values are outside of the

scope of this document.

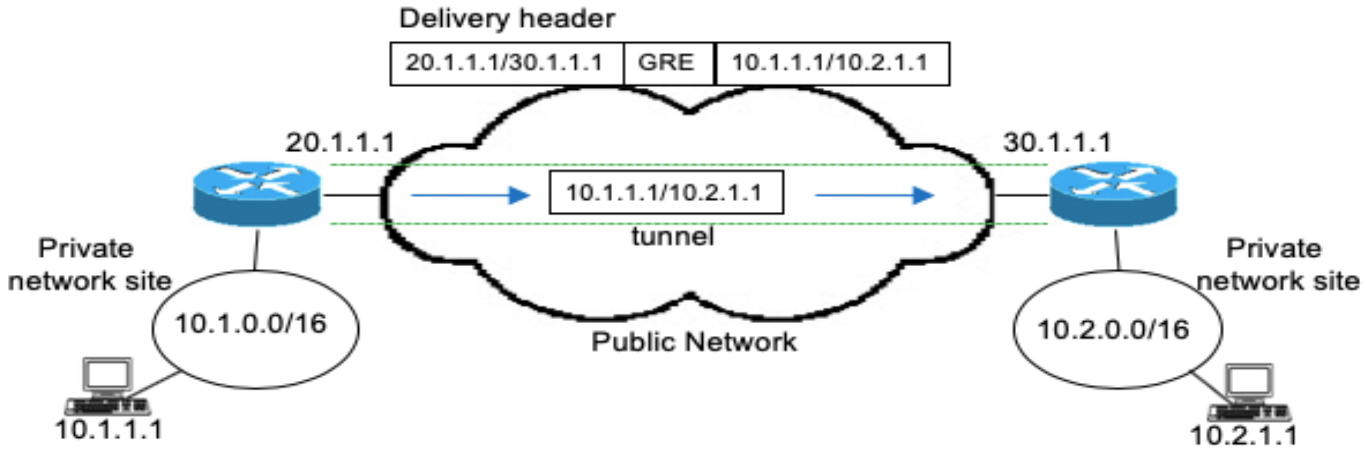
Current List of Protocol Types The following are currently assigned protocol types for GRE. Future protocol types must be taken from DIX ethernet encoding. For historical reasons, a number of other values have been used for some protocols. The following table of values MUST be used to identify the following protocols:

Protocol Family	PTYPE
Reserved	0000
SNA	0004
OSI network layer	00FE
PUP	0200
XNS	0600
IP	0800
Chaos	0804
RFC 826 ARP	0806
Frame Relay ARP	0808
VINES	0BAD
VINES Echo	0BAE
VINES Loopback	0BAF
DECnet (Phase IV)	6003
Transparent Ethernet Bridging	6558
Raw Frame Relay	6559
Apollo Domain	8019
Ethertalk (Appletalk)	809B
Novell IPX	8137
RFC 1144 TCP/IP compression	876B
IP Autonomous Systems	876C
Secure Data	876D
Reserved	FFFF

HOW DOES IT WORK?

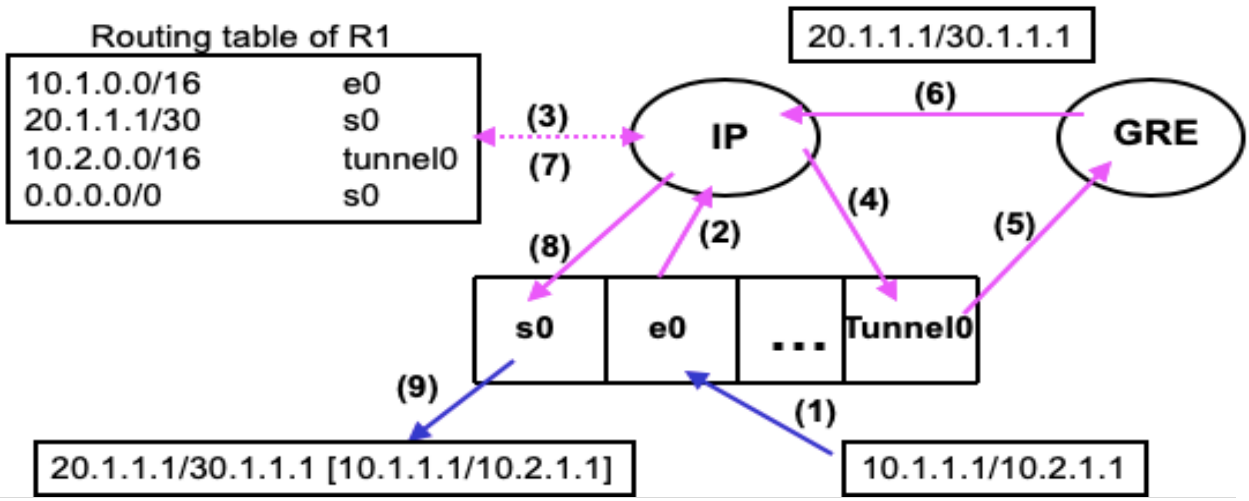
Generic Routing Encapsulation (GRE)

- Tunneling
  - Encapsulation with delivery header
  - The addresses in the delivery header are the addresses of the head-end and the tail-end of the tunnel



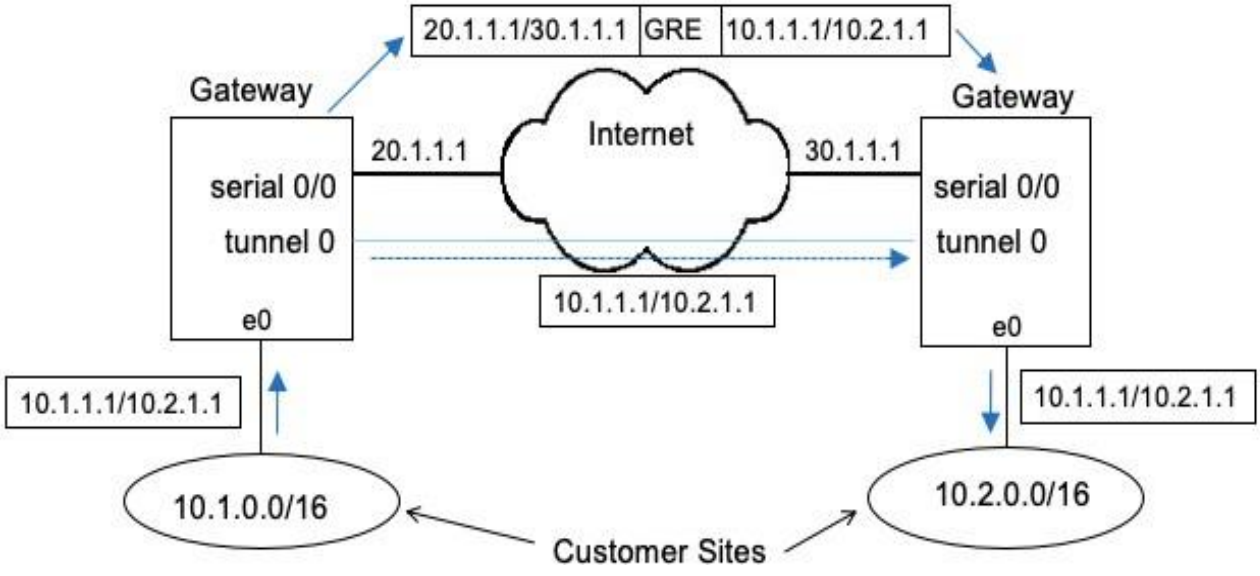
Generic Routing Encapsulation (GRE)

- Tunneling mechanism at IP
  - Outbound traffic



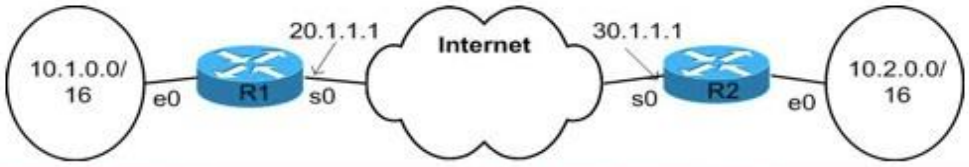
Generic Routing Encapsulation (GRE)

- IP access of the tunnel through the tunnel interface



Generic Routing Encapsulation (GRE)

- Example




```
interface tunnel0
  ip unnumbered s0
  tunnel source s0
  tunnel destination 30.1.1.1
!
ip route 10.2.0.0 255.255.0.0 tunnel0
```

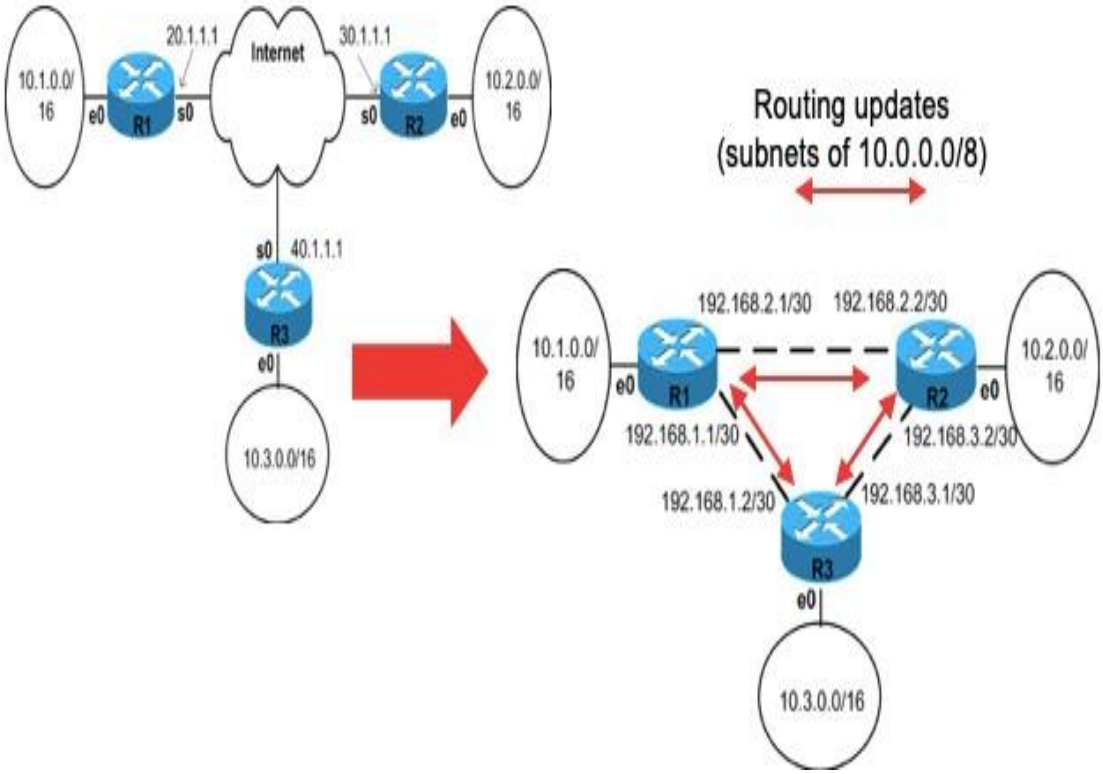
```
interface tunnel0
  ip unnumbered s0
  tunnel source s0
  tunnel destination 20.1.1.1
!
ip route 10.1.0.0 255.255.0.0 tunnel0
```

Routing table of R1

10.1.0.0/16	e0
20.1.1.1/30	s0
10.2.0.0/16	tunnel0
0.0.0.0/0	s0

Generic Routing Encapsulation (GRE)

- GRE tunneling with routing



WHY GRE?

Generic Routing Encapsulation (GRE), defined by RFC 2784, is a simple IP packet encapsulation protocol. ***GRE** is used when IP packets need to be sent from one network to another, without being parsed or treated like IP packets by any intervening routers.*

For example, in Mobile IP, a mobile node registers with a Home Agent. When the mobile node roams to a new network, it registers with a Foreign Agent there. Whenever IP packets addressed to the mobile node are received by the Home Agent, they can be relayed over a GRE tunnel to the Foreign Agent for delivery. It does not matter how the Home Agent and Foreign Agent communicate with each other -- hops in between just pass along the GRE packet. Only the GRE tunnel endpoints -- the two Agents -- actually route the encapsulated IP packet.

Use GRE where IP tunneling without privacy is required -- it's simpler and thus faster. But, use IPsec ESP where IP tunneling *and* data privacy are required -- it provides security features that are not even attempted by GRE.

GRE can carry other routed protocols as well as IP packets in an IP network while IPSec cannot.

REALIZATION

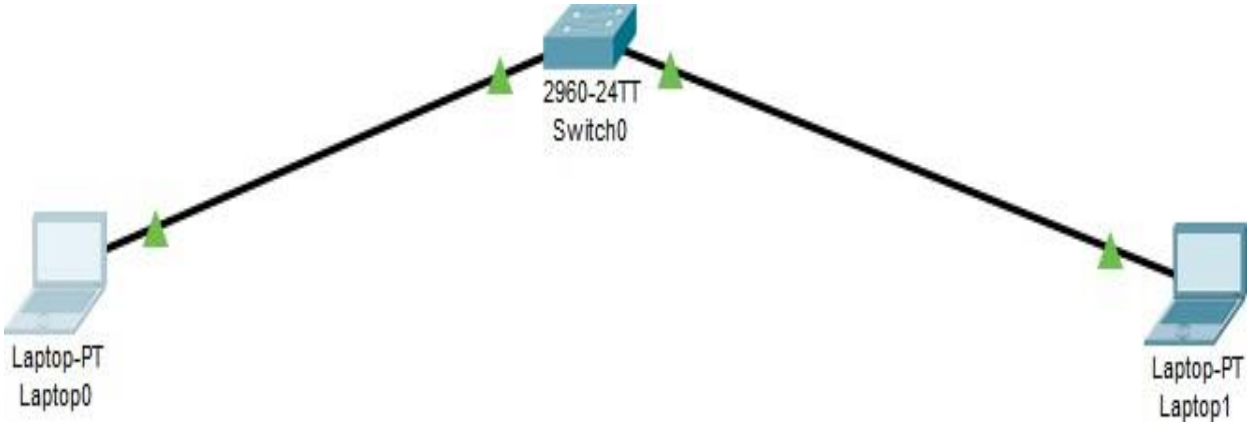
##1. Configuring a Switched Ethernet layer LAN(Exemplar:-For iternal vlan configuration)

Code :

IP ADDRESS GIVEN TO PC
1 IS 192.168.1.1 IP ADDRESS
GIVEN TO PC 2 IS
192.168.1.2

```
Switch>enable
Switch#configure
terminal
Enter configuration commands, one per
line. End with CNTL/Z.
Switch(config)#vlan 2
Switch(config-vlan)#name
SURAJ Switch(config-
vlan)#exit
Switch(config)#interface fa
0/1 Switch(config-
if)#switchport access vlan 2
Switch(config-if)#exit
Switch(config)#interface fa
0/2 Switch(config-
if)#switchport access vlan 2
Switch(config-if)#exit
Switch(config)#
```

OUTPUT



Laptop0

Physical Config Desktop Programming Attributes

Command Prompt

```
Packet Tracer PC Command Line 1.0
C:\>ping 192.168.1.2

Pinging 192.168.1.2 with 32 bytes of data:

Reply from 192.168.1.2: bytes=32 time=1ms TTL=128
Reply from 192.168.1.2: bytes=32 time<1ms TTL=128
Reply from 192.168.1.2: bytes=32 time<1ms TTL=128
Reply from 192.168.1.2: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.1.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>
```

Top

##2.Configuring internal architecture of network(Data centre)

Code :

```
Router 1 config
!
interface FastEthernet0/0
 ip address 192.168.1.2 255.255.255.0
 duple
 x
 auto
 speed
 auto
!
interface FastEthernet0/1
 ip address 192.168.2.2 255.255.255.0
 duple
 x
 auto
 speed
 auto
!
interface
 FastEthernet0/1
 /0 switchport
 mode access
!
interface
 FastEthernet0/1
 /1 switchport
 mode access
!
interface
 FastEthernet0/1
```

```
 /2 switchport
 mode access
!
interface
 FastEthernet0/1
 /3 switchport
 mode access
!
interface
 FastEthernet0/3
 /0 switchport
 mode access
!
interface
 FastEthernet0/3
 /1 switchport
 mode access
!
interface
 FastEthernet0/3
 /2 switchport
 mode access
!
interface
 FastEthernet0/3
 /3 switchport
 mode access
!
interface FastEthernet1/0
 ip address 192.168.3.2 255.255.255.0
 duple
 x
 auto
 speed
 auto
```

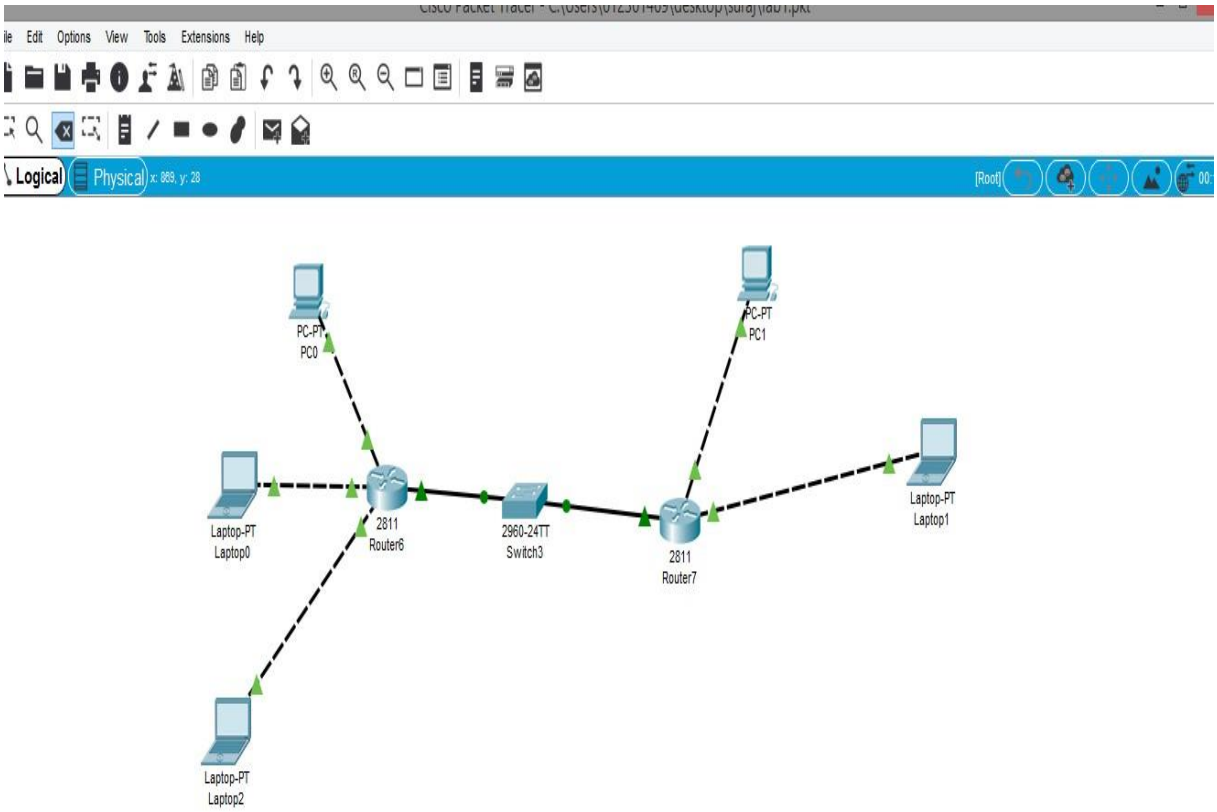
```
!
interface FastEthernet1/1
 ip address 192.168.0.1 255.255.255.0
 duple
 x
 auto
 speed
 auto
!
interfac
 e
 Vlan1
 no ip
 address
 shutdo
 wn
!
End
```

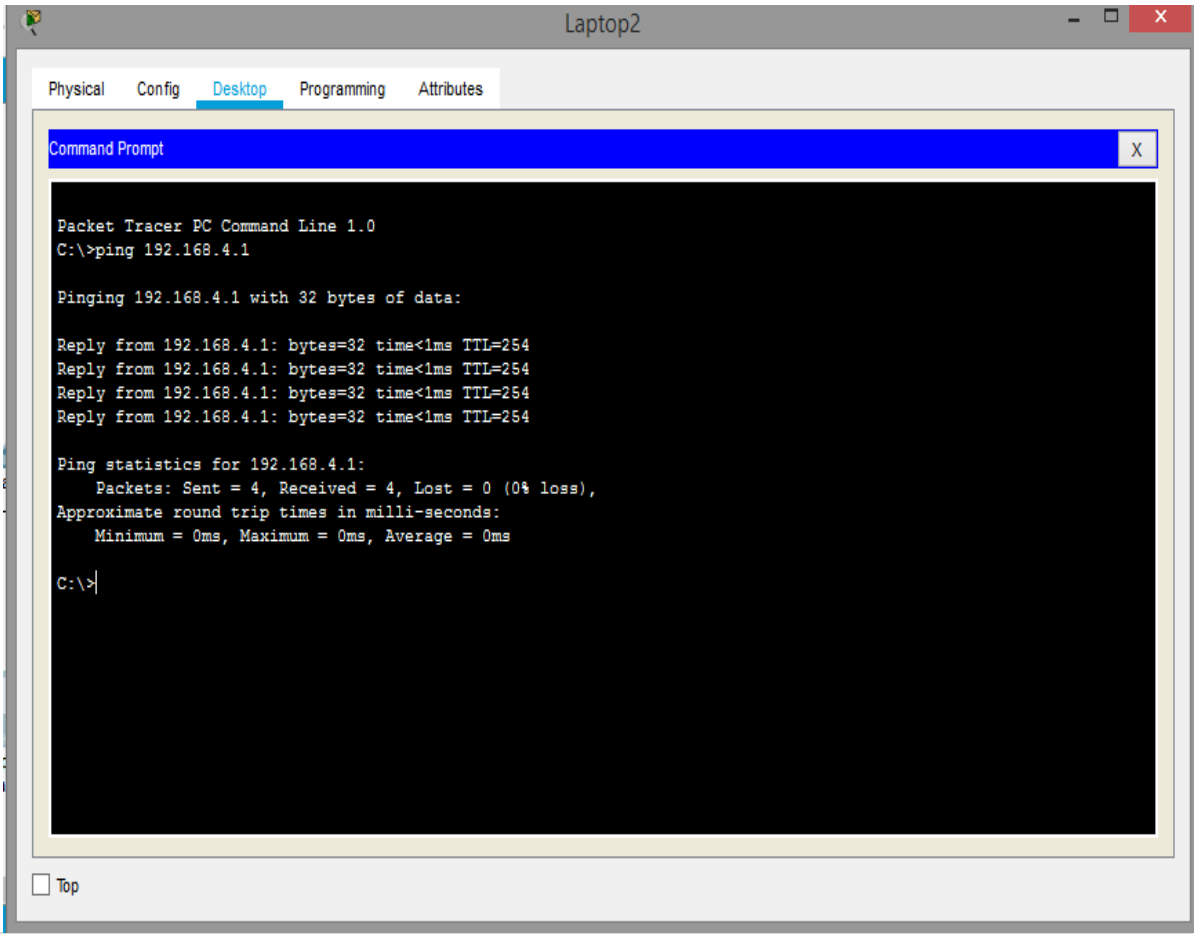
Router 2 configuration

```
hostname Router
!
interface
FastEthernet0/0
 ip address 192.168.0.2 255.255.255.0
 duple
 x auto
 speed
 auto
!
interface FastEthernet0/1
 ip address 192.168.5.1 255.255.255.0
 duple
 x auto
 speed
 auto
!
interface FastEthernet1/0
 ip address 192.168.4.1 255.255.255.0
 duple
 x auto
 speed
 auto
!
interface
 FastEthernet1/
 1 no ip address
 duple
 x  auto
 speed
 auto
 shutd
```

```
 own
!
interface
 Vlan1
 no ip
 address
 shutdo
 wn
!
ip classless
ip route 0.0.0.0 0.0.0.0 192.168.0.1
!
ip flow-export
version 9 line
con 0
!
line aux 0
!
line
 vty 0
 4
 login
!
End
```

OUTPUT


File Edit Options View Tools Extensions Help
Logical
Physical
PC-PT PC0
PC-PT PC1
Laptop-PT Laptop0
2811 Router6
2960-24TT Switch3
2811 Router7
Laptop-PT Laptop1
Laptop-PT Laptop2


Laptop2
Physical
Config
Desktop
Programming
Attributes
Command Prompt
Packet Tracer PC Command Line 1.0
C:\>ping 192.168.4.1
Pinging 192.168.4.1 with 32 bytes of data:
Reply from 192.168.4.1: bytes=32 time<1ms TTL=254
Reply from 192.168.4.1: bytes=32 time<1ms TTL=254
Reply from 192.168.4.1: bytes=32 time<1ms TTL=254
Reply from 192.168.4.1: bytes=32 time<1ms TTL=254
Ping statistics for 192.168.4.1:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 0ms, Average = 0ms
C:\>
Top

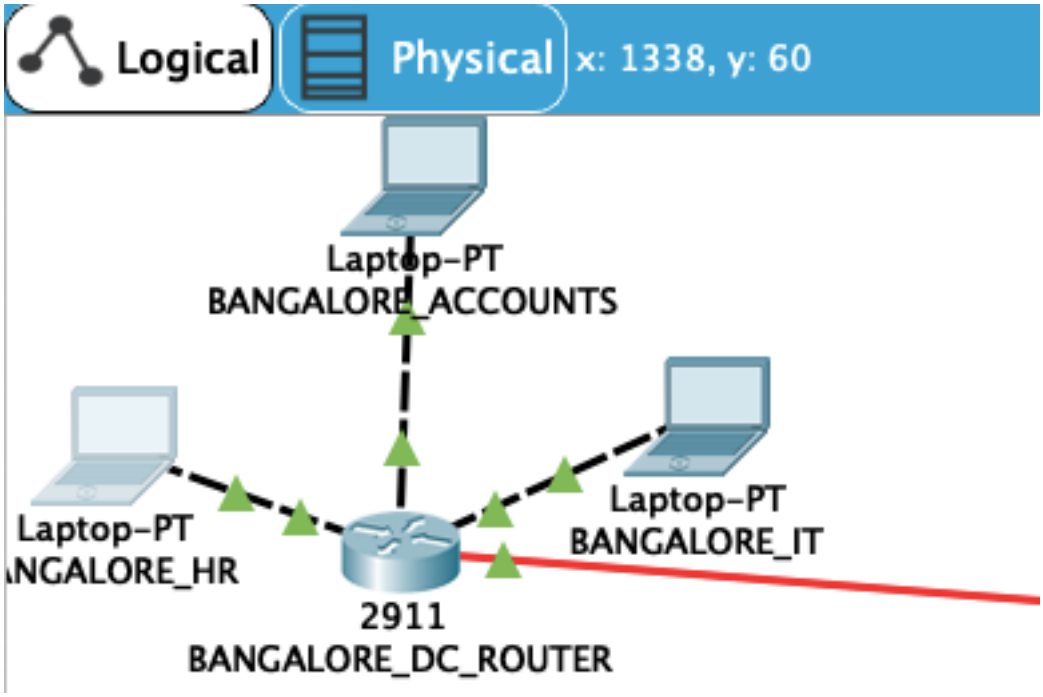
(ABOVE STEP IS REPEATED FOUR TIMES FOR FOUR DATA CENTRES.)

##3. GRE AND INTERNAL ROUTING CONFIGURATIONS.

Here we are going to configure unencrypted point-to-point GRE tunnel and verify that network traffic is using the tunnel, we are also configuring the OSPF routing protocol inside the GRE VPN tunnel, the GRE tunnel is between Router1 and Router2 routers in OSPF area 0, the ISP has no knowledge of the GRE tunnel, communication between the Router1 and Router2 routers and the ISP is accomplished using default static routes.

Now configuring the interfaces IP addresses on the routers.

(BANGALORE DATA CENTRE)



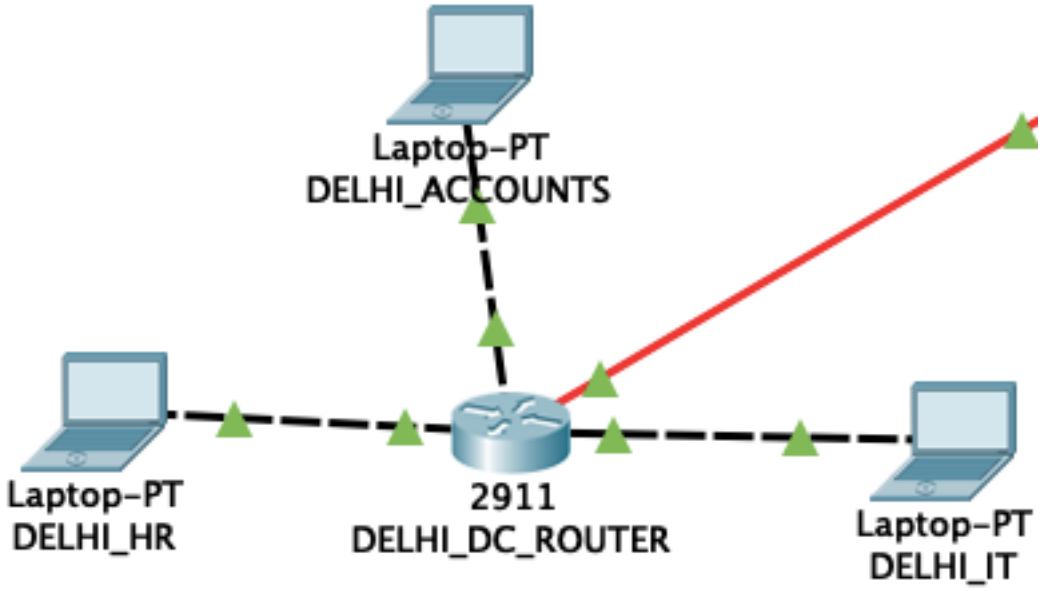
BANGALORE LOCAL ROUTER

```
hostname Router
!
interface Tunnel0
ip address 192.168.1.1 255.255.255.0
mtu 1476
tunnel source GigabitEthernet0/3/0
tunnel destination 10.2.1.1
!
!
interface Tunnel1
ip address 192.168.2.1 255.255.255.0
mtu 1476
tunnel source GigabitEthernet0/3/0
tunnel destination 10.2.2.1
```

```
!
!
interface Tunnel2
ip address 192.168.3.1 255.255.255.0
mtu 1476
tunnel source GigabitEthernet0/3/0
tunnel destination 10.2.3.1
!
!
interface GigabitEthernet0/0
ip address 10.1.0.1 255.255.255.0
duplex auto
speed auto
!
interface GigabitEthernet0/1
ip address 10.1.2.1 255.255.255.0
duplex auto
speed auto
!
interface GigabitEthernet0/2
ip address 10.1.1.1 255.255.255.0
duplex auto
speed auto
!
interface GigabitEthernet0/3/0
ip address 10.2.0.1 255.255.255.0
!
interface Vlan1
no ip address
shutdown
!
router ospf 1
log-adjacency-changes
```

```
network 10.1.0.0 0.0.0.255 area 0
network 10.1.1.0 0.0.0.255 area 0
network 10.1.2.0 0.0.0.255 area 0
!
router rip
network 10.0.0.0
no auto-summary
end
```

(DELHI DATA CENTRE)



DELHI LOCAL ROUTER

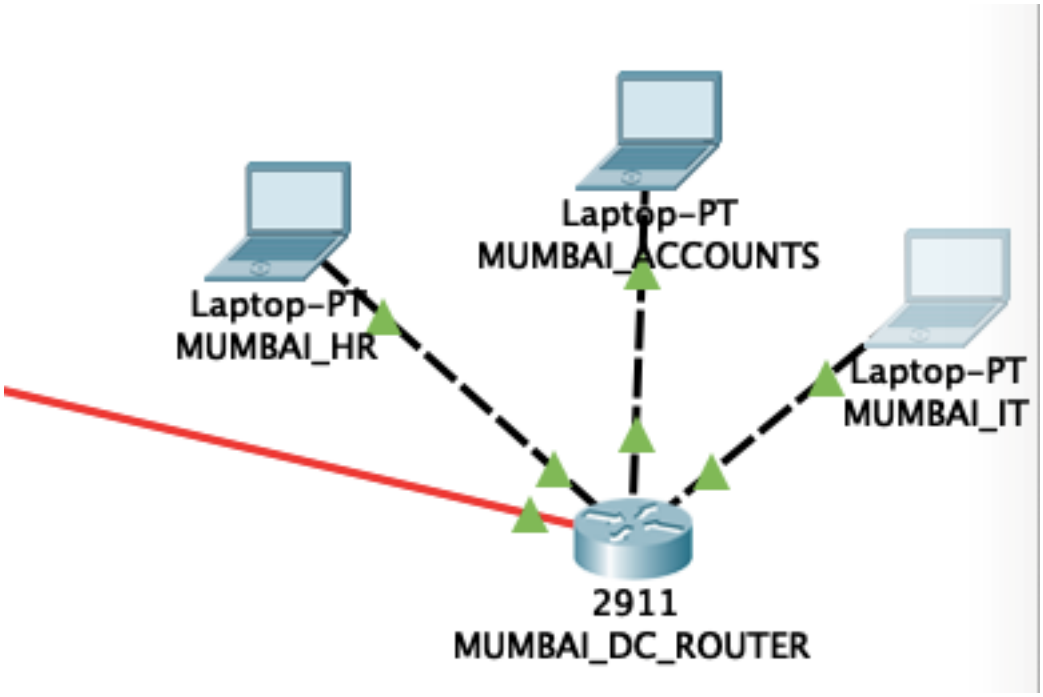
```
Building configuration...

hostname Router
!
interface Tunnel0
ip address 192.168.1.1 255.255.255.0
mtu 1476
tunnel source GigabitEthernet0/3/0
tunnel destination 10.2.1.1
!
interface Tunnel1
ip address 192.168.2.1 255.255.255.0
mtu 1476
tunnel source GigabitEthernet0/3/0
tunnel destination 10.2.2.1
!
```

```
interface Tunnel2
ip address 192.168.3.1 255.255.255.0
mtu 1476
tunnel source GigabitEthernet0/3/0
tunnel destination 10.2.3.1
!
interface GigabitEthernet0/0
ip address 10.1.0.1 255.255.255.0
duplex auto
speed auto
!
interface GigabitEthernet0/1
ip address 10.1.2.1 255.255.255.0
duplex auto
speed auto
!
interface GigabitEthernet0/2
ip address 10.1.1.1 255.255.255.0
duplex auto
speed auto
!
interface GigabitEthernet0/3/0
ip address 10.2.0.1 255.255.255.0
!
interface Vlan1
no ip address
shutdown
!
router ospf 1
log-adjacency-changes
network 10.1.0.0 0.0.0.255 area 0
network 10.1.1.0 0.0.0.255 area 0
network 10.1.2.0 0.0.0.255 area 0
```

```
!
router rip
network 10.0.0.0
no auto-summary
end
```

(MUMBAI DATA CENTRE)

IP ADDRESSES GIVEN IN MUMBAI DATA CENTRE



MUMBAI LOCAL ROUTER

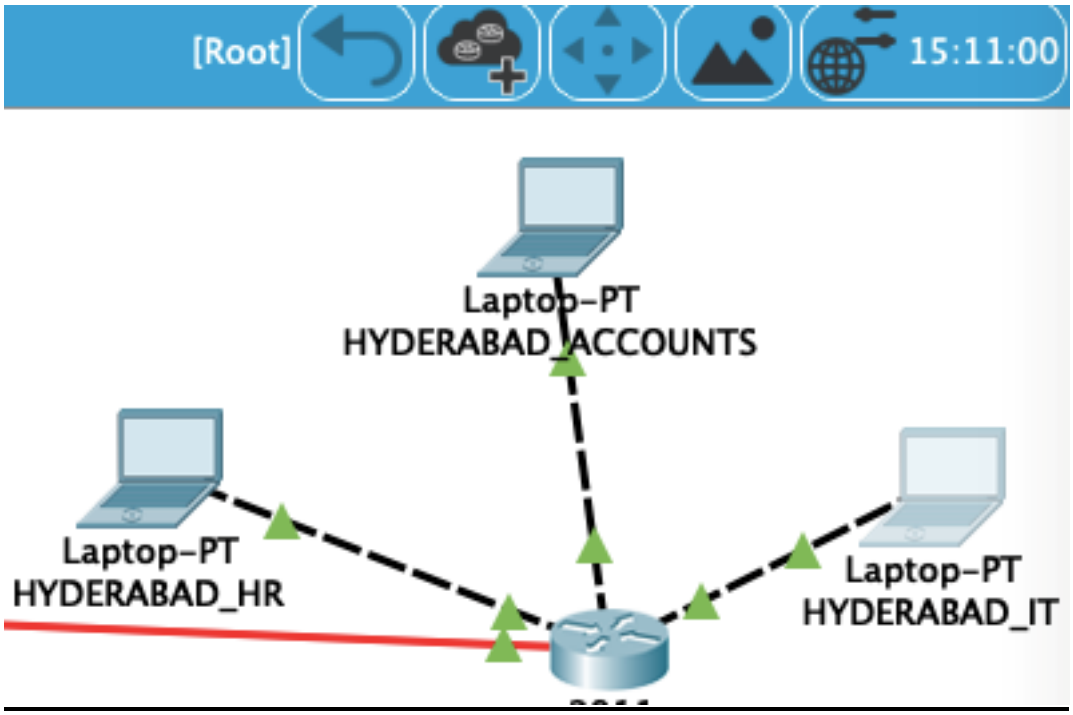
```
Building configuration...

interface Tunnel6
ip address 192.168.7.1 255.255.255.0
mtu 1476
tunnel source GigabitEthernet0/3/0
tunnel destination 10.2.0.1
!
```

```
interface Tunnel7
ip address 192.168.8.1 255.255.255.0
mtu 1476
tunnel source GigabitEthernet0/3/0
tunnel destination 10.2.1.1
!
interface Tunnel8
ip address 192.168.9.1 255.255.255.0
mtu 1476
tunnel source GigabitEthernet0/3/0
tunnel destination 10.2.3.1
!
interface GigabitEthernet0/0
ip address 10.1.9.1 255.255.255.0
duplex auto
speed auto
!
interface GigabitEthernet0/1
ip address 10.1.10.1 255.255.255.0
duplex auto
speed auto
!
interface GigabitEthernet0/2
ip address 10.1.11.1 255.255.255.0
duplex auto
speed auto
!
interface GigabitEthernet0/3/0
ip address 10.2.2.1 255.255.255.0
!
interface Vlan1
no ip address
shutdown
```

```
!
router ospf 1
log-adjacency-changes
network 10.1.0.0 0.0.0.255 area 0
network 10.1.1.0 0.0.0.255 area 0
network 10.1.2.0 0.0.0.255 area 0
network 10.1.9.0 0.0.0.255 area 0
network 10.1.10.0 0.0.0.255 area 0
network 10.1.11.0 0.0.0.255 area 0
!
router rip
network 10.0.0.0
no auto-summary
!
ip classless
!
ip flow-export version 9
!
line con 0
!
line aux 0
!
line vty 0 4
login
end


Router#
```

(HYDERABAD DATA CENTRE)

IP ADDRESSES GIVEN IN HYDERABAD DATA CENTRE



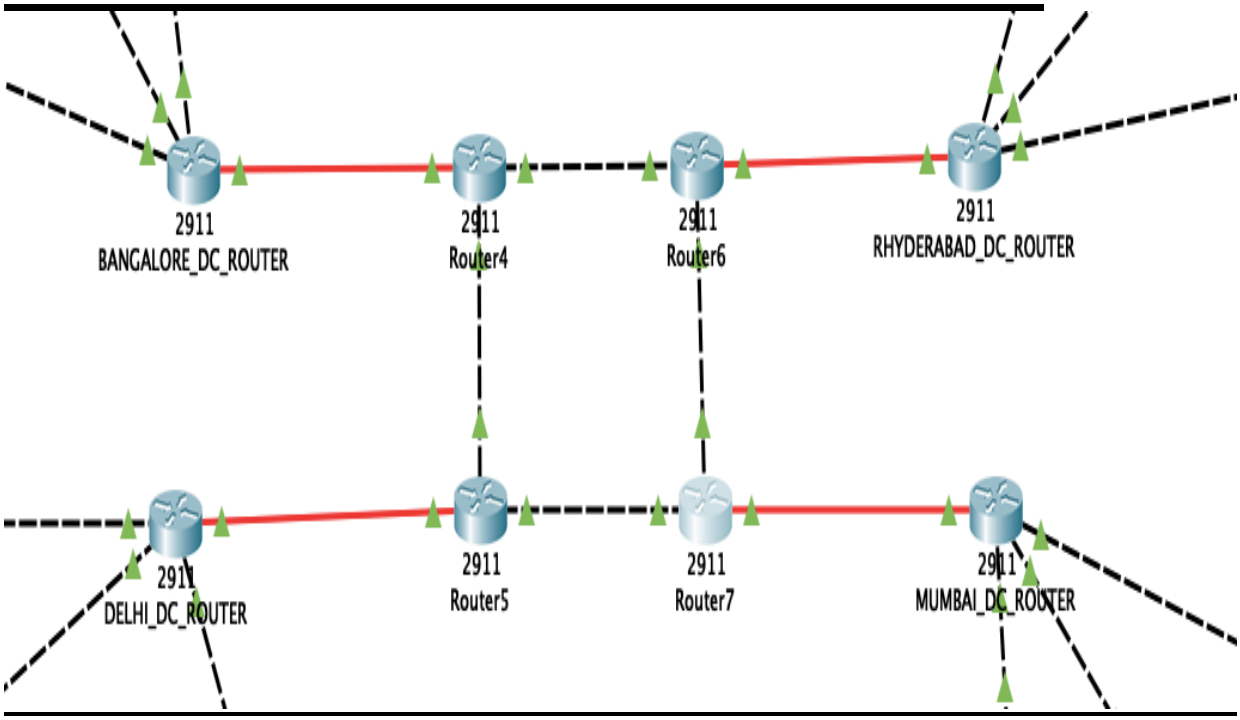
HYDERABAD LOCAL ROUTER

```
Building configuration...

interface Tunnel9
ip address 192.168.10.1 255.255.255.0
mtu 1476
tunnel source GigabitEthernet0/3/0
tunnel destination 10.2.0.1
!
interface Tunnel10
ip address 192.168.11.1 255.255.255.0
mtu 1476
tunnel source GigabitEthernet0/3/0
tunnel destination 10.2.1.1
!
interface Tunnel11
ip address 192.168.12.1 255.255.255.0
mtu 1476
tunnel source GigabitEthernet0/3/0
```

```
tunnel destination 10.2.2.1
!
interface GigabitEthernet0/0
ip address 10.1.6.1 255.255.255.0
duplex auto
speed auto
!
interface GigabitEthernet0/1
ip address 10.1.7.1 255.255.255.0
duplex auto
speed auto
!
interface GigabitEthernet0/2
ip address 10.1.8.1 255.255.255.0
duplex auto
speed auto
!
interface GigabitEthernet0/3/0
ip address 10.2.3.1 255.255.255.0
!
interface Vlan1
no ip address
shutdown
!
router ospf 1
log-adjacency-changes
network 10.1.6.0 0.0.0.255 area 0
network 10.1.7.0 0.0.0.255 area 0
network 10.1.8.0 0.0.0.255 area 0
!
router rip
network 10.0.0.0
no auto-summary
```

```
!

Router#
```

ISP NETWORK IS VISUALISED AS



ISP_BANGALORE_ROUTER

```
Building configuration...

interface Tunnel9
ip address 192.168.10.1 255.255.255.0
mtu 1476
```

```
tunnel source GigabitEthernet0/3/0
tunnel destination 10.2.0.1
!
interface Tunnel10
ip address 192.168.11.1 255.255.255.0
mtu 1476
tunnel source GigabitEthernet0/3/0
tunnel destination 10.2.1.1
!
interface Tunnel11
ip address 192.168.12.1 255.255.255.0
mtu 1476
tunnel source GigabitEthernet0/3/0
tunnel destination 10.2.2.1
!
interface GigabitEthernet0/0
ip address 10.1.6.1 255.255.255.0
duplex auto
speed auto
!
interface GigabitEthernet0/1
ip address 10.1.7.1 255.255.255.0
duplex auto
speed auto
!
interface GigabitEthernet0/2
ip address 10.1.8.1 255.255.255.0
duplex auto
speed auto
!
interface GigabitEthernet0/3/0
ip address 10.2.3.1 255.255.255.0
!
```

```
interface Vlan1
no ip address
shutdown
!
router ospf 1
log-adjacency-changes
network 10.1.6.0 0.0.0.255 area 0
network 10.1.7.0 0.0.0.255 area 0
network 10.1.8.0 0.0.0.255 area 0
!
router rip
network 10.0.0.0
no auto-summary
!
```

ISP_DELHI_ROUTER

```
Building configuration...

Current configuration : 830 bytes
hostname Router
interface GigabitEthernet0/0
ip address 10.2.4.2 255.255.255.0
duplex auto
speed auto
!
interface GigabitEthernet0/1
ip address 10.2.6.1 255.255.255.0
duplex auto
speed auto
!
interface GigabitEthernet0/2
no ip address
```

```
duplex auto
speed auto
shutdown
!
interface GigabitEthernet0/3/0
ip address 10.2.1.2 255.255.255.0
!
interface Vlan1
no ip address
shutdown
!
router rip
network 10.0.0.0
no auto-summary
!
end

Router#
```

ISP_MUMBAI_ROUTER

```
Building configuration...

interface GigabitEthernet0/0
ip address 10.2.6.2 255.255.255.0
duplex auto
speed auto
!
interface GigabitEthernet0/1
ip address 10.2.7.1 255.255.255.0
duplex auto
speed auto
!
interface GigabitEthernet0/2
```

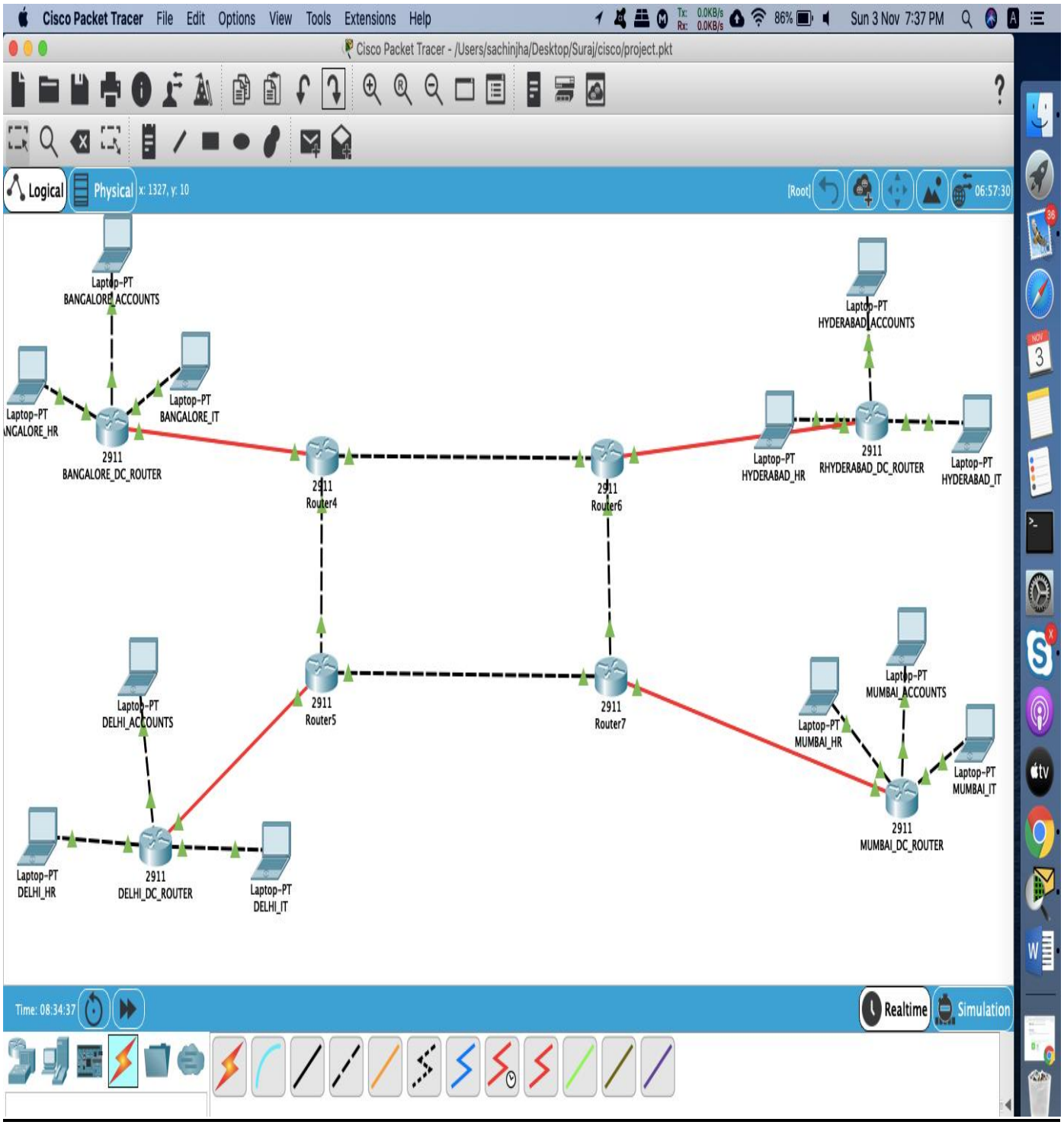
```
no ip address
duplex auto
speed auto
shutdown
!
interface GigabitEthernet0/3/0
ip address 10.2.2.2 255.255.255.0
!
interface Vlan1
no ip address
shutdown
!
router rip
network 10.0.0.0
!
end


Router#
```

ISP_HYDERABAD_ROUTER

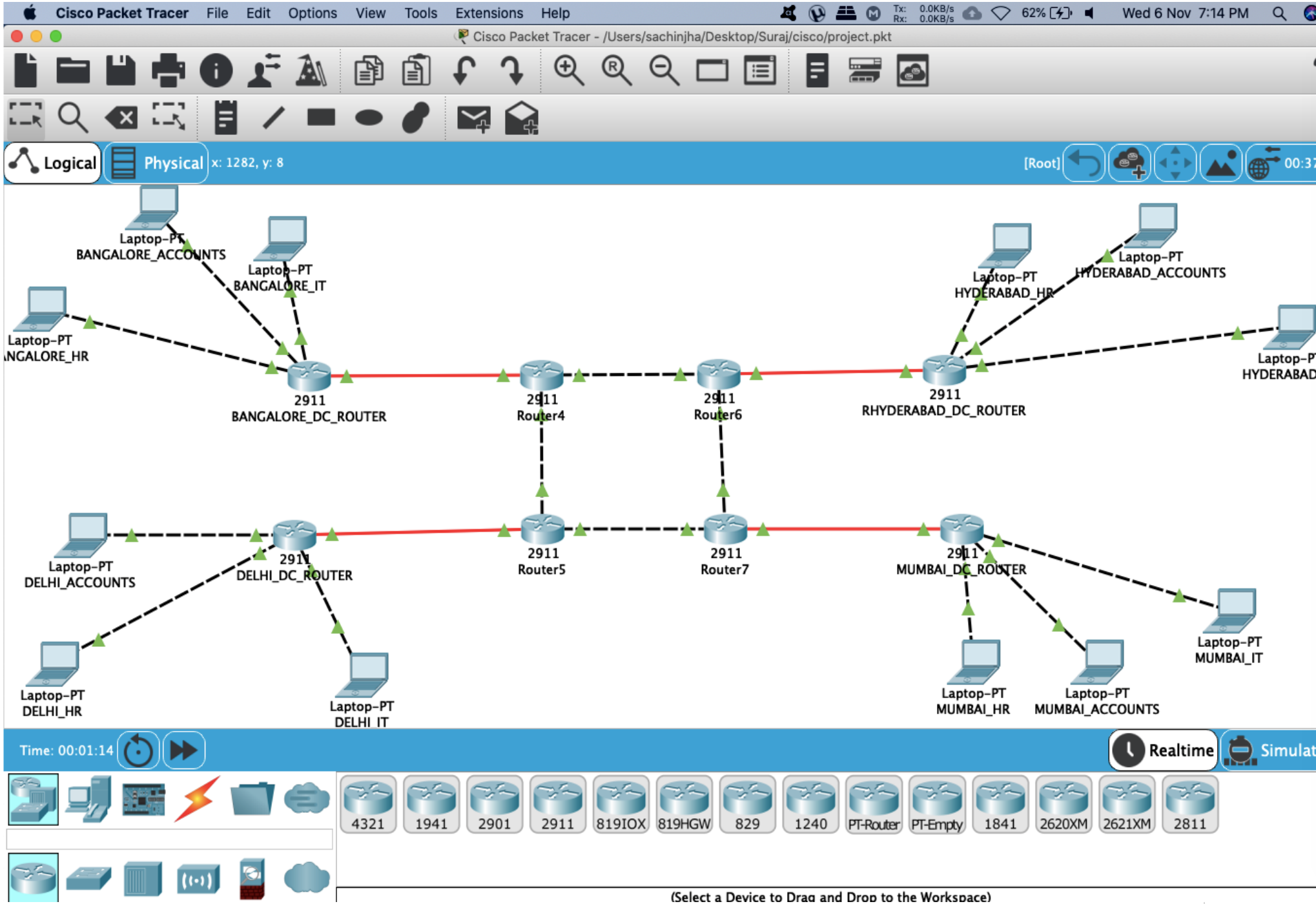
```
Building configuration...
!
hostname Router
interface GigabitEthernet0/0
ip address 10.2.6.2 255.255.255.0
duplex auto
speed auto
!
interface GigabitEthernet0/1
```

```
ip address 10.2.7.1 255.255.255.0
duplex auto
speed auto
!
interface GigabitEthernet0/2
no ip address
duplex auto
speed auto
shutdown
!
interface GigabitEthernet0/3/0
ip address 10.2.2.2 255.255.255.0
!
interface Vlan1
no ip address
shutdown
!
router rip
network 10.0.0.0
!
end


Router#
```

INITIAL SKELETON OF NETWORK


Cisco Packet Tracer File Edit Options View Tools Extensions Help
Sun 3 Nov 7:37 PM
Cisco Packet Tracer - /Users/sachinjha/Desktop/Suraj/cisco/project.pkt
Logical
Physical
x: 1327, y: 10
[Root]
06:57:30
Laptop-PT BANGALORE_ACCOUNTS
Laptop-PT BANGALORE_IT
Laptop-PT NGALORE_HR
2911 BANGALORE_DC_ROUTER
2911 Router4
2911 Router6
Laptop-PT HYDERABAD_ACCOUNTS
Laptop-PT HYDERABAD_HR
2911 RHYDERABAD_DC_ROUTER
Laptop-PT HYDERABAD_IT
Laptop-PT DELHI_ACCOUNTS
2911 Router5
2911 Router7
Laptop-PT MUMBAI_ACCOUNTS
Laptop-PT MUMBAI_HR
Laptop-PT MUMBAI_IT
2911 MUMBAI_DC_ROUTER
Laptop-PT DELHI_HR
2911 DELHI_DC_ROUTER
Laptop-PT DELHI_IT
Time: 08:34:37
Realtime
Simulation


Physical
Config
Desktop
Programming
Attributes
Command Prompt
X
Packet Tracer PC Command Line 1.0
C:\>
C:\>
C:\>ping 10.1.10.2
Pinging 10.1.10.2 with 32 bytes of data:
Request timed out.
Request timed out.
Request timed out.
Request timed out.
Ping statistics for 10.1.10.2:
Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
C:\>ping 10.1.2.2
Pinging 10.1.2.2 with 32 bytes of data:
Request timed out.
Reply from 10.1.2.2: bytes=32 time<1ms TTL=127
Reply from 10.1.2.2: bytes=32 time<1ms TTL=127
Reply from 10.1.2.2: bytes=32 time<1ms TTL=127
Ping statistics for 10.1.2.2:
Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 0ms, Average = 0ms
C:\>
C:\>
C:\>
C:\>
C:\>ping 10.1.10.2
Pinging 10.1.10.2 with 32 bytes of data:
Request timed out.
Reply from 10.1.10.2: bytes=32 time=1ms TTL=123
Reply from 10.1.10.2: bytes=32 time<1ms TTL=123
Reply from 10.1.10.2: bytes=32 time<1ms TTL=123
Ping statistics for 10.1.10.2:
Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 1ms, Average = 0ms


Cisco Packet Tracer File Edit Options View Tools Extensions Help
Wed 6 Nov 7:14 PM
Cisco Packet Tracer - /Users/sachinjha/Desktop/Suraj/cisco/project.pkt
Logical
Physical
x: 1282, y: 8
[Root]
Laptop-PT BANGALORE_ACCOUNTS
Laptop-PT BANGALORE_IT
Laptop-PT NGALORE_HR
2911 BANGALORE_DC_ROUTER
2911 Router4
2911 Router6
Laptop-PT HYDERABAD_HR
Laptop-PT HYDERABAD_ACCOUNTS
2911 RHYDERABAD_DC_ROUTER
Laptop-PT HYDERABAD
Laptop-PT DELHI_ACCOUNTS
2911 DELHI_DC_ROUTER
2911 Router5
2911 Router7
2911 MUMBAI_DC_ROUTER
Laptop-PT DELHI_HR
Laptop-PT DELHI_IT
Laptop-PT MUMBAI_HR
Laptop-PT MUMBAI_ACCOUNTS
Laptop-PT MUMBAI_IT
Time: 00:01:14
Realtime
4321
1941
2901
2911
819IOX
819HGW
829
1240
PT-Router
PT-Empty
1841
2620XM
2621XM
2811
(Select a Device to Drag and Drop to the Workspace)

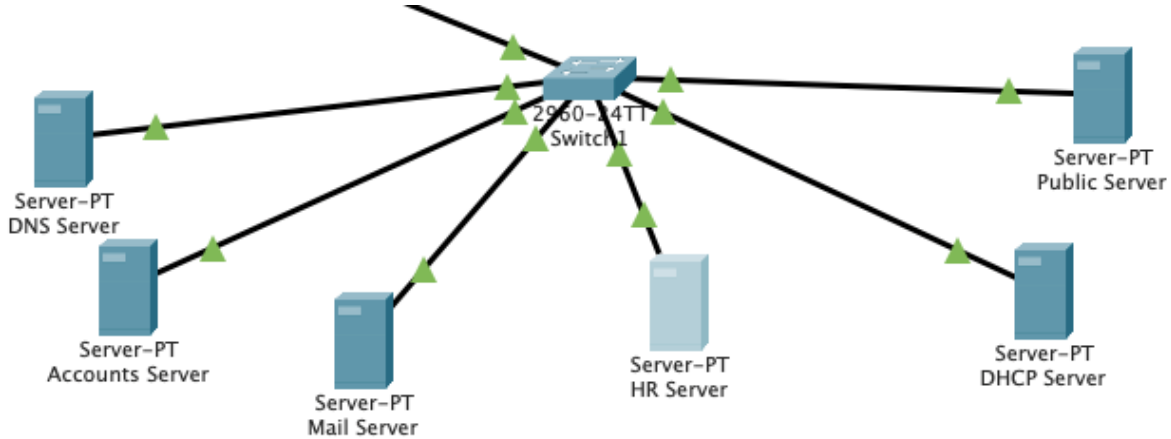
4. CONFIGURATION OF SERVERS AND THEIR LOCAL SWITCHES IN VARIOUS DCs and DRs

DC stands for DATA CENTRE and DR stands for DISASTER RECOVERY

4.1 Switch configuration of DC Delhi SERVERS

```
Building configuration...

Current configuration : 1080 bytes
!
version 12.2
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname Switch
spanning-tree mode pvst
spanning-tree extend system-id
!
interface FastEthernet0/1
!
interface FastEthernet0/2
!
interface FastEthernet0/3
!
interface FastEthernet0/4
!
interface FastEthernet0/5
!
interface FastEthernet0/6
!
interface FastEthernet0/7
!
interface FastEthernet0/8
!
interface FastEthernet0/9
!
interface FastEthernet0/10
!
interface FastEthernet0/11
!
interface FastEthernet0/12
!
interface FastEthernet0/13
!
```

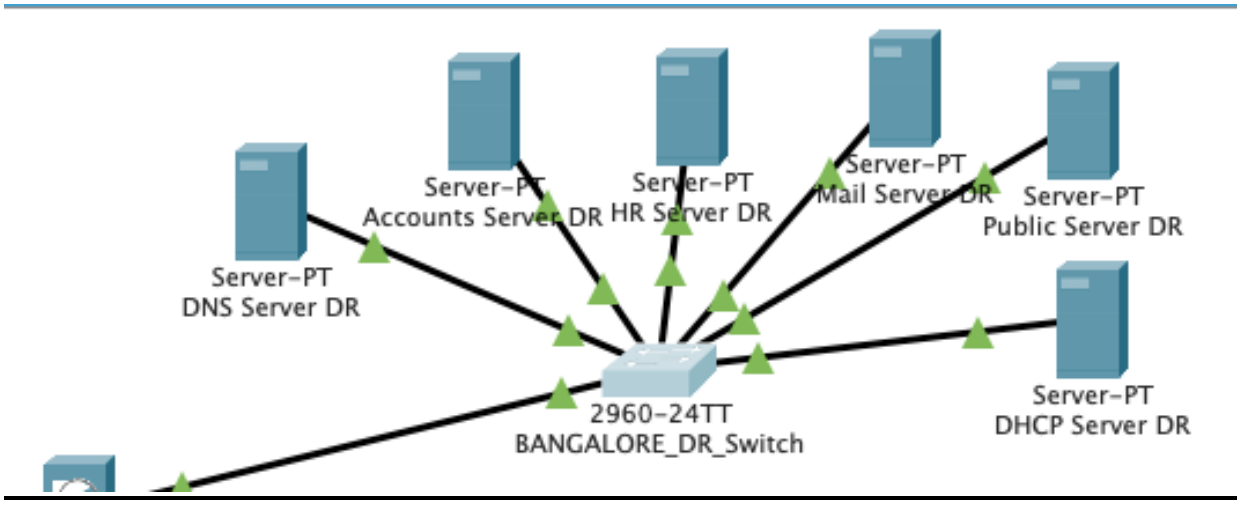
```
interface FastEthernet0/14
!
interface FastEthernet0/15
!
interface FastEthernet0/16
!
interface FastEthernet0/17
!
interface FastEthernet0/18
!
interface FastEthernet0/19
!
interface FastEthernet0/20
!
interface FastEthernet0/21
!
interface FastEthernet0/22
!
interface FastEthernet0/23
!
interface FastEthernet0/24
!
interface GigabitEthernet0/1
!
interface GigabitEthernet0/2
!
interface Vlan1
no ip address
shutdown
line con 0
!
line vty 0 4
login
line vty 5 15
login
end
```



4.2 Switch configuration of DC Bangalore(DR of DC Delhi) SERVERS

```
Building configuration...

Current configuration : 1080 bytes
!
version 12.2
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname Switch
spanning-tree mode pvst
spanning-tree extend system-id
!
interface FastEthernet0/1
!
interface FastEthernet0/2
!
interface FastEthernet0/3
!
interface FastEthernet0/4
!
interface FastEthernet0/5
!
interface FastEthernet0/6
!
interface FastEthernet0/7
!
interface FastEthernet0/8
!
interface FastEthernet0/9
!
interface FastEthernet0/10
!
interface FastEthernet0/11
!
interface FastEthernet0/12
!
interface FastEthernet0/13
!
interface FastEthernet0/14
```

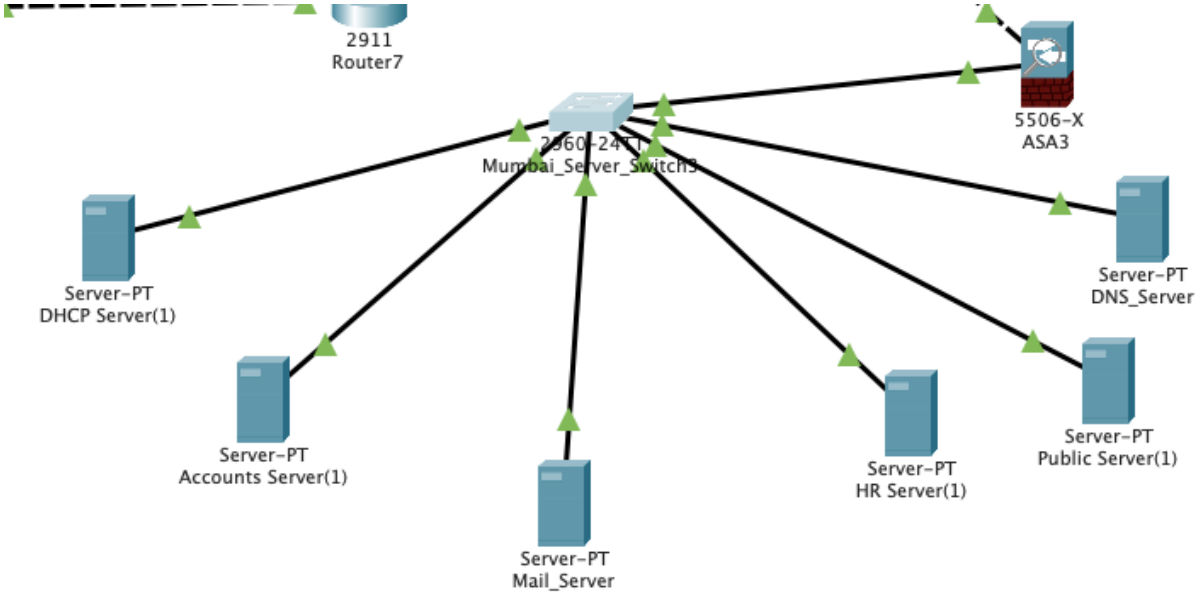
```
!
interface FastEthernet0/15
!
interface FastEthernet0/16
!
interface FastEthernet0/17
!
interface FastEthernet0/18
!
interface FastEthernet0/19
!
interface FastEthernet0/20
!
interface FastEthernet0/21
!
interface FastEthernet0/22
!
interface FastEthernet0/23
!
interface FastEthernet0/24
!
interface GigabitEthernet0/1
!
interface GigabitEthernet0/2
!
interface Vlan1
no ip address
shutdown
line con 0
!
line vty 0 4
login
line vty 5 15
login
end
```



4.3 Switch configuration of DC Mumbai SERVERS

```
Building configuration...

Current configuration : 1080 bytes
!
version 12.2
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname Switch
spanning-tree mode pvst
spanning-tree extend system-id
!
interface FastEthernet0/1
!
interface FastEthernet0/2
!
interface FastEthernet0/3
!
interface FastEthernet0/4
!
interface FastEthernet0/5
!
interface FastEthernet0/6
!
interface FastEthernet0/7
!
interface FastEthernet0/8
!
interface FastEthernet0/9
!
interface FastEthernet0/10
!
interface FastEthernet0/11
!
interface FastEthernet0/12
!
interface FastEthernet0/13
!
interface FastEthernet0/14
!
interface FastEthernet0/15
!
interface FastEthernet0/16
!
interface FastEthernet0/17
!
interface FastEthernet0/18
!
```

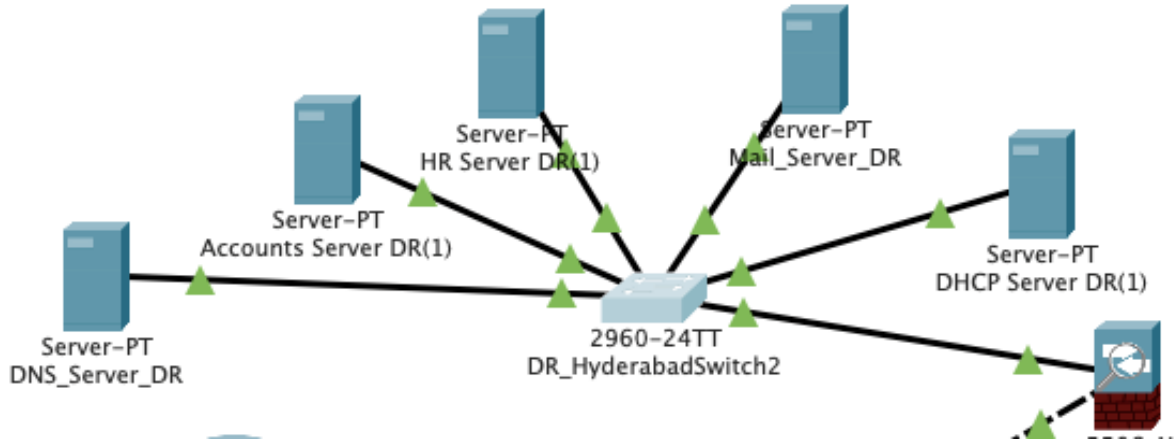
```
interface FastEthernet0/19
!
interface FastEthernet0/20
!
interface FastEthernet0/21
!
interface FastEthernet0/22
!
interface FastEthernet0/23
!
interface FastEthernet0/24
!
interface GigabitEthernet0/1
!
interface GigabitEthernet0/2
!
interface Vlan1
no ip address
shutdown
line con 0
!
line vty 0 4
login
line vty 5 15
login
end
```



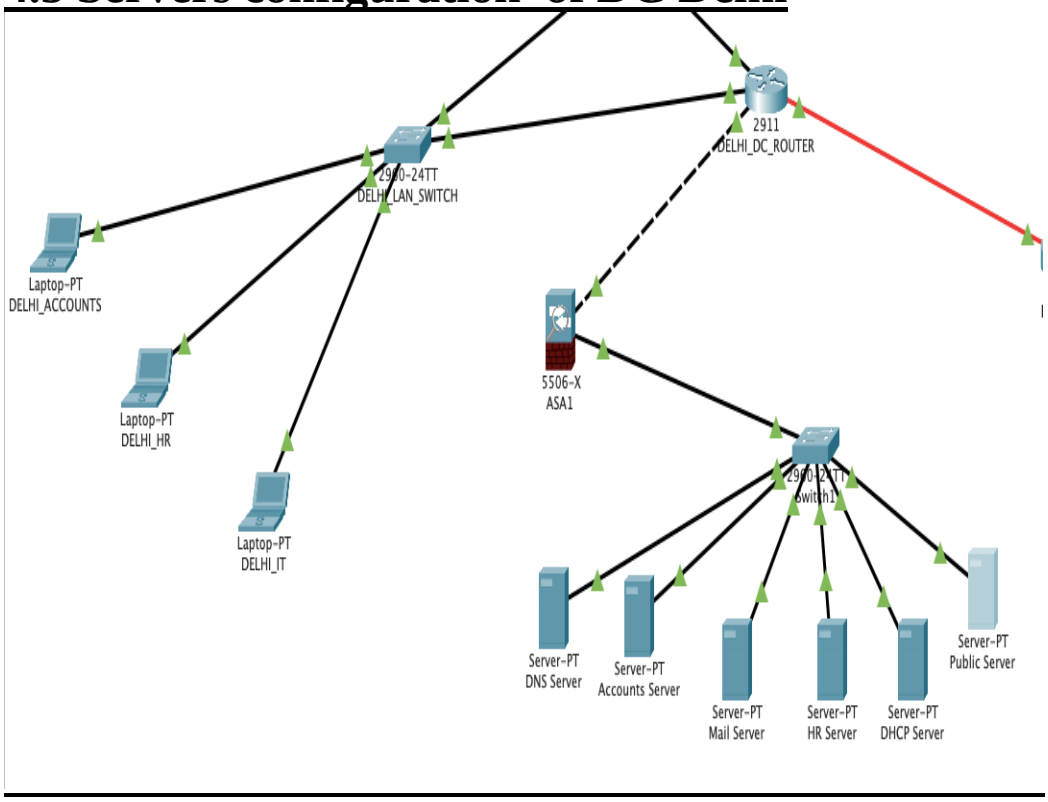
4.4 Switch configuration of DC Hyderabad(DR of DC Mumbai) SERVERS

```
Building configuration...

Current configuration : 1080 bytes
!
version 12.2
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname Switch
spanning-tree mode pvst
spanning-tree extend system-id
!
interface FastEthernet0/1
!
interface FastEthernet0/2
!
interface FastEthernet0/3
!
interface FastEthernet0/4
!
interface FastEthernet0/5
!
interface FastEthernet0/6
!
interface FastEthernet0/7
!
interface FastEthernet0/8
!
interface FastEthernet0/9
!
interface FastEthernet0/10
!
interface FastEthernet0/11
!
interface FastEthernet0/12
!
interface FastEthernet0/13
!
interface FastEthernet0/14
!
interface FastEthernet0/15
!
interface FastEthernet0/16
!
interface FastEthernet0/17
!
```

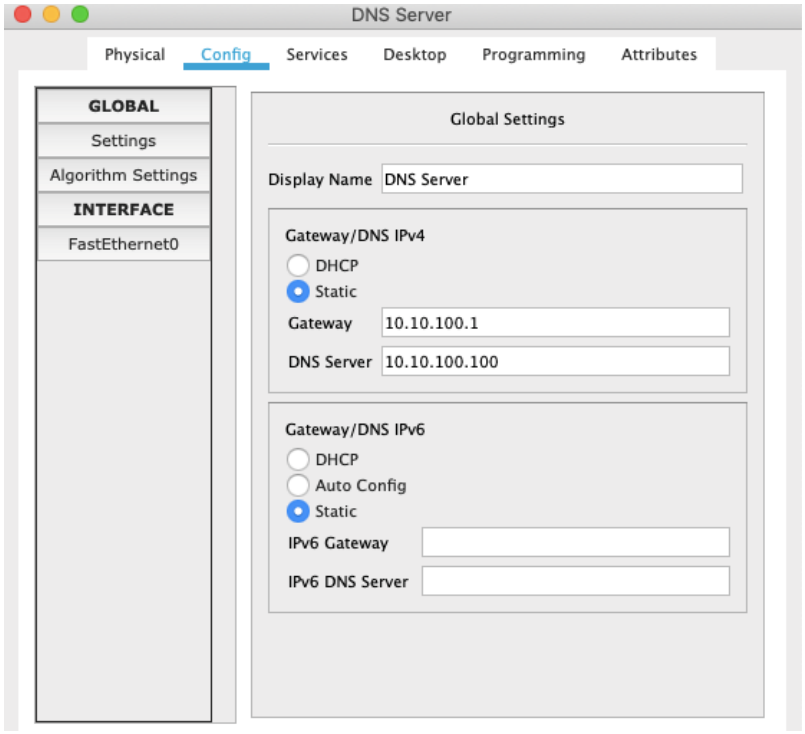
```
interface FastEthernet0/18
!
interface FastEthernet0/19
!
interface FastEthernet0/20
!
interface FastEthernet0/21
!
interface FastEthernet0/22
!
interface FastEthernet0/23
!
interface FastEthernet0/24
!
interface GigabitEthernet0/1
!
interface GigabitEthernet0/2
!
interface Vlan1
no ip address
shutdown
line con 0
!
line vty 0 4
login
line vty 5 15
login
 end
```

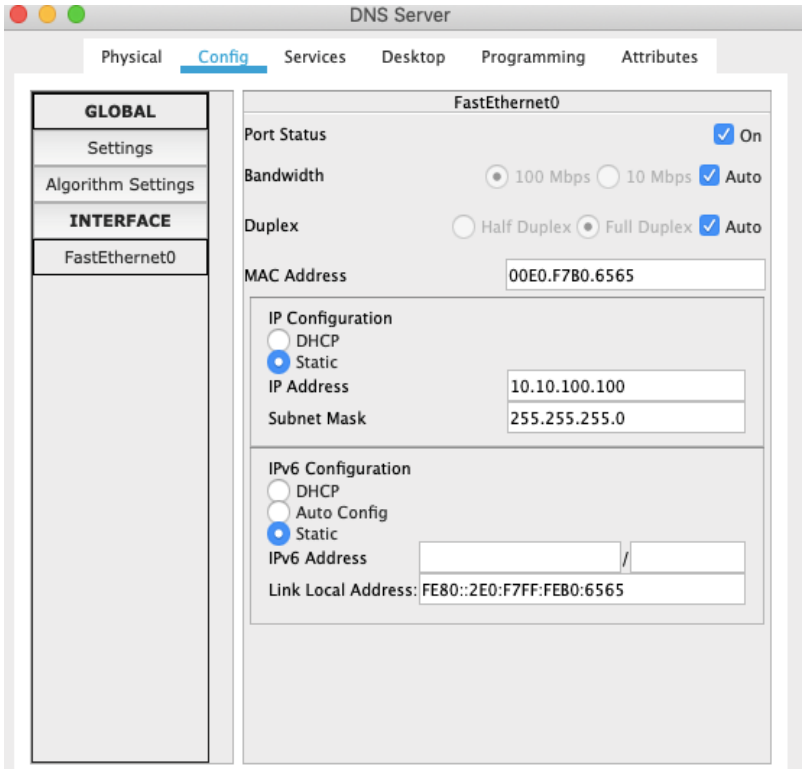


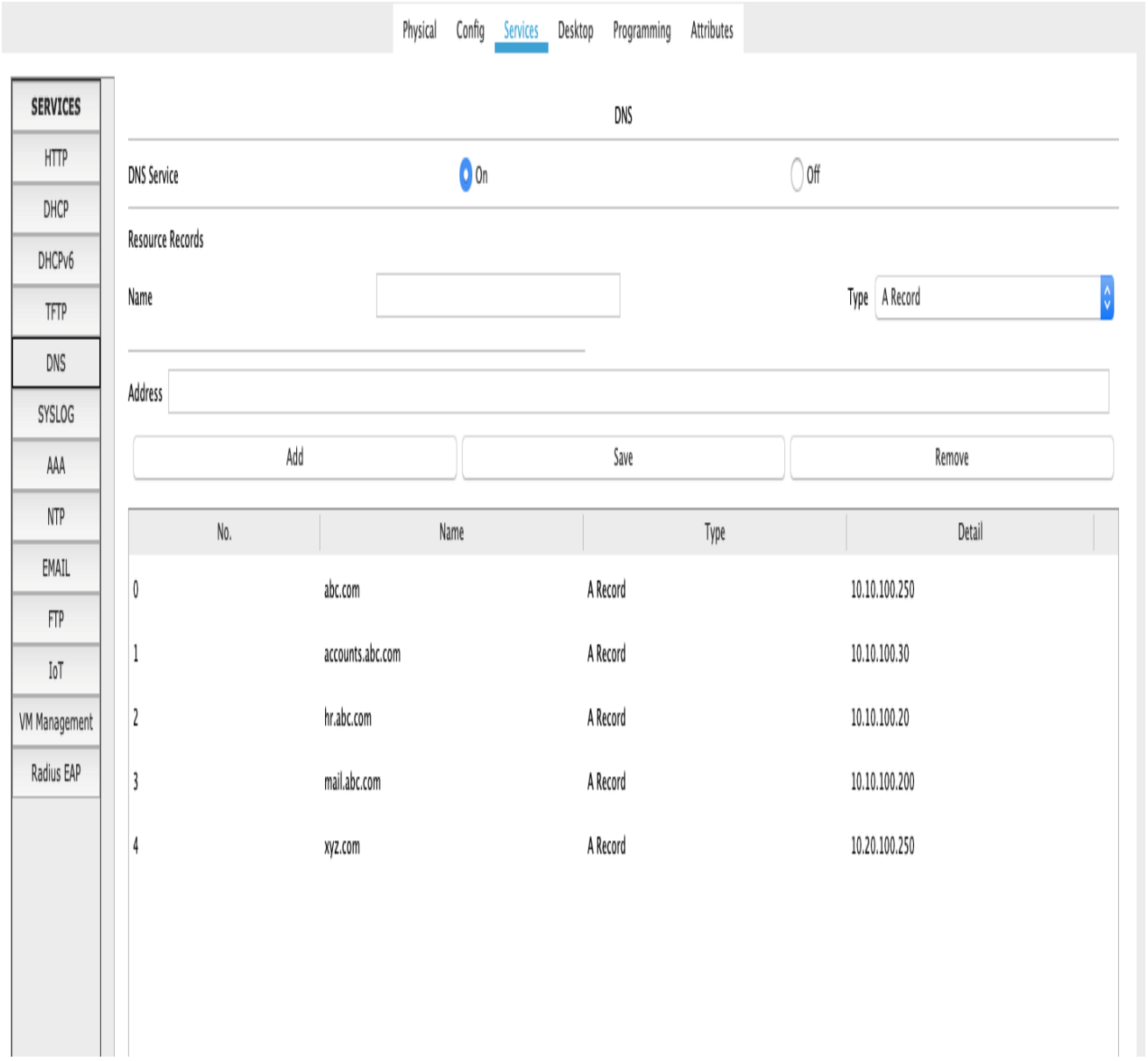
4.5 Servers configuration of DC Delhi



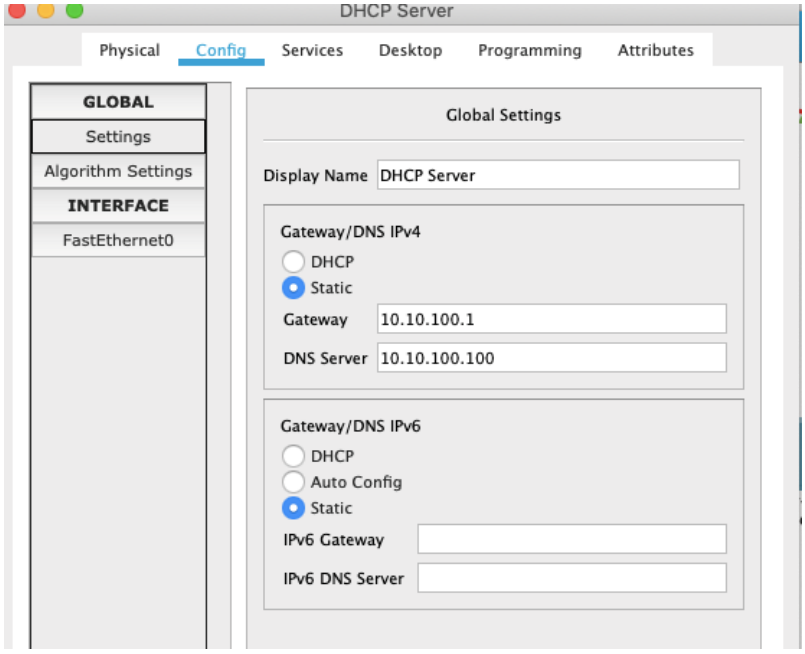
4.5.1 DNS SERVER CONFIGURATION

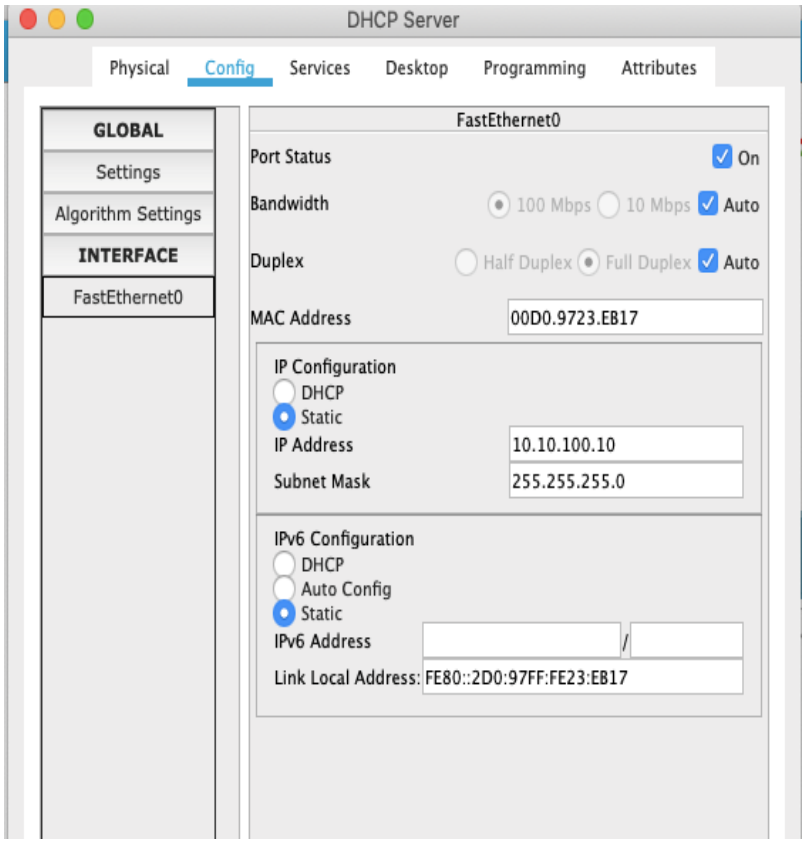




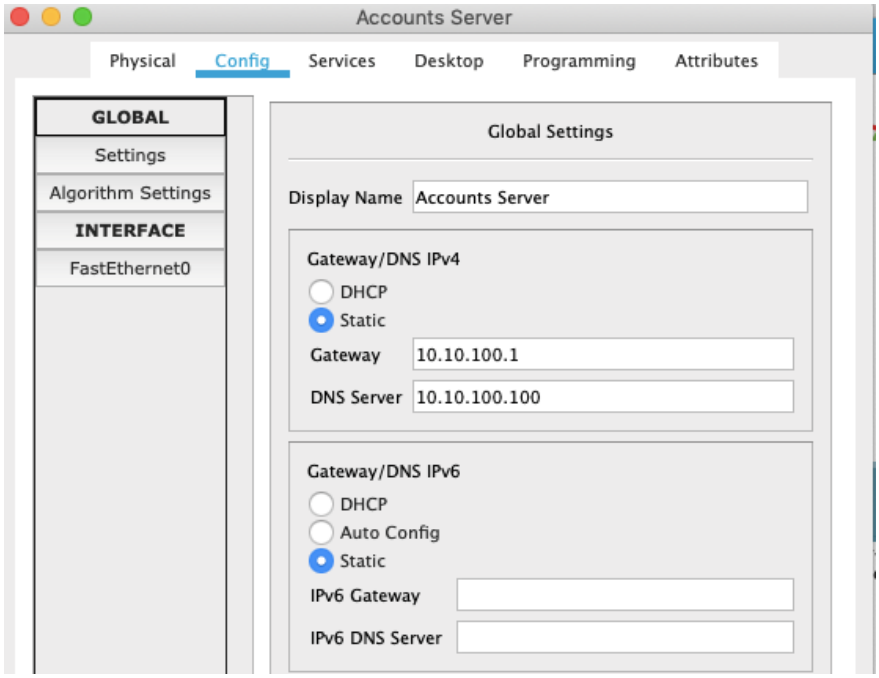

Physical
Config
Services
Desktop
Programming
Attributes
SERVICES
HTTP
DHCP
DHCPv6
TFTP
DNS
SYSLOG
AAA
NTP
EMAIL
FTP
IoT
VM Management
Radius EAP
DNS
DNS Service
On
Off
Resource Records
Name
Type
A Record
Address
Add
Save
Remove
No.
Name
Type
Detail
0
abc.com
A Record
10.10.100.250
1
accounts.abc.com
A Record
10.10.100.30
2
hr.abc.com
A Record
10.10.100.20
3
mail.abc.com
A Record
10.10.100.200
4
xyz.com
A Record
10.20.100.250

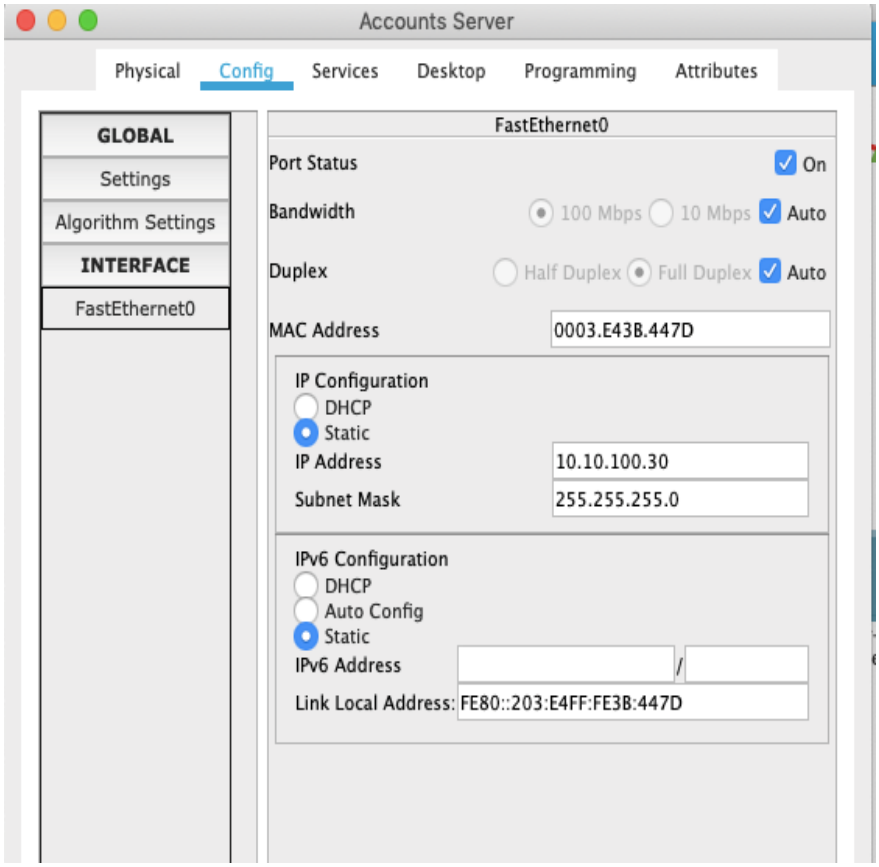
4.5.2 DHCP SERVER CONFIGURATION



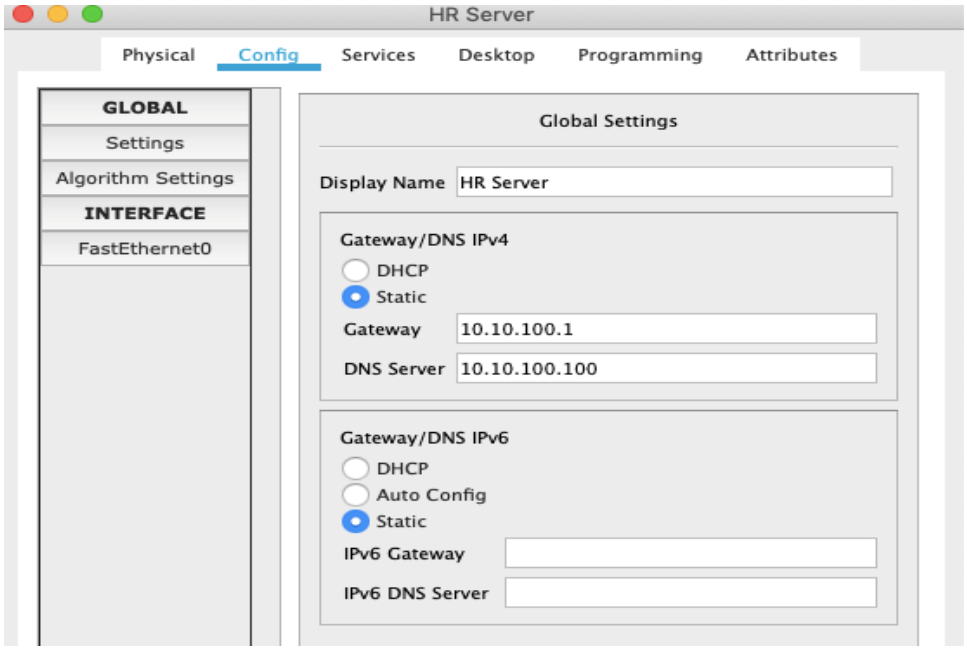


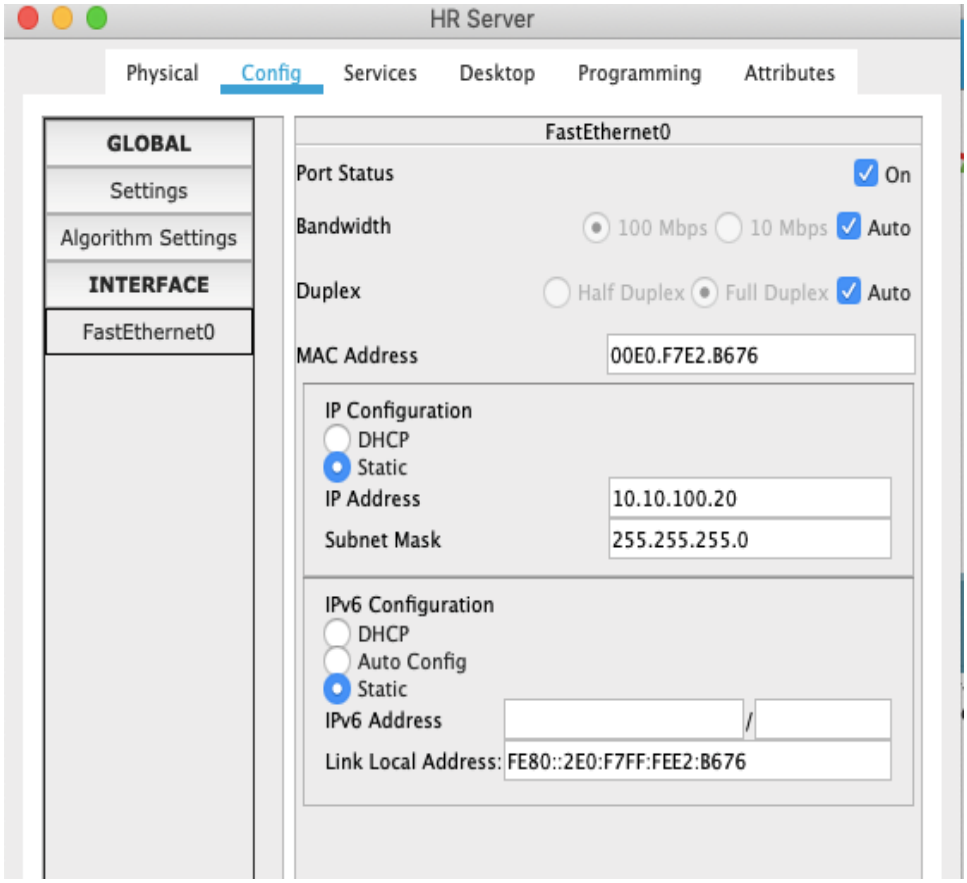
4.5.3 ACCOUNTS SERVER CONFIGURATION



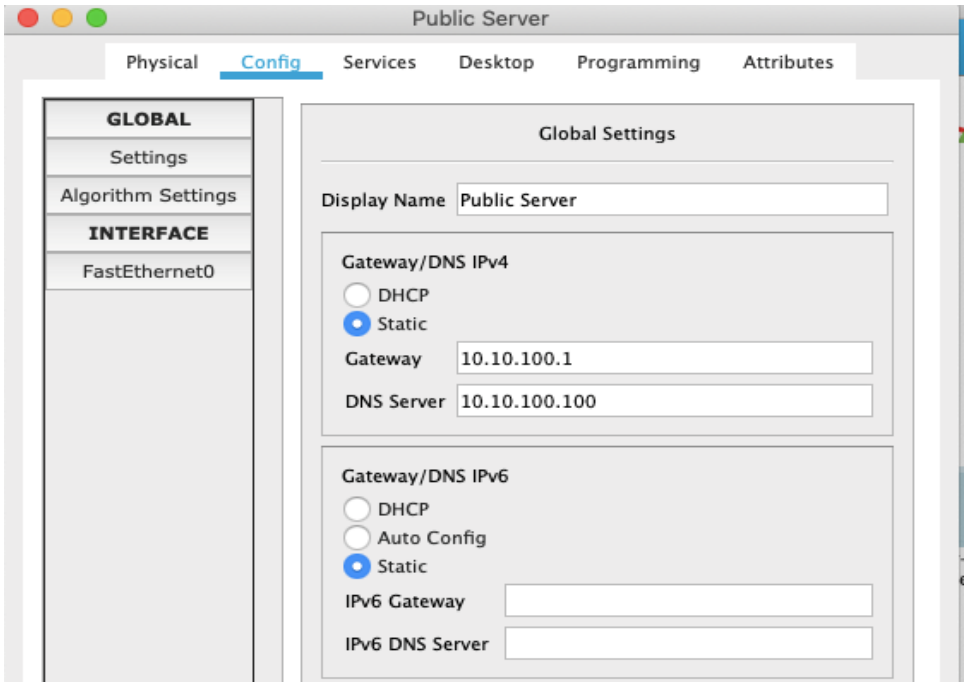


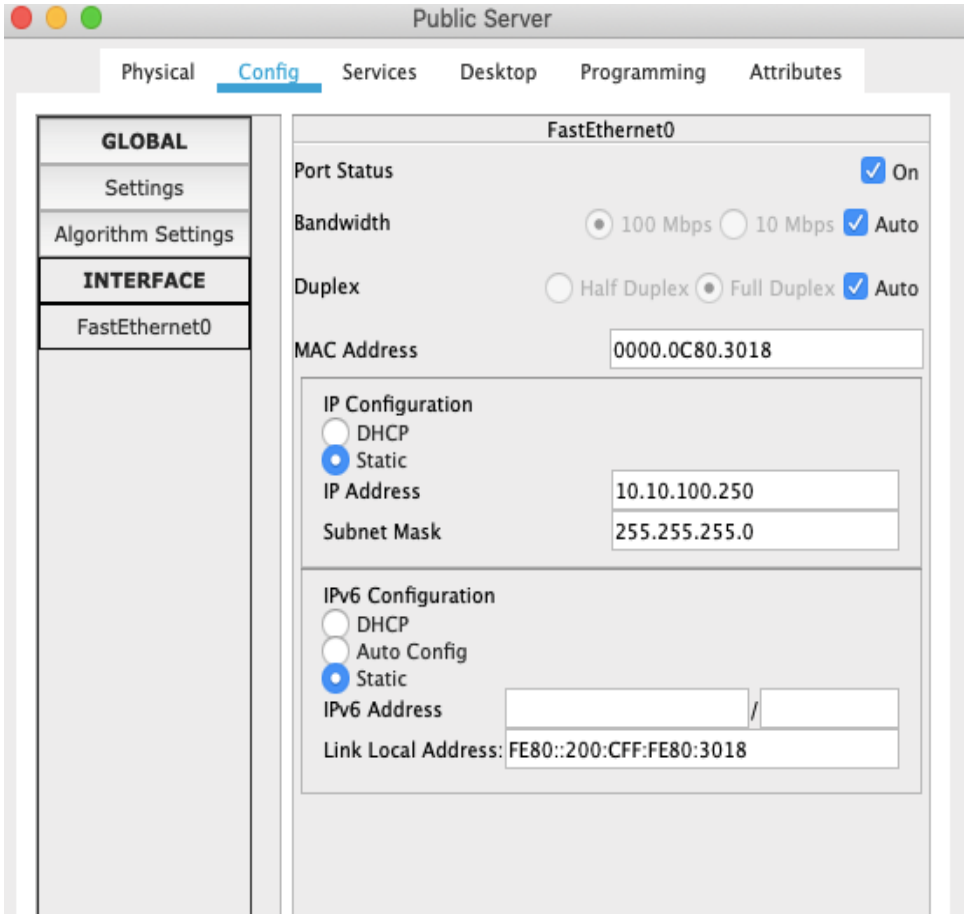
4.5.4 HR SERVER CONFIGURATION



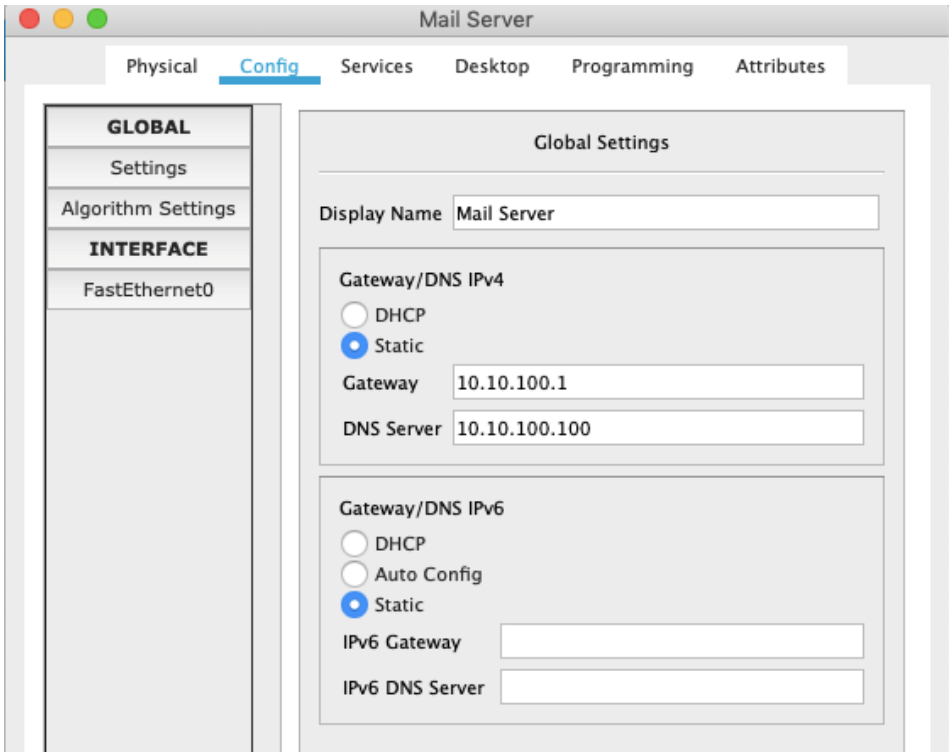


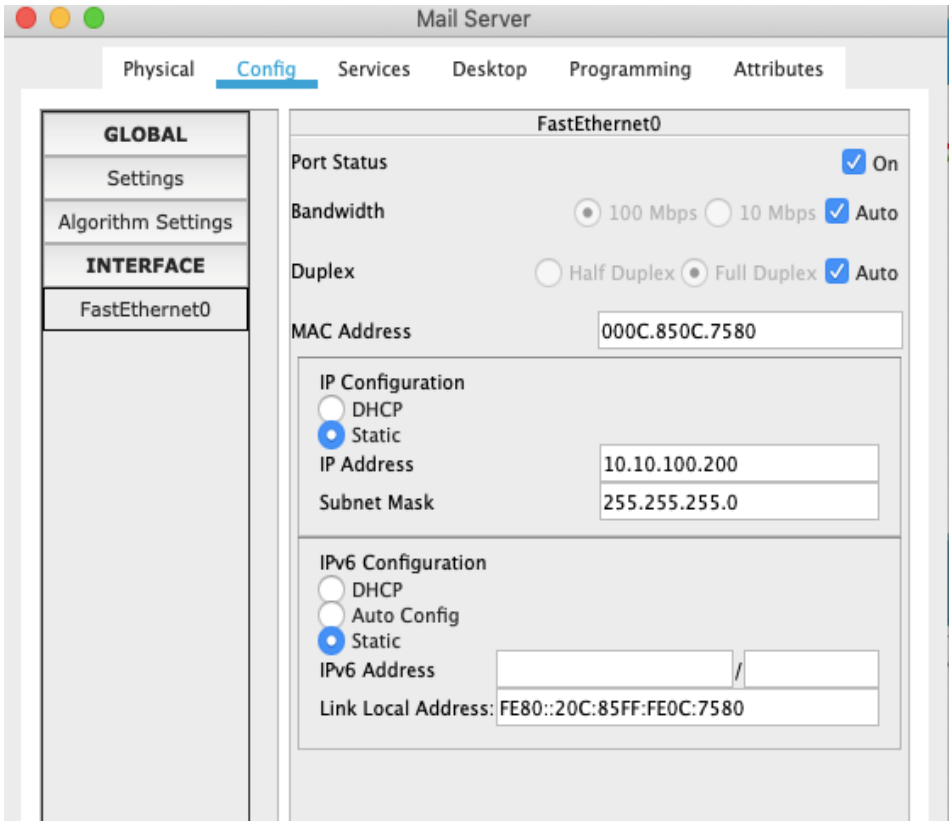
4.5.5 PUBLIC SERVER CONFIGURATION





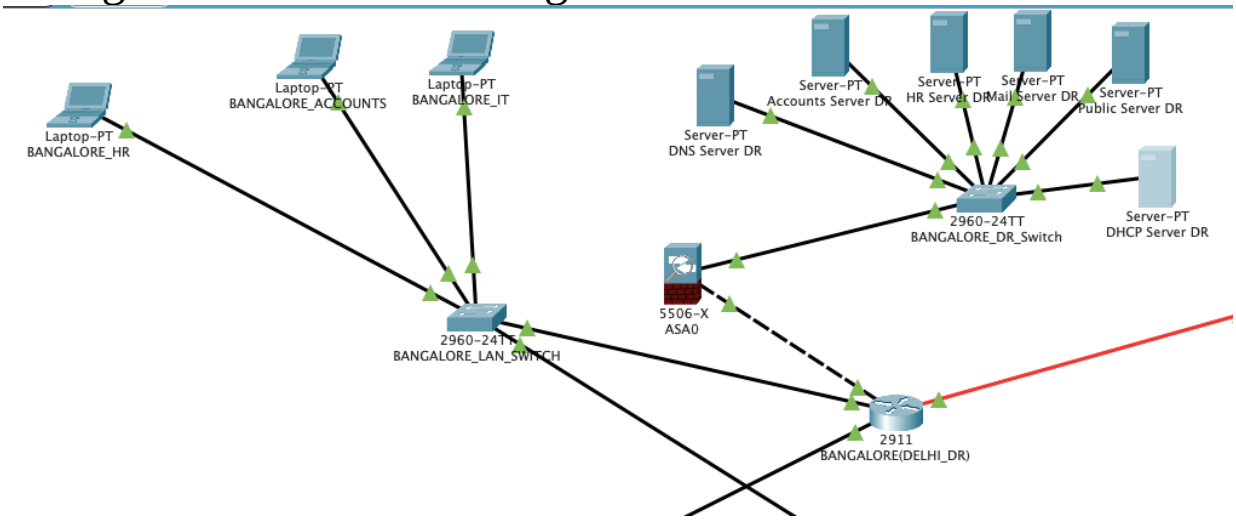
4.5.6 MAIL SERVER CONFIGURATION





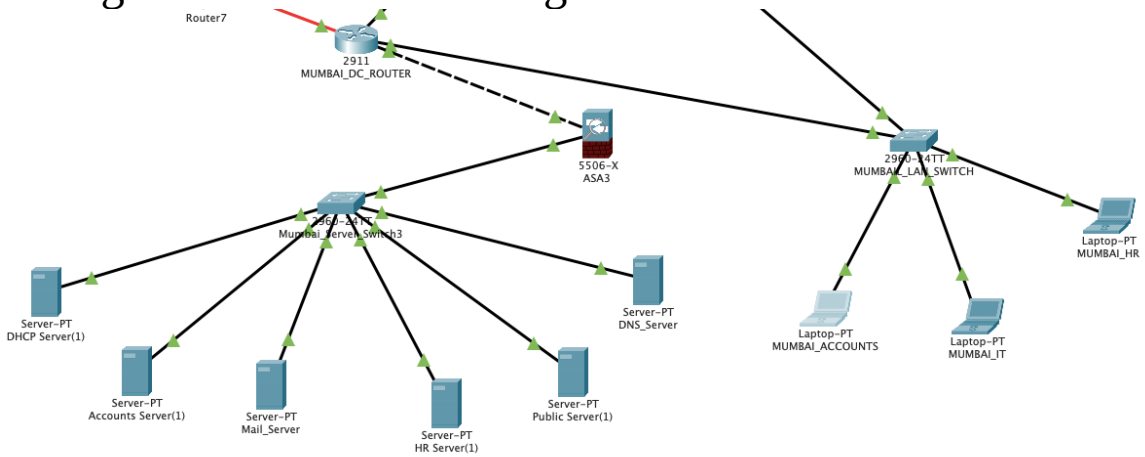
4.6 Servers configuration of DC Bangalore(DR of DC Delhi)

Similarly all the servers in this data centre(Bangalore) are configured as we have configured the Delhi Data Centre.



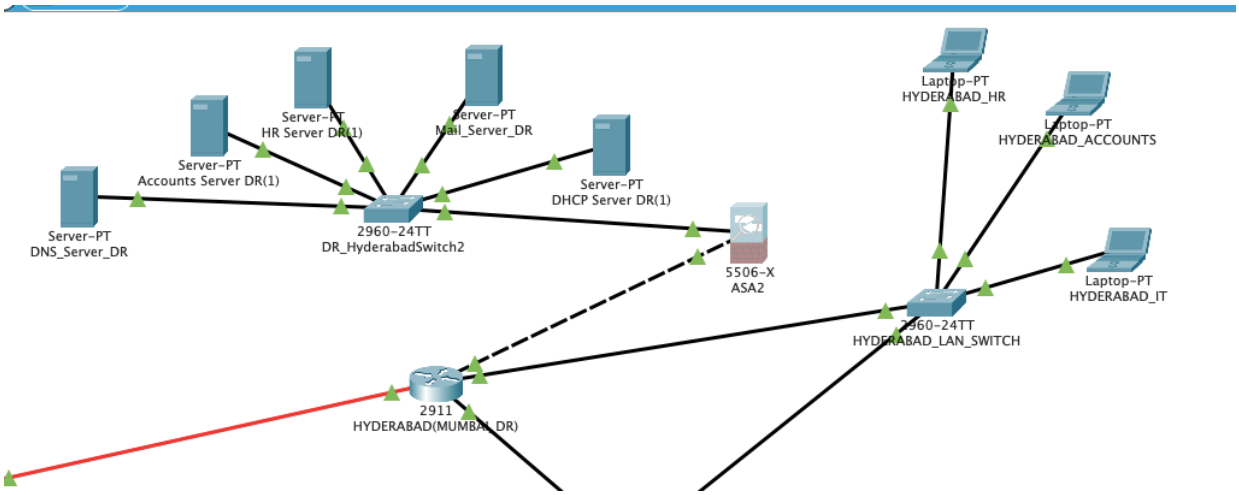
4.7 Servers configuration of DC Mumbai

Similarly all the servers in this data centre(Mumbai) are configured as we have configured the Delhi Data Centre.

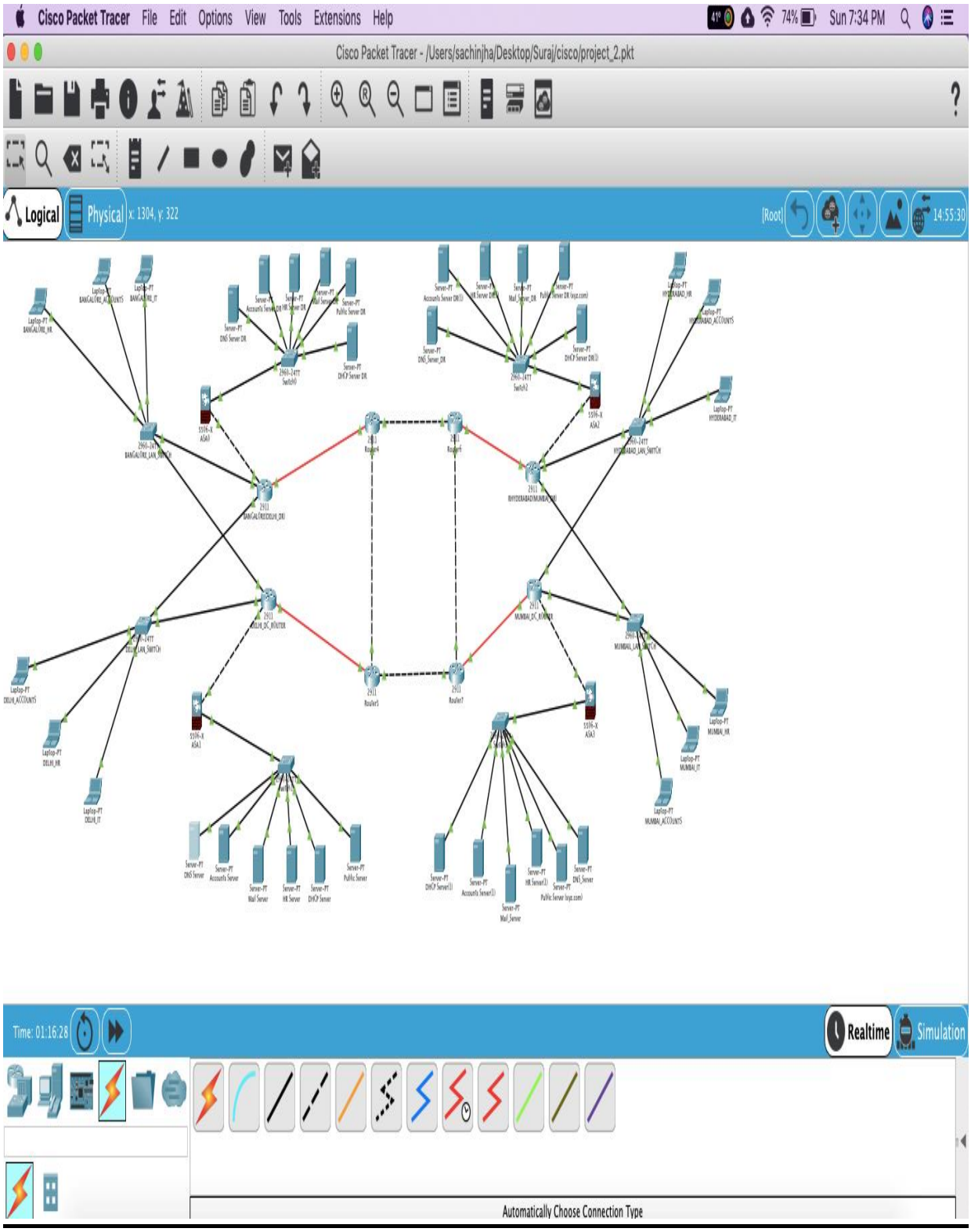


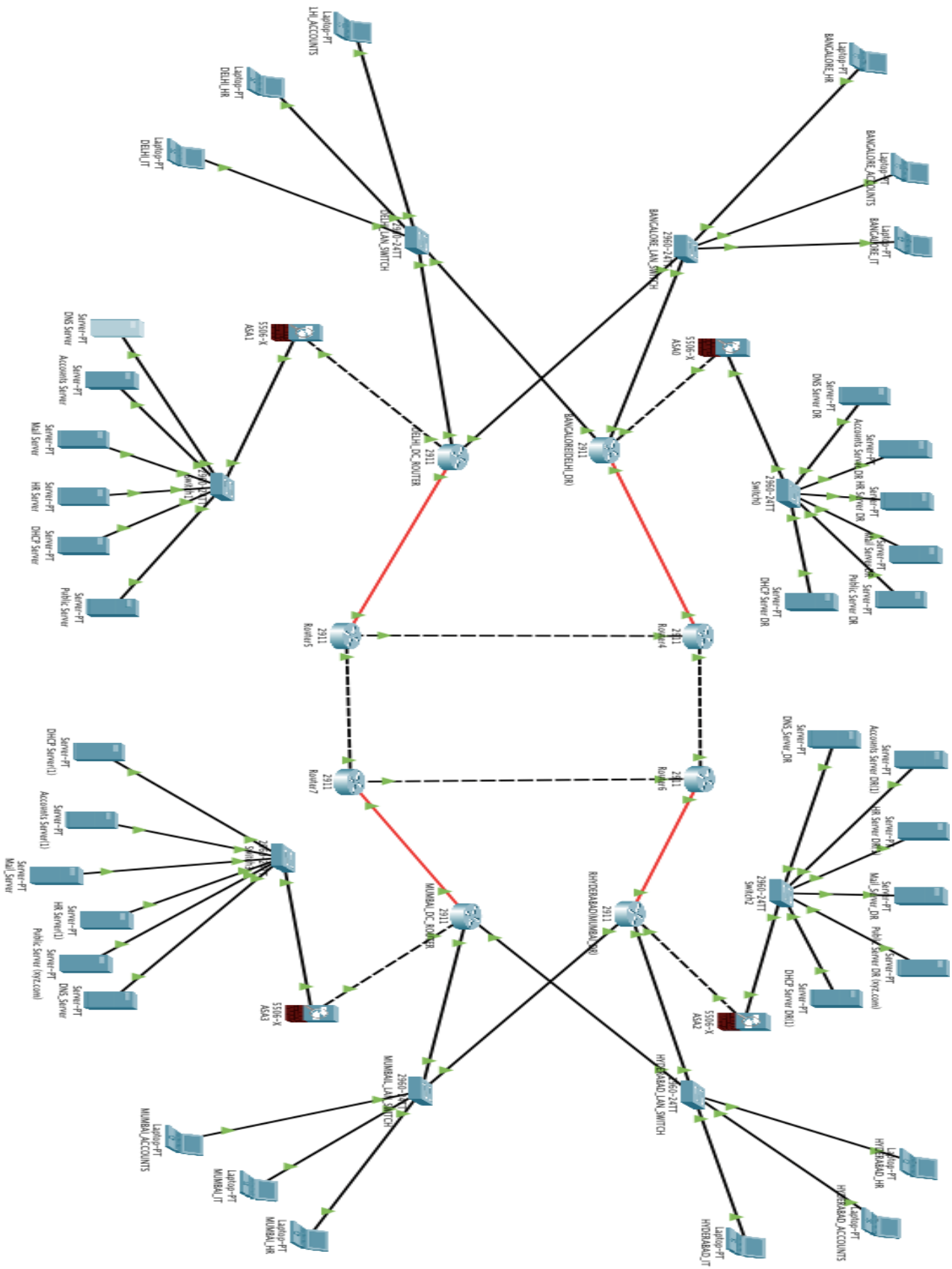
4.8 Servers configuration of DC Hyderabad(DR of DC Mumbai)

Similarly all the servers in this data centre(Hyderabad) are configured as we have configured the Delhi Data Centre.



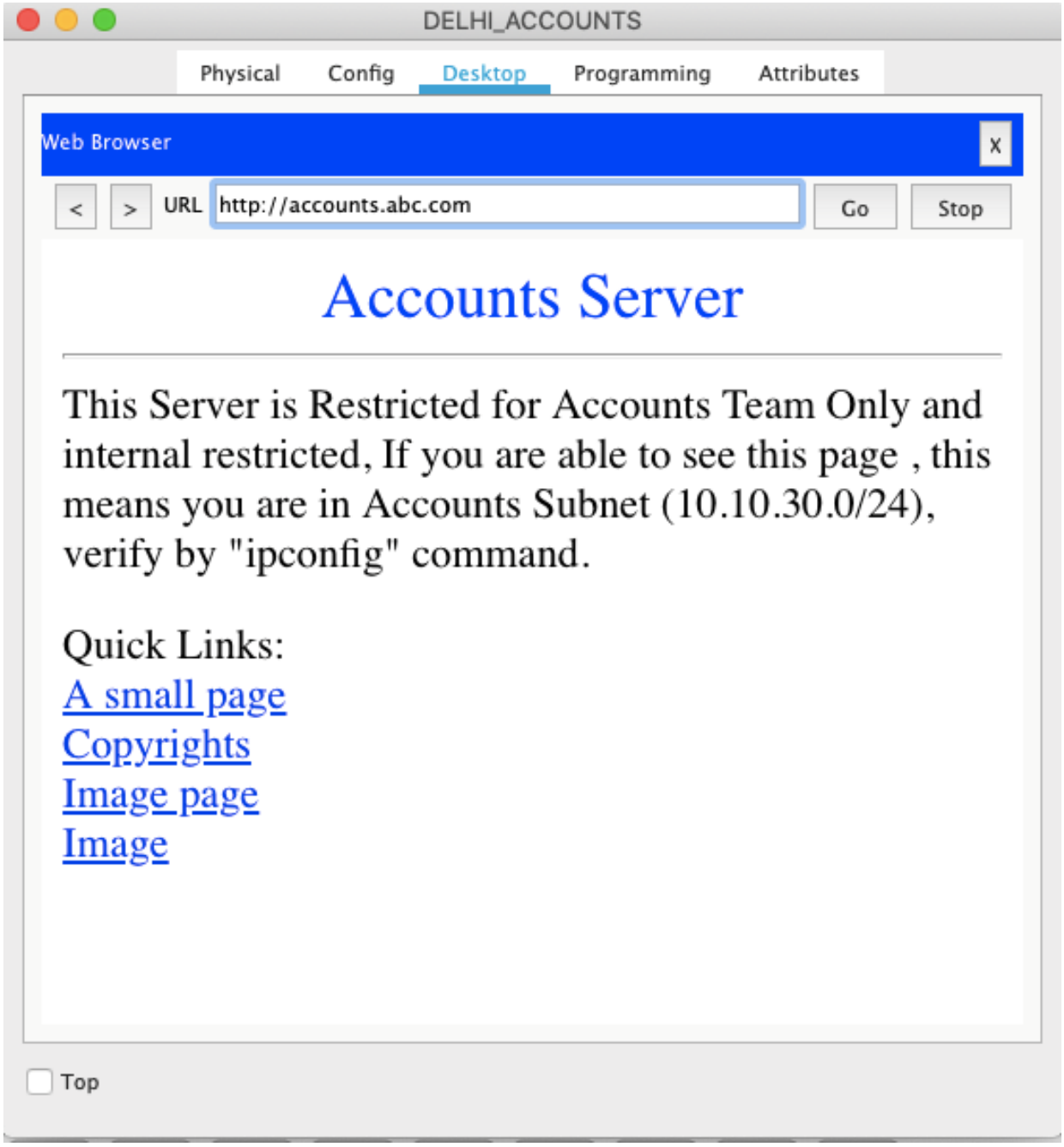
5. FINAL COMPLETE ARCHITECTURE OF OUR NETWORK WHICH INCLUDES ALL THE DATA CENTRES, THEIR DISASTER RECOVERY CENTRES,ALL SERVERS,ROUTERS,SWITCHES AND END DEVICES


Cisco Packet Tracer File Edit Options View Tools Extensions Help
Sun 7:34 PM
Cisco Packet Tracer - /Users/sachinjha/Desktop/Suraj/cisco/project_2.pkt
Logical
Physical
x: 1304, y: 322
[Root]
14:55:30
Time: 01:16:28
Realtime
Simulation
Automatically Choose Connection Type

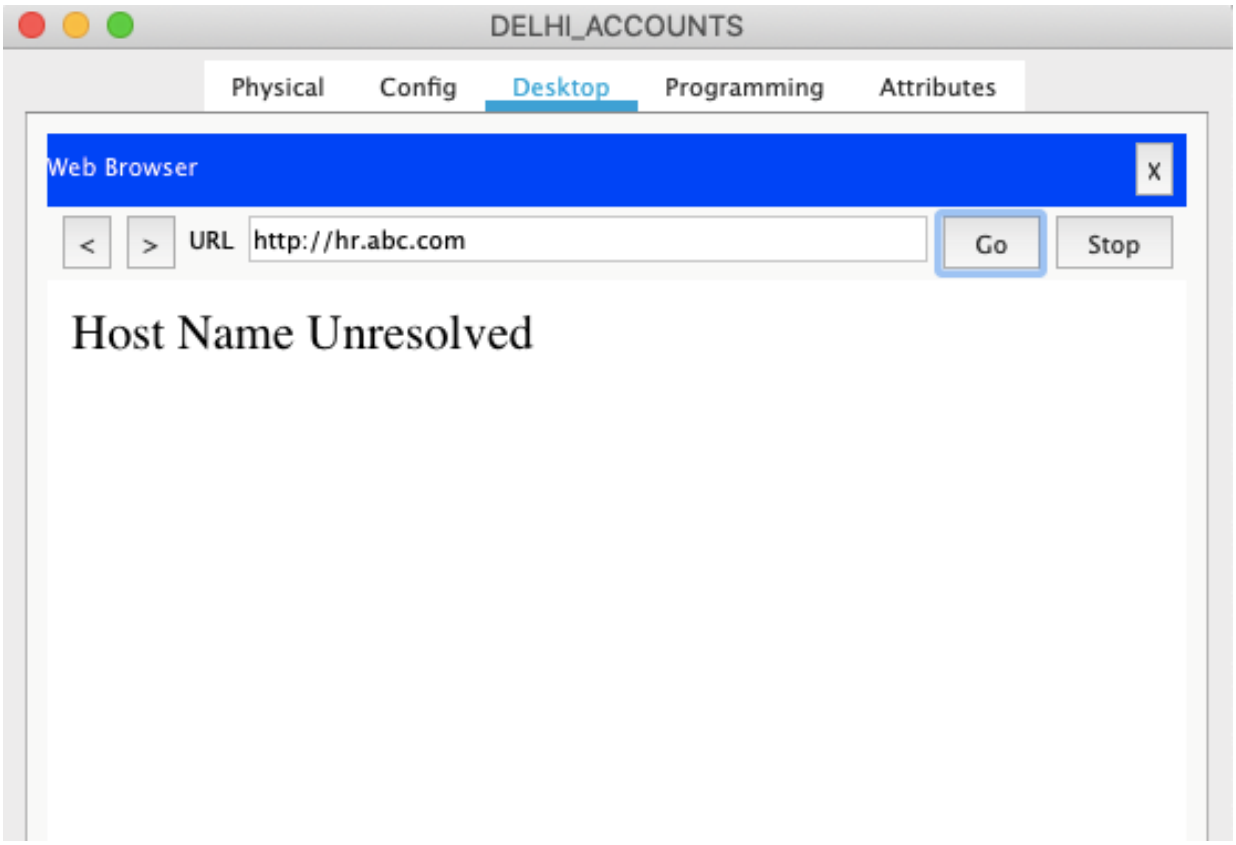

Laptop-PT
LHI_ACCOUNTS
Laptop-PT
DELHI_HR
Laptop-PT
DELHI_IT
2960-24TT
DELHI_LAN_SWITCH
5506-X
ASA1
Server-PT
DNS Server
Server-PT
Accounts Server
Server-PT
Mail Server
Server-PT
HR Server
Server-PT
DHCP Server
Server-PT
Public Server
2911
DELHI_DC_ROUTER
2911
Router5
2911
Router4
2911
Router7
2911
Router6
2911
MUMBAI_DC_ROUTER
2911
RHYDERABADMUMBAI_DR0
Laptop-PT
BANGALORE_HR
Laptop-PT
BANGALORE_ACCOUNTS
Laptop-PT
BANGALORE_IT
2960-24TT
BANGALORE_LAN_SWITCH
5506-X
ASA0
2911
BANGALOREDELHI_DR0
2960-24TT
Switch0
Server-PT
DNS Server DR
Server-PT
Accounts Server_DR
Server-PT
HR Server DR
Server-PT
Mail Server DR
Server-PT
Public Server DR
Server-PT
DHCP Server DR
2960-24TT
Switch1
Server-PT
DHCP Server(1)
Server-PT
Accounts Server(1)
Server-PT
Mail Server
Server-PT
HR Server(1)
Server-PT
Public Server (xyz.com)
Server-PT
DNS Server
5506-X
ASA3
Server-PT
DNS_Server_DR
Server-PT
Accounts Server DR(1)
Server-PT
HR Server DR(1)
Server-PT
Mail Server_DR
Server-PT
Public Server DR (xyz.com)
Server-PT
DHCP Server DR(1)
2960-24TT
Switch2
5506-X
ASA2
2960-24TT
MUMBAI_LAN_SWITCH
Laptop-PT
MUMBAI_ACCOUNTS
Laptop-PT
MUMBAI_IT
Laptop-PT
MUMBAI_HR
2960-24TT
HYDERABAD_LAN_SWITCH
Laptop-PT
HYDERABAD_HR
Laptop-PT
HYDERABAD_ACCOUNTS
Laptop-PT
HYDERABAD_IT

SIMULATION RESULTS

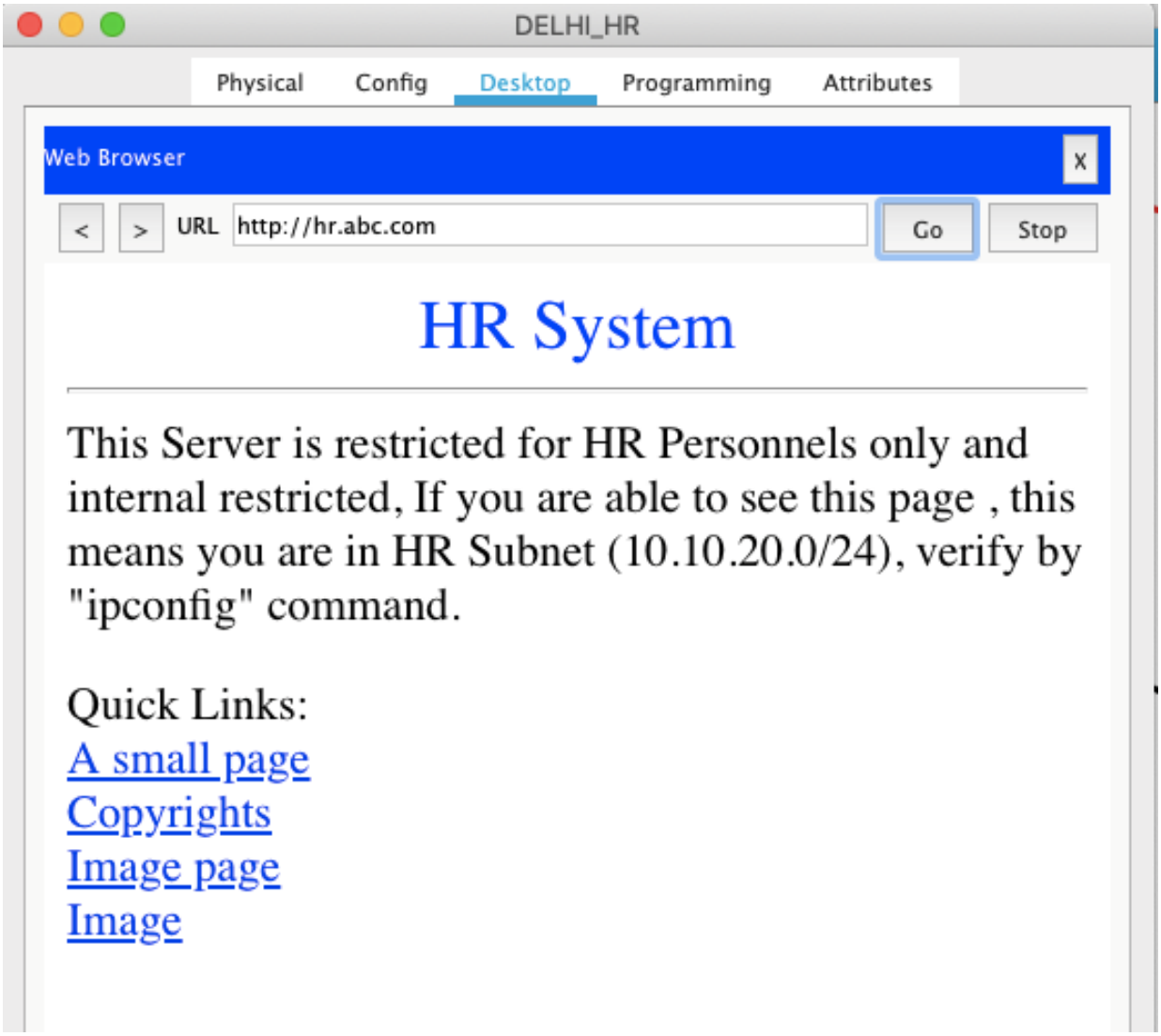
1. **When Delhi Accounts Dept. tried to access its ACCOUNTS server.**



2. **When Delhi's Accounts Dept. tried to access its HR server.**


DELHI_ACCOUNTS
Physical
Config
Desktop
Programming
Attributes
Web Browser
X
<
>
URL
http://hr.abc.com
Go
Stop
Host Name Unresolved

3. When Delhi HR Dept. tried to access its HR server.

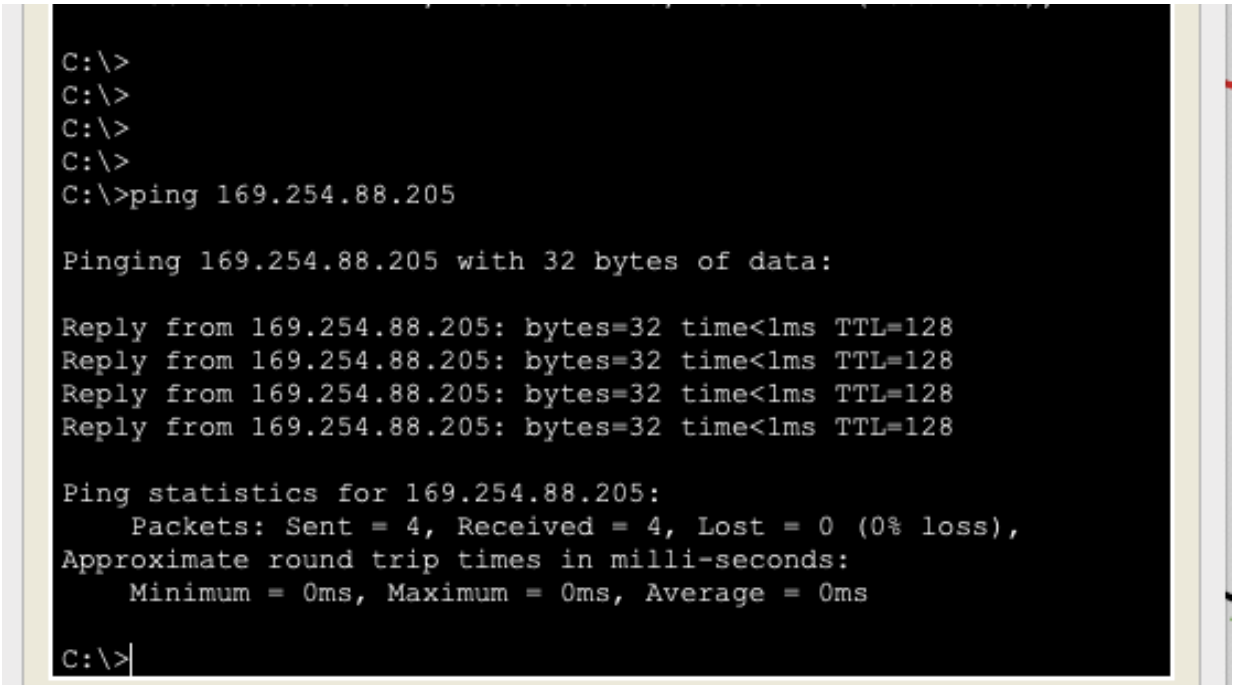


4. When Delhi HR Dept. tried to access another company's(or its own another DC) public server.

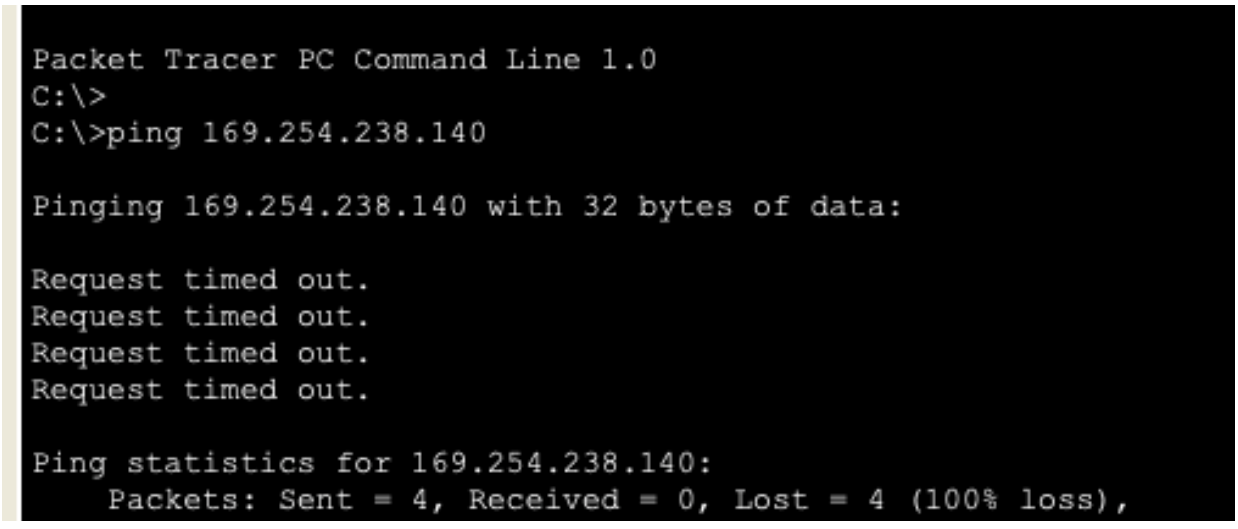
a. <u>When DC is working fine</u>

b. <u>When DC is not working fine</u>

5. When Delhi Accounts Dept. tried to contact its DR accounts dept.



6. When Delhi Accounts Dept. tried to contact another DC's accounts dept.



ANALYSIS OF THIS PROJECT WORK & ITS ACHIEVEMENT

By this project we have created a **blue print** for the **medium level enterprises** which have two or more sites or data centers and having multiple departments running on the same site.

By **our project's blueprint** they can easily configure their **own data centers** and their **data recovery centres** and sites by just changing the subnet masks and range of IP addresses in their DHCP servers according to their requirements and they can also allot IP addresses to the PCs of their departments(here HR,Management,IT) statically by static means and they can communicate safely.

To increase the security of IP packets we can also change the tunneling form from GRE to IPSec.

REFERENCES

[1] Routing configuration Guide,Cisco IOS XE Everest16.6.X(Catalyst 9300 switches) CHAPTER:Configuring Generic Routing Encapsulation(GRE) Tunnel IP Source and Destination.

[2] Cisco CMTS Router Layer 2 and VPN Features Configuration Guide. Chapter: Generic Routing Encapsulation on the Cisco CMTS Routers.

[3] Cisco IOS IP Routing: OSPF Command Reference. Chapter: OSPF Commands: A through ip ospf demand-circuit

[4] Cisco IOS IP Routing: RIP Command Reference

[5] Basic CISCO commands for IP addressing and allocation of subnet masks.

CERTIFICATE

This is to certify that the project report entitled "Designing and configuring a medium level enterprise network with the help of CISCO packet tracer.", submitted by Suraj Jha to University School of Information and Communication Technology, GGSIPU in partial fulfillment of the requirement for the award of degree B.Tech in Electronics and Communication Engineering is a record of bonafide project work carried out by them under my guidance. The project fulfills the requirements as per the regulations of this institute and in my opinion meets the necessary standard of submission. This content of this report have not been submitted and will not be submitted either in part or in full for the award of any other degree or diploma in this institute or any other institute or University to the best of my knowledge.

Guide:Prof. Udayan Ghose
University School of Information and Communication Technology, GGSIPU