



Bahria University, Lahore Campus

PROJECT : Hospital Network Design

Group Partners

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DESCRIPTION

1. Main Reception Counter:

Serves as the central point for information and assistance.

Staffed by trained personnel to provide information about various hospital departments and services.

Connected to the hospital's information system for quick access to patient records and scheduling.

2. Internet Service Provider (ISP):

Provides reliable and high-speed internet connectivity throughout the hospital.

Supports communication, research, and data exchange among various departments.

3. Hospital Administrator:

Manages the overall functioning of the hospital.

Accessible only through a password-protected system to ensure security and confidentiality.

Oversees administrative tasks, resource allocation, and strategic decision-making.

4. Wards:

Cancer, Heart, Emergency, Corona, and Operation wards.

Each ward is equipped with specialized facilities and personnel to cater to specific medical needs.

One specialist, doctor, and laboratory dedicated to each ward for focused patient care.

5. Emergency Block:

Separate housing for emergency staff, including emergency doctors and nurses.

Ensures immediate availability of emergency medical personnel.

Connected to the main hospital network for quick response and coordination.

6. Guest House:

Special guest house for visitors to patients.

Equipped with internet services for communication and information access.

Provides a comfortable and convenient stay for guests.

7. Comport for Specialist Doctors:

Designated area for specialist doctors to prepare for urgent operations.

Connected to the hospital network for quick access to patient data and diagnostic information.

Equipped with necessary tools and facilities for emergency procedures.

8. Medical Store:

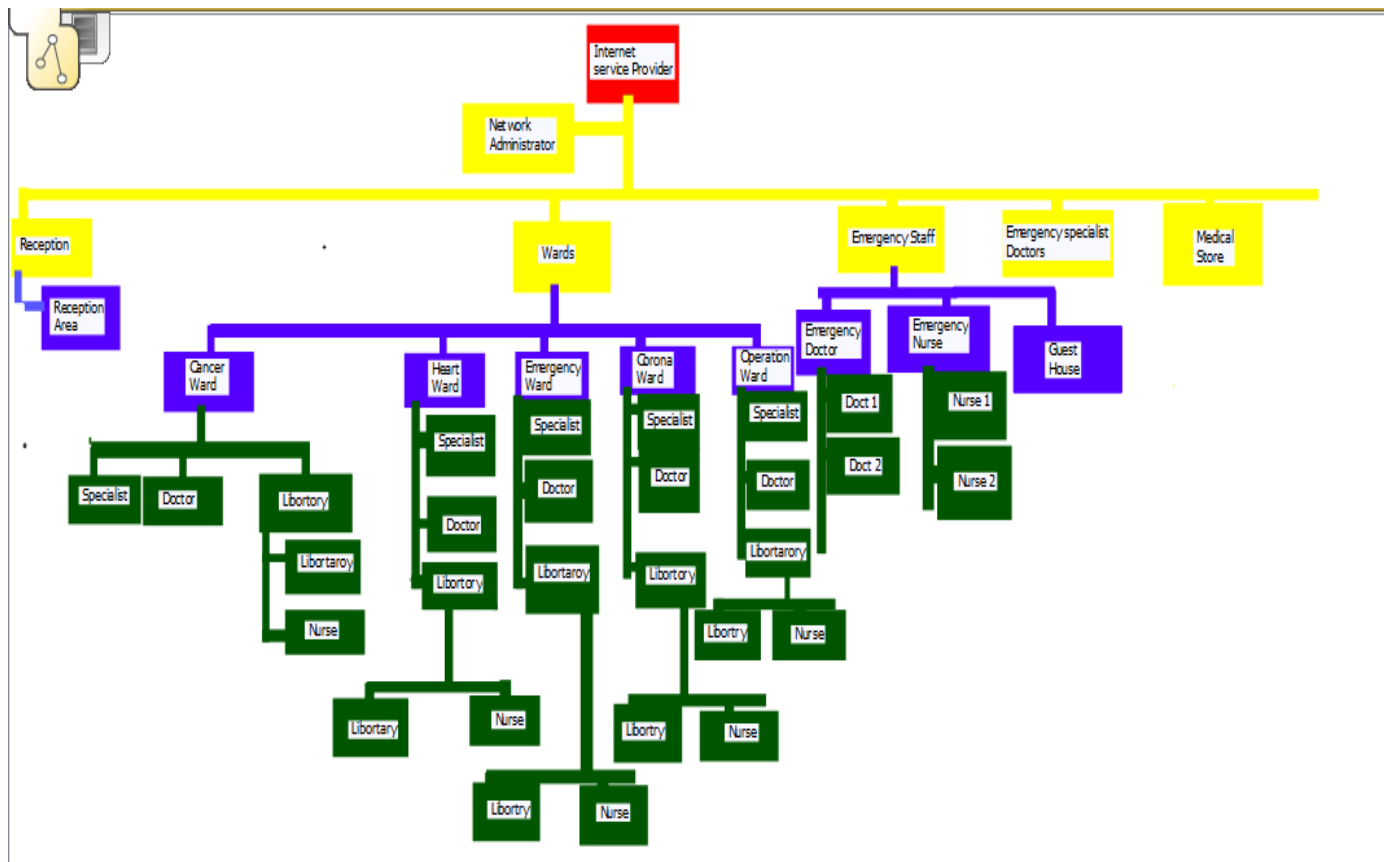
Contains all necessary medicines available in the hospital.

Facilitates easy access to medications prescribed by doctors.

Connected to the hospital's inventory management system for efficient restocking.

This detailed network design ensures that each aspect of the hospital's operation is interconnected, allowing for efficient communication, immediate response to emergencies, and the seamless flow of information to enhance patient care.

NETWORK TOPOLOGY DIAGRAM



TOOLS USED AND KEY HIGHLIGHTS

TOOLS:

The main tool used is cisco packet tracer.

HIGHLIGHTS:

Network administrator (password protected).

Main reception of hospital.

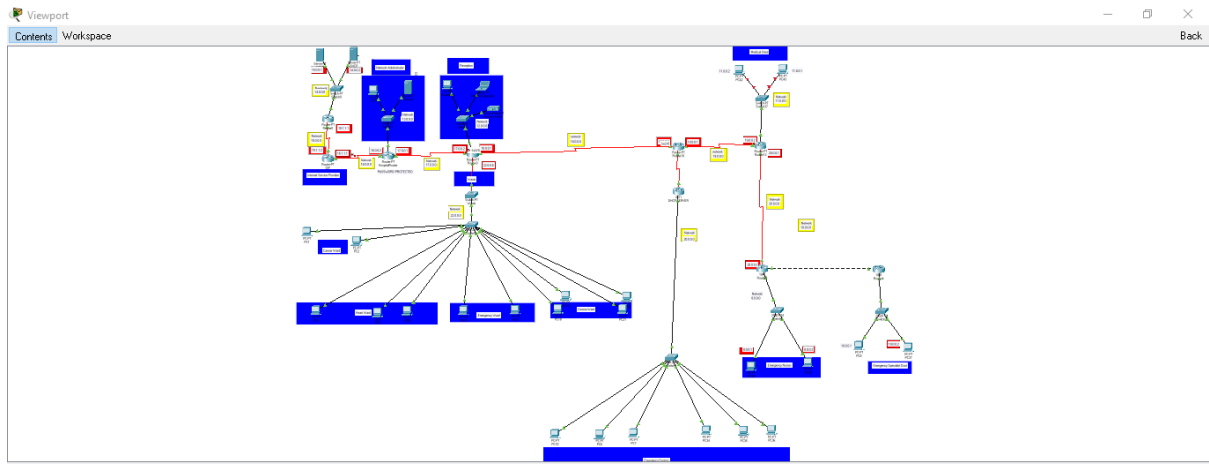
Various wards of hospital.

Laboratory test lab of every wards of hospital.

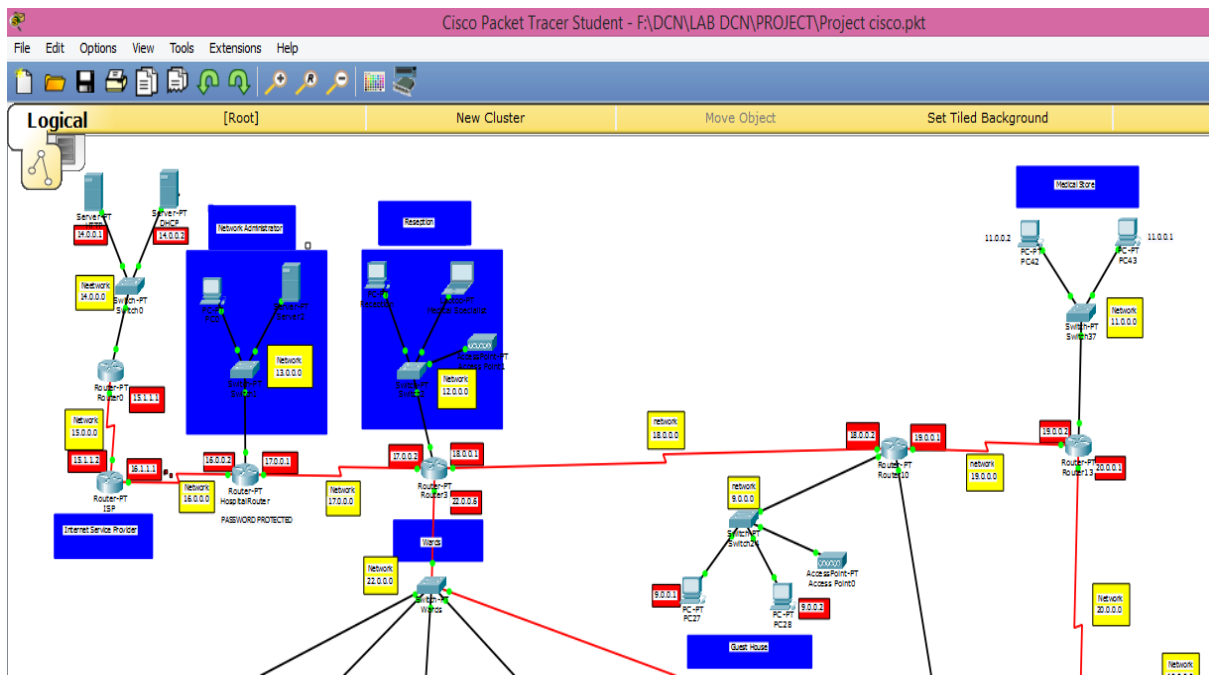
Medical store.

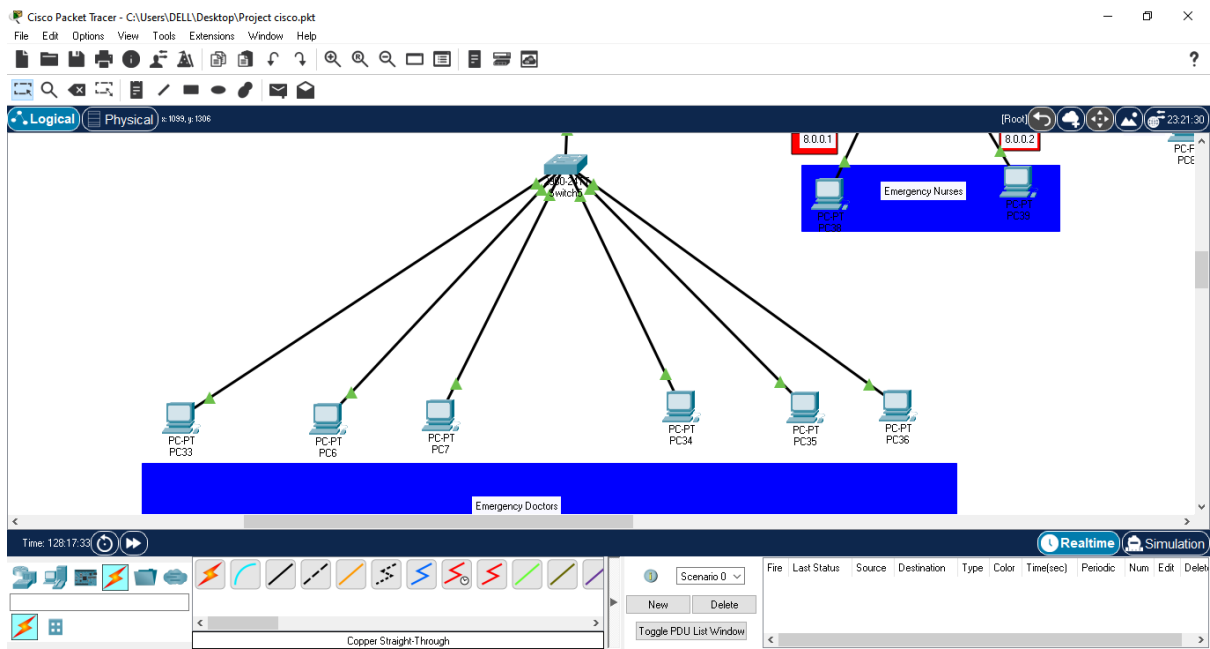
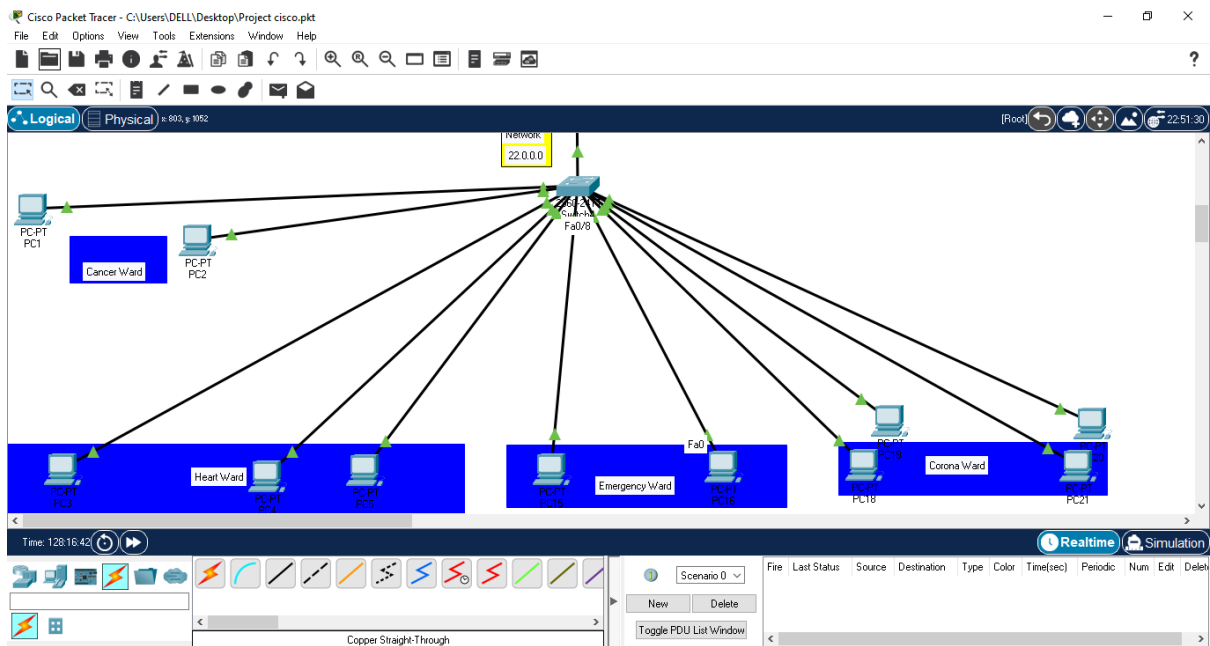
Emergency doctor and nurses department

HOSPITAL NETWORK DESIGN CISCO PACKET PICTURE

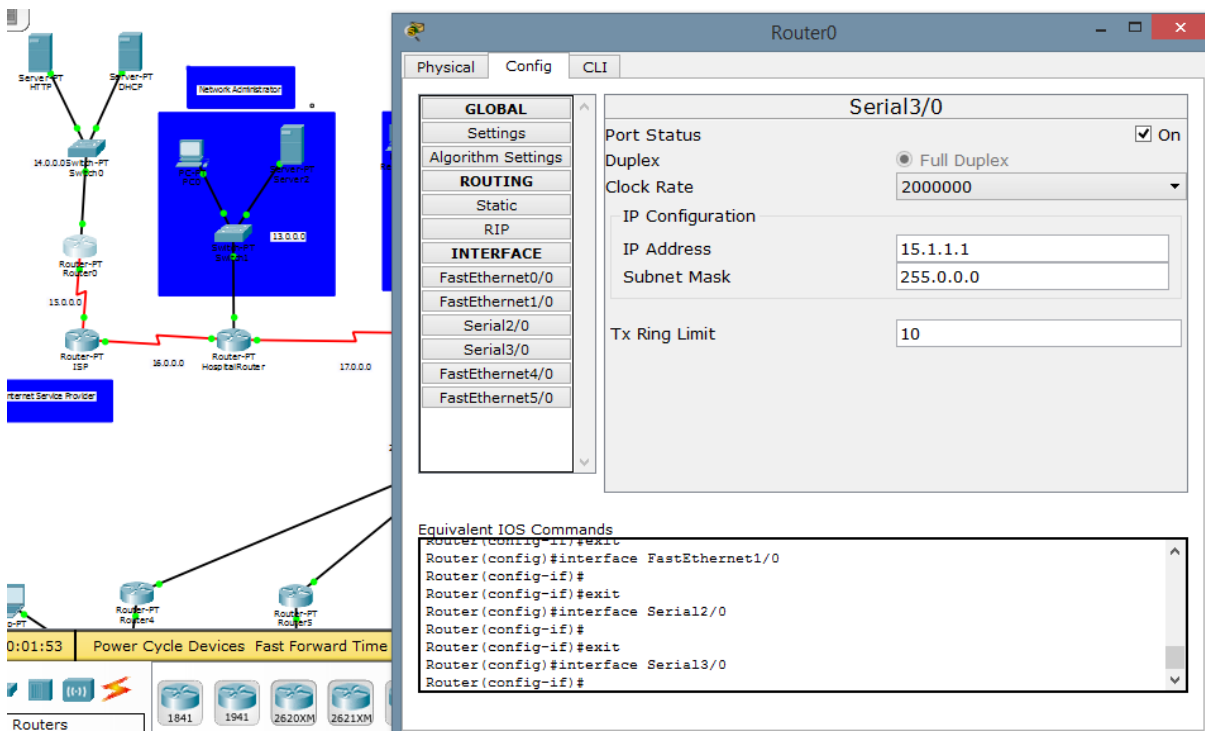
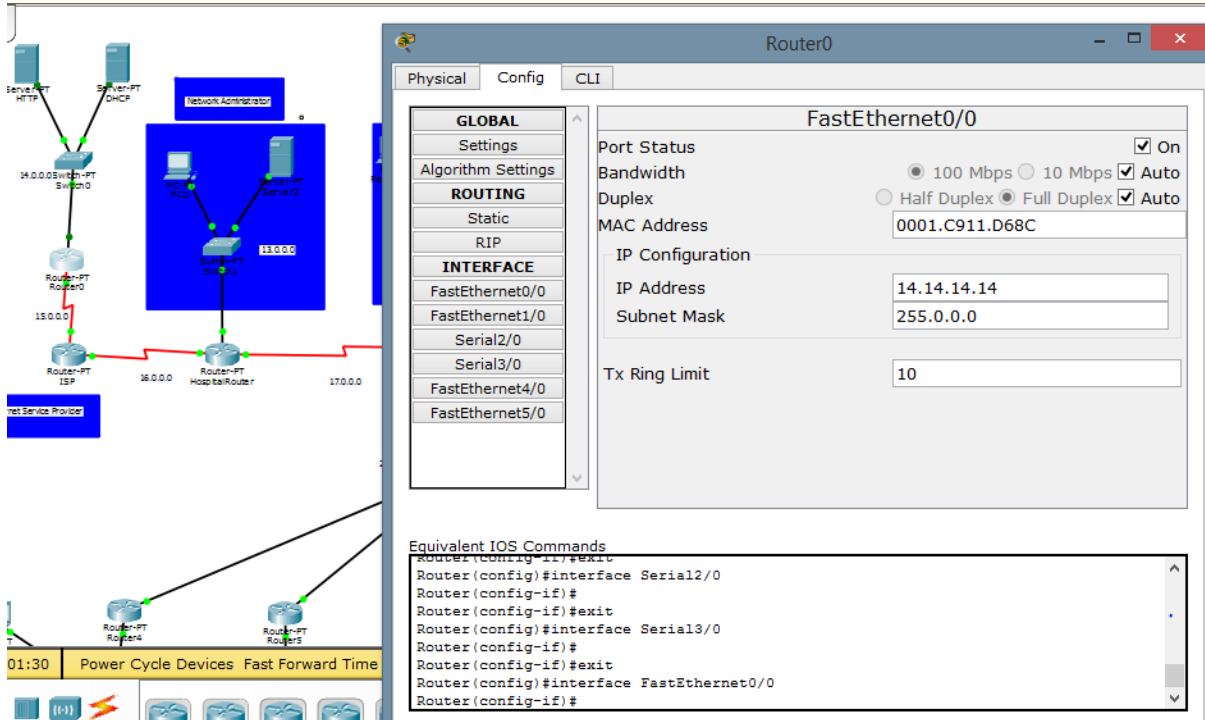


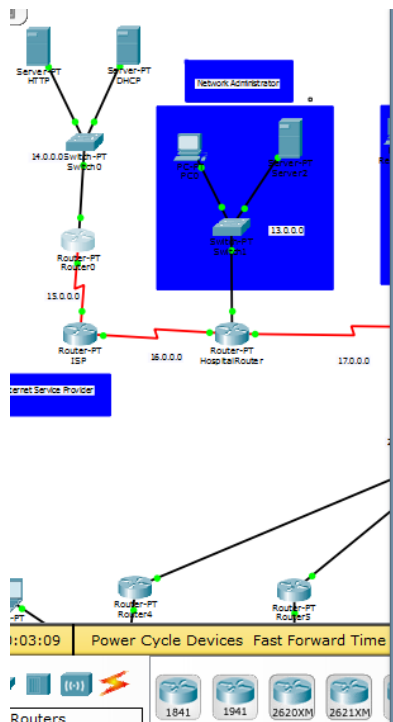
DUE TO BIG NETWORK THE CISCO PROJECT DIAGRAM DIVIDE INTO 3 PICS





ROUTERS CONFIGURATIONS:





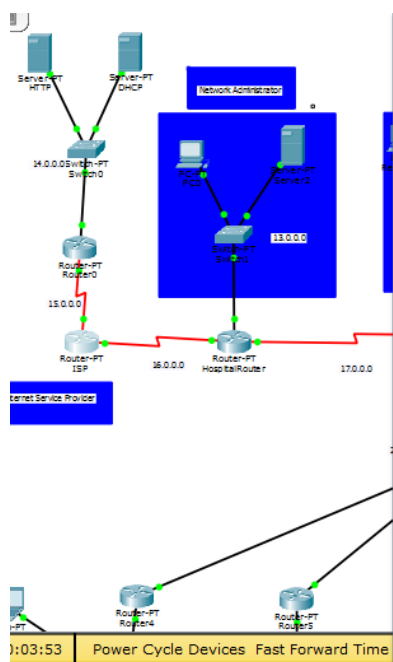
Router0

Physical Config CLI

IOS Command Line Interface

```
Router(config-if)#exit
Router(config)#interface Serial2/0
Router(config-if)#
Router(config)#interface Serial3/0
Router(config-if)#
Router(config)#interface FastEthernet0/0
Router(config-if)#
Router(config)#interface FastEthernet1/0
Router(config-if)#
Router(config)#interface Serial2/0
Router(config-if)#
Router(config)#interface Serial3/0
Router(config-if)#
Router(config)#exit
Router(config)#router eigrp 10
Router(config-router)#network 14.0.0.0
Router(config-router)#network 15.0.0.0
Router(config-router)#exit
Router(config)#do write
Building configuration...
[OK]
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
```

Copy Paste



ISP

Physical Config CLI

GLOBAL

- Settings
- Algorithm Settings

ROUTING

- Static
- RIP

INTERFACE

- FastEthernet0/0
- FastEthernet1/0
- Serial2/0
- Serial3/0
- FastEthernet4/0
- FastEthernet5/0

Serial2/0

Port Status ☒ On

Duplex ☒ Full Duplex

Clock Rate 2000000

IP Configuration

IP Address 16.1.1.1

Subnet Mask 255.0.0.0

Tx Ring Limit 10

Equivalent IOS Commands

```
Arslan(config)#interface Serial2/0
Arslan(config-if)#
Arslan(config)#exit
Arslan(config)#interface Serial3/0
Arslan(config-if)#
Arslan(config)#exit
Arslan(config)#interface Serial2/0
```


The network diagram shows a topology with a central router (Router-PT HospitalRouter) connected to a switch (Switch-PT Switch0) and another switch (Switch-PT Switch1). The switch is connected to a PC (PC-PT PC0). The router is also connected to a switch (Switch-PT Switch1) and a router (Router-PT Router0). The router is connected to a switch (Switch-PT Switch0) and a router (Router-PT Router0). The router is connected to a switch (Switch-PT Switch0) and a router (Router-PT Router0). The router is connected to a switch (Switch-PT Switch0) and a router (Router-PT Router0).

HospitalRouter Configuration - FastEthernet0/0

- Port Status: ☒ On
- Bandwidth: ☒ 100 Mbps ☐ 10 Mbps ☒ Auto
- Duplex: ☐ Half Duplex ☒ Full Duplex ☒ Auto
- MAC Address: 0090.2B1D.0A69
- IP Configuration:
 - IP Address: 13.13.13.13
 - Subnet Mask: 255.0.0.0
- Tx Ring Limit: 10

Equivalent IOS Commands

```

Arslan>enable
Password:
Arslan#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Arslan(config)#interface FastEthernet0/0
Arslan(config-if)#
  
```

The network diagram shows a topology with a central router (Router-PT HospitalRouter) connected to a switch (Switch-PT Switch0) and another switch (Switch-PT Switch1). The switch is connected to a PC (PC-PT PC0). The router is also connected to a switch (Switch-PT Switch1) and a router (Router-PT Router0). The router is connected to a switch (Switch-PT Switch0) and a router (Router-PT Router0). The router is connected to a switch (Switch-PT Switch0) and a router (Router-PT Router0).

HospitalRouter Configuration - Serial2/0

- Port Status: ☒ On
- Duplex: ☒ Full Duplex
- Clock Rate: 2000000
- IP Configuration:
 - IP Address: 17.0.0.1
 - Subnet Mask: 255.0.0.0
- Tx Ring Limit: 10

Equivalent IOS Commands

```

Arslan(config)#interface FastEthernet0/0
Arslan(config-if)#
Arslan(config-if)#exit
Arslan(config)#interface FastEthernet1/0
Arslan(config-if)#
Arslan(config-if)#exit
Arslan(config)#interface Serial2/0
Arslan(config-if)#
  
```

The network diagram shows a topology with a central 'HospitalRouter' (Router-PT) connected to an 'ISP' (Router-PT) and a 'Network Administrator' (Switch-PT). The ISP is connected to a 'Service Provider' (Switch-PT) which has a 'Server-PT DHCP' and a 'PC-PT'. The HospitalRouter is connected to a 'PC-PT' and a 'Server-PT'. The HospitalRouter has interfaces 16.0.0.0 and 17.0.0.0. The ISP has interfaces 14.0.0.0 and 15.0.0.0. The Service Provider has interfaces 14.0.0.0 and 15.0.0.0. The Network Administrator has interfaces 14.0.0.0 and 15.0.0.0. The HospitalRouter is connected to the ISP via a red line. The HospitalRouter is connected to the Network Administrator via a red line. The HospitalRouter is connected to the Service Provider via a red line. The HospitalRouter is connected to the PC-PT and Server-PT via a red line.

The HospitalRouter configuration window shows the 'Serial3/0' interface settings:

- Port Status: ☒ On
- Duplex: ☒ Full Duplex
- Clock Rate: 2000000
- IP Configuration:
 - IP Address: 16.0.0.2
 - Subnet Mask: 255.0.0.0
- Tx Ring Limit: 10

Equivalent IOS Commands:

```

Arslan(config)#interface FastEthernet1/0
Arslan(config-if)#
Arslan(config-if)#exit
Arslan(config)#interface Serial2/0
Arslan(config-if)#
Arslan(config-if)#exit
Arslan(config)#interface Serial3/0
Arslan(config-if)#
  
```

The network diagram shows a topology with a central 'HospitalRouter' (Router-PT) connected to an 'ISP' (Router-PT) and a 'Network Administrator' (Switch-PT). The ISP is connected to a 'Service Provider' (Switch-PT) which has a 'Server-PT DHCP' and a 'PC-PT'. The HospitalRouter is connected to a 'PC-PT' and a 'Server-PT'. The HospitalRouter has interfaces 16.0.0.0 and 17.0.0.0. The ISP has interfaces 14.0.0.0 and 15.0.0.0. The Service Provider has interfaces 14.0.0.0 and 15.0.0.0. The Network Administrator has interfaces 14.0.0.0 and 15.0.0.0. The HospitalRouter is connected to the ISP via a red line. The HospitalRouter is connected to the Network Administrator via a red line. The HospitalRouter is connected to the Service Provider via a red line. The HospitalRouter is connected to the PC-PT and Server-PT via a red line.

The HospitalRouter configuration window shows the 'IOS Command Line Interface' with the following commands:

```

Arslan>en
Password:
Arslan#config t
Enter configuration commands, one per line. End with CNTL/Z.
Arslan(config)#router eigrp 10
Arslan(config-router)#network 13.0.0.0
Arslan(config-router)#network 16.0.0.0
Arslan(config-router)#network 17.0.0.0
Arslan(config-router)#exit
Arslan(config)#do write
Building configuration...
[OK]
Arslan(config)#enable password arslan
Arslan(config)#exit
Arslan#
*SYS-5-CONFIG_I: Configured from console by console

Arslan#exit
  
```

The network diagram shows a topology with three routers: Router-PT ISP (15.0.0.0), Router-PT HospitalRoute (16.0.0.0), and Router-PT Router0 (4.0.0.0). Router0 is connected to Switch-PT Switch0, which is connected to a Server-PT DHCP. Router0 is also connected to Switch-PT Switch1, which is connected to a PC-PT PC0. The routers are connected in a line: Router0 -> Router-PT ISP -> Router-PT HospitalRoute.

The Router3 configuration window shows the configuration for FastEthernet0/0:

- Physical** tab: Port Status is On, Bandwidth is 100 Mbps, Duplex is Full Duplex, MAC Address is 0001.4260.9159.
- Config** tab: IP Address is 12.12.12.12, Subnet Mask is 255.0.0.0, Tx Ring Limit is 10.
- CLI** tab: Shows the equivalent IOS commands:


```
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface FastEthernet0/0
Router(config-if)#
```

The network diagram is identical to the one above, showing the same topology of routers, switches, and devices.

The Router3 configuration window shows the configuration for Serial2/0:

- Physical** tab: Port Status is On, Duplex is Full Duplex, Clock Rate is 2000000.
- Config** tab: IP Address is 17.0.0.2, Subnet Mask is 255.0.0.0, Tx Ring Limit is 10.
- CLI** tab: Shows the equivalent IOS commands:


```
Router(config)#interface FastEthernet0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet1/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial2/0
Router(config-if)#
```

The network diagram shows a topology with a Server-PT (DHCP) and a PC-PT connected to a Switch-PT (14.0.0.0). The switch is connected to Router-PT (Router0). Router0 is connected to Router-PT (ISP) via a serial link (15.0.0.0). The ISP is connected to a Host (16.0.0.0). The Host is connected to a Host (18.0.0.0).

The Router3 configuration window shows the configuration for the Serial3/0 interface. The interface is configured with the IP address 18.0.0.1 and a subnet mask of 255.0.0.0. The clock rate is set to 2000000. The port status is On, and the duplex is Full Duplex. The Tx Ring Limit is set to 10.

Equivalent IOS Commands:

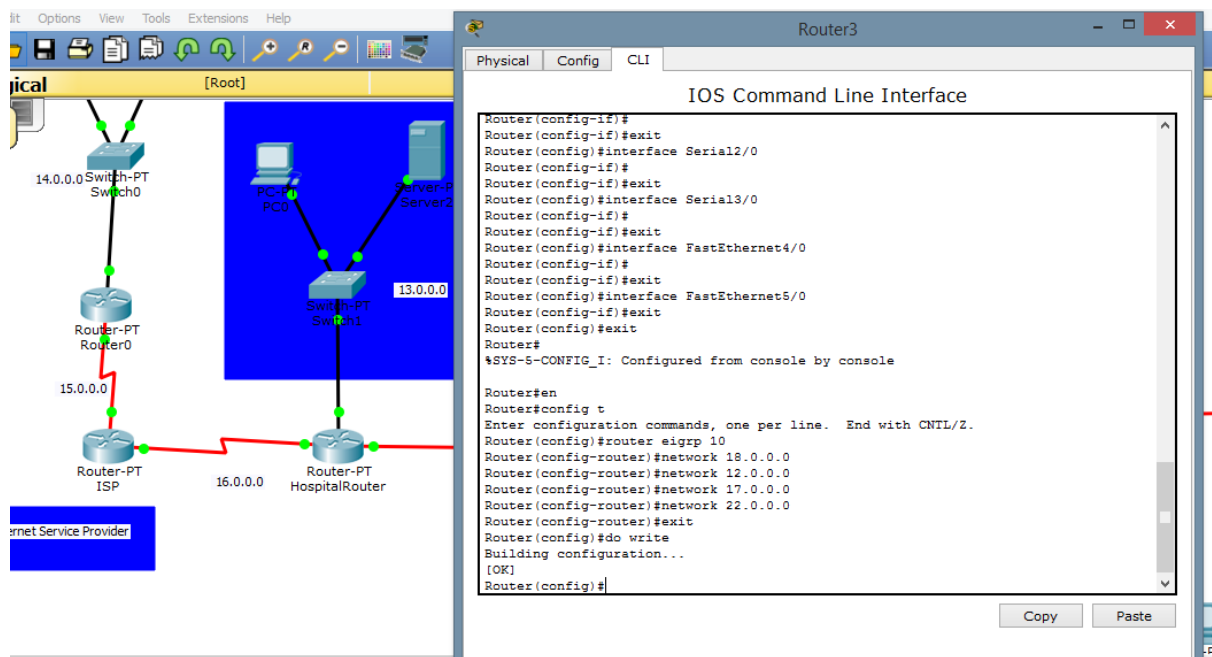
```
Router(config)#exit
Router(config)#interface FastEthernet1/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial2/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial3/0
Router(config-if)#
```

The network diagram is identical to the one above, showing the same topology with the Server-PT, Switch-PT, Router0, ISP, and Hosts.

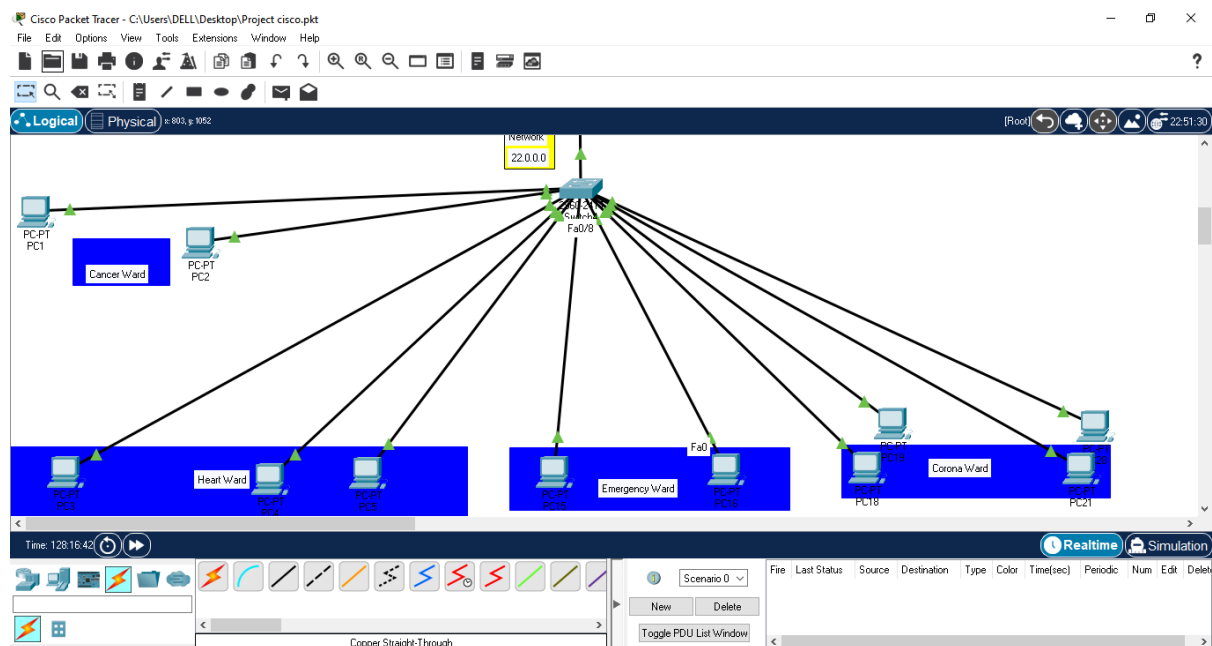
The Router3 configuration window shows the configuration for the FastEthernet4/0 interface. The interface is configured with the IP address 22.0.0.6 and a subnet mask of 255.0.0.0. The bandwidth is set to 100 Mbps, and the duplex is Full Duplex. The MAC Address is 0002.1749.E912. The Tx Ring Limit is set to 10.

Equivalent IOS Commands:

```
Router(config)#exit
Router(config)#interface Serial2/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial3/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet4/0
Router(config-if)#
```



VLAN CONFIGURATIONS :



IOS Command Line Interface

```
%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
```

```
Switch>enable
Switch#show vlan
```

VLAN	Name	Status	Ports
1	default	active	Fa0/1, Fa0/13, Fa0/14, Fa0/15 Fa0/16, Fa0/17, Fa0/18, Fa0/19 Fa0/20, Fa0/21, Fa0/22, Fa0/23 Fa0/24, Gig0/1, Gig0/2
2	cancerward	active	Fa0/2, Fa0/3
3	heartward	active	Fa0/4, Fa0/5, Fa0/6
4	emergency	active	Fa0/7, Fa0/8
5	corona	active	Fa0/9, Fa0/10, Fa0/11, Fa0/12
1002	fddi-default	active	
1003	token-ring-default	active	
1004	fddinet-default	active	
1005	trnet-default	active	

VLAN	Type	SAID	MTU	Parent	RingNo	BridgeNo	Stp	BrdgMode	Trans1	Trans2
1	enet	100001	1500	-	-	-	-	-	0	0
2	enet	100002	1500	-	-	-	-	-	0	0
3	enet	100003	1500	-	-	-	-	-	0	0
4	enet	100004	1500	-	-	-	-	-	0	0

```
--More--
```

Ctrl+F6 to exit CLI focus

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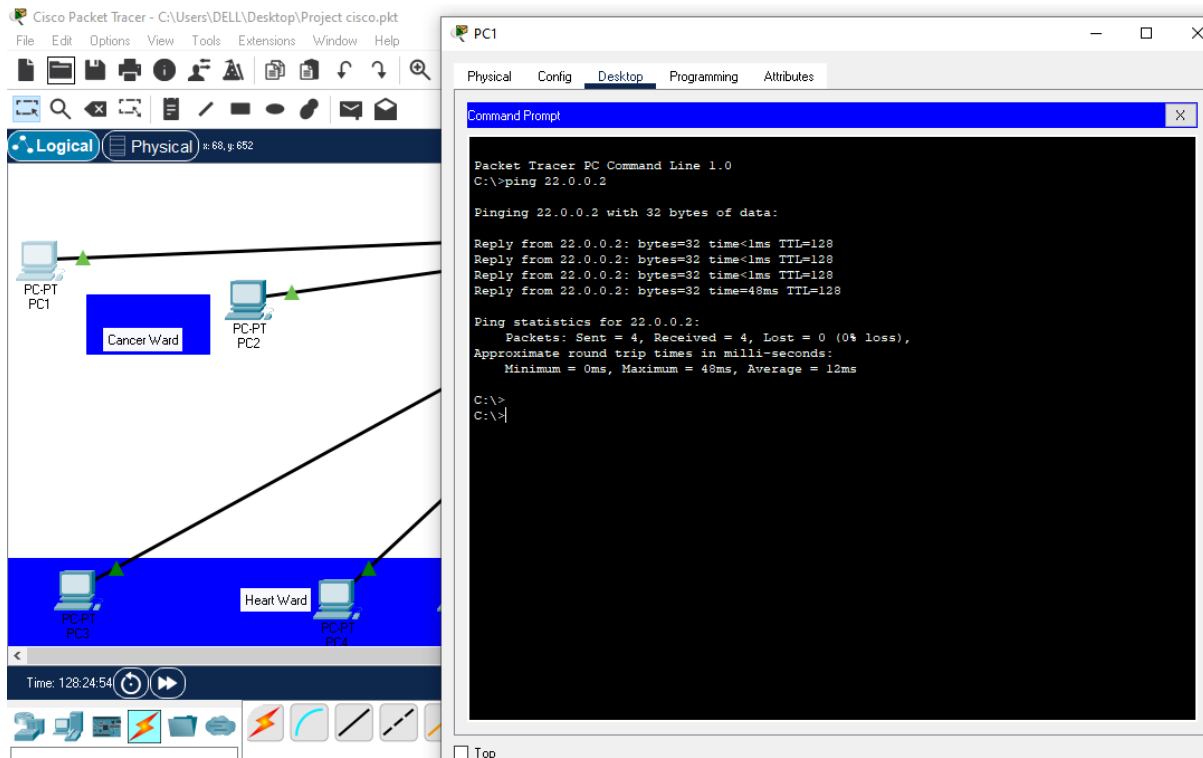
☐ Top

Port Status Summary Table for Switch4

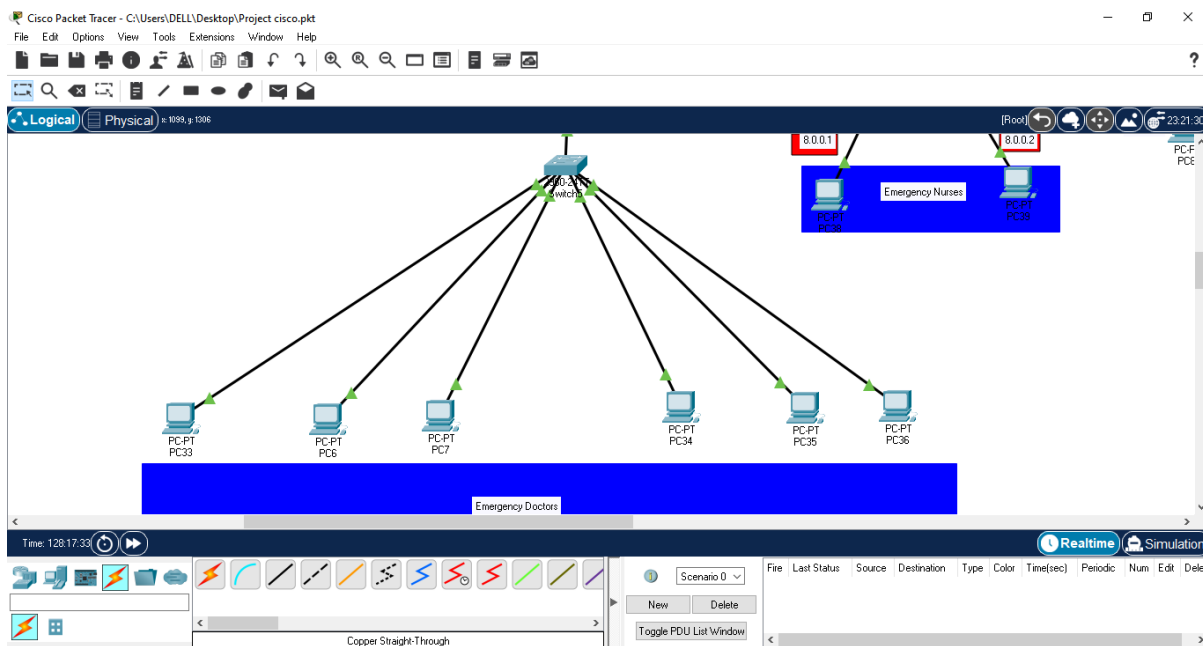
Custom Device Model: 2960 IOS15

Hostname: Switch

Port	Link	VLAN	IP Address	MAC Address
FastEthernet0/1	Up	1	--	0001.4378.E801
FastEthernet0/2	Up	2	--	0001.4378.E802
FastEthernet0/3	Up	2	--	0001.4378.E803
FastEthernet0/4	Up	3	--	0001.4378.E804
FastEthernet0/5	Up	3	--	0001.4378.E805
FastEthernet0/6	Up	3	--	0001.4378.E806
FastEthernet0/7	Up	4	--	0001.4378.E807
FastEthernet0/8	Up	4	--	0001.4378.E808
FastEthernet0/9	Up	5	--	0001.4378.E809
FastEthernet0/10	Up	5	--	0001.4378.E80A
FastEthernet0/11	Up	5	--	0001.4378.E80B
FastEthernet0/12	Up	5	--	0001.4378.E80C
FastEthernet0/13	Down	1	--	0001.4378.E80D



DHCP CONFIGURATIONS :



Physical Config CLI Attributes

IOS Command Line Interface

```
dhcp-server#show ip dhcp binding
IP address      Client-ID/
Hardware address Lease expiration Type
192.168.1.7     0030.A331.C3BB -- Automatic
192.168.1.6     0030.F24D.33BD -- Automatic
192.168.1.5     00D0.58C0.5A62 -- Automatic
192.168.1.2     0010.11C2.0B39 -- Automatic
192.168.1.3     0009.7CEB.E119 -- Automatic
dhcp-server#show ip dhcp pool

Pool 192.168.1.1 :
Utilization mark (high/low) : 100 / 0
Subnet size (first/next)    : 0 / 0
Total addresses              : 254
Leased addresses             : 5
Excluded addresses          : 2
Pending event                : none

1 subnet is currently in the pool
Current index   IP address range   Leased/Excluded/Total
192.168.1.1    192.168.1.1 - 192.168.1.254  5 / 2 / 254

Pool 192.168.2.1 :
Utilization mark (high/low) : 100 / 0
Subnet size (first/next)    : 0 / 0
Total addresses              : 254
Leased addresses             : 0
Excluded addresses          : 2
Pending event                : none

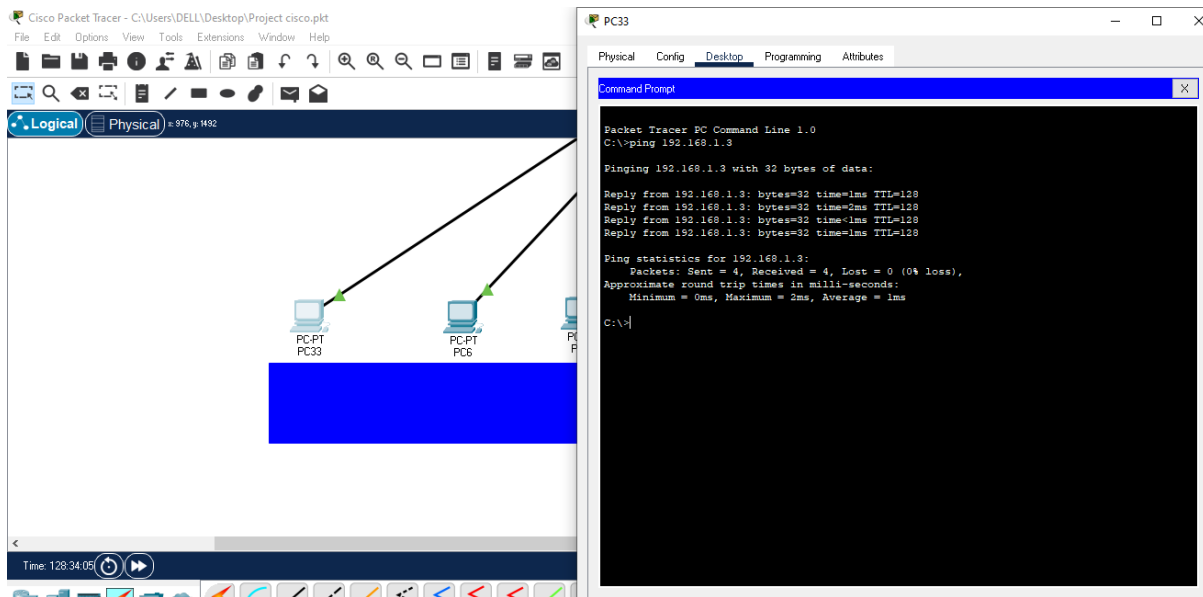
1 subnet is currently in the pool
Current index   IP address range   Leased/Excluded/Total
192.168.2.1    192.168.2.1 - 192.168.2.254  0 / 2 / 254
dhcp-server#
```

Ctrl+F6 to exit CLI focus

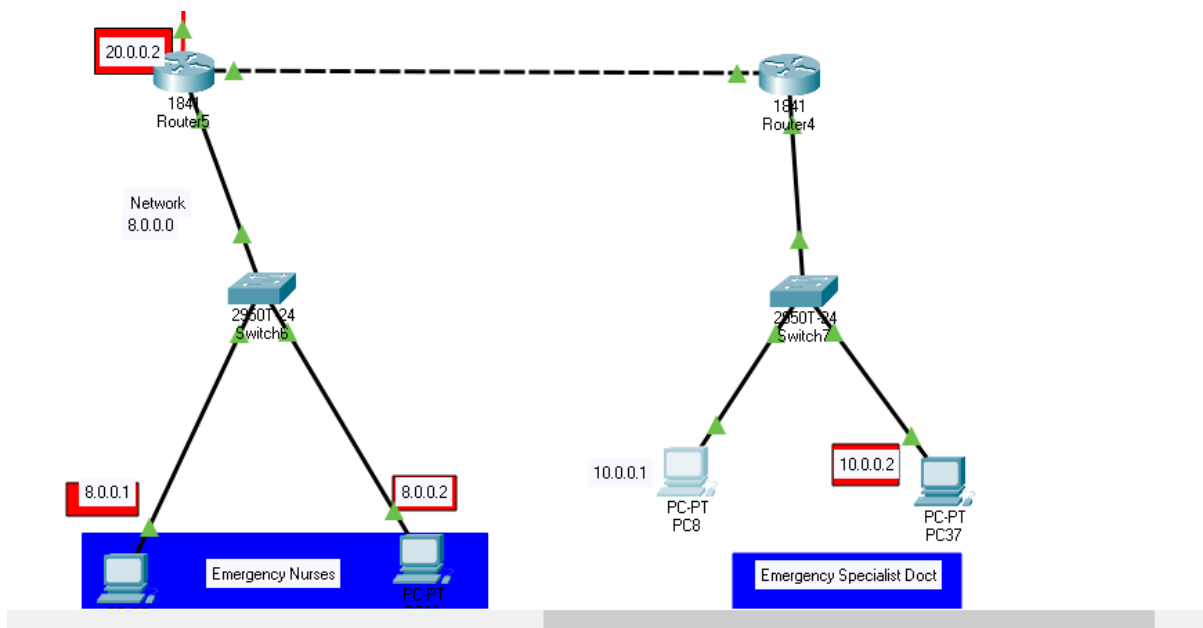
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☐ Top



WAN CONNECTIVITY :



Routing Table for Router5

Type	Network	Port	Next Hop IP	Metric
C	8.0.0.0/8	FastEthernet0/1	---	0/0
R	10.0.0.0/8	FastEthernet0/0	192.168.1.2	120/1
C	20.0.0.0/8	Serial0/1/0	---	0/0
C	192.168.1.0/24	FastEthernet0/0	---	0/0

Routing Table for Router4

Type	Network	Port	Next Hop IP	Metric
R	8.0.0.0/8	FastEthernet0/0	192.168.1.4	120/1
C	10.0.0.0/8	FastEthernet0/1	---	0/0
C	192.168.1.0/24	FastEthernet0/0	---	0/0

Cisco Packet Tracer - C:\Users\DELL\Desktop\Project cisco.pkt

File Edit Options View Tools Extensions Window Help

Logical Physical 1812.3.488

200.0.2
1841 Router
Network 8000
2501/24 Switch
800.1
800.2
Emergency Nurses
PC-PT
1000.1
1000.2
Emergency Specialist Doctor
PC-PT
PC-PT

Time: 128.41.44

Automatically Choose Connection Type

PC38

Physical Config Desktop Programming Attributes

Command Prompt

```
Packet Tracer PC Command Line 1.0
C:\>ping 10.0.0.1

Pinging 10.0.0.1 with 32 bytes of data:

Reply from 10.0.0.1: bytes=32 time<1ms TTL=126
Reply from 10.0.0.1: bytes=32 time=10ms TTL=126
Reply from 10.0.0.1: bytes=32 time=10ms TTL=126

Ping statistics for 10.0.0.1:
    Packets: Sent = 3, Received = 3, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 10ms, Average = 6ms

Control-C
~C
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=126
Reply from 10.0.0.2: bytes=32 time<1ms TTL=126

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:\>
```

Cisco Packet Tracer - C:\Users\DELL\Desktop\Project cisco.pkt

File Edit Options View Tools Extensions Window Help

PC3

Physical Config Desktop Programming Attributes

Command Prompt

```
Packet Tracer PC Command Line 1.0
C:\>ping 8.0.0.1

Pinging 8.0.0.1 with 32 bytes of data:

Ping statistics for 8.0.0.1:
    Packets: Sent = 1, Received = 0, Lost = 1 (100% loss),

Control-C
~C
C:\>ping 8.0.0.1

Pinging 8.0.0.1 with 32 bytes of data:

Reply from 8.0.0.1: bytes=32 time<1ms TTL=126
Reply from 8.0.0.1: bytes=32 time=10ms TTL=126
Reply from 8.0.0.1: bytes=32 time=11ms TTL=126
Reply from 8.0.0.1: bytes=32 time=51ms TTL=126

Ping statistics for 8.0.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 51ms, Average = 18ms

C:\>ping 8.0.0.2

Pinging 8.0.0.2 with 32 bytes of data:

Request timed out.
Reply from 8.0.0.2: bytes=32 time=10ms TTL=126
Reply from 8.0.0.2: bytes=32 time=24ms TTL=126
Reply from 8.0.0.2: bytes=32 time=37ms TTL=126

Ping statistics for 8.0.0.2:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
```

200.0.2
1841 Router
Network 8000
2501/24 Switch
800.1
800.2
Emergency Nurses
PC-PT
1000.1
1000.2
Emergency Specialist Doctor
PC-PT
PC-PT

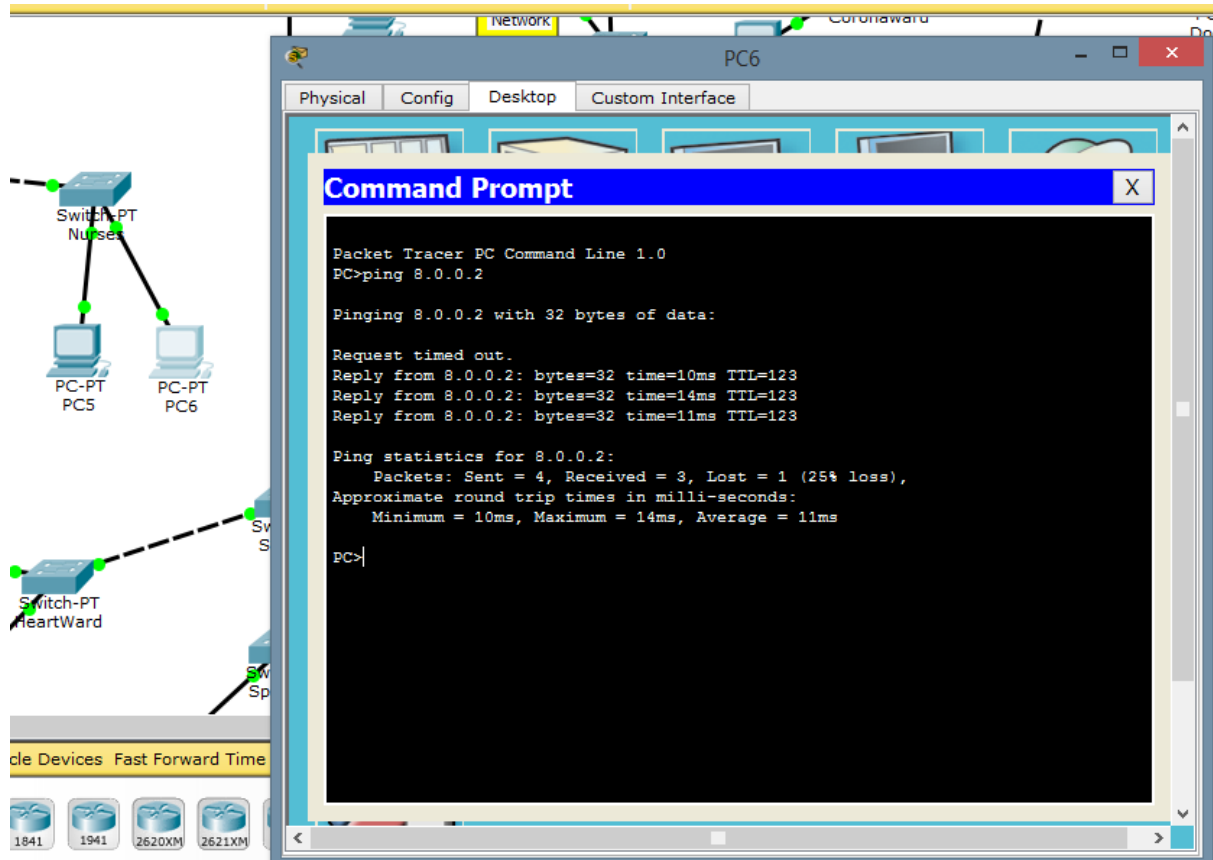
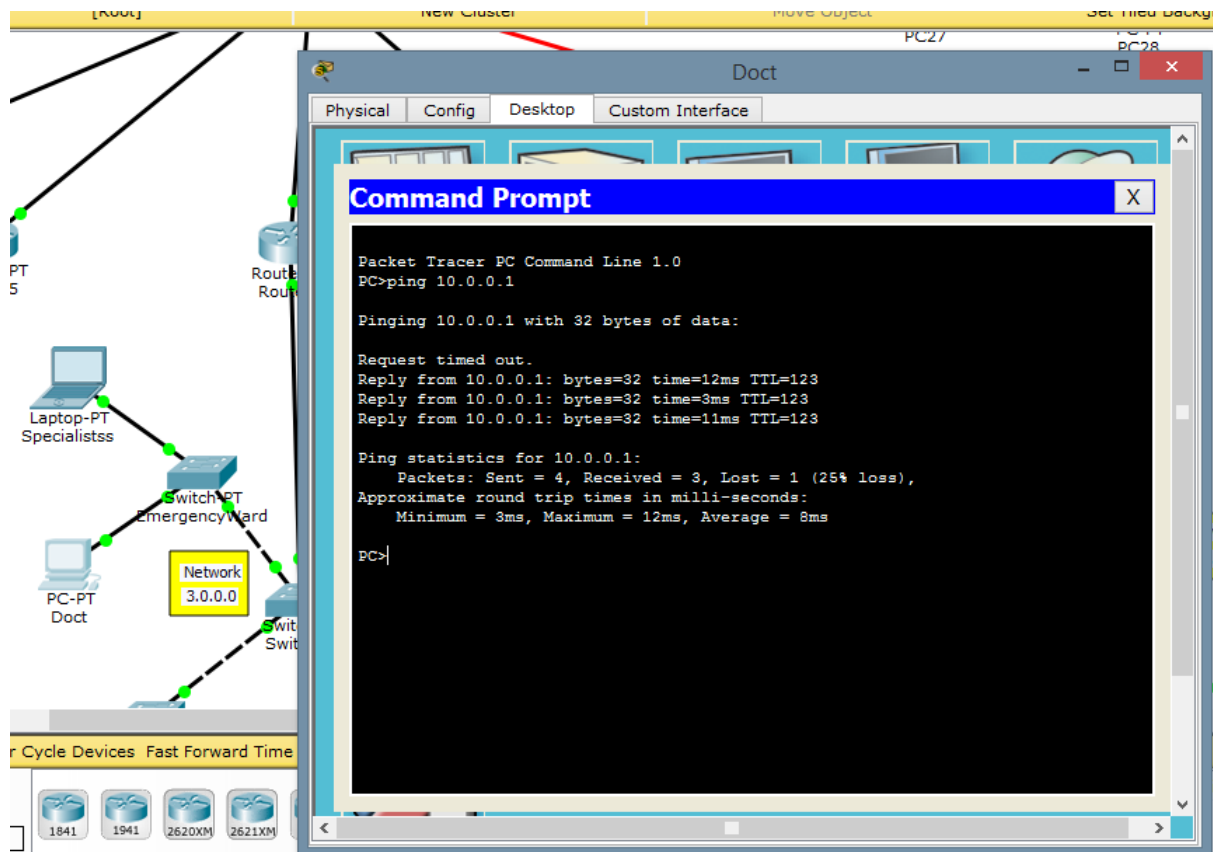
Realtime Simulation

Scenario 0

New Delete

Toggle PDU List Window

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
------	-------------	--------	-------------	------	-------	-----------	----------	-----	------	--------



Conclusion:

In conclusion, the hospital network design not only optimizes efficiency, security, and patient care but also prioritizes robust cybersecurity measures. The integration of advanced firewalls at critical points, such as the Main Reception Counter, Internet Service Provider, and Hospital Administrator system, ensures an additional layer of protection against potential threats. This cybersecurity focus safeguards patient data, reinforces confidentiality, and fortifies the entire network infrastructure. From specialized wards to emergency facilities, the interconnected system, fortified by firewalls, guarantees seamless communication and operations while meeting the highest standards of healthcare security. This concise yet comprehensive network design facilitates swift responses to emergencies, upholds advanced technological integration, and establishes a resilient foundation for improved patient care within a secure healthcare environment.