

Project Brief: Hospital Management System Network Design and Implementation

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Objective

The objective of this project is to design and implement a robust and scalable network infrastructure for a hospital management system, ensuring seamless connectivity and secure communication across departments. The network architecture will support critical hospital operations by enabling efficient data sharing, reliable inter-device communication, and secure internet access. The system will integrate advanced technologies like DHCP for automated IP address allocation, NAT for secure external connectivity, and a dynamic routing protocol for optimized data flow. By providing a structured layout across three floors and leveraging devices such as routers, switches, PCs, wireless access points, smartphones, printers, and telephones, the network will meet the hospital's requirements for efficient departmental interaction and patient care management.

Technologies Used

This project is built in Cisco Packet Tracer. It contains 4 routers, 3 for each floor of the hospital and another that is responsible for configuring NAT with the help of a server. A total of two servers were used in the project, one for NAT and the other for DHCP. The network ensures seamless communication between devices.

Challenges & Learnings

NAT was a little challenging to implement but the rest of the project was easy. Through this project I learned how to configure multiple devices and how to build a real-life robust network topology. It was a fun project to work on.

Implementation Details

Floor and Department Layout

1st Floor: Network - 192.168.10.0

- Reception
- Emergency Department
- Pharmacy

2nd Floor: Network – 192.168.14.0

- Surgery Department
- Radiology
- Patient Records

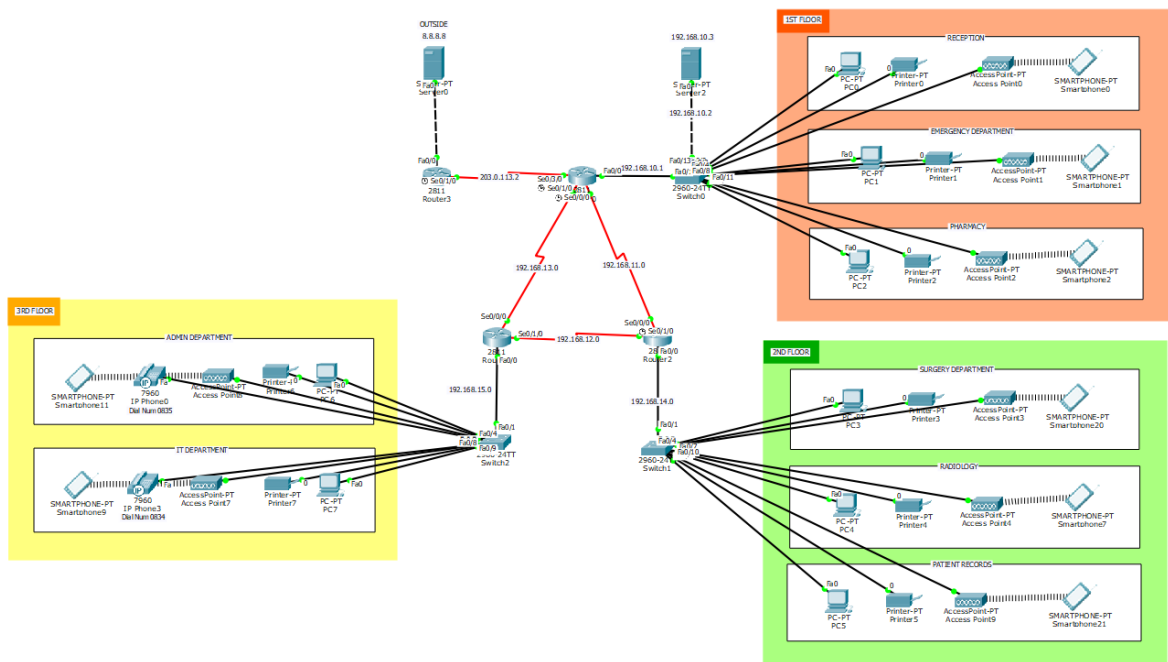
3rd Floor: Network – 192.168.15.0

- Admin Department
- IT Department

Network Design Requirements

1. Routers
 2. Switches
 3. PCs
 4. Wireless Access Points
 5. Smartphones
 6. Printers
 7. Telephones
 8. Routing Protocol
 9. DHCP Configuration
 10. NAT
 11. Inter-Device Communication
-

Network Topology



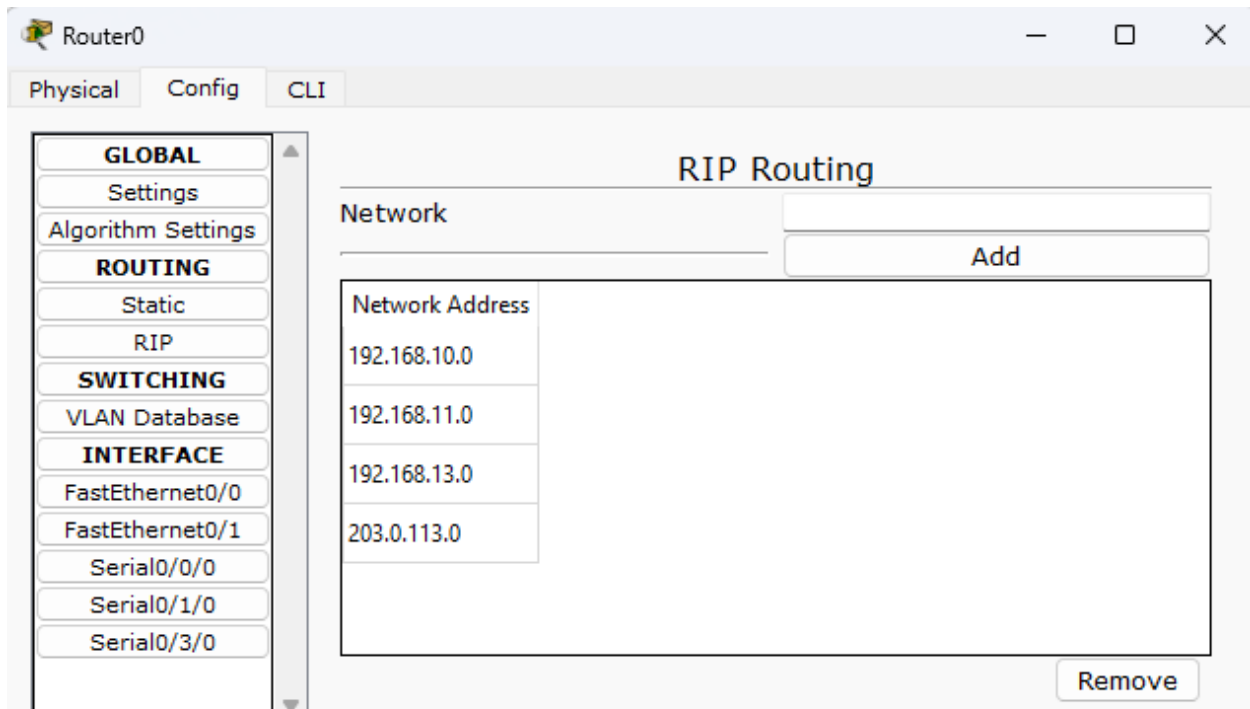
Scenarios

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	Smartphone11	Smartphone0	ICMP		0.000	N	0	(edit)	(delete)
	Successful	PC0	Smartphone20	ICMP		0.000	N	1	(edit)	(delete)
	Successful	PC2	Smartphone9	ICMP		0.000	N	2	(edit)	(delete)

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	PC6	Printer1	ICMP		0.000	N	0	(edit)	(delete)
	Successful	PC6	Server0	ICMP		0.000	N	1	(edit)	(delete)
	Successful	Server0	Smartphone2	ICMP		0.000	N	2	(edit)	(delete)

Routing

RIP routing used on each router



The screenshot shows the Router0 configuration window with the 'Config' tab selected. The left sidebar contains a tree view with categories: GLOBAL, ROUTING, SWITCHING, and INTERFACE. Under ROUTING, 'RIP' is selected. The main area is titled 'RIP Routing' and contains a 'Network' section with a table of network addresses. The table has one column, 'Network Address', and lists four addresses: 192.168.10.0, 192.168.11.0, 192.168.13.0, and 203.0.113.0. Above the table is an 'Add' button, and below it is a 'Remove' button.

Network Address
192.168.10.0
192.168.11.0
192.168.13.0
203.0.113.0

Equivalent IOS Commands

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

DHCP

PC0

Physical Config Desktop Custom Interface

IP Configuration

IP Configuration

☒ DHCP ☐ Static DHCP request successful.

IP Address	192.168.10.11
Subnet Mask	255.255.255.0
Default Gateway	192.168.10.1
DNS Server	192.168.10.2

IPv6 Configuration

☐ DHCP ☐ Auto Config ☒ Static

IPv6 Address	
Link Local Address	FE80::202:4AFF:FE0B:434A
IPv6 Gateway	
IPv6 DNS Server	

NAT Translations

Router0

Physical Config CLI

IOS Command Line Interface

```
Router#sh ip nat translations
Pro Inside global      Inside local      Outside local      Outside
global
icmp 203.0.113.2:15    192.168.10.11:15  8.8.8.8:15         8.8.8.8:15
icmp 203.0.113.2:16    192.168.10.11:16  8.8.8.8:16         8.8.8.8:16
icmp 203.0.113.2:17    192.168.10.11:17  8.8.8.8:17         8.8.8.8:17
icmp 203.0.113.2:18    192.168.10.11:18  8.8.8.8:18         8.8.8.8:18
icmp 203.0.113.2:19    192.168.10.11:19  8.8.8.8:19         8.8.8.8:19
icmp 203.0.113.2:20    192.168.10.11:20  8.8.8.8:20         8.8.8.8:20
icmp 203.0.113.2:21    192.168.10.11:21  8.8.8.8:21         8.8.8.8:21
icmp 203.0.113.2:22    192.168.10.11:22  8.8.8.8:22         8.8.8.8:22
icmp 203.0.113.2:23    192.168.10.11:23  8.8.8.8:23         8.8.8.8:23
icmp 203.0.113.2:24    192.168.10.11:24  8.8.8.8:24         8.8.8.8:24
icmp 203.0.113.2:25    192.168.10.11:25  8.8.8.8:25         8.8.8.8:25
icmp 203.0.113.2:26    192.168.10.11:26  8.8.8.8:26         8.8.8.8:26
icmp 203.0.113.2:27    192.168.10.11:27  8.8.8.8:27         8.8.8.8:27
icmp 203.0.113.2:28    192.168.10.11:28  8.8.8.8:28         8.8.8.8:28
icmp 203.0.113.2:29    192.168.10.11:29  8.8.8.8:29         8.8.8.8:29
icmp 203.0.113.2:30    192.168.10.11:30  8.8.8.8:30         8.8.8.8:30
icmp 203.0.113.2:31    192.168.10.11:31  8.8.8.8:31         8.8.8.8:31
icmp 203.0.113.2:32    192.168.10.11:32  8.8.8.8:32         8.8.8.8:32
icmp 203.0.113.2:33    192.168.10.11:33  8.8.8.8:33         8.8.8.8:33
icmp 203.0.113.2:34    192.168.10.11:34  8.8.8.8:34         8.8.8.8:34
icmp 203.0.113.2:35    192.168.10.11:35  8.8.8.8:35         8.8.8.8:35
--More--
```

Copy Paste

PDU Information at Device: Router3

OSI Model Inbound PDU Details Outbound PDU Details

PDU Formats

HDLC

0	8	16	32	32+x	48+x
FLG:	ADR:	CONTROL:	DATA: (VARIABLE LENGTH)	FCS:	FL
0111	0x8f	0x0		0x0	0:
1110					1:

IP

0	4	8	16	19	31	Bits
4	IHL	DSCP: 0x0	TL: 28			
ID: 0x6		0x0		0x0		
TTL: 253		PRO: 0x1		CHKSUM		
SRC IP: 203.0.113.2						
DST IP: 8.8.8.8						
OPT: 0x0				0x0		
DATA (VARIABLE LENGTH)						

ICMP

0	8	16	31	Bits
TYPE: 0x8	CODE: 0x0	CHECKSUM		
ID: 0x4		SEQ NUMBER: 3		

Conclusion

The hospital management system network was successfully designed to meet the hospital's operational and communication needs. The system ensures seamless connectivity across three floors, enabling departments such as reception, emergency, pharmacy, surgery, radiology, and IT to function efficiently. Features like DHCP simplify IP address management, NAT enhances secure internet access, and a dynamic routing protocol ensures optimal data flow. Devices including routers, switches, PCs, wireless access points, printers, and telephones were integrated to support the hospital's diverse technological requirements.

In future, it is recommended to enhance the network, implement advanced security measures, integrate IoT devices for better patient care, and use monitoring tools for optimal performance. Prioritize scalability for future growth and establish a robust backup and disaster recovery plan to ensure data integrity and continuity.