

MINOR PROJECT - BANKING NETWORK ARCHITECTURE

Network design architecture for Bank

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Network design proposal for Bank

1.Abstract

In this project we will primarily focus on design and implementation of Bank Network using Cisco Packet Tracer (CPT). Security breach in the sector of banks is one of the most important concerns that needs to be addressed in the first place since loss of information can lead to huge losses to the bank overall. This project will help us curb such concerns by understanding the regulated flow of information/data. We will consider a national bank which has its head offices located in big cities like Gandhinagar. The other small branches will be present in

cities like

Ahmedabad , Surat & Rajkot . These small branches in each state will be connected through LANs. Apart from this, VLANs and WANs will automatically be a part of the project networking since we are working on a Bank Network. Additionally, bank machines will be made available all around each city in specific to ensure better reach and reliable services to the people. Employees use a special software to access user accounts. The level of access to advanced resources within the bank varies from employee to employee based upon several criteria which include the designation of the employee, criticality of the information etc. The typical servers, mail, web, files and directories will be made available to all the employees to understand the flow of work within the bank.

1.1 Objectives

The main objective of this project is to design a network for the bank with the given constrains.

In this we have 3 Sub - branches and 1 Main branch. This network design of bank also has a server for online transaction which is used by the customers of all branches.

1. Network Requirements:
2. Identify the hardware components required to setup the network for the Bank
3. High availability should be available to the application server, which is accessible using https protocol.
4. The application server should be setup in a secure manner with network and host level protection.
5. All traffic into the application server should be scanned for security attacks.
6. IP network design for the branch and main offices.
7. IP addressing range for users and hardware components.
8. The users at different locations should be able to access each other, including the application server.

9. Identify the features and methodology which would be followed to achieve the solution.
10. Network Topology diagram.

2.1 Network requirement analysis

As the locations of the banks are spanned across different geographical locations, a VPN

solution is recommended as it would be more economical as compared with a leased line

solution. VPN appliances are required for the same. The application server is recommended

as Windows 10 / Windows 11, with appropriate failover clustering to provide high availability to the application. The application server should be setup on a DMZ, where only

access to https protocol (TCP port 443), should be made available to users accessing from the

outside. Antivirus with desktop firewall should be installed on the server, which would provide host level protection. An appliance, which would perform deep packet inspection,

should be setup on the network, to filter incoming traffic to the application server.

This would

scan the traffic for security threats and attacks.

2.2 Hardware and software requirement analysis

1. At the main office, a VPN appliance would be required, which would have integrated firewall and deep packet inspection. The recommended VPN appliance is Sonic wall NSA 220/W, which has the capacity to support site to site VPN tunnels and also has deep packet inspection and firewall capabilities.
2. There are 200 users in the main office. A total of 5 no. of 48 port switches are recommended

considering ports for servers, VPN appliance and expansion plan. The Cisco Catalyst 2960S-48FPD-L is recommended for the same.

3. At the branch offices, the Sonicwall TZ105 series is recommended to establish site to site VPN connectivity with the main office.
4. There are a total of 100 users each at the branch office. A total of 3 no.s of 48 port switches is recommended, which are Cisco Catalyst 2960S-48FPD-L, considering future expansion plans.
5. Windows 10/11 is recommended for the application server with server hardware.

2.3 Additional requirements

1. All the locations have high speed internet connection. At the main office, an additional public IP address would be required to host the application server. The IP address would be registered with a domain name, which would enable users on the outside world (internet), to access the application.

2. Implementation – Cisco Packet Tracer:

For implementing this bank prototype we have used Router-PT which have serial ports, So that it will be easy for us to connect to 6 branches and we have also used 2960-24TT switches all over the network to connect to various campuses among the cities which are then interconnected to the servers and users. All the serial ports are assigned with IP addresses so they can be recognized between the cities without confusion.

3.1 Cisco Packet Tracer:

- Cisco Packet Tracer is a visual simulation tool designed by Cisco Systems that allows users to create network topologies and imitate modern computer networks.
- Using packet tracer we have implemented network topology, assigned routers and switches.
- We can also configure each and every router and network with the IP address and tested whether the data transfer is successful or not.

3.2 IP Address Design :

Branch	IP Address	Subnet Mask
Gandhinagar	Router – 170.20.56.2/21 Router – 170.20.64.1/21 Router – 170.20.72.1/21 Router – 170.20.80.1/21	255.255.248.0 255.255.248.0 255.255.248.0 255.255.248.0
Ahmedabad	Router – 172.20.24.2/21	255.255.248.0
Surat	Router – 172.20.40.2/21	255.255.248.0
Rajkot	Router – 172.20.112.2/21	255.255.248.0

4. Feature and Services

4.1 VLAN

Two networks are required at the main office. One network would be for the LAN, where

the offices users would be connected. The second network would be the DMZ network, where the application server is hosted. This is required since the application server would require access from outside. Two VLANS would be created which would be mapped with the LAN and DMZ network. VLANS would be configured on the Switches.

4.2 Access control lists

Access control lists are configured on the VPN appliance at the main office. The ACLs are used to restrict communication from the internet to only the allowed port, which is TCP port 443 on the application server in the DMZ. ACL is also configured to allow all traffic from the branch office networks to the DMZ and LAN network in the main office.

4.3 Static NAT

Static NAT is configured on the VPN Appliance to allow traffic from the public IP address of the application server, to the LAN IP address.

4.4 Failover cluster

Failover cluster is configured on the Windows 10/11, on which the application server is hosted. This would ensure that high availability is provided to the application.

4.5 RIP (Routing Information Protocol)

This protocol are the intradomain (interior) routing protocol which is based on distance vector routing and it is used inside an autonomous system. Routers and network links are called node. The first column of routing table is destination address. The cost of metric in this protocol is hop count which is number of networks which need to be passed to reach destination. Here infinity is defined by a fixed number which is 16 it means

that
using a Rip, network cannot have more than 15 hops.

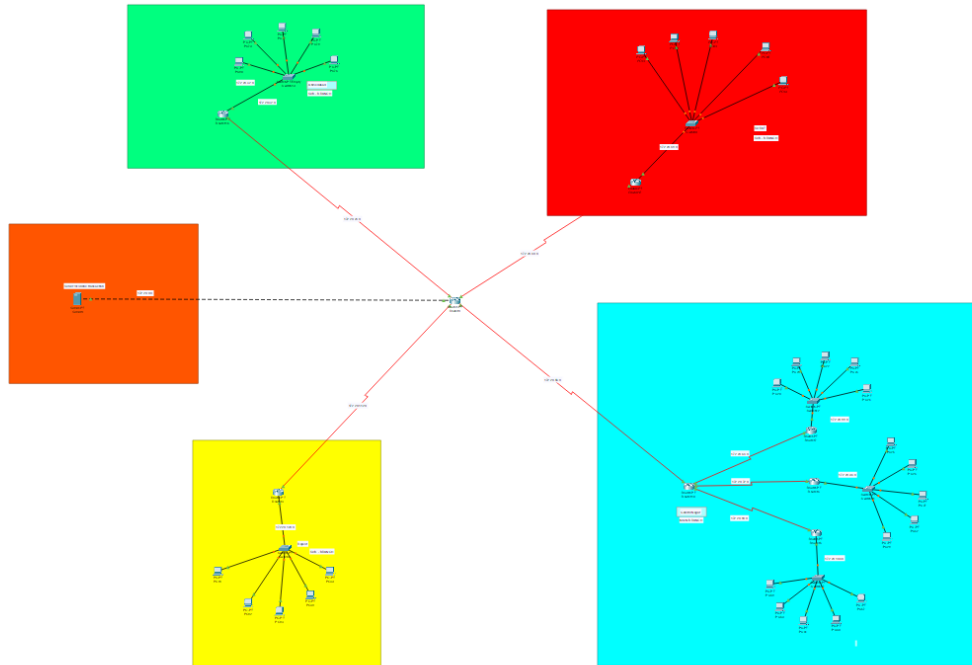
5.RIP Version-2:

Due to some deficiencies in the original RIP specification, RIP version 2 was developed in 1993. It supports classless Inter-Domain Routing (CIDR) and has the ability to carry subnet information, its metric is also hop count, and max hop count 15 is same as rip version 1. It supports authentication and does subnetting and multicasting. Auto summary can be done on every router. In RIPv2 Subnet masks are included in the routing update. RIPv2 multicasts the entire routing table to all adjacent routers at the address 224.0.0.9, as opposed to RIPv1 which uses broadcast (255.255.255.255).

5.1 Advantages of RIP version-2

1. It's a standardized protocol.
2. It's VLSM compliant.
3. Provides fast convergence.
4. It sends triggered updates when the network changes.
5. Works with snapshot routing – making it ideal for dial networks.

6. Network Topology Diagram



6.1 Access Layer

In this layer, all the end devices are connected to each other to the network and we will be having the layer 1 switch for the further connections.

6.2 Distribution Layer

Distribution layer, mostly the layer 3 switches are used to connect the end devices and make the network correspond and this connects to the access and core layers of the network design.

6.3 Core Layer

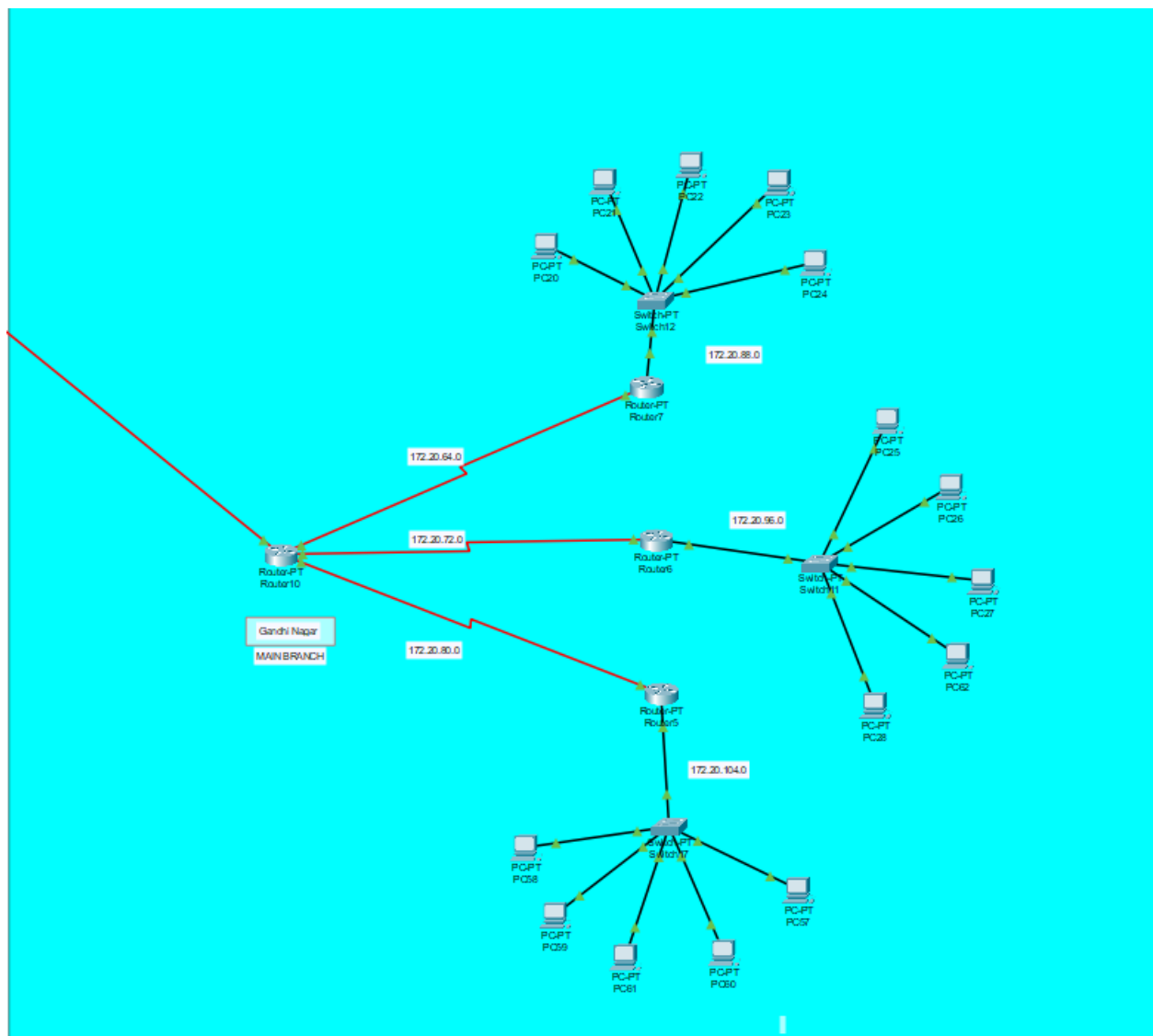
The core layer is the main source of all the layers, where this layer is used to transfer the large amount of traffic very quickly.

There will be 1 Main branch and 3 Sub-branches for this network topology:

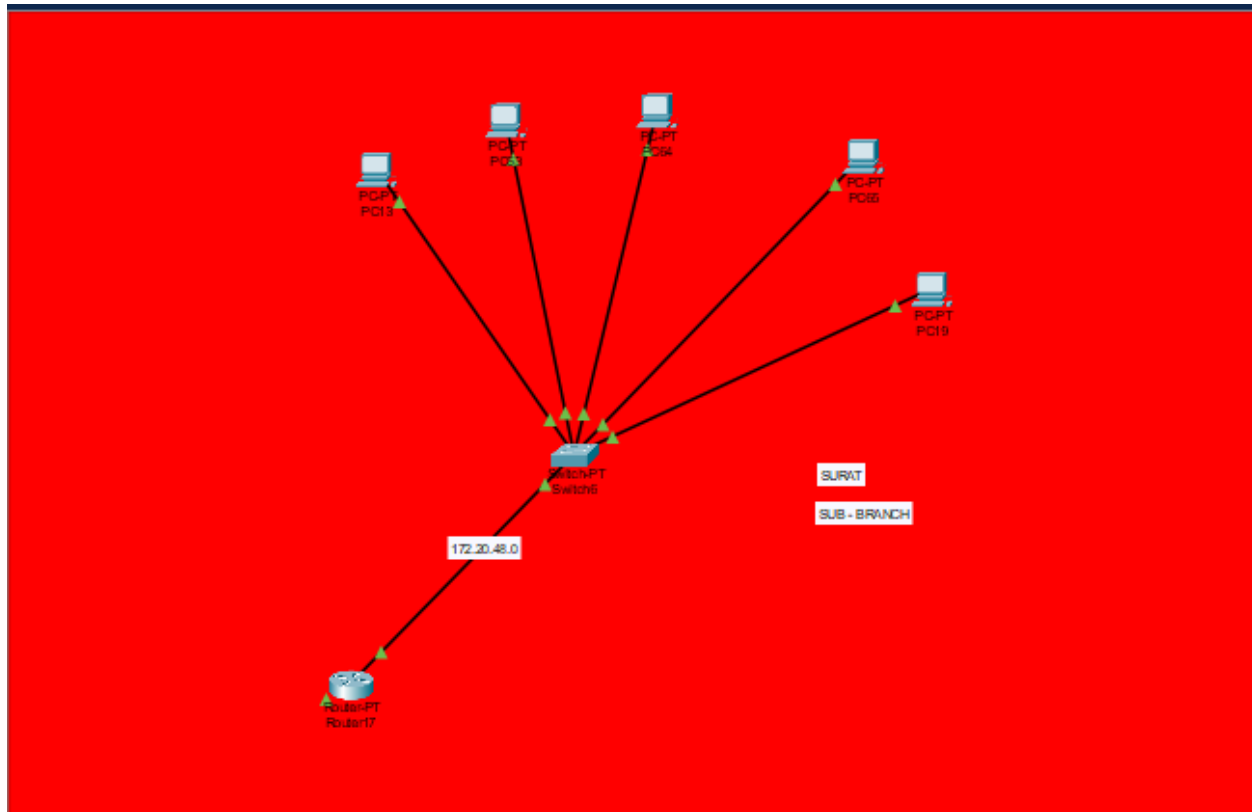
- Gandhinagar (Main Branch)
- Surat
- Ahmedabad
- Rajkot

Each branch is explained separately for better understanding of the network. We'll get started with Gandhinagar network topology then followed by Surat , Ahmedabad & Rajkot network topologies.

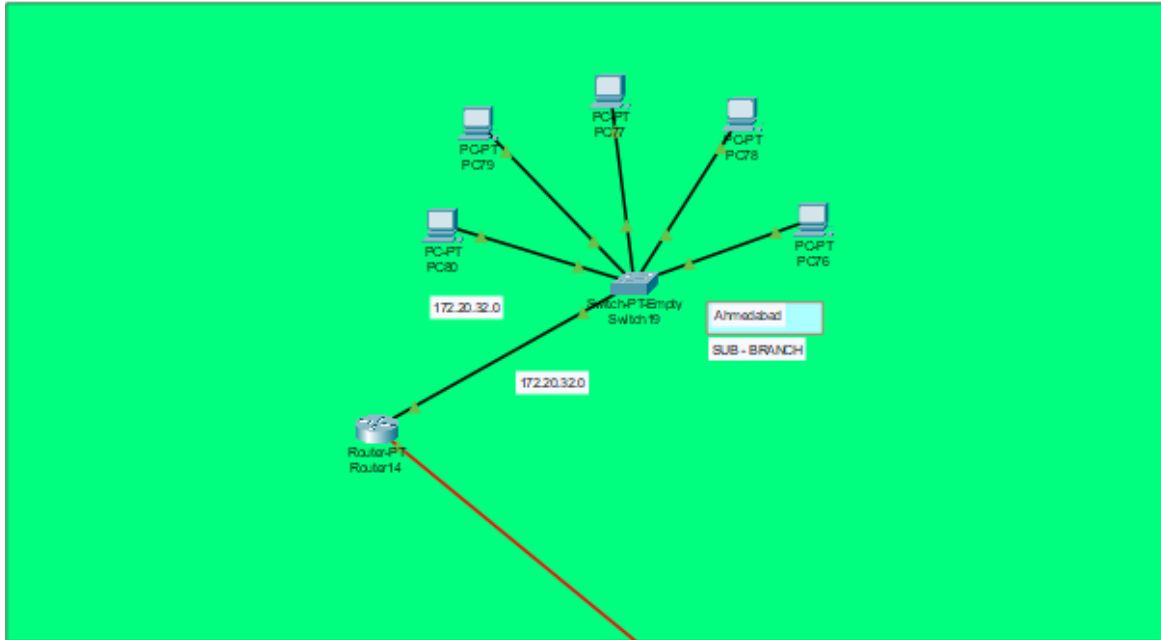
6.4 Gandhinagar – Network Topology:



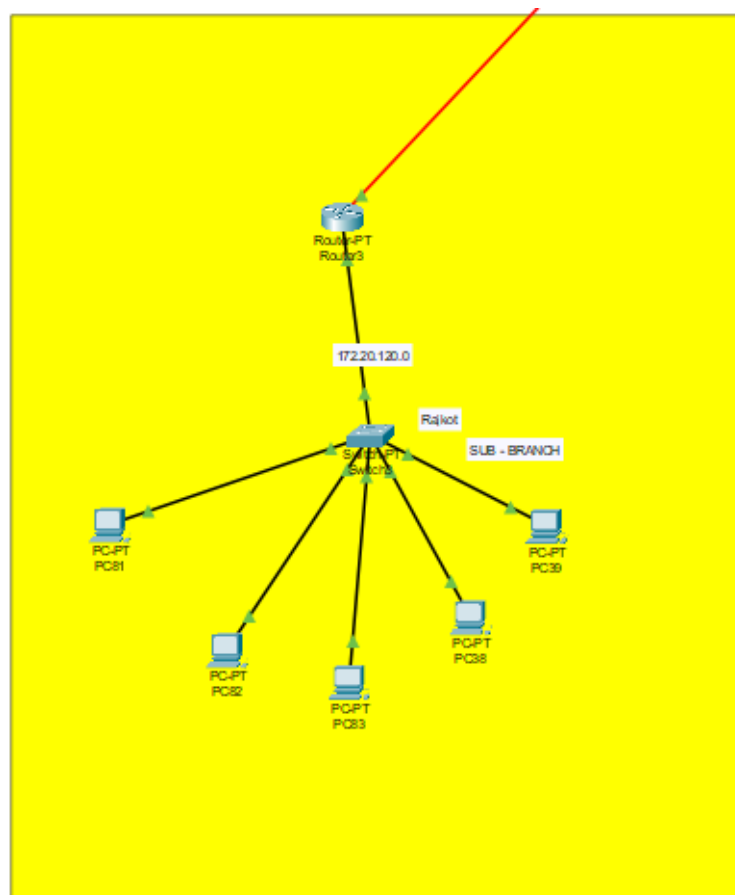
6.5 Surat – Network Topology:



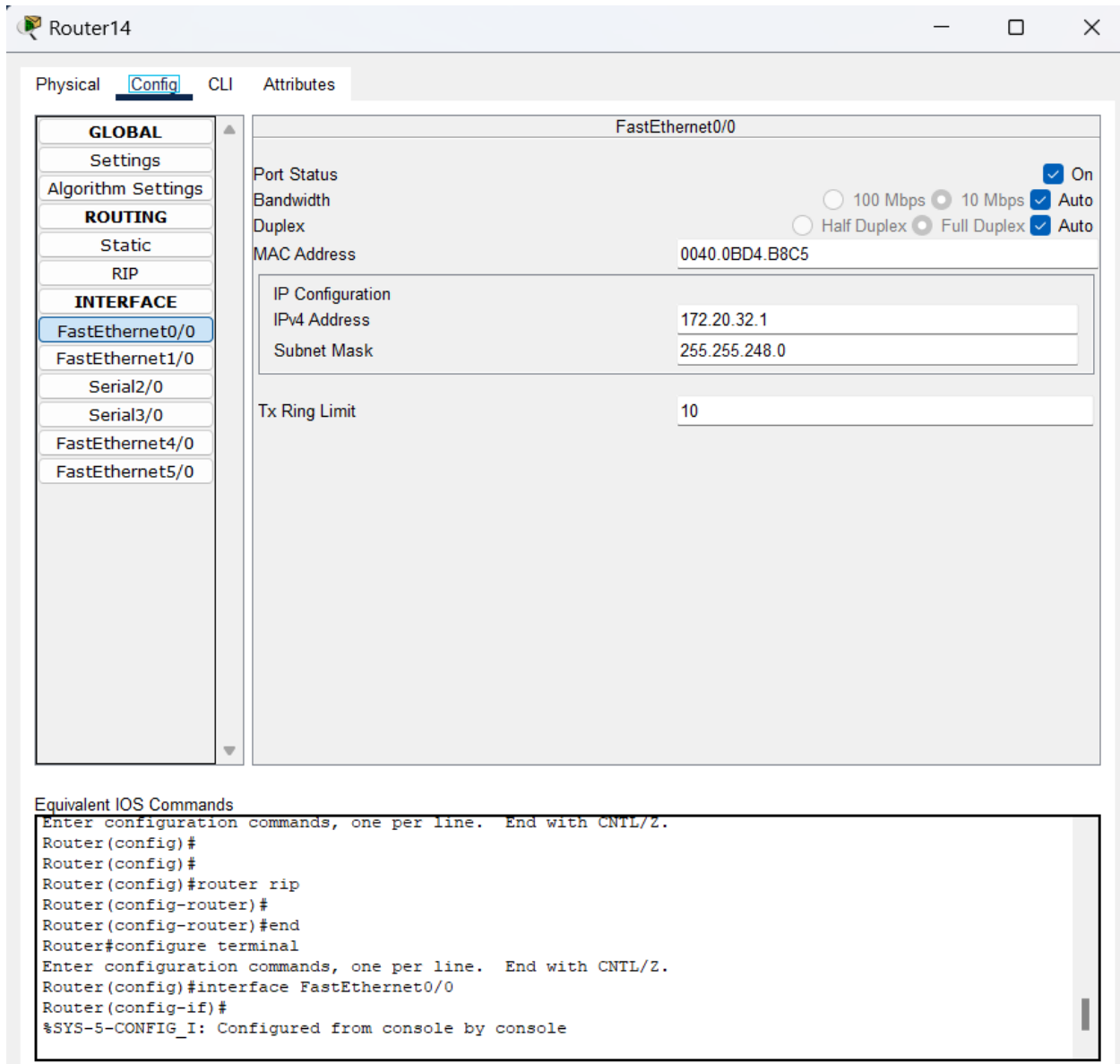
6.6 Ahmedabad – Network Topology:



6.7 Rajkot – Network Topology:



7. Network Design and configuration strategy:



The screenshot shows the configuration interface for Router14. The 'Config' tab is selected, and the 'FastEthernet0/0' interface is chosen from the left sidebar. The main configuration area displays the following settings:

- Port Status:** On (checked)
- Bandwidth:** 10 Mbps (selected), 100 Mbps (unselected)
- Duplex:** Full Duplex (selected), Half Duplex (unselected)
- MAC Address:** 0040.0BD4.B8C5
- IP Configuration:**
 - IPv4 Address: 172.20.32.1
 - Subnet Mask: 255.255.248.0
- Tx Ring Limit:** 10

Below the configuration area, the 'Equivalent IOS Commands' section provides the following commands:

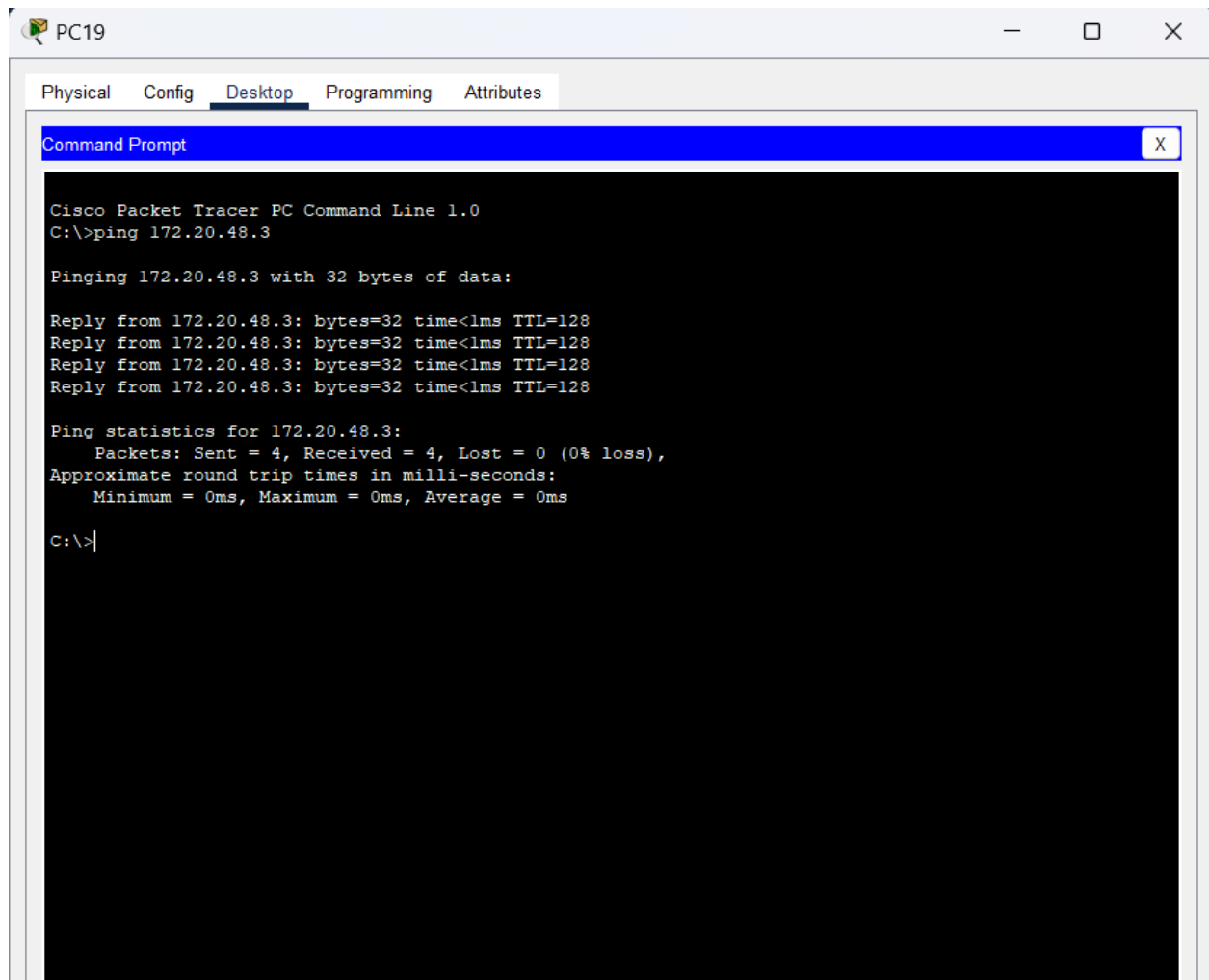
```
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
Router(config)#
Router(config)#router rip
Router(config-router)#
Router(config-router)#end
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface FastEthernet0/0
Router(config-if)#
%SYS-5-CONFIG_I: Configured from console by console
```

We have manually checked if the network between each user in the branch is connected to one other.

This is done individually with testing from one branch device to other branch devices instead of buffer manager interface. After testing this manually buffer testing is implemented

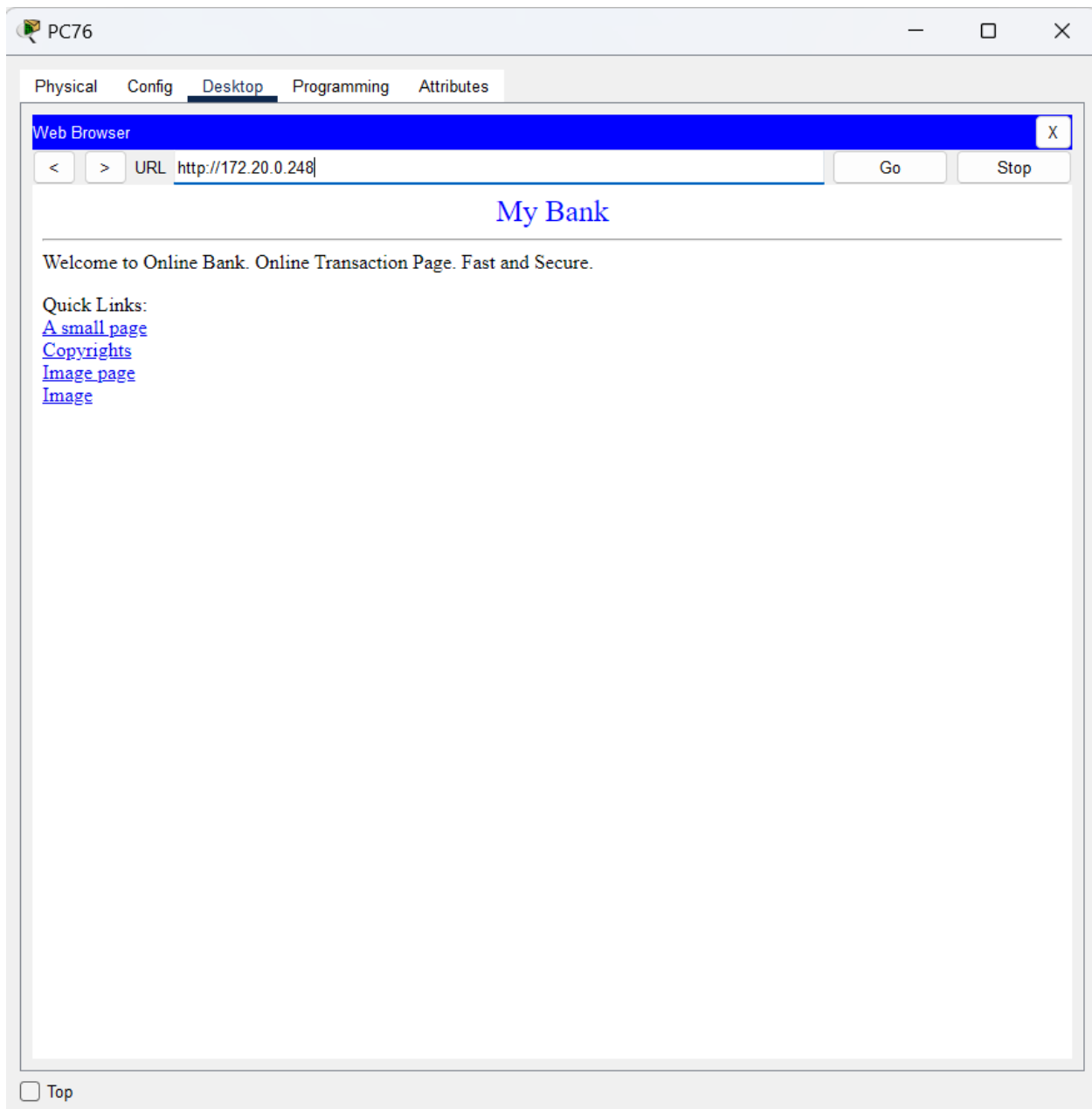
and
checked.

7.1 Ping from a PC to Another PC:



- The above screenshot shows the successful implementation of the connection across two different systems, where it executes perfectly.
- All the data packets are received without any loss of data.

7.2 Application server for online transaction using HTTPS Protocol



7.3 Use of DNS (Domain Name System)

PC76

Physical
Config
Desktop
Programming
Attributes

GLOBAL
Settings
Algorithm Settings
INTERFACE
FastEthernet0
Bluetooth

FastEthernet0

Port Status
Bandwidth
Duplex
MAC Address

☐ 100 Mbps
☒ 10 Mbps
☒ On

☐ Half Duplex
☒ Full Duplex
☒ Auto

0006.2A67.CA2D

IP Configuration
☐ DHCP
☒ Static

IPv4 Address
Subnet Mask

172.20.32.2
255.255.248.0

IPv6 Configuration
☐ Automatic
☒ Static

IPv6 Address
Link Local Address:

/
FE80::206:2AFF:FE67:CA2D

Top

REFERENCES

Here are the references in IEEE format:

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3. Cisco NetAcad, "Packet Tracer Courses," [Online]. Available: <https://www.netacad.com/courses/packet-tracer>. Accessed on: September 13, 2024.
4. Cisco, "OSPF Configuration Guide," [Online]. Available: https://www.cisco.com/c/en/us/td/docs/ios-xml/ios/iproute_ospf/configuration/xr-16/ios-xr-16-book/ios-xr-16-book-configuration.html. Accessed on: September 13, 2024.
5. NetworkLessons, "Basic OSPF Configuration," [Online]. Available: <https://networklessons.com/ospf/basic-ospf-configuration>. Accessed on: September 13, 2024.

Here are some more additional CCNA-related references in IEEE format, specifically focused on network design:

1. Cisco, "Enterprise Campus 3.0 Architecture: Overview and Framework," [Online]. Available: https://www.cisco.com/c/en/us/solutions/collateral/enterprise/design-zone-enterprise/ent_arch_design_guide.html. Accessed on: September 13, 2024.
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