

COMPUTER NETWORKS MINI PROJECT

Review - 1

COMPANY NETWORK DESIGN Using WAN

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PROBLEM STATEMENT



- **Companies usually operate in different offices, locations, countries - need for a proper interconnected network communication system**
- **Working on singular, local systems can result in huge traffic and time wastage - reductions in productivity and efficiency for the enterprise**
- **Local Area Networks are not useful for communications over large geographical locations - security, traffic**
- **Old methods for local networks — like on-site installations and manual maintenance**

OBJECTIVE:

- To build a networking model to initiate the inter process communication mechanisms while controlling expenses using a **wide area network**
- Model with high reliability and enhanced security
- Sharing and relaying of information to other users instantly between devices around the world
- Editing of remote sites and access to database like financial records
- Build a largely virtualized, cloud-based, and less-expensive solution than the hardware-intensive scenarios of the past

Functionalities and Computing Resources

We will try to implement our network model using the following protocols:

- TELNET and SSH
- SMTP and POP3
- DNS
- DHCP
- FTP and TFTP
- HTTP

We will use the Cisco Packet Tracer and the following devices as resources:

- Routers
- Switches
- Cables
- Servers
- PCs
- Laptops

Alternative Solutions/Methods

1. The current idea of the network system will be implemented using IPv4 protocol. Alternatively, it can also be configured using IPv6.
 - a. IPv6 is a new network protocol - improved scalability and routing, security ease-of-configuration and higher performance
 - b. IPv6 is incompatible with IPv4, will require changes to the software in every networked device
2. We can use RADIUS SERVER - central server authentication and TELNET configuration.
3. We can implement different router layer security aspects - OSPF, EIGRP, networks and authentication

IPv4 (Internet Protocol Version 4)

- 1. Encryption and authentication is not provided in IPv4 (Internet Protocol Version 4).**
- 2. Header of IPv4 is 20 – 60 bytes.**
- 3. Packet flow identification is not available in IPv4 (Internet Protocol Version 4).**
- 4. Sender and forwarding routers performs fragmentation in IPv4**
- 5. In IPv4, security features relies on application**
- 6. IPv4 supports DHCP and Manual address configuration**

IPv6 (Internet Protocol Version 6)

- 1. Encryption and authentication is provided in IPv6 (Internet Protocol Version 6).**
 - 2. Header of IPV6 is fixed at 40 bytes**
 - 3. Packet flow identification is available in IPv6. Flow label field is available in the header.**
 - 4. Fragmentation is performed only by the sender in IPv6**
 - 5. In IPv6 there is an inbuilt security feature named IPSEC**
 - 6. IPv6 supports renumbering and auto address configuration**
-

Design constraints for required performance criteria.

- Expensive to install - setting up a WAN requires extensive purchasing of routers, switches and security solutions.
- Disconnection problems in remote locations
- Maintenance - data center must operate 24/7 requiring a full time job assistance from network administrators and technicians.

PERFORMANCE CRITERIA

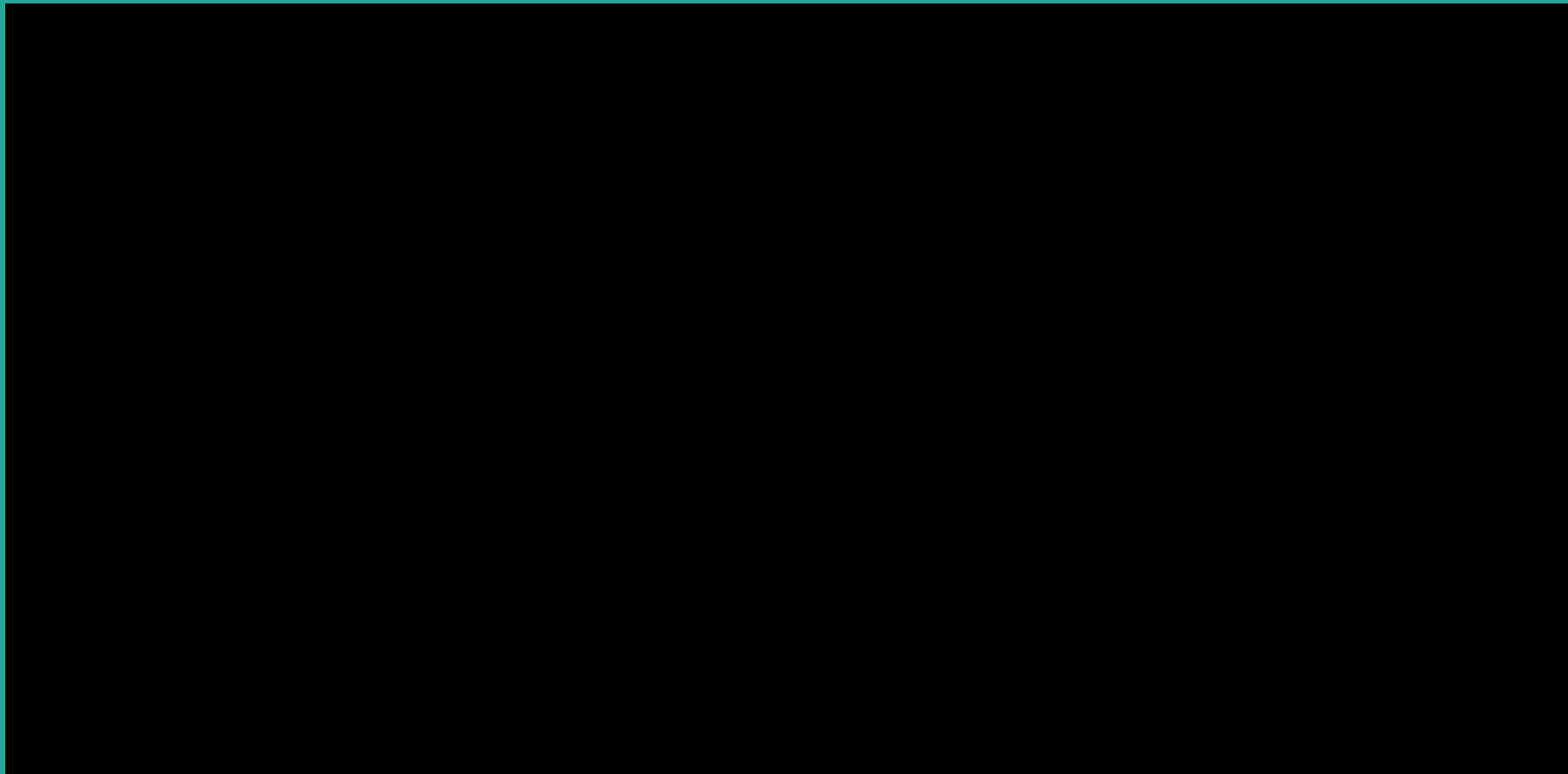
- Bandwidth - how rapidly the web server is able to upload the requested information, | measure of data or information that can be transmitted in a fixed measure of time.
- Throughput - number of messages successfully transmitted per unit time
- Latency - total time taken for a complete message to arrive at the destination,
- Jitter - interference in the normal order of sending data packets, packets with different delays result in jitter at receiver end

PROTOCOLS
SUCCESSFULLY
IMPLEMENTED

—

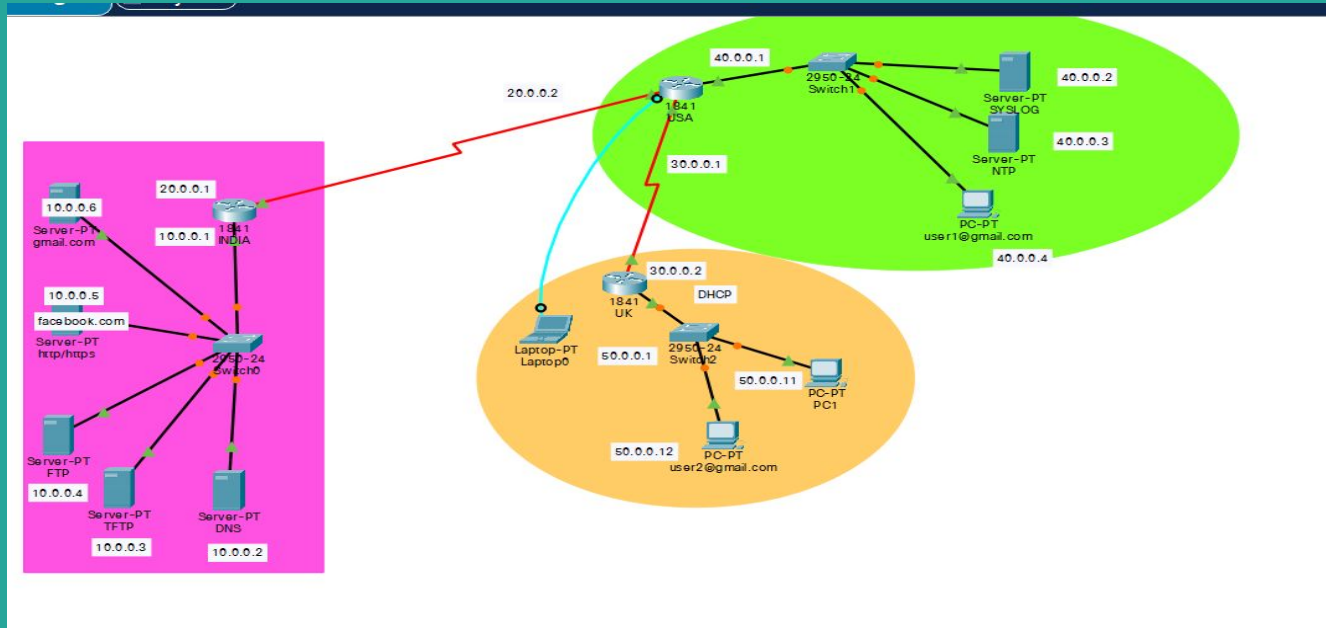
- **DNS - Domain Name System** is a hierarchical and decentralized naming system for computers, services, or other resources connected to the Internet or a private network
- **TFTP - Trivial File Transfer Protocol** - a simple protocol that provides basic file transfer function with no user authentication, intended for applications that do not need the sophisticated interactions.
- **FTP - The File Transfer Protocol** is a standard communication protocol used for the transfer of computer files from a server to a client on a computer network.
- **HTTPS-Hypertext Transfer Protocol Secure** is an extension of the Hypertext Transfer Protocol. It is used for secure communication over a computer network, and is widely used on the Internet.
- **SYSLOG -System Logging Protocol** (Syslog) is a way network devices can use a standard message format to communicate with a logging server. It was designed specifically to make it easy to monitor network devices. Devices can use a Syslog agent to send out notification messages under a wide range of specific conditions.
- **NTP - Network Time Protocol** (NTP) is a protocol used to synchronize computer clock times in a network. It belongs to and is one of the oldest parts of the TCP/IP protocol suite. The term *NTP* applies to both the protocol and the client-server programs that run on computers.

OUR WORKING MODEL DEMO

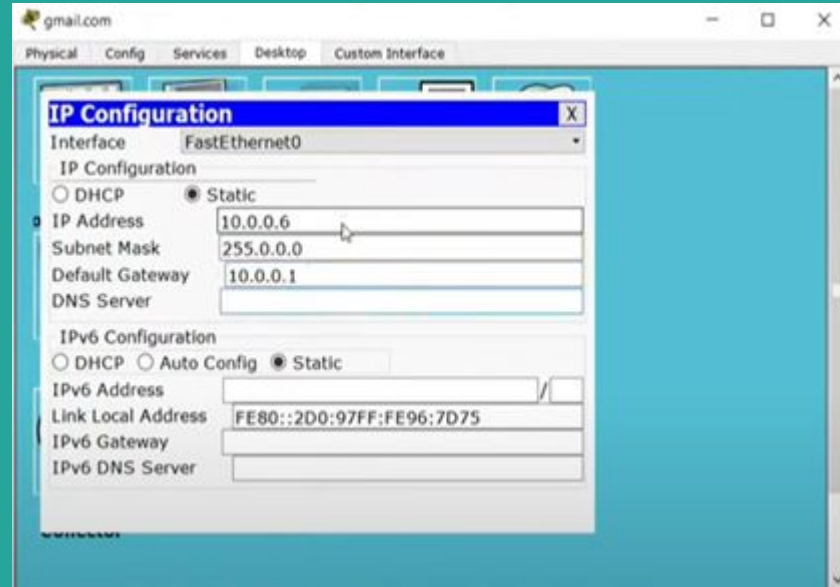
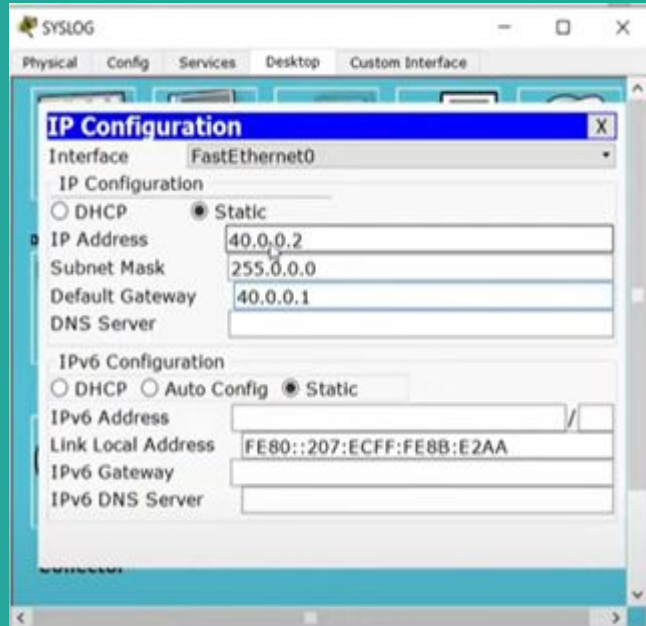


Making of the model

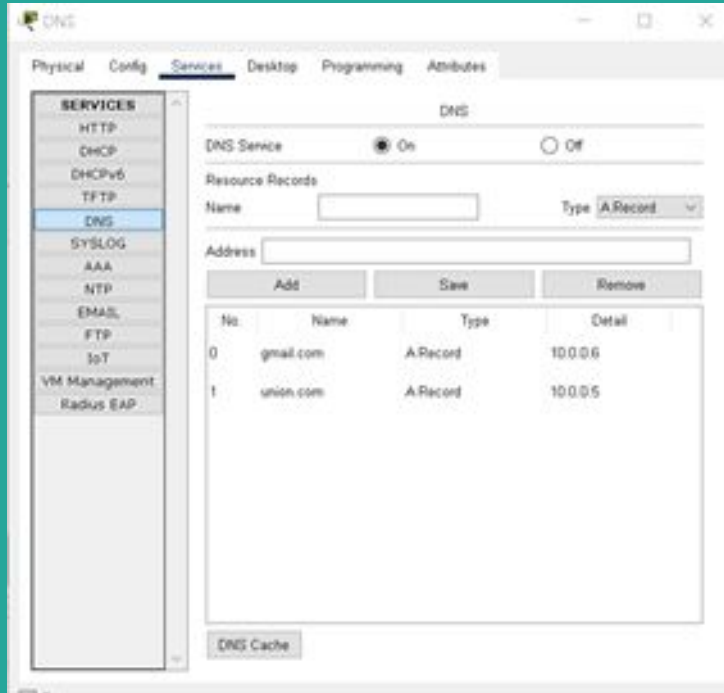
STEP 1 : make the configuration for company branches with different devices



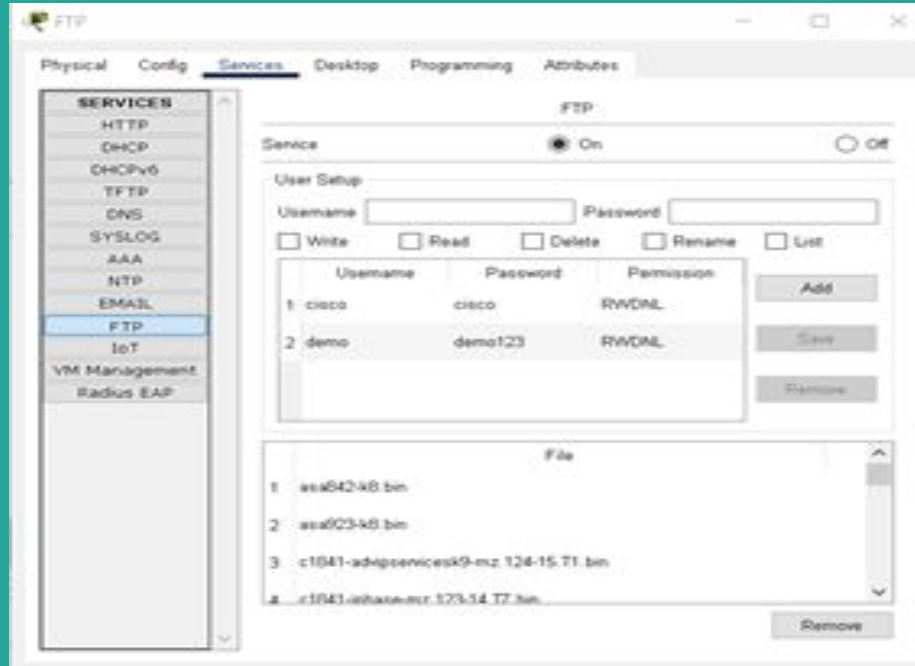
Step2: do IP CONFIGURATION for all devices all devices



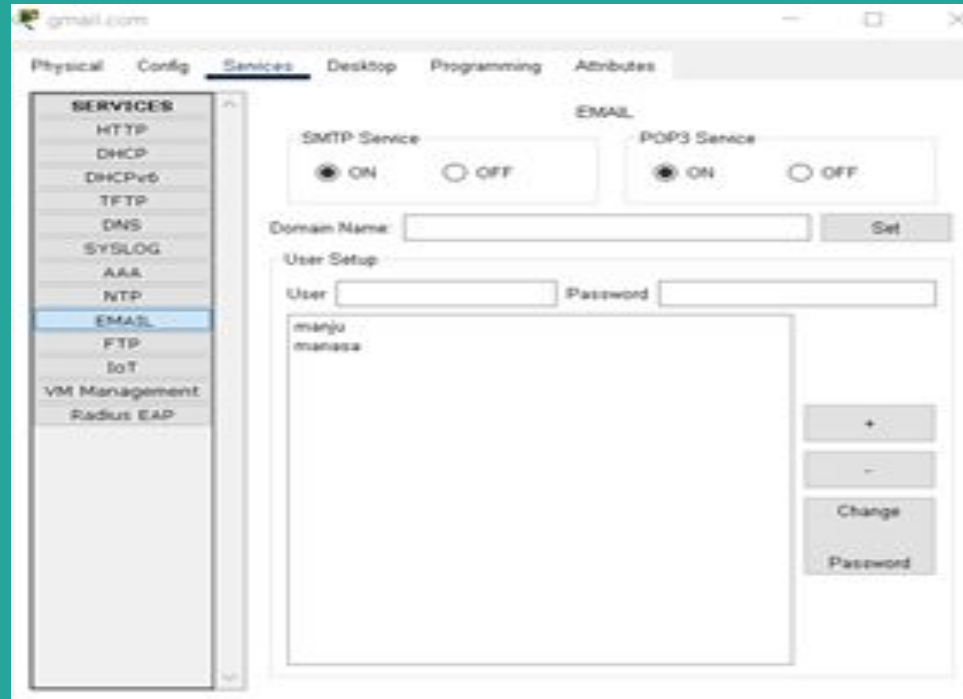
Step3: make DNS for company website and gmail for sending mails



Step4: create a user using FTP SERVER name called demo



Step5: make users for sending mails between company branches GMAIL SERVER



Step6: apply DHCP on one of the branch

```
Physical Config GUI
IOS Command Line Interface
Cisco 1841 (revision 3.0) with 1144800K/14334K bytes of memory.
Processor board ID FTX0947219E
M840 processor: part number 0, mask 49
2 FastEthernet/IEEE 802.3 interface(s)
3 Low-speed serial(sync/asynch) network interface(s)
191K bytes of NVRAM.
41488K bytes of ATA CompactFlash (Read/Write)
Cisco IOS Software, 1841 Software (C1841-ADVISESERVICE90), Version
12.4(15)T1, RELEASE SOFTWARE (fc2)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2007 by Cisco Systems, Inc.
Compiled Wed 10-Jul-07 04:52 by pt_team

Press RETURN to get started!

ALINE-S-CHANGED: Interface Serial0/0/0, changed state to up
ALINEPROTO-S-UPDOWN: Line protocol on Interface FastEthernet0/0, changed
state to up
ALINEPROTO-S-UPDOWN: Line protocol on Interface Serial0/0/0, changed state
to up

C>en
C#conf t
Enter configuration commands, one per line. End with CNTL/Z.
C(config)#ip route 10.0.0.0 255.0.0.0 30.0.0.1
C(config)#ip route 20.0.0.0 255.0.0.0 30.0.0.1
C(config)#ip route 40.0.0.0 255.0.0.0 30.0.0.1
C(config)#
C(config)#
C(config)#ip dhcp excluded-address 50.0.0.1 50.0.0.10
C(config)#ip dhcp pool LAB1
C(dhcp-config)#default-router 50.0.0.1
C(dhcp-config)#net-server 10.0.0.2
C(dhcp-config)#netw_
```

PC1

Physical Config Desktop Custom Interface

IP Configuration

☒ DHCP ☐ Static DHCP request successful.

IP Address 50.0.0.11

Subnet Mask 255.0.0.0

Default Gateway 50.0.0.1

DNS Server 10.0.0.2

IPv6 Configuration

☐ DHCP ☐ Auto Config ☒ Static

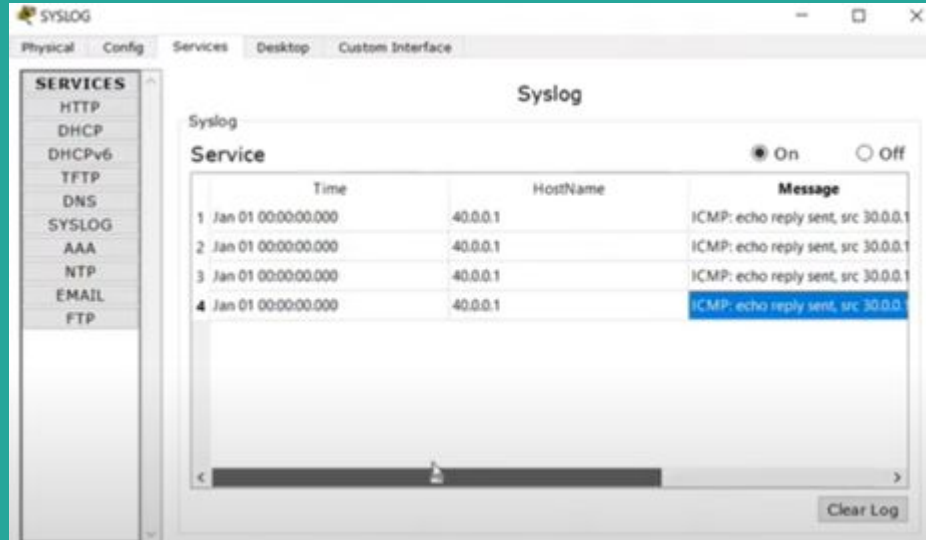
IPv6 Address

Link Local Address FE80::2E0:F9FF:FE0D:C152

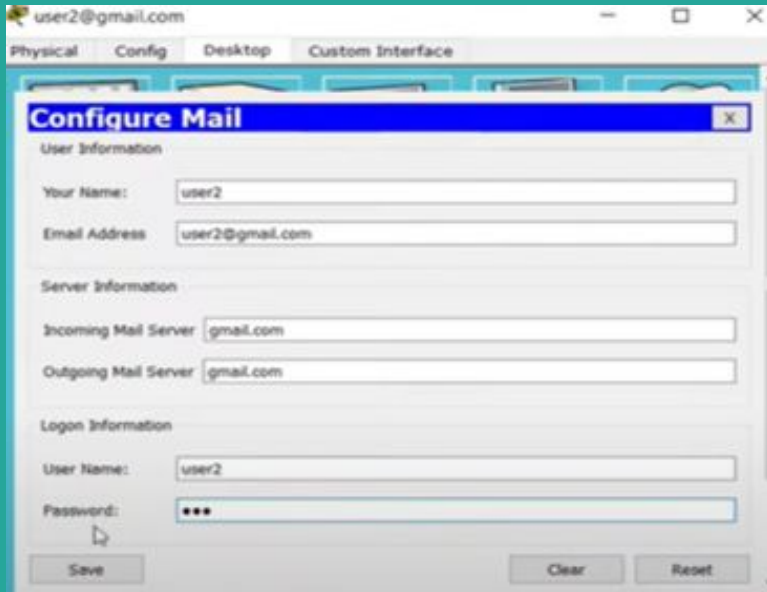
IPv6 Gateway

IPv6 DNS Server

Step7: Make SYSLOG server for seeing the log of connection between different branches



STEP8: CONFIGURE MAIL so that we can send information from one branch to another using gmail



The screenshot shows a window titled 'user2@gmail.com' with tabs for 'Physical', 'Config', 'Desktop', and 'Custom Interface'. The 'Config' tab is active, displaying the 'Configure Mail' dialog. The dialog is divided into three sections: 'User Information', 'Server Information', and 'Logon Information'. In the 'User Information' section, 'Your Name' is 'user2' and 'Email Address' is 'user2@gmail.com'. In the 'Server Information' section, both 'Incoming Mail Server' and 'Outgoing Mail Server' are set to 'gmail.com'. In the 'Logon Information' section, 'User Name' is 'user2' and 'Password' is masked with three dots. At the bottom are 'Save', 'Clear', and 'Reset' buttons.

user2@gmail.com

Physical Config Desktop Custom Interface

Configure Mail

User Information

Your Name: user2

Email Address: user2@gmail.com

Server Information

Incoming Mail Server: gmail.com

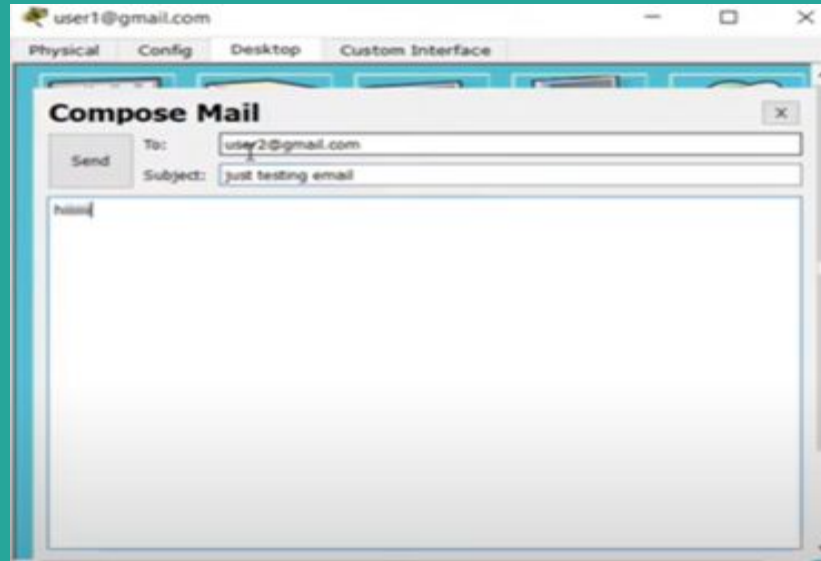
Outgoing Mail Server: gmail.com

Logon Information

User Name: user2

Password: ***

Save Clear Reset



The screenshot shows a window titled 'user1@gmail.com' with tabs for 'Physical', 'Config', 'Desktop', and 'Custom Interface'. The 'Config' tab is active, displaying the 'Compose Mail' dialog. The dialog has a 'Send' button and fields for 'To:', 'Subject:', and a large text area for the message body. The 'To:' field contains 'user2@gmail.com', the 'Subject:' field contains 'just testing email', and the message body contains the text 'hello'.

user1@gmail.com

Physical Config Desktop Custom Interface

Compose Mail

Send To: user2@gmail.com

Subject: just testing email

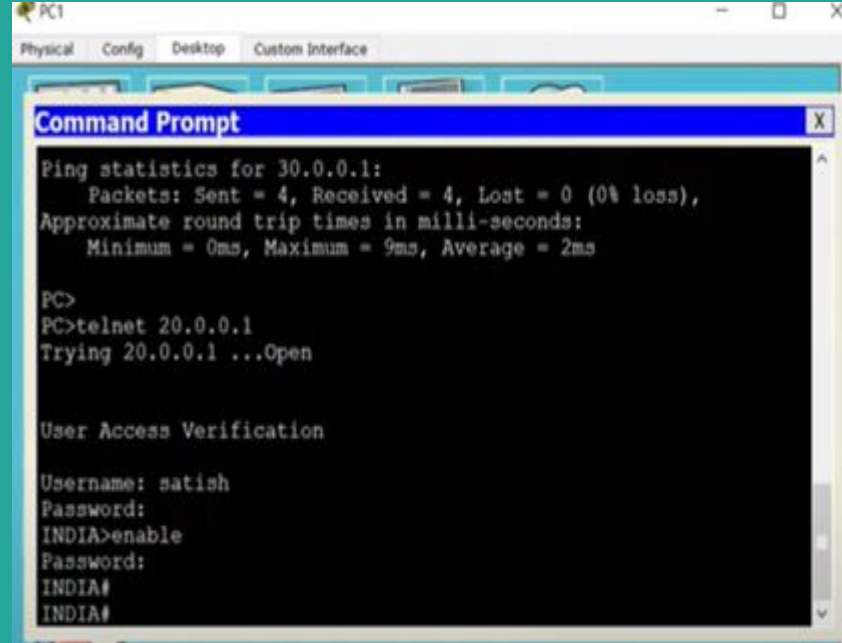
hello

Step9: make password for ENABLE so that outside user cannot login only local users have the access

```
- 887 bytes]

bytes copied in 0.138 secs (6000 bytes/sec)
IA#
IA#
IA#enable password redhat
nvalid input detected at '^' marker.

IA#config t
er configuration commands, one per line. End with CNTL/Z.
IA(config)#enable password redhat
IA(config)#
IA(config)#username satish password 12345
IA(config)#username goyal password 123
IA(config)#username deepak password ccna
IA(config)#
IA(config)#line vty 0 4
IA(config-line)#login local
IA(config-line)#exit
IA(config)#
```



```
PC1
Physical Config Desktop Custom Interface

Command Prompt

Ping statistics for 30.0.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 9ms, Average = 2ms

PC>
PC>telnet 20.0.0.1
Trying 20.0.0.1 ...Open

User Access Verification

Username: satish
Password:
INDIA>enable
Password:
INDIA#
INDIA#
```

ADVANTAGES



1. Area Coverage

WAN generally covers geographical areas of large proportions (1000 kms or more than that). Probably if your business offices are located at different locations, then without an effort all the branches can be communicated through WAN. For this purpose Internet Service Providers (ISPs) can provide leased lines.

2. Centralized Data

Using WAN means that you can share the data connected to all the devices in the respective network. For an example you can setup head office server and share the data among all the office branches. Hence, there is no need to purchase separate emails, files and backup servers. Instead you can get all the backup and support from the head office server.

3. Updated Files

From WAN users can get updated files and data from the servers. Companies can work to update files from the servers so that all the connected devices can receive them. That too in a fraction of seconds.

4. Message Exchange

With the advancement of Internet of Things (IoT) and LAN, a sudden growth of WAN based devices can be seen. From this communication through messages can be done fast with the help of popular applications such as messenger and whatsapp.

REQUIREMENTS

- All routers are provided with the security of radius server - different usernames and passwords for each
- Login system will prevent unauthorised access to unknown users
- Minimum connection speed of 100 Mbps
- Average required throughput - 5 Mbps
- Peak traffic load can increase it to 10-15 Mbps



THANK YOU!