CNSL Assignment 11

Application Layer Protocol

Aim

Study and analyze the performance of DHCP, Email, HTTP, HTTPS, and FTP protocol using Packet tracer tool. Create DHCP, DNS, HTTP AND HTTPS Web Server and Email Server on packet tracer and show the simulation between clients and servers. Also Analyze packet formats at various Layers.

Motivation

Protocols like DHCP, HTTP/HTTPS, FTP, and Email are fundamental for real-time communication and internet services. This lab helps students gain practical knowledge of how these protocols operate, how servers are configured in a network, and how client-server communication works at different layers of the OSI model.

Learning Outcomes

- Configure and simulate DHCP, DNS, HTTP, HTTPS, FTP, and Email Servers in Packet Tracer.
- Understand how clients dynamically receive IP addresses via DHCP.
- Demonstrate web services (HTTP/HTTPS) access from client systems.
- Demonstrate file transfer using FTP.
- Demonstrate email exchange between clients and server.
- Analyze packet formats at different OSI layers using simulation mode.

Software/Hardware Requirements

- **Software:** Cisco Packet Tracer (Version 8.0 or above recommended)
- **Hardware:** Standard computer with min. 4GB RAM, internet for installation

Theory (Protocols Overview)

1. **DHCP (Dynamic Host Configuration Protocol)**
    - Provides automatic IP address allocation to clients.
    - Operates on UDP port 67 (server) and UDP port 68 (client).
2. **DNS (Domain Name System)**
    - Translates domain names into IP addresses.
    - Operates on UDP/TCP port 53.
3. **HTTP (Hyper Text Transfer Protocol)**
    - Application layer protocol for transmitting web pages.
    - Operates on TCP port 80.
4. **HTTPS (Secure HTTP)**
    - Encrypted communication using SSL/TLS.
    - Operates on TCP port 443.

5. **FTP (File Transfer Protocol)**
    - Transfers files between client and server.
    - Uses TCP ports 20 (data) and 21 (control).
6. **Email (SMTP/POP3/IMAP)**
    - **SMTP:** Simple Mail Transfer Protocol (sending emails) ->TCP port 25
    - **POP3:** Post Office Protocol (retrieving emails) ->TCP port 110
    - **IMAP:** Internet Message Access Protocol ->TCP port 143

Procedure with Expected Output Network

Topology:

1. Drop 3 PCs, 5 Servers and 1 Switch (2960-24TT) from network devices and end devices section.
2. Connect PCs with one switch and switch to five servers with a copper straight through cable.
3. Name all PCs and Servers suitably.

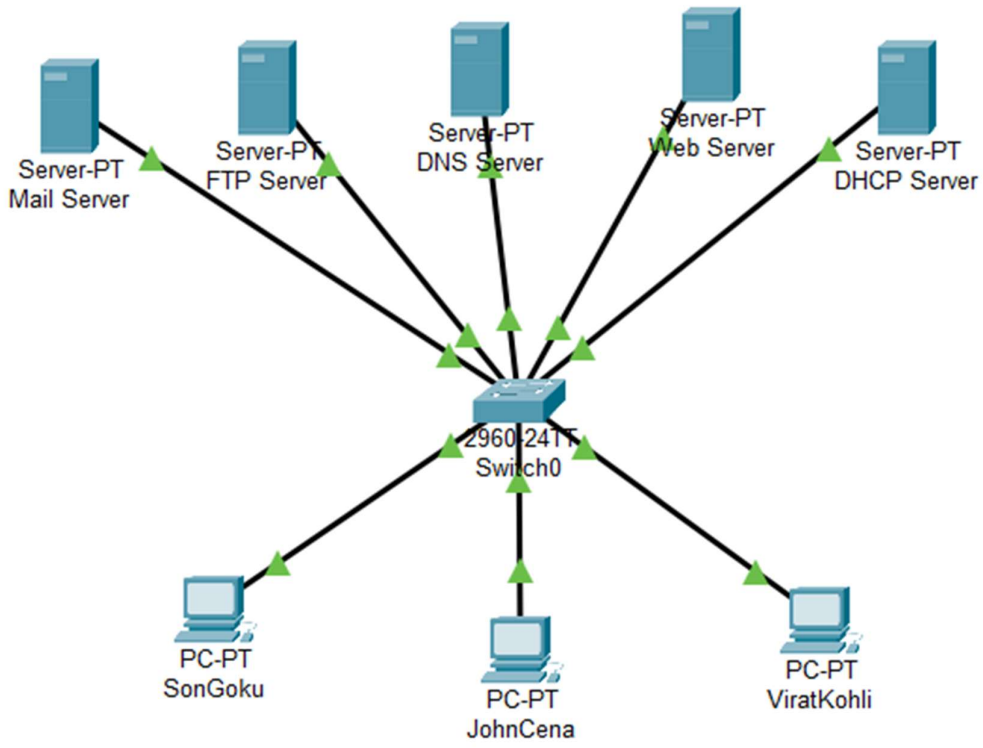


Fig 1: Network topology

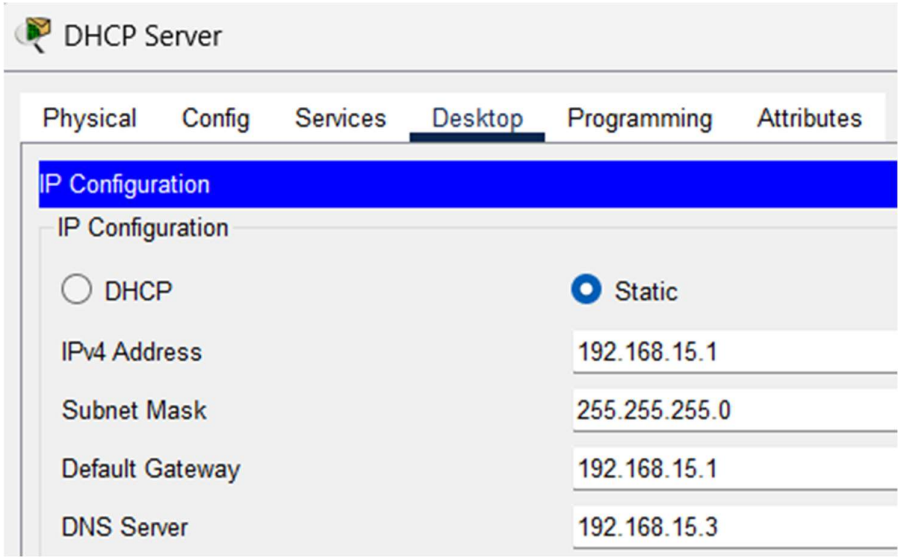
IP Address Configuration: Configuring

DHCP server-

1. Go to DHCP server -> Desktop > IP Configuration.
2. Set as static and manually set IP Addresses and fill DNS servers IP Address.

- **Static IP:** 192.168.15.1
- **Subnet Mask:** 255.255.255.0
- **DNS Server:** 192.168.15.3

3. Then go to services and configure DHCP there.
4. Turn on the DHCP service and give starting IP as 192.168.15.1.
5. Click on save and close.



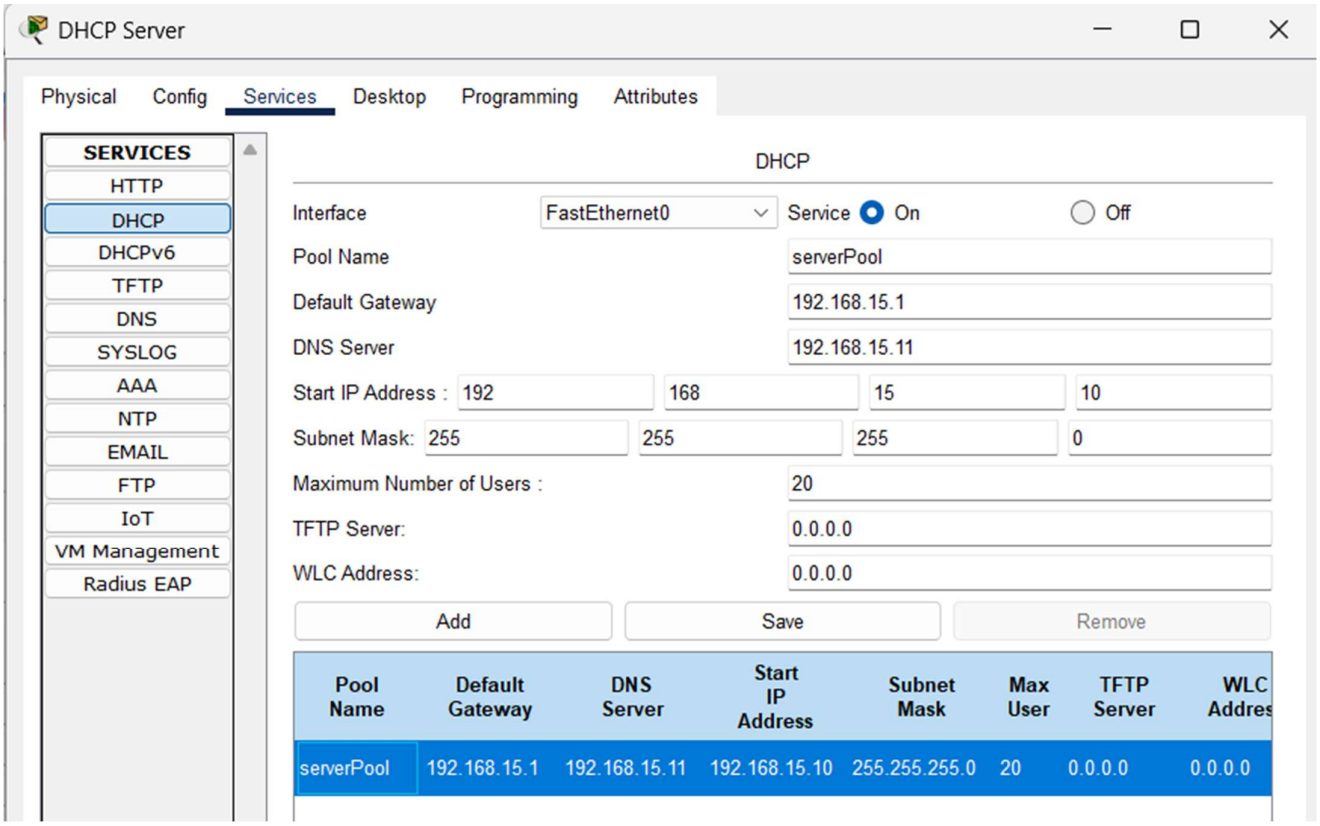


Fig 2: DHCP server

Configuring IP address for rest of network:

1. Go to Webserver -> IP Configuration select DHCP.
2. By doing so it will automatically fill the IP Address and DNS server address.
3. Repeat the same process for DNS server, FTP server, Mail server, SONGOKU, JOHNCENA and VIRATKOHLI.
    - *Note: In the provided screenshots, the DNS Server is configured with a **Static IP** of 192.168.15.3.*

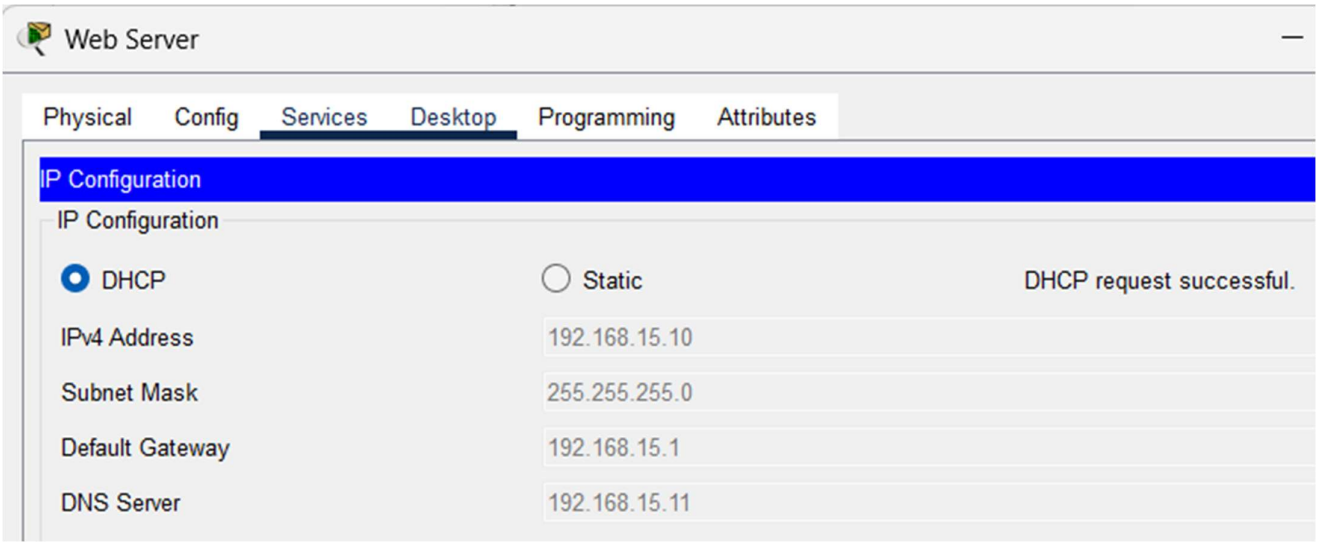


Fig 3: Web server

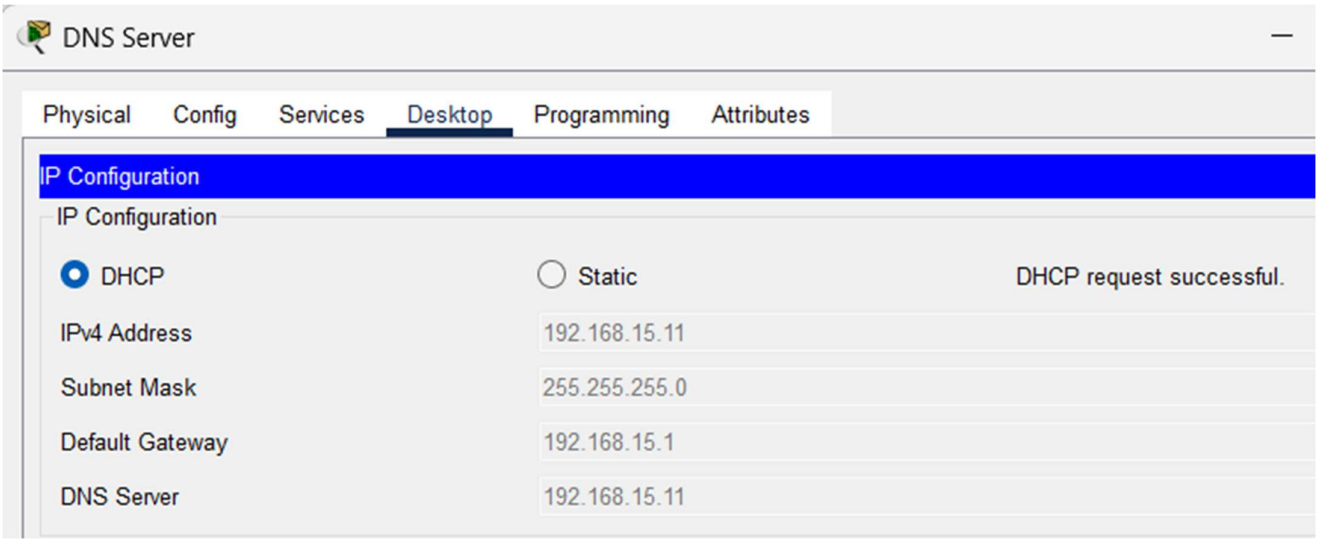


Fig 4: DNS server

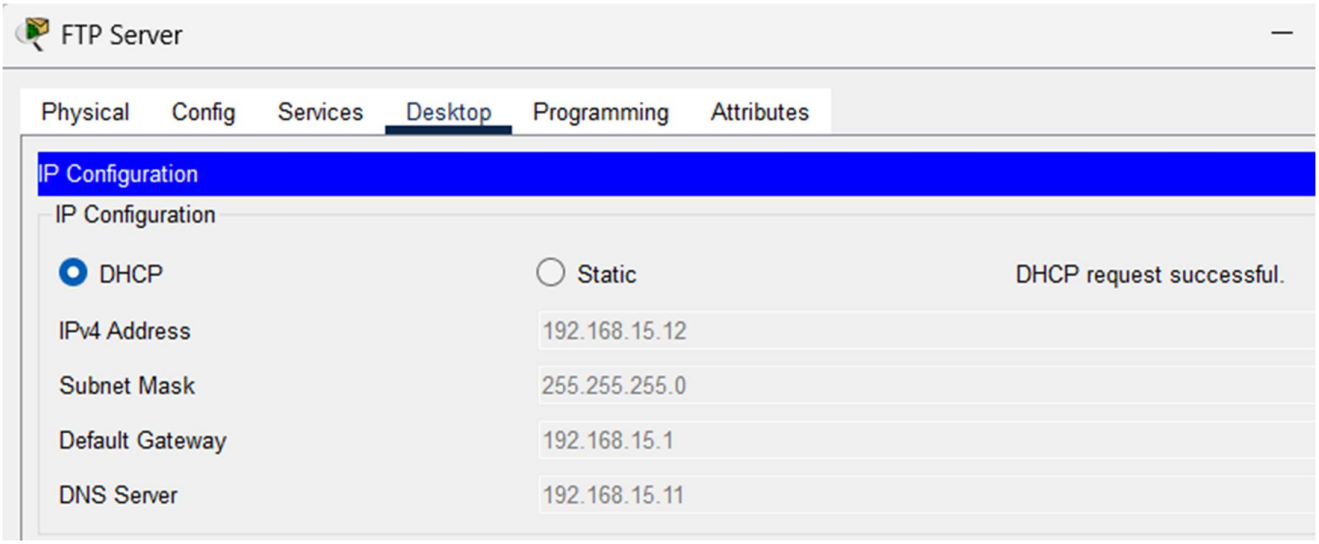


Fig 5: FTP server

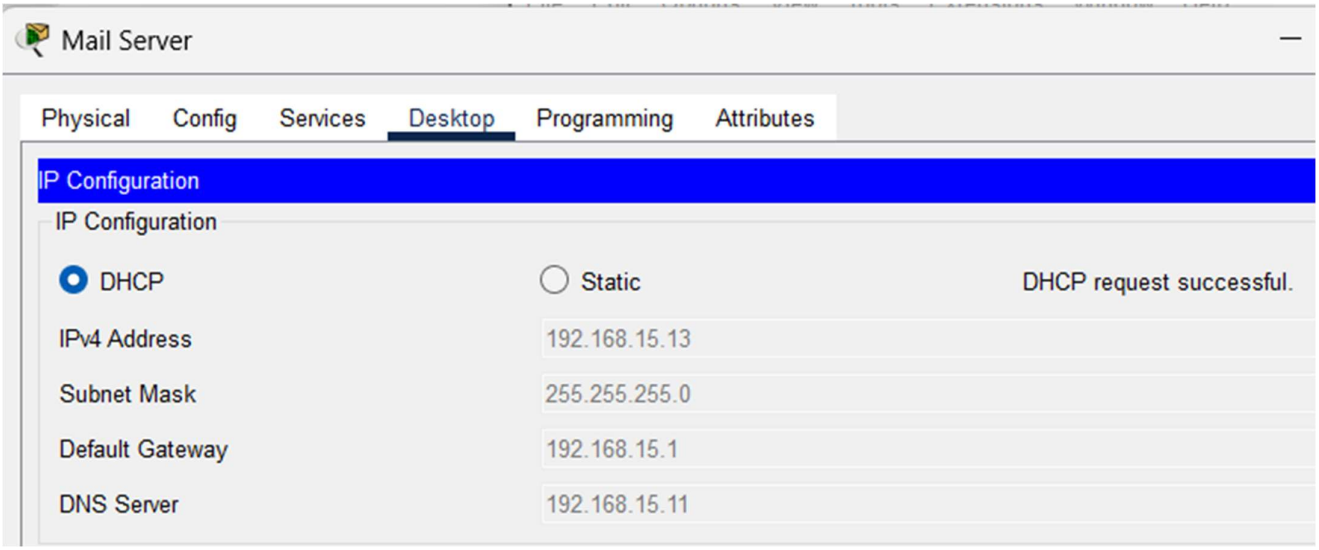


Fig 6: Mail Server

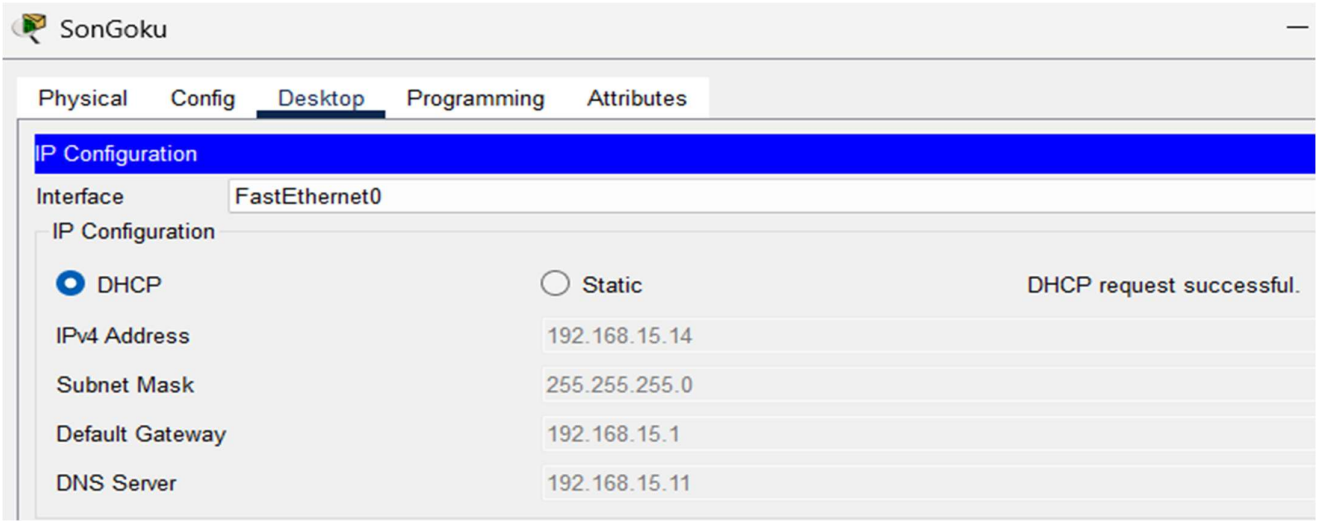


Fig 7: SonGoku config

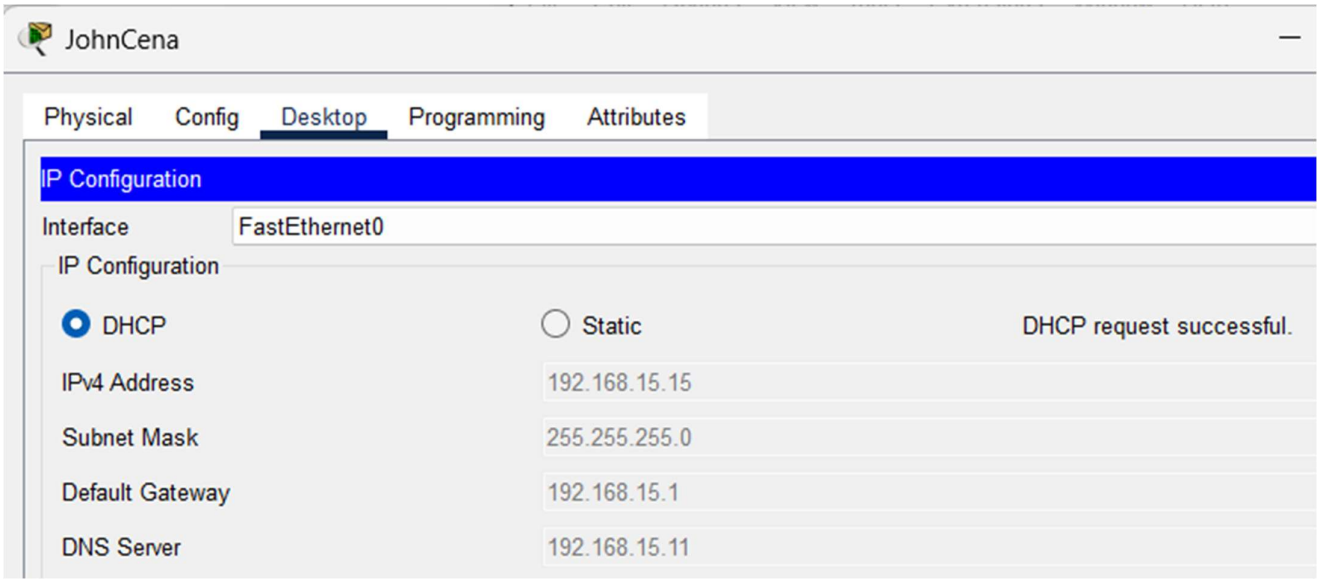


Fig 8: JohnCena Config

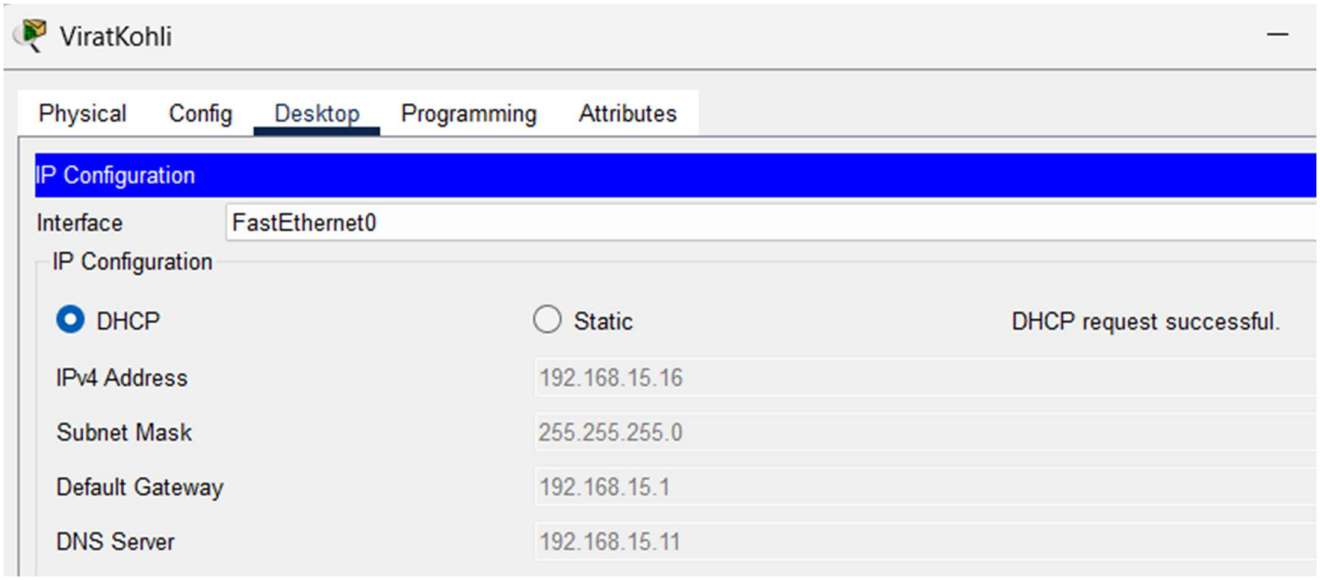


Fig 9: ViratKohli config

Configuring Mail server:

1. Go to Mail Server -> Services -> Email.
2. Turn on services (SMTP and POP3) and add user and password for SONGOKU, JOHNCENA and VIRATKOHLI.
3. After this go to SONGOKU and configure mail from desktop.
4. After giving mail server and entering login information.
5. Save and close.

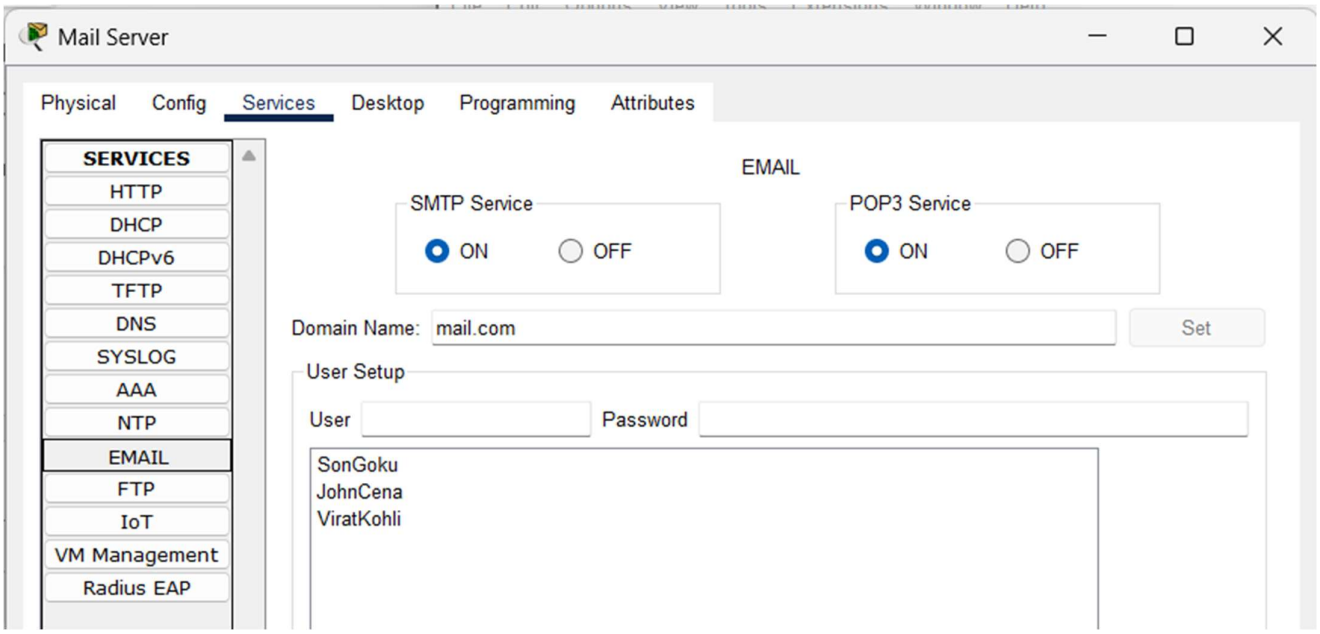


Fig 10: mail server configuration

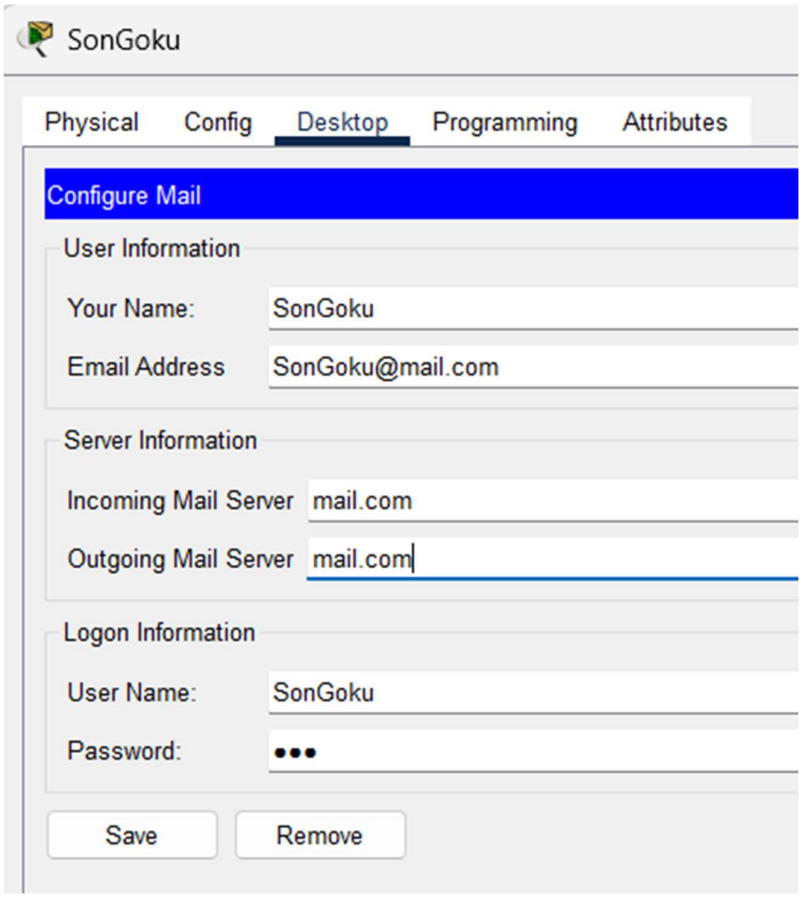


Fig 11: SONGOKU config for mail

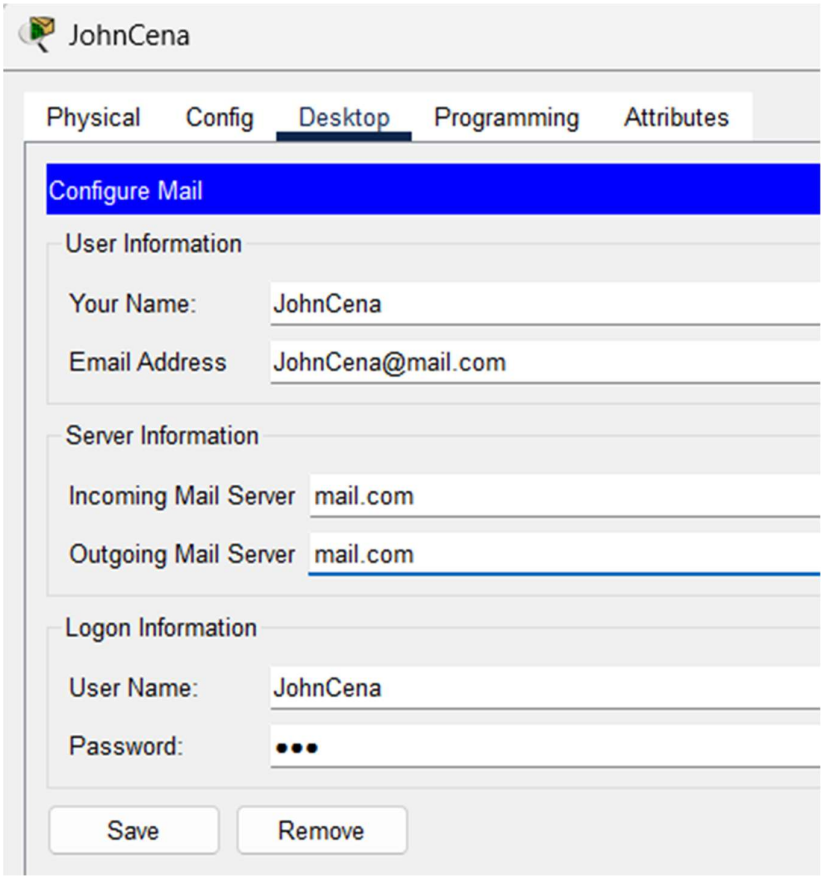


Fig 12: JOHNCENA config for mail

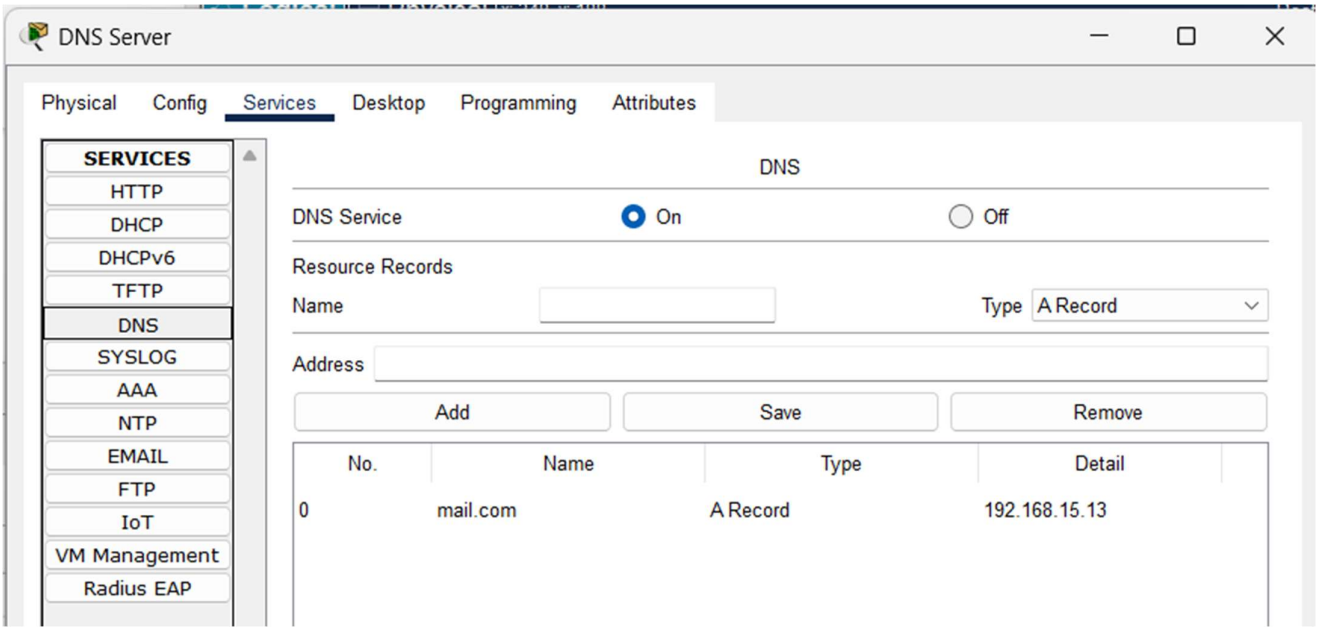


Fig 15: DNS server configuration for domain name resolution

Composing and Sending Mail from SONGOKU to JOHNCENA:

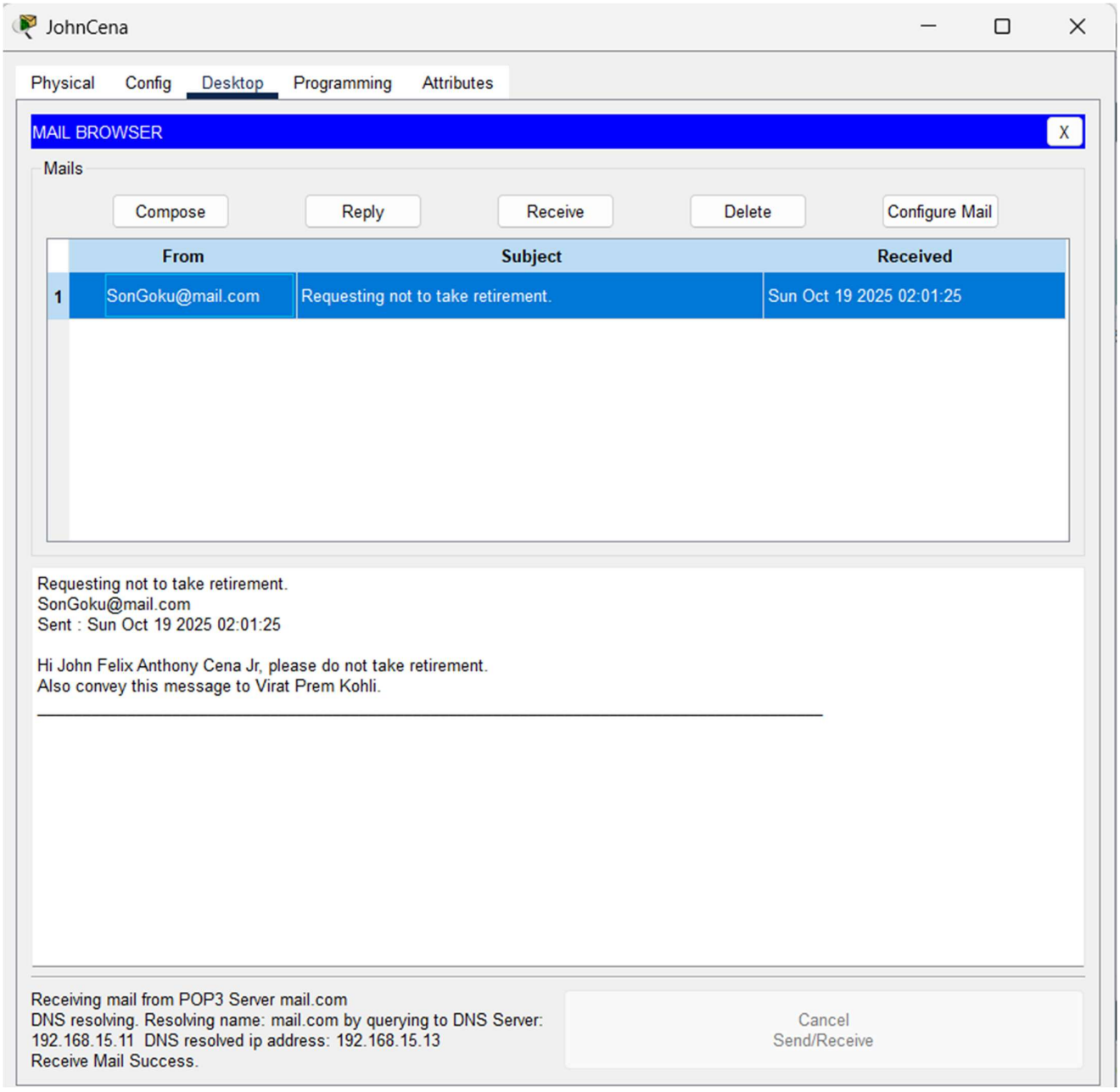


Fig 14: mail received from SONGOKU to JOHNCENA

Configuring web server:

1. Go to Web server -> services -> HTTP.
2. Edit the index.html file to get desired output on the web page.

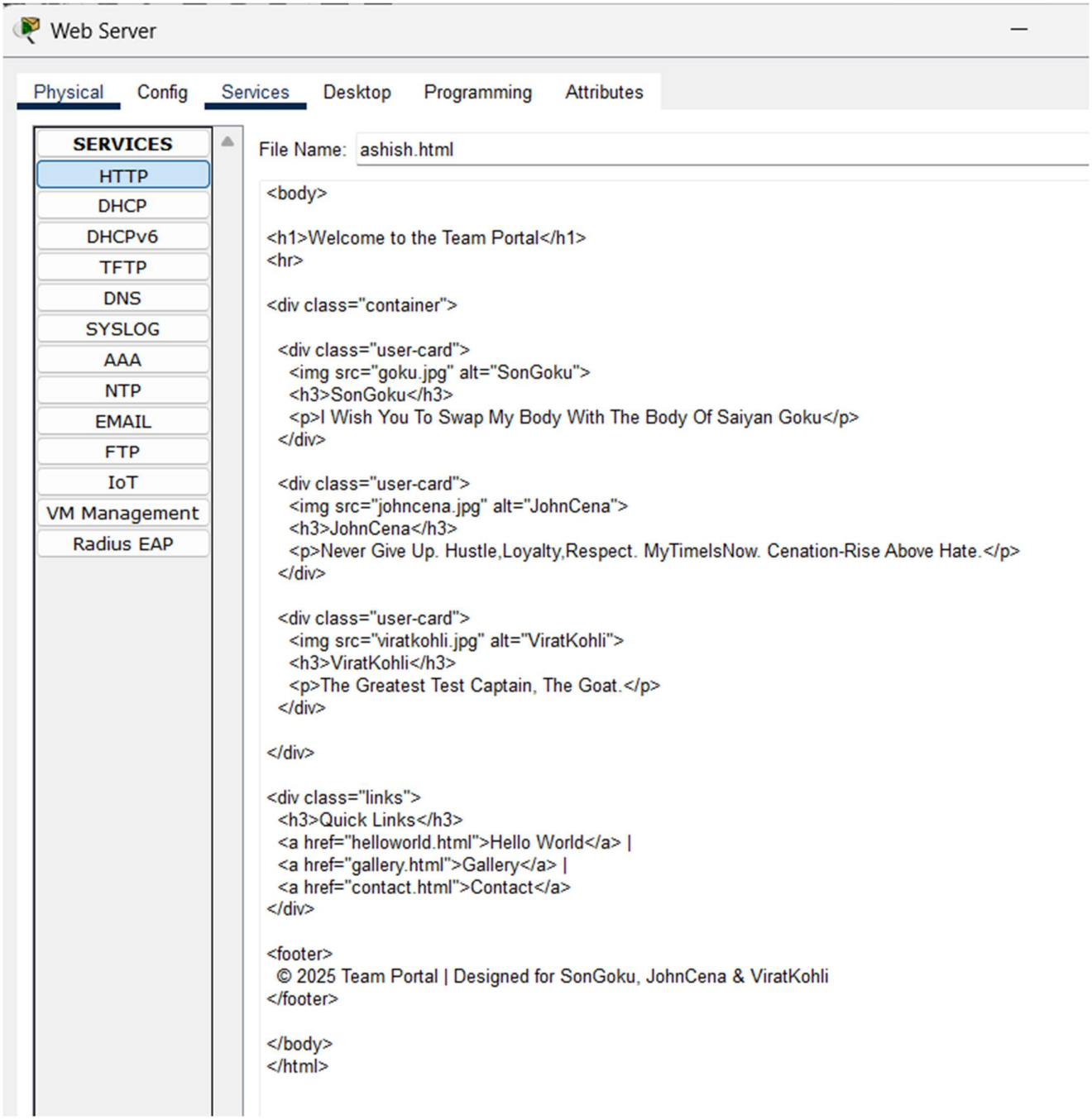


Fig 15: Web page creation on web server

Accessing Web server from SONGOKU using DNS:

1. Open Web browser on any PC let's say SONGOKU.
2. Write your domain name. For example, here we have ashish.html.

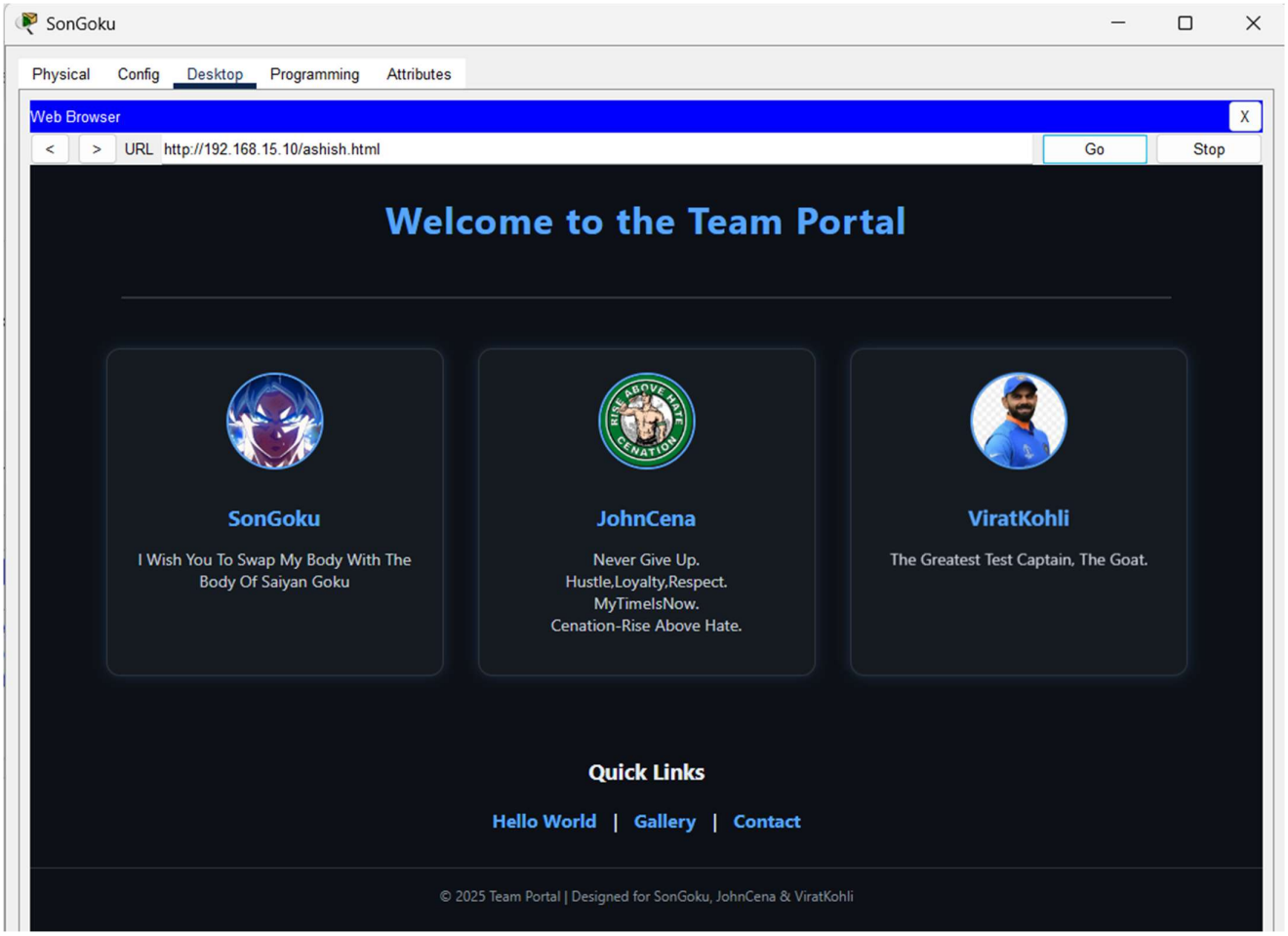


Fig 16: Accessing the web page from Web server

Q) Configure FTP Server using packet tracer. Set username and password on FTP server.

FTP (File Transfer Protocol) over two networks: (sic - should be over one network)

1. Firstly, to setup go to FTP server.
2. Go to services -> FTP.
3. Enable FTP then to configure it by adding PCs user and password along with enabling permissions.
4. Go to any PC say JOHNCENA, then to Desktop->text editor.
5. Write something.
6. Give suitable name with txt extension and save.

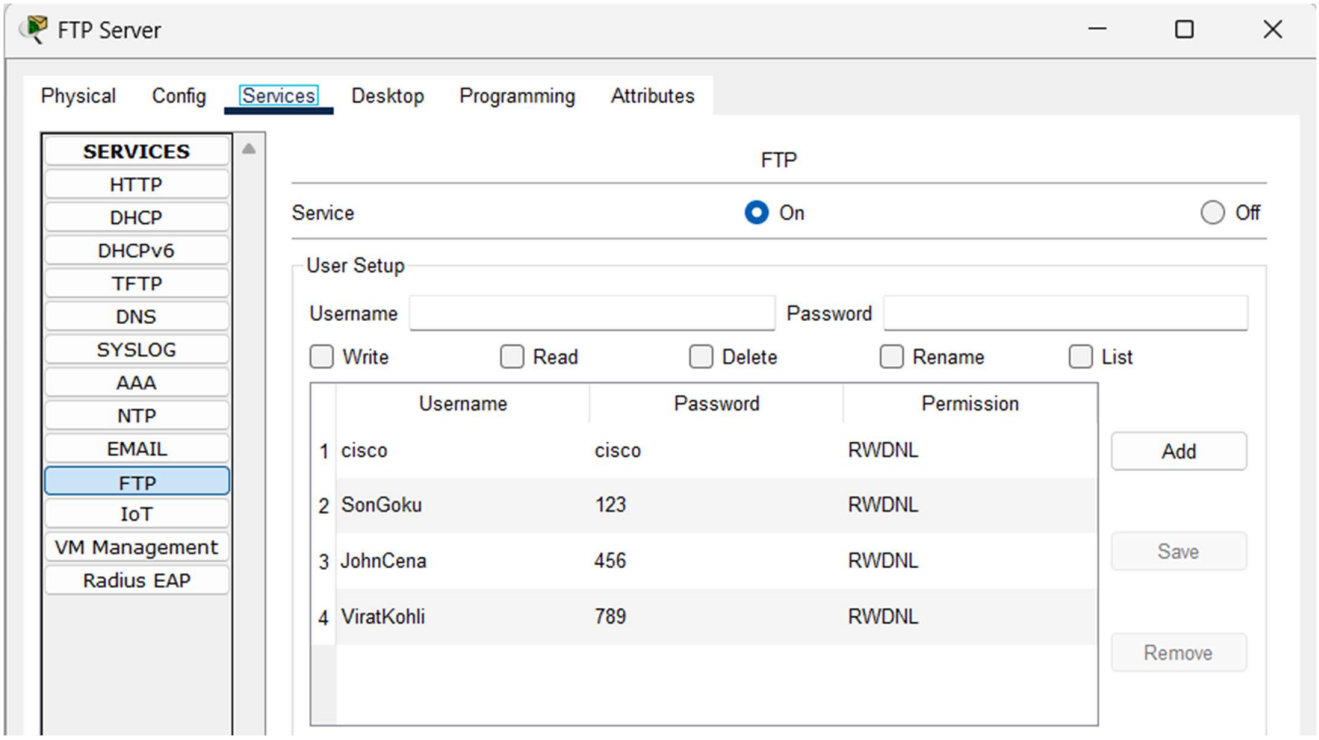


Fig 17: configuring the FTP server with PCs

```
C:\>ftp 192.168.15.12
Trying to connect...192.168.15.12
Connected to 192.168.15.12
220- Welcome to PT Ftp server
Username:JohnCena
331- Username ok, need password
Password:
230- Logged in
(passive mode On)
ftp>put ashish.txt

Writing file ashish.txt to 192.168.15.12:
File transfer in progress...

[Transfer complete - 334 bytes]

334 bytes copied in 0.087 secs (3839 bytes/sec)
ftp>
```

Fig 18: Uploading the file to the FTP server from JOHNCENA

```
C:\>ftp 192.168.15.12
Trying to connect...192.168.15.12
Connected to 192.168.15.12
220- Welcome to PT Ftp server
Username:ViratKohli
331- Username ok, need password
Password:
230- Logged in
(passive mode On)
ftp>get ashish.txt

Reading file ashish.txt from 192.168.15.12:
File transfer in progress...

[Transfer complete - 334 bytes]

334 bytes copied in 0 secs
ftp>
```

Fig 19: Getting the file from the FTP server from VIRATKOHLI