



University of Asia Pacific

Department of Computer Science and Engineering

Course Title: Computer Networks Lab

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Network Components:

- End Device: PC = 6, Laptop = 6, Server = 12 (DNS = 4, DHCP = 12)
- Network Device: Router = 6, Switch = 12
- Wire: Copper Straight Through, Fiber

Network Design:

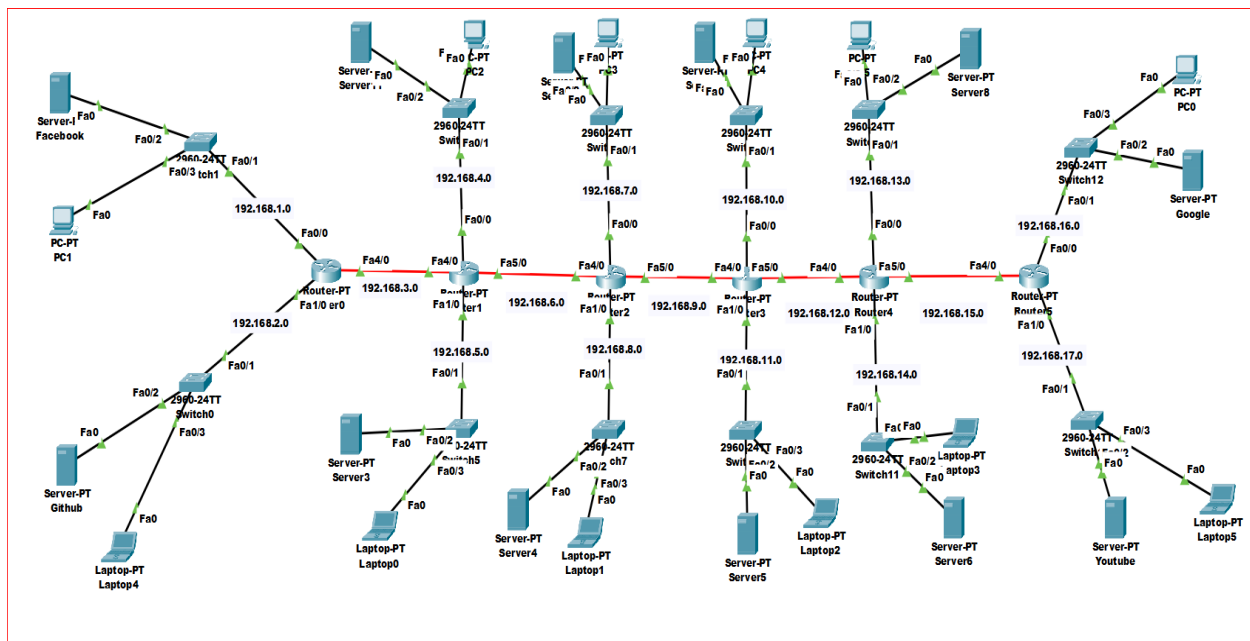


Figure: 01

Connecting all the Routers with **Fiber cables** and End devices which are PC, Laptop, Servers will be connected with **Copper Straight Through cables**.

Network Addressing Table

SL No.	Network Name	Host Requirements	Network Address	Subnet Mask	First Host	Last Host	Broadcast Address
1	Zone-1	254	192.168.1.0	255.255.255.0	192.168.1.1	192.168.1.254	192.168.1.255
2	Zone-2	254	192.168.2.0	255.255.255.0	192.168.2.1	192.168.2.254	192.168.2.255
3	R0-R1	2	192.168.3.0	255.255.255.0	192.168.3.1	192.168.3.254	192.168.3.255
4	Zone-3	254	192.168.4.0	255.255.255.0	192.168.4.1	192.168.4.254	192.168.4.255
5	Zone-4	254	192.168.5.0	255.255.255.0	192.168.5.1	192.168.5.254	192.168.5.255
6	R1-R2	2	192.168.6.0	255.255.255.0	192.168.6.1	192.168.6.254	192.168.6.255
7	Zone-5	254	192.168.7.0	255.255.255.0	192.168.7.1	192.168.7.254	192.168.7.255
8	Zone-6	254	192.168.8.0	255.255.255.0	192.168.8.1	192.168.8.254	192.168.8.255
8	R2-R3	2	192.168.9.0	255.255.255.0	192.168.9.1	192.168.9.254	192.168.9.255
10	Zone-7	254	192.168.10.0	255.255.255.0	192.168.10.1	192.168.10.254	192.168.10.255
11	Zone-8	254	192.168.11.0	255.255.255.0	192.168.11.1	192.168.11.254	192.168.11.255
12	R3-R4	2	192.168.12.0	255.255.255.0	192.168.12.1	192.168.12.254	192.168.12.255
13	Zone-9	254	192.168.13.0	255.255.255.0	192.168.13.1	192.168.13.254	192.168.13.255
14	Zone-10	254	192.168.14.0	255.255.255.0	192.168.14.1	192.168.14.254	192.168.14.255
15	R4-R5	2	192.168.15.0	255.255.255.0	192.168.15.1	192.168.15.254	192.168.15.255
16	Zone-11	254	192.168.16.0	255.255.255.0	192.168.16.1	192.168.16.254	192.168.16.255
17	Zone-12	254	192.168.17.0	255.255.255.0	192.168.17.1	192.168.17.254	192.168.17.255

Table: 01

Router Configuration:

The screenshot shows the 'Router1' configuration window with the 'Config' tab selected. The left sidebar lists configuration categories: GLOBAL, Settings, Algorithm Settings, ROUTING, Static, RIP, INTERFACE, and a list of interfaces. 'FastEthernet1/0' is selected under the INTERFACE category. The main panel displays the configuration for 'FastEthernet1/0'. It includes fields for Port Status (checked 'On'), Bandwidth (radio buttons for 100 Mbps and 10 Mbps, checked 'Auto'), Duplex (radio buttons for Half Duplex and Full Duplex, checked 'Auto'), MAC Address (00D0.9767.418A), IP Configuration (IPv4 Address: 192.168.5.1, Subnet Mask: 255.255.255.0), and Tx Ring Limit (10). At the bottom, there is a section for 'Equivalent IOS Commands' showing a sequence of commands in a terminal-like box. A 'Top' button is located at the bottom left of the window.

Router1

Physical **Config** CLI Attributes

GLOBAL

- Settings
- Algorithm Settings

ROUTING

- Static
- RIP

INTERFACE

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

FastEthernet1/0

Port Status ☒ **On**

Bandwidth ☒ 100 Mbps ☐ 10 Mbps ☒ **Auto**

Duplex ☐ Half Duplex ☒ Full Duplex ☒ **Auto**

MAC Address 00D0.9767.418A

IP Configuration

IPv4 Address 192.168.5.1

Subnet Mask 255.255.255.0

Tx Ring Limit 10

Equivalent IOS Commands

```
Router>enable
Router#
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface FastEthernet1/0
Router(config-if)#
```

☐ **Top**

Figure: 02

Here, press the router and go to the **config** tab then for each FastEthernet port **Turn ON** the port status and set the IP address for IPv4, also set the Subnet Mask for each port and each router. The IP address for each port will be the **First Host ID** or **Second Host ID** depends on need of each network connected to the dedicated port.

Connection Router to another networks:

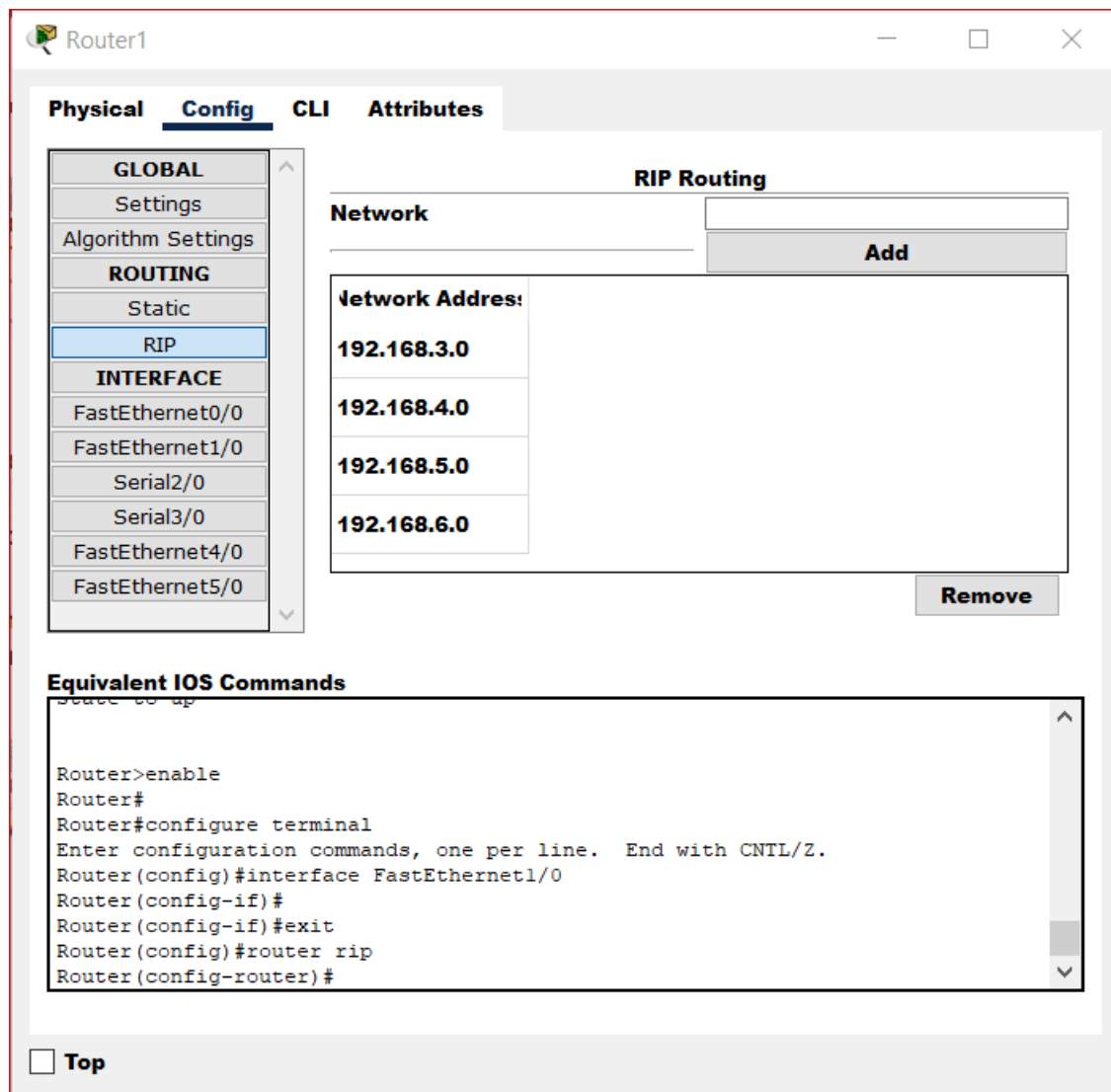
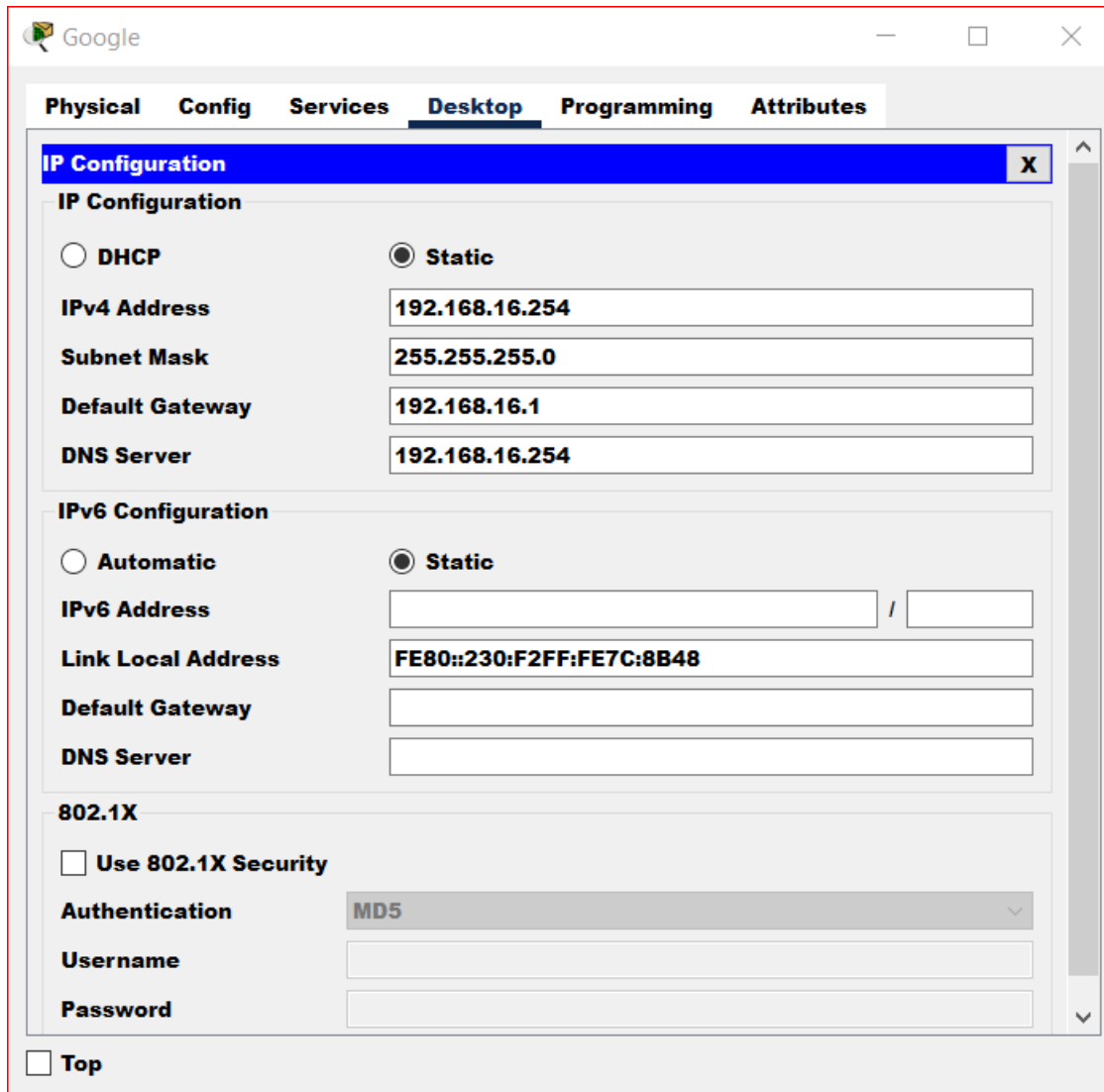


Figure: 03

Select the router and go to the config tab, then select the **RIP** section. Here we have to provide the IP address of other possible networks which are directly connected to this router and press the add button.

Configuring the DHCP & DNS Servers:



The screenshot shows the Google server configuration interface. The 'Desktop' tab is selected, and the 'IP Configuration' window is open. The 'Static' radio button is selected for both IPv4 and IPv6 configurations. The IPv4 configuration fields are filled with: IPv4 Address: 192.168.16.254, Subnet Mask: 255.255.255.0, Default Gateway: 192.168.16.1, and DNS Server: 192.168.16.254. The IPv6 configuration fields are: IPv6 Address (empty), Link Local Address: FE80::230:F2FF:FE7C:8B48, Default Gateway (empty), and DNS Server (empty). The 802.1X section has 'Use 802.1X Security' unchecked, 'Authentication' set to MD5, and 'Username' and 'Password' fields empty. A 'Top' button is at the bottom left.

IP Configuration	
<input type="radio"/> DHCP <input checked="" type="radio"/> Static	
IPv4 Address	192.168.16.254
Subnet Mask	255.255.255.0
Default Gateway	192.168.16.1
DNS Server	192.168.16.254
IPv6 Configuration	
<input type="radio"/> Automatic <input checked="" type="radio"/> Static	
IPv6 Address	/
Link Local Address	FE80::230:F2FF:FE7C:8B48
Default Gateway	
DNS Server	
802.1X	
<input type="checkbox"/> Use 802.1X Security	
Authentication	MD5
Username	
Password	

☐ Top

Figure: 04

In server **Google** select the Desktop and open IP configuration. Here we have to select the **static** mode. Then give IPv4 address which will be the **Last Host ID** of that network. Provide subnet mask default gateway and give its own IP address as **DNS Server** to convert this server to DNS server alongside DHCP server.

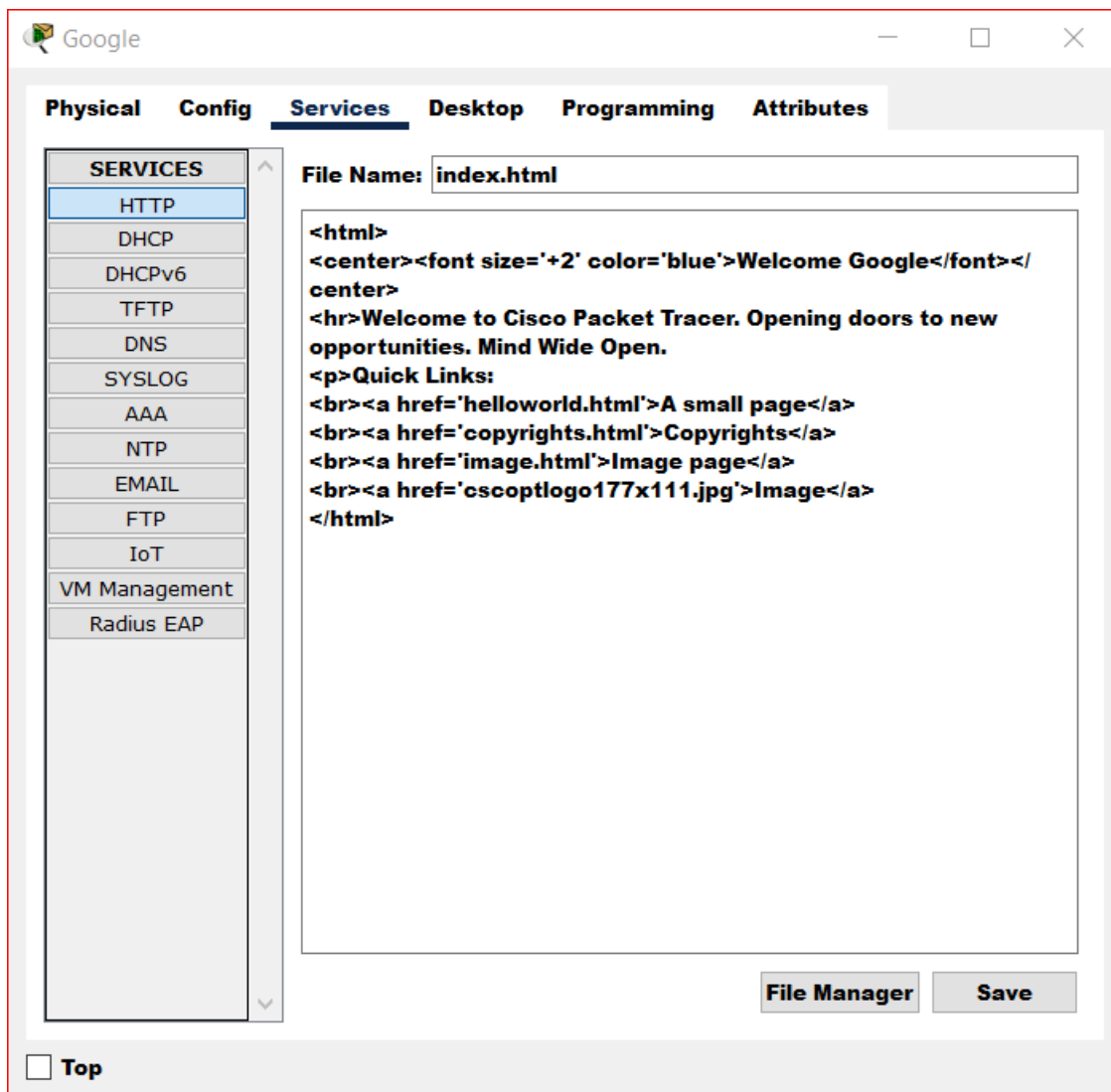


Figure: 05

In the Services tab we select the HTTP section edit the index.html. Here renames the title to Welcome Google. And we have to follow this step for other DNS servers and rename them as their corresponding name.

Google

Physical

Config

Services

Desktop

Programming

Attributes

SERVICES

HTTP

DHCP

DHCPv6

TFTP

DNS

SYSLOG

AAA

NTP

EMAIL

FTP

IoT

VM Management

Radius EAP

DHCP

Interface

FastEthernet0

Service

On

Off

Pool Name

serverPool

Default Gateway

192.168.16.1

DNS Server

192.168.16.254

Start IP Address :

192

168

16

2

Subnet Mask:

255

255

255

0

Maximum Number of Users :

254

TFTP Server:

0.0.0.0

WLC Address:

0.0.0.0

Add

Save

Remove

Pool Name	Default Gateway	DNS Server	Start IP Address	Subnet Mask	Max Use	TFTP Server	WLC Address
serverPool	192....	192....	192....	255....	254	0.0.0.0	0.0.0.0

<

>

Top

Figure: 06

Then in the Services tab select the **DHCP** section **Turn ON** the Service option. After that give the default gateway of the network here, **192.168.16.1**. Also add the DNS server to its IP address, here **192.168.16.254**. Reserve the first two IP address and start the host Ip address from **192.168.16.2**
Then press the save button.

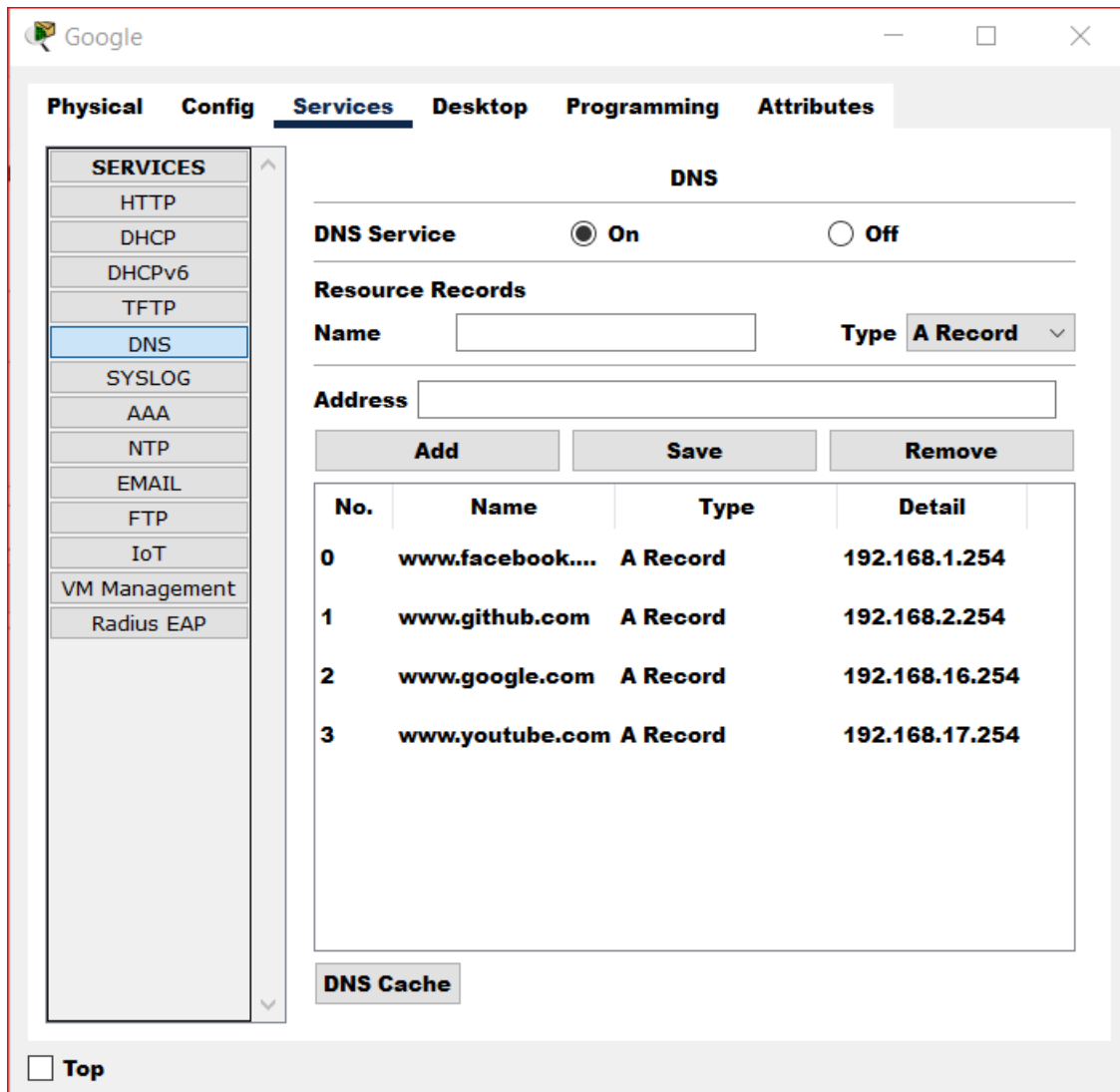


Figure: 07

In the DNS section Turn ON the DNS Service, give the **URL name** and the **IP address** for the specific network and press the save button for saving the information in the DNS server.

Here we have added 4 web services to this DNS server.

- URL 1: www.facebook.com
IP address 1: 192.168.1.254
- URL 2: www.github.com
IP address 2: 192.168.2.254
- URL 3: www.google.com
IP address 3: 192.168.16.254
- URL 4: www.youtube.com
IP address 4: 192.168.17.254

Configuration of the PC & Laptop:

The screenshot shows a configuration window for a device labeled 'PC1'. The window has several tabs: 'Physical', 'Config', 'Desktop' (which is selected), 'Programming', and 'Attributes'. Under the 'Desktop' tab, there is a sub-tab 'IP Configuration' which is also selected. Below this, the 'Interface' is set to 'FastEthernet0'. The 'IP Configuration' section has two radio buttons: 'DHCP' (which is selected) and 'Static'. Below these are four text input fields: 'IPv4 Address' with the value '192.168.1.2', 'Subnet Mask' with '255.255.255.0', 'Default Gateway' with '192.168.1.1', and 'DNS Server' with '192.168.1.254'. The 'IPv6 Configuration' section has two radio buttons: 'Automatic' and 'Static' (which is selected). Below these are four text input fields: 'IPv6 Address' (empty), 'Link Local Address' with the value 'FE80::203:E4FF:FE8B:A4BA', 'Default Gateway' (empty), and 'DNS Server' (empty). The '802.1X' section has a checkbox 'Use 802.1X Security' which is unchecked. Below this are two more fields: 'Authentication' with a dropdown menu showing 'MD5' and 'Username' (empty). At the bottom left of the window is a 'Top' button.

PC1

Physical Config **Desktop** Programming Attributes

IP Configuration X

Interface FastEthernet0

IP Configuration

☒ DHCP ☐ Static

IPv4 Address 192.168.1.2

Subnet Mask 255.255.255.0

Default Gateway 192.168.1.1

DNS Server 192.168.1.254

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address /

Link Local Address FE80::203:E4FF:FE8B:A4BA

Default Gateway

DNS Server

802.1X

☐ Use 802.1X Security

Authentication MD5

Username

☐ Top

Figure: 08

Select the PC and go to the Desktop tab, then select the IP Configuration. Here, we have to select the DHCP mode. So that the device will get all its information needed from the DHCP server which is connected with it.

Testing of Networks:

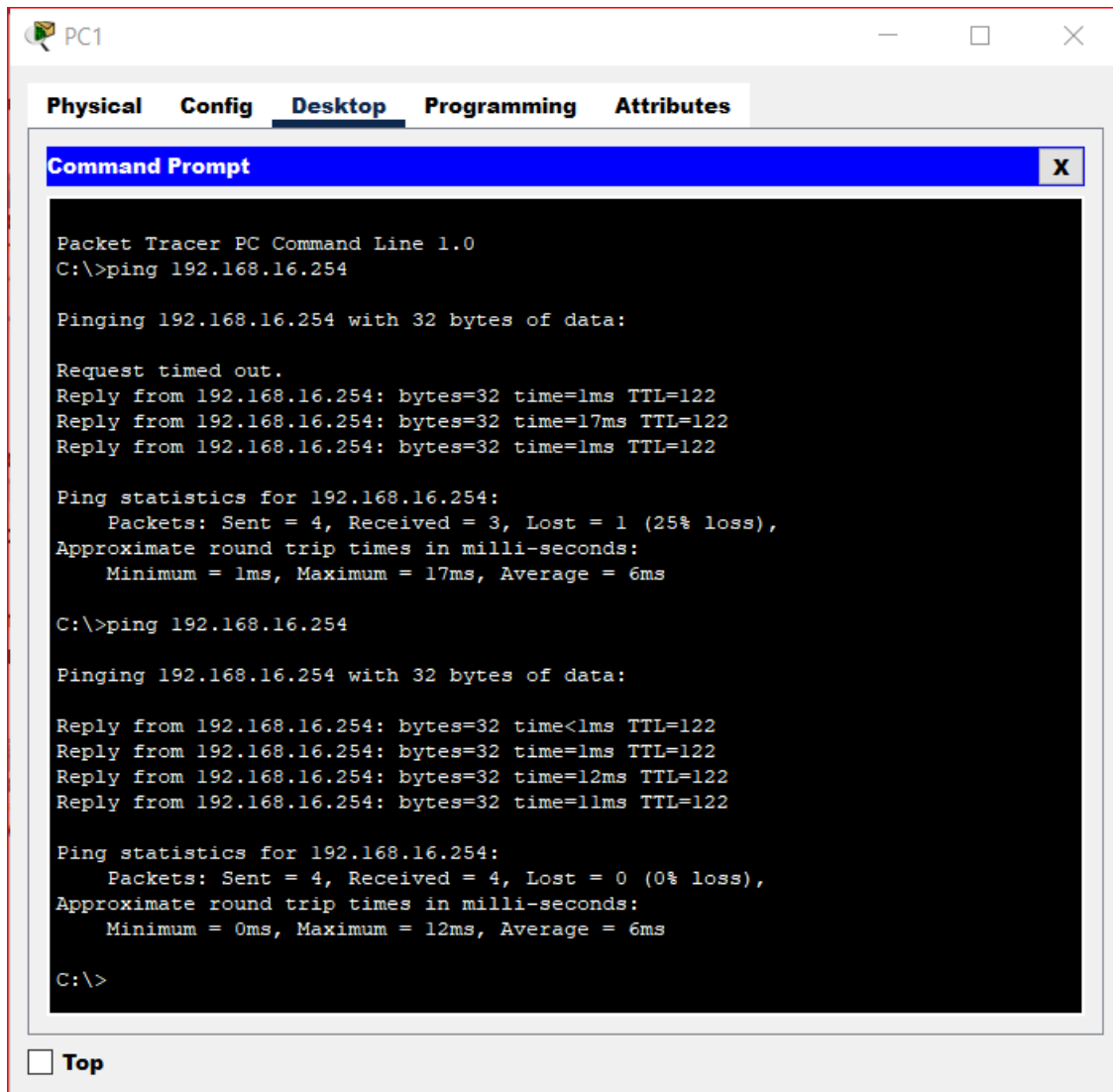


Figure: 09

For testing the network, first we have to select a PC and open the Command Prompt from the desktop tab. Then **ping** to a particular **IP address** here, 192.168.16.254
We can see that-

Sent = 4 packets

Received = 4 packets

Lost = 0 packets

So, all the packet transmitted and received successfully and the network established.

Browsing from the PC:

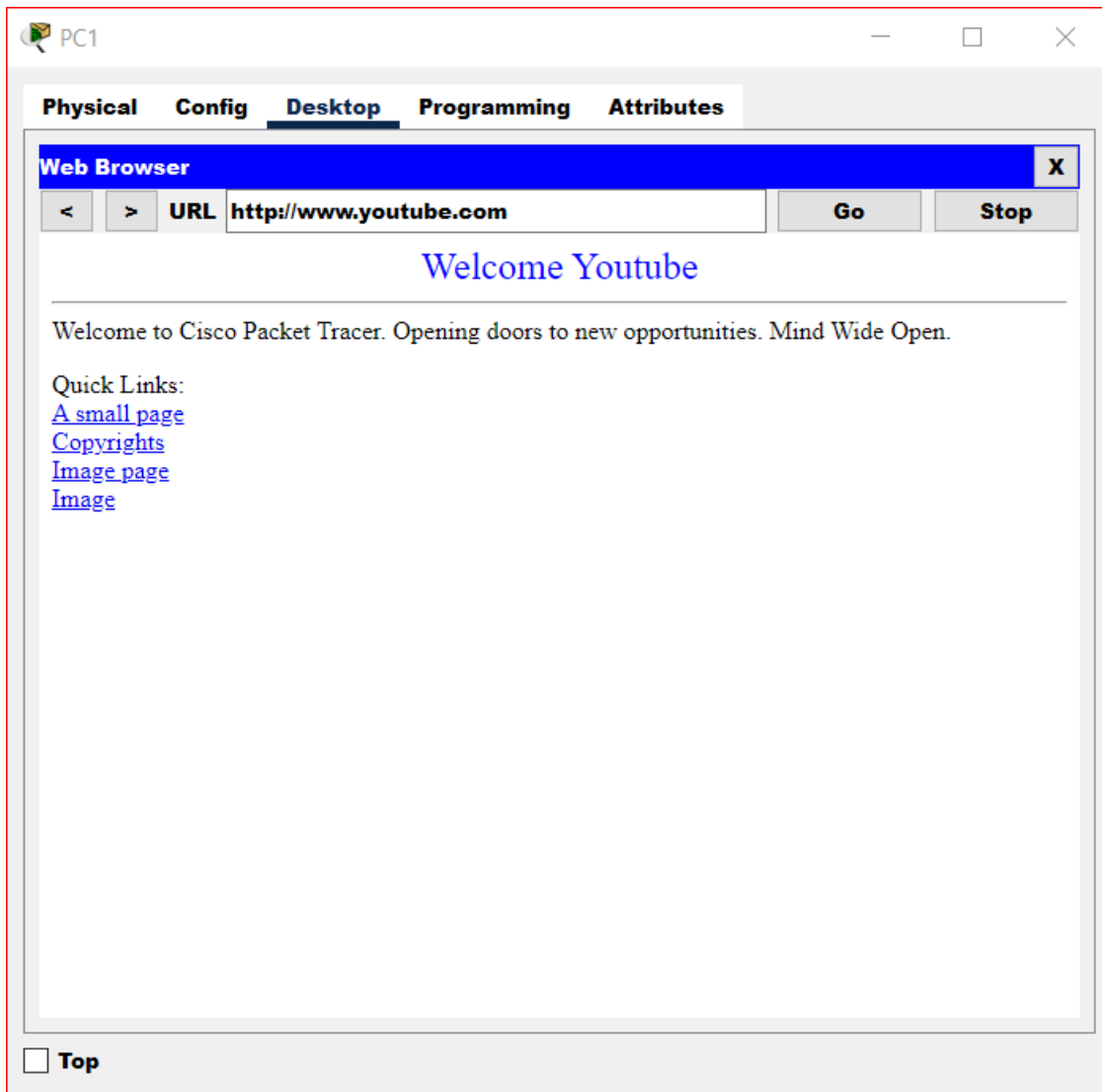


Figure: 10

From a particular PC or Laptop we can also browse. First select desktop then open Web Browser press the **URL** which was set in the **DNS server**. Then we can see the interface of that website.

Here,

Web URL: <http://www.youtube.com>

Associated IP with this URL: 162.168.17.254