



# University of Asia Pacific

*Department of Computer Science and Engineering*

**Course Title:** Computer Networks Lab

**Course Code:** CSE 320

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## Network Components:

- End Device: PC = 2, Server = 9 (DNS = 1, Web Server = 8)
- Network Device: Router = 9, Switch = 5
- Wire: Serial DCE, Fiber, Copper Straight-Through

## Network Design:

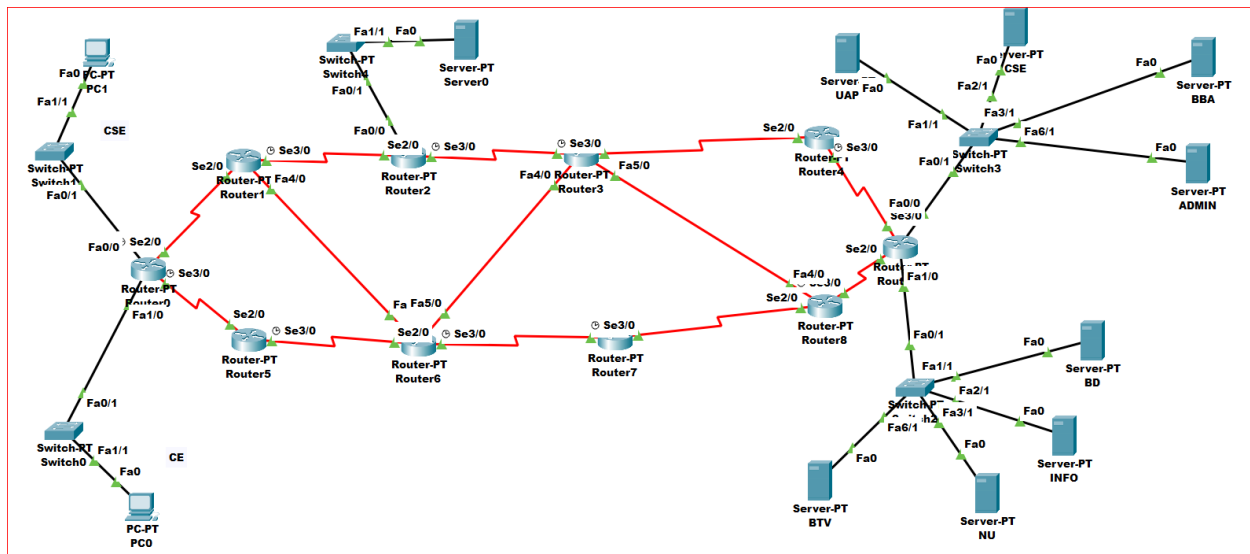


Figure: 01

Connect all the routers with **Serial DCE** and **Fiber cables**. Connect all the switches with access routers and end devices with the switches through **Copper Straight-Through cables**.

## Network Addressing Table

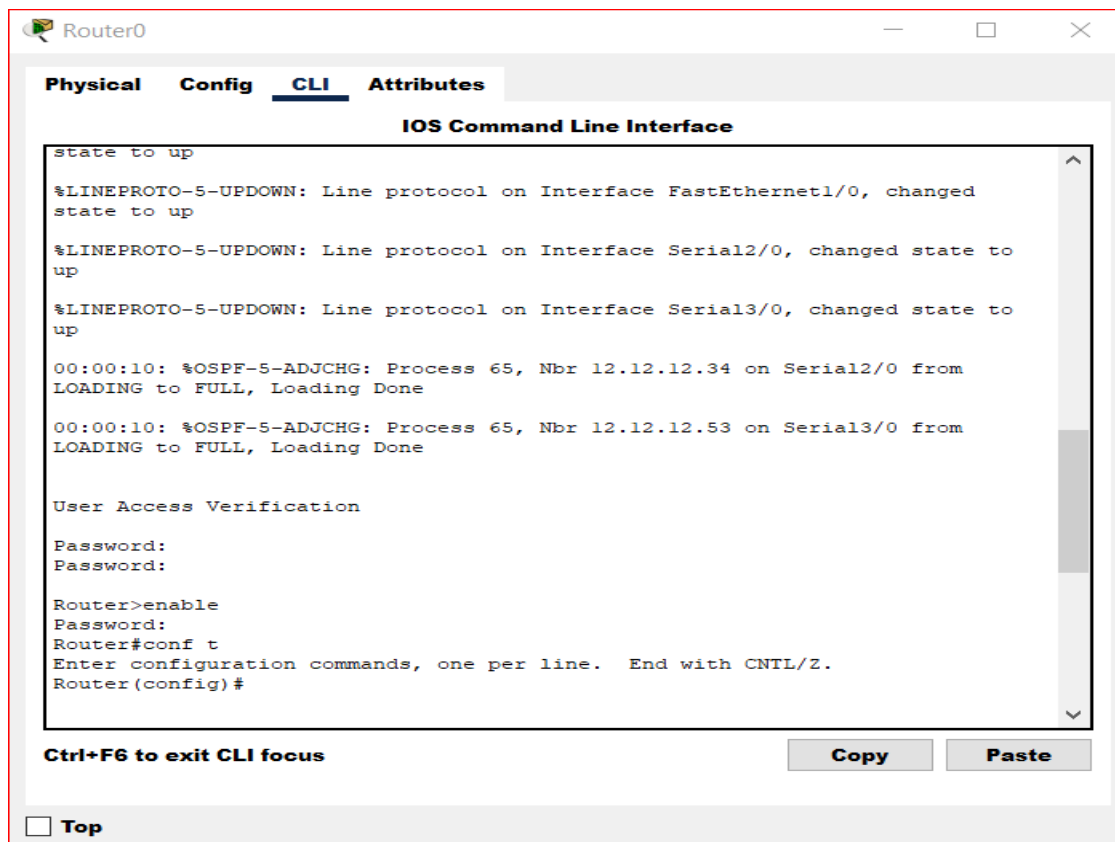
SL No.	Network Name	Host Requirements	Host Bit	Network Address	Subnet Mask	First Host	Last Host	Broadcast Address
1	CSE	500	9	172.12.0.0/23	255.255.254.0	172.12.0.1	172.12.1.254	172.12.1.255
2	CE	300	9	172.12.2.0/23	255.255.254.0	172.12.2.1	172.12.3.254	172.12.1.255
3	Educational Servers	4	3	172.12.4.0/29	255.255.255.248	172.12.4.1	172.12.4.6	172.12.4.7
4	Organization Server	4	3	172.12.4.8/29	255.255.255.248	172.12.4.9	172.12.4.14	172.12.4.15
5	R3-R6	4	3	12.12.12.0/29	255.255.255.248	12.12.12.1	12.12.12.6	12.12.12.7
6	R6-R1	4	3	12.12.12.8/29	255.255.255.248	12.12.12.9	12.12.12.14	12.12.12.15
7	R1-R2	3	3	12.12.12.16/29	255.255.255.248	12.12.12.17	12.12.12.22	12.12.12.23
8	R8-R3	3	3	12.12.12.24/29	255.255.255.248	12.12.12.25	12.12.12.30	12.12.12.31
9	R0-R1	2	2	12.12.12.32/30	255.255.255.252	12.12.12.33	12.12.12.34	12.12.12.35
10	R0-R5	2	2	12.12.12.36/30	255.255.255.252	12.12.12.37	12.12.12.38	12.12.12.39
11	R2-R3	2	2	12.12.12.40/30	255.255.255.252	12.12.12.41	12.12.12.42	12.12.12.43
12	R4-R3	2	2	12.12.12.44/30	255.255.255.252	12.12.12.45	12.12.12.46	12.12.12.47
13	R4-R9	2	2	12.12.12.48/30	255.255.255.252	12.12.12.49	12.12.12.50	12.12.12.51
14	R5-R6	2	2	12.12.12.52/30	255.255.255.252	12.12.12.53	12.12.12.54	12.12.12.55
15	R7-R6	2	2	12.12.12.56/30	255.255.255.252	12.12.12.57	12.12.12.58	12.12.12.59
16	R7-R8	2	2	12.12.12.60/30	255.255.255.252	12.12.12.61	12.12.12.62	12.12.12.63
17	R9-R8	2	2	12.12.12.64/30	255.255.255.252	12.12.12.65	12.12.12.66	12.12.12.67
18	DNS Server	1	2	192.168.10.32/30	255.255.255.252	192.168.10.33	192.168.10.34	192.168.10.35

**Table: 01**

## Router Configuration:

- **Secure access Routers with password:** In router 0 open the **CLI** tab. Here we have to set **three** types of passwords. First **terminal password**, **console password**, **virtual terminal password**.
  - **Password Setting Commands:**

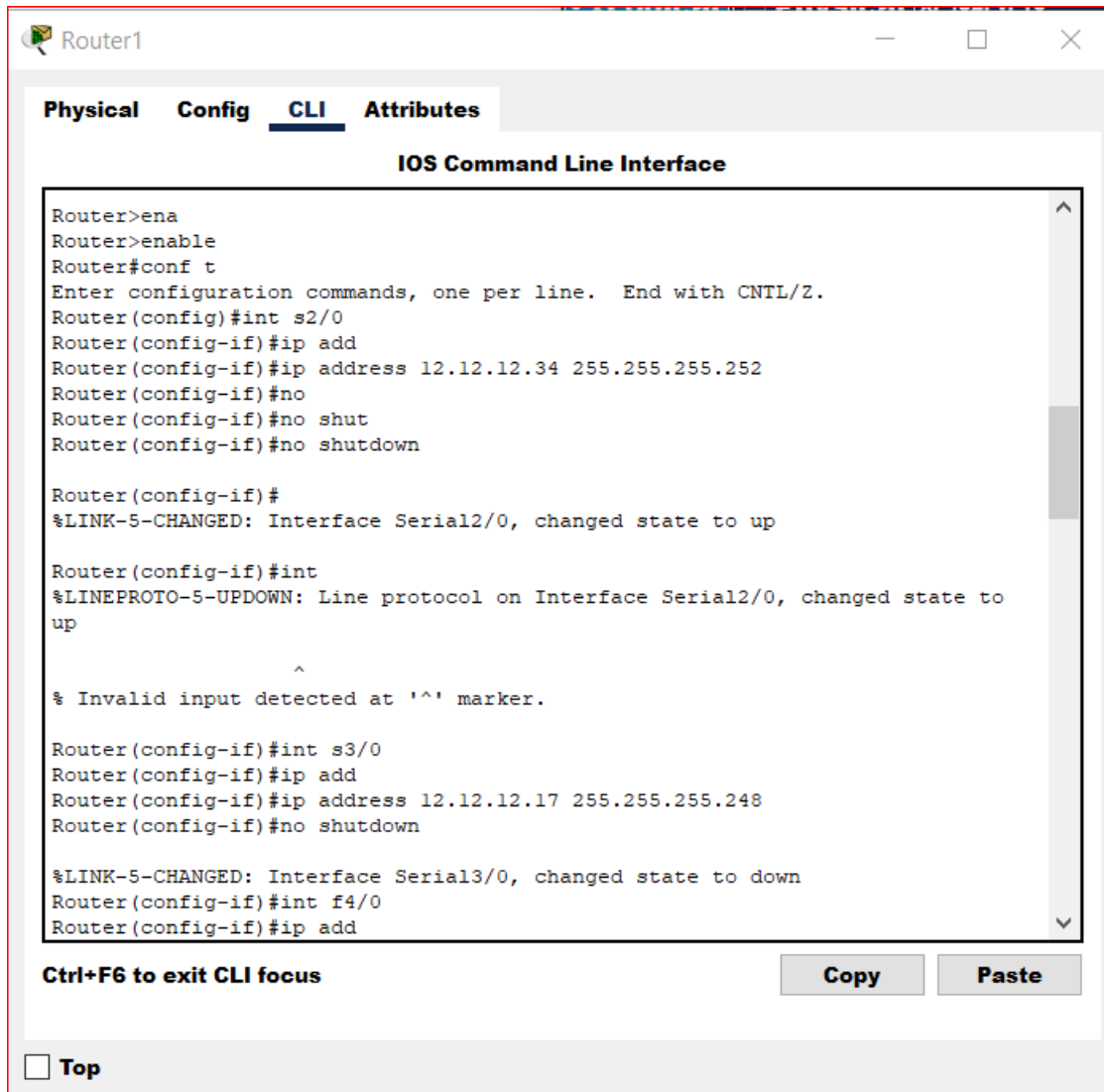
```
Router>enable
Router #configure terminal
Router(config) #enable secret 18201065
Router(config) #no ip domain-lookup
Router(config-line) #line console 0
Router(config-line) #password 18201065
Router(config-line) #login
Router(config-line) #line vty 0 4
Router(config-line) #password 18201065
Router(config-line) #login
Router(config)#end
Router#
```



**Figure: 02**

After Setting the passwords, while entering in the router 0 we have to give the terminal and console password '18201065'. Then will be able to access the router 0.

- **Configure Router Interface:**



**Figure: 03**

In router 1 select CLI tab. Then configure the interfaces with the ip addresses and subnet masks which are connected with the router 1.

Here,

interface s2/0 -> 12.12.12.34 255.255.255.252

interface s3/0 -> 12.12.12.17 255.255.255.248

- Router OSPF Configuration & Show IP Route:

The screenshot shows a Cisco Packet Tracer window titled 'Router3'. The 'CLI' tab is selected, displaying the 'IOS Command Line Interface'. The output of the 'show ip route' command is visible, showing the router's routing table. The output includes a legend for route codes (C, D, N1, E1, i, \*, P), a message 'Gateway of last resort is not set', and a list of routes including directly connected networks and OSPF-learned routes.

```

00:00:45: %OSPF-5-ADJCHG: Process 65, Nbr 12.12.12.57 on FastEthernet4/0 from LOADING to FULL, Loading Done

Router>enable
Router#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

 12.0.0.0/8 is variably subnetted, 13 subnets, 2 masks
C    12.12.12.0/29 is directly connected, FastEthernet4/0
O    12.12.12.8/29 [110/2] via 12.12.12.1, 00:58:00, FastEthernet4/0
O    12.12.12.16/29 [110/66] via 12.12.12.1, 00:58:00, FastEthernet4/0
C    12.12.12.24/29 is directly connected, FastEthernet5/0
O    12.12.12.32/30 [110/66] via 12.12.12.1, 00:58:00, FastEthernet4/0
O    12.12.12.36/30 [110/129] via 12.12.12.1, 00:58:00, FastEthernet4/0
C    12.12.12.40/30 is directly connected, Serial2/0
C    12.12.12.44/30 is directly connected, Serial3/0
O    12.12.12.48/30 [110/128] via 12.12.12.46, 00:58:25, Serial3/0
O    12.12.12.52/30 [110/65] via 12.12.12.1, 00:58:00, FastEthernet4/0
O    12.12.12.56/30 [110/65] via 12.12.12.1, 00:58:00, FastEthernet4/0
O    12.12.12.60/30 [110/65] via 12.12.12.26, 00:58:00, FastEthernet5/0
O    12.12.12.64/30 [110/65] via 12.12.12.26, 00:58:00, FastEthernet5/0
 172.12.0.0/16 is variably subnetted, 4 subnets, 2 masks
O    172.12.0.0/23 [110/67] via 12.12.12.1, 00:58:00, FastEthernet4/0
O    172.12.2.0/23 [110/67] via 12.12.12.1, 00:58:00, FastEthernet4/0
O    172.12.4.0/29 [110/66] via 12.12.12.26, 00:58:00, FastEthernet5/0
O    172.12.4.8/29 [110/66] via 12.12.12.26, 00:58:00, FastEthernet5/0
 192.168.10.0/30 is subnetted, 1 subnets
O    192.168.10.32 [110/65] via 12.12.12.41, 00:58:25, Serial2/0

Router#
  
```

Figure: 04

Go to CLI tab with enter in the router config mode.

Router(config) #router ospf 065

Router(config-router) # network 12.12.12.0 0.0.0.7 area 18201065

Router(config-router) # network 12.12.12.24 0.0.0.7 area 18201065

Router(config-router) # network 12.12.12.40 0.0.0.3 area 18201065

Router(config-router) # network 12.12.12.44 0.0.0.3 area 18201065

After that enter show ip route command then we can see all the path which are directly or indirectly connected to the router.

## PC Configuration:

The screenshot shows a window titled "PC1" with a standard Windows-style title bar (minimize, maximize, close buttons). Inside the window, there are five tabs: "Physical", "Config", "Desktop" (which is selected and highlighted), "Programming", and "Attributes". Under the "Desktop" tab, there is a sub-tab labeled "IP Configuration" with a close button (X) in its top right corner. Below this sub-tab, the "Interface" is set to "FastEthernet0". The "IP Configuration" section has two radio buttons: "DHCP" (unselected) and "Static" (selected). Below these are four text input fields: "IPv4 Address" (172.12.0.2), "Subnet Mask" (255.255.254.0), "Default Gateway" (172.12.0.1), and "DNS Server" (192.168.10.34). The "IPv6 Configuration" section also has two radio buttons: "Automatic" (unselected) and "Static" (selected). Below these are four text input fields: "IPv6 Address" (empty), "Link Local Address" (FE80::210:11FF:FEE9:383D), "Default Gateway" (empty), and "DNS Server" (empty). The "802.1X" section has a checkbox "Use 802.1X Security" (unchecked), a dropdown menu for "Authentication" (set to MD5), and a text input field for "Username" (empty). At the bottom left of the window, there is a "Top" button.

Interface	FastEthernet0
<b>IP Configuration</b>	
<input type="radio"/> DHCP	<input checked="" type="radio"/> Static
IPv4 Address	172.12.0.2
Subnet Mask	255.255.254.0
Default Gateway	172.12.0.1
DNS Server	192.168.10.34
<b>IPv6 Configuration</b>	
<input type="radio"/> Automatic	<input checked="" type="radio"/> Static
IPv6 Address	
Link Local Address	FE80::210:11FF:FEE9:383D
Default Gateway	
DNS Server	
<b>802.1X</b>	
<input type="checkbox"/> Use 802.1X Security	
Authentication	MD5
Username	

Figure: 05

Select PC1, press the Desktop tab and select the IP Configuration option select the static mode.

Here,

Ip address 172.12.0.2

Subnet mask: 255.255.254.0

Default Gateway: 172.12.0.1

DNS Server: 192.168.10.34

## Web Server Configuration:

The screenshot shows the UAP (Universal Access Point) configuration interface. The 'Desktop' tab is selected, and the 'IP Configuration' section is active. The 'Static' radio button is selected for IPv4 configuration. The IPv4 Address is set to 172.12.4.2, Subnet Mask to 255.255.255.248, Default Gateway to 172.12.4.1, and DNS Server to 192.168.10.34. The IPv6 Configuration section shows the 'Static' radio button selected, with a Link Local Address of FE80::201:C9FF:FE65:2297. The 802.1X section shows the 'Use 802.1X Security' checkbox unchecked, with Authentication set to MD5. A 'Top' link is at the bottom left.

IP Configuration	
<input type="radio"/> DHCP <input checked="" type="radio"/> Static	
IPv4 Address	172.12.4.2
Subnet Mask	255.255.255.248
Default Gateway	172.12.4.1
DNS Server	192.168.10.34

IPv6 Configuration	
<input type="radio"/> Automatic <input checked="" type="radio"/> Static	
IPv6 Address	
Link Local Address	FE80::201:C9FF:FE65:2297
Default Gateway	
DNS Server	

802.1X	
<input type="checkbox"/> Use 802.1X Security	
Authentication	MD5
Username	
Password	

☐ Top

Figure: 06

Select UAP server, press the Desktop tab and select the IP Configuration option select the static mode.

Here,

Ip address 172.12.4.2

Subnet mask: 255.255.255.248

Default Gateway: 172.12.4.1

DNS Server: 192.168.10.34



## DNS Server Configuration:

The screenshot shows the 'Server0' configuration window with the 'Desktop' tab selected. The 'IP Configuration' section is active, showing 'Static' mode selected. The IPv4 Address is 192.168.10.34, Subnet Mask is 255.255.255.252, Default Gateway is 192.168.10.33, and DNS Server is 0.0.0.0. The IPv6 Configuration section shows 'Static' mode selected, with a Link Local Address of FE80::20B:BEFF:FE86:44C7. The 802.1X section shows 'Use 802.1X Security' unchecked, Authentication set to MD5, and empty fields for Username and Password. A 'Top' button is at the bottom left.

IP Configuration	
<input type="radio"/> DHCP	<input checked="" type="radio"/> Static
IPv4 Address	192.168.10.34
Subnet Mask	255.255.255.252
Default Gateway	192.168.10.33
DNS Server	0.0.0.0

IPv6 Configuration	
<input type="radio"/> Automatic	<input checked="" type="radio"/> Static
IPv6 Address	
Link Local Address	FE80::20B:BEFF:FE86:44C7
Default Gateway	
DNS Server	

802.1X	
<input type="checkbox"/> Use 802.1X Security	
Authentication	MD5
Username	
Password	

☐ Top

**Figure: 07**

Select Server 0, press the Desktop tab and select the IP Configuration option select the static mode.

Here,

Ip address 192.168.10.34

Subnet mask: 255.255.255.252

Default Gateway: 192.168.10.33

## Add Web-Server address to DNS Server:

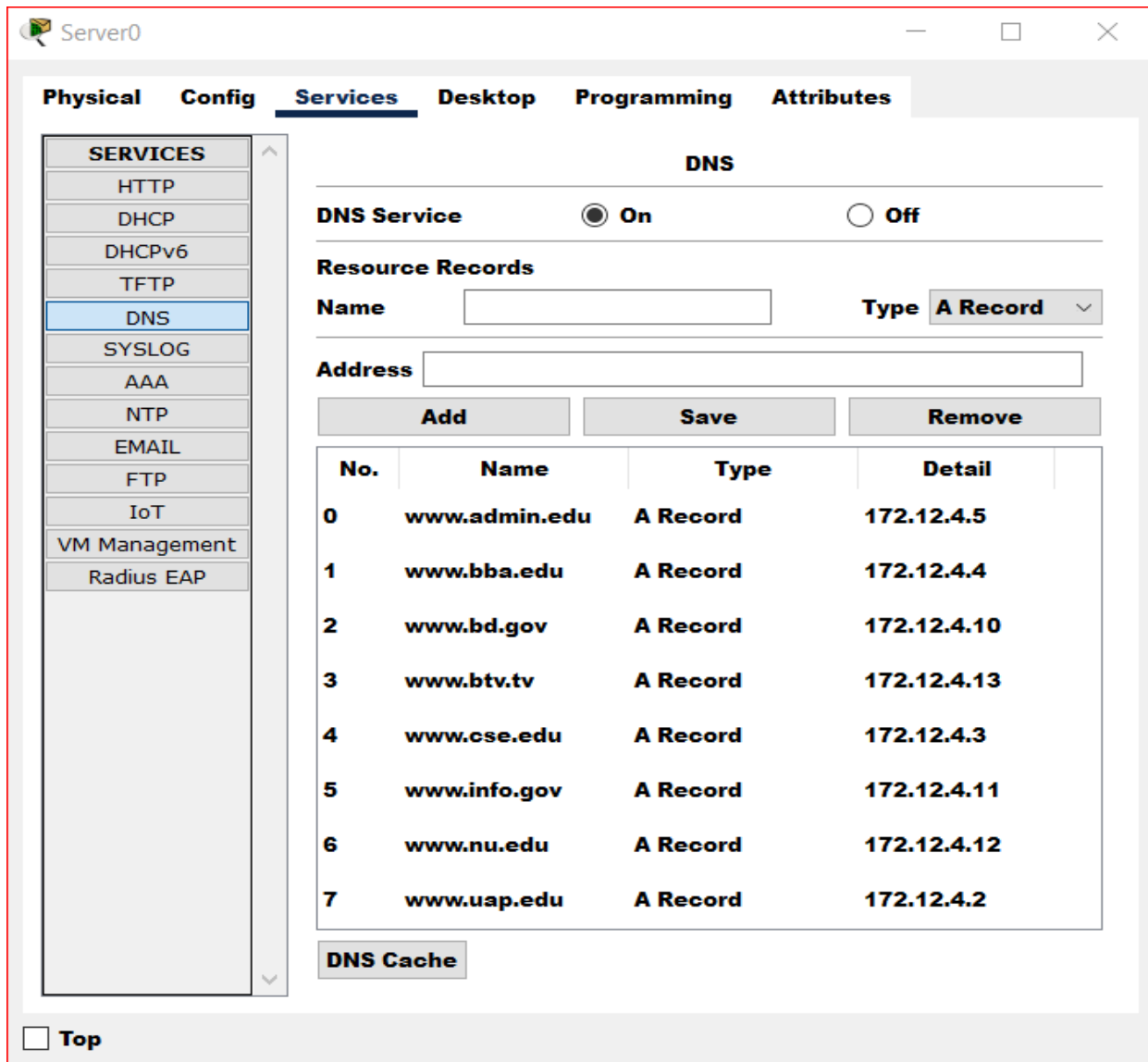
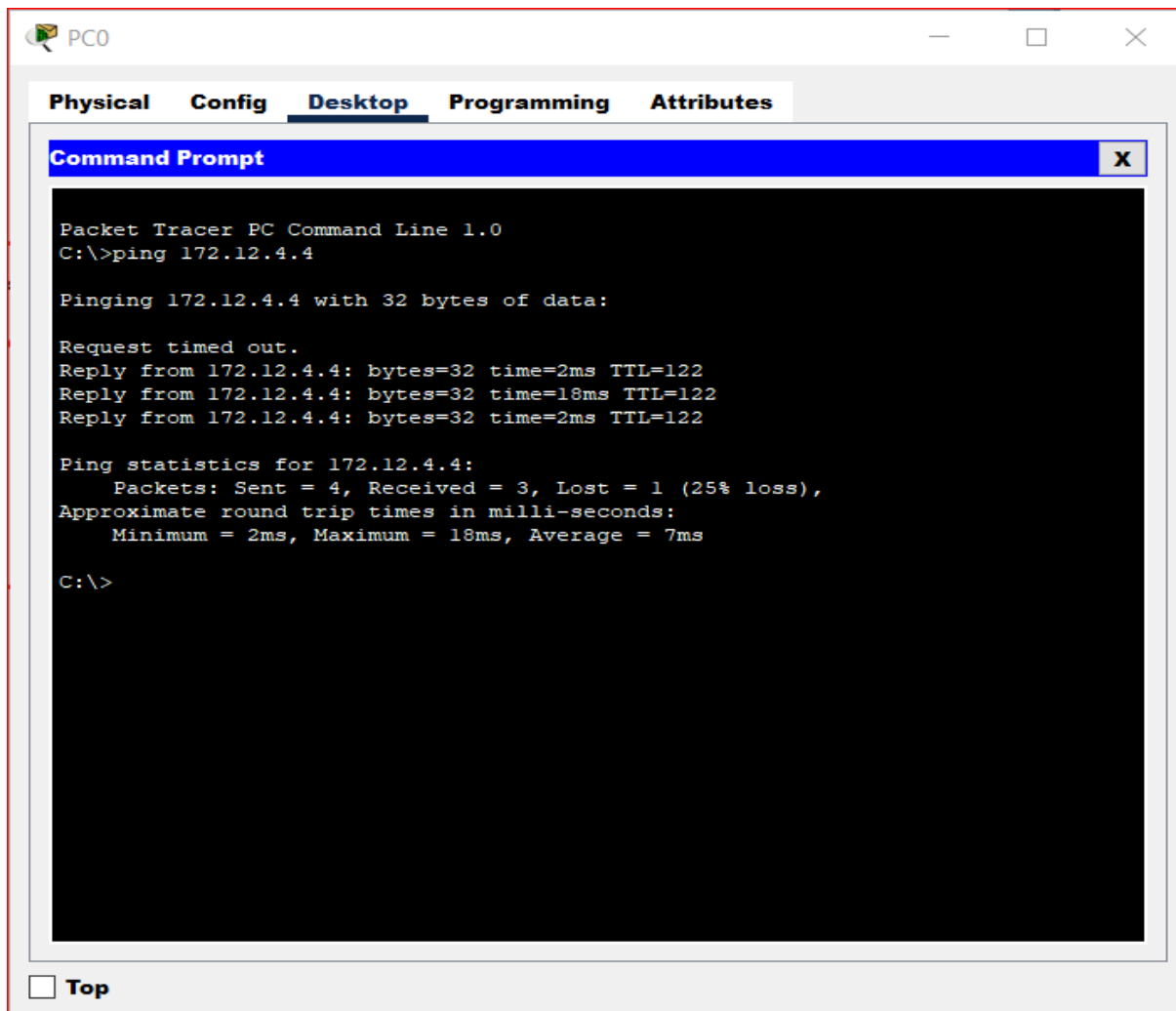


Figure: 08

Open Server 0, press the service tab select the DNS option. Turn on the DNS Service. After that add 8 web servers in this DNS server with their corresponding ip addresses and domain names.

## Testing Network:



**Figure: 09**

For testing the network, first we have to select a PC0 and open the Command Prompt from the desktop tab. Then **ping** to a particular **IP address** here, 172.12.4.4  
We can see that-

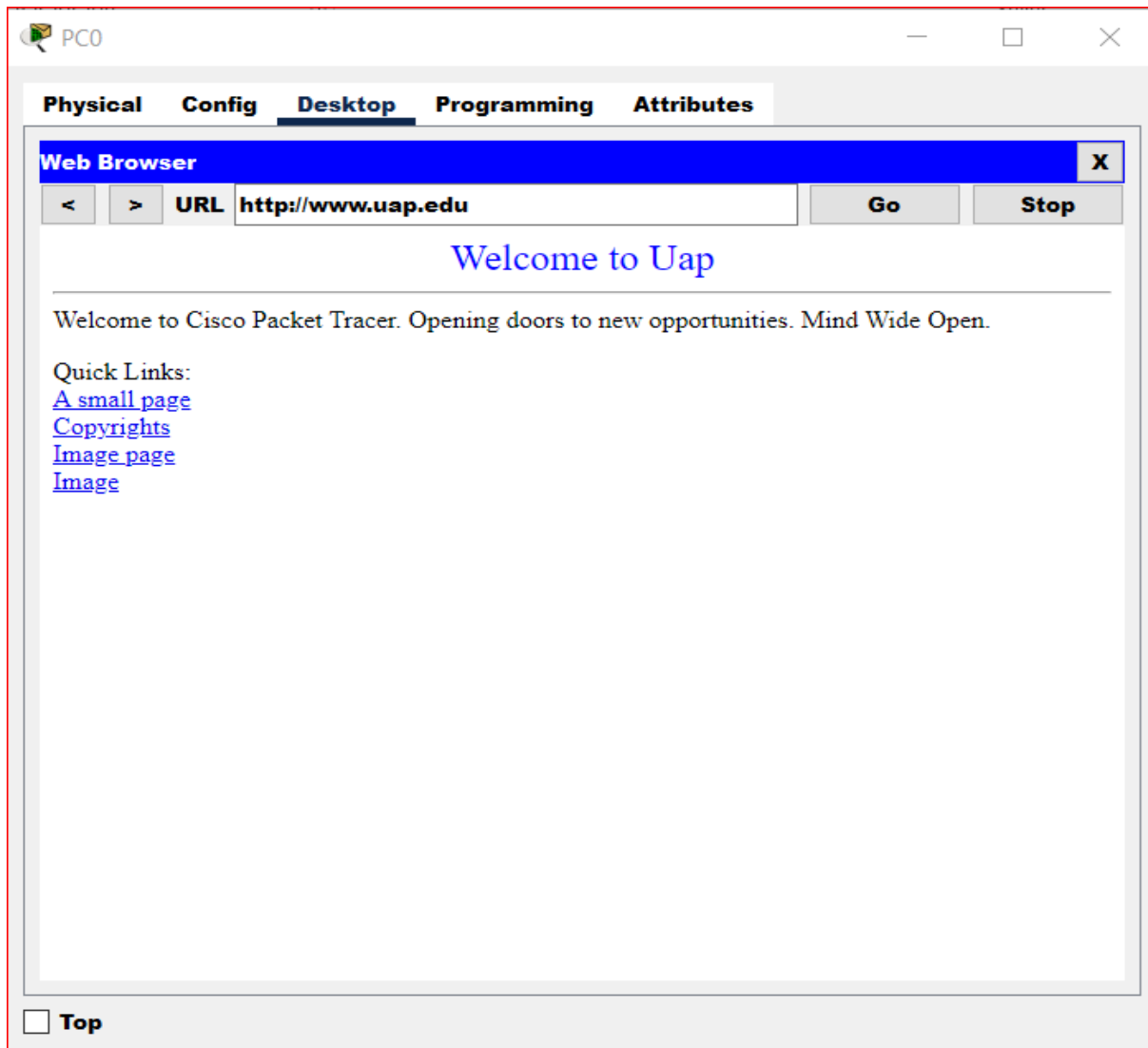
Sent = 4 packets

Received = 3 packets

Lost = 1 packets

So, 3 packets transmitted and received successfully but 1 lost and the network established.

## Browsing from the PC:



**Figure: 10**

From particular PC0 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.uap.edu

Associated IP with this URL: 172.12.4.2