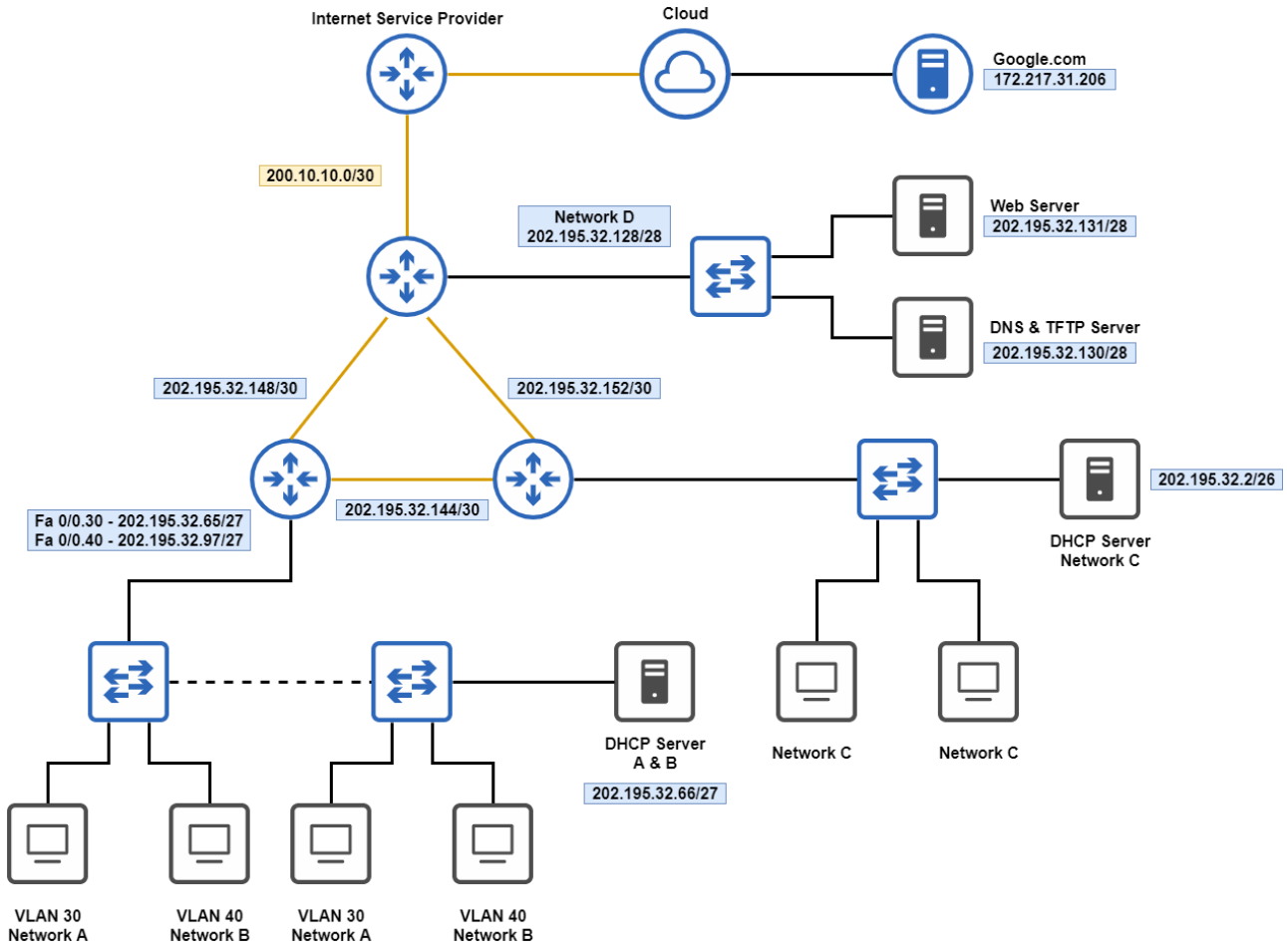
PROJECT

ENTERPRISE NETWORK DESIGN AND IMPLEMENTATION IN CISCO PACKET TRACER

PROBLEM STATEMENT

1. An ISP granted a block of IP address starting with **202.195.32.0/24** to an enterprise. Enterprise having 2 virtual subnet, 2 physical subnet and 4 links. Number of hosts required in different subnets are:
    a. Network A = 30 host
    b. Network B = 30 host
    c. Network C = 60 host
    d. Network D = 12 host
2. Distribute the IP address to different subnets and links by subnetting IP block granted by ISP. Use a different IP for link between Enterprise Router and ISP Router (e.g. **200.10.10.0/30**).
3. Create 2 Virtual Network A and B. Implement Inter VLAN Routing between VLANs.
4. Connect a DHCP server in Network A and configure DHCP relay in router to allow automatic IP configuration in Network B. Connect another DHCP server in Network C. Use static IP in Network D.
5. Implement Dynamic routing protocol for routing within enterprise network and default routing to connect with ISP.
6. Implement webserver, FTP server and DNS Server in network D.
7. Restrict host of Network A from exiting the network. Host of Network C should not able to access web server but can connect with internet. Hosts of Network B should not able to access internet.

NETWORK DIAGRAM VIEW



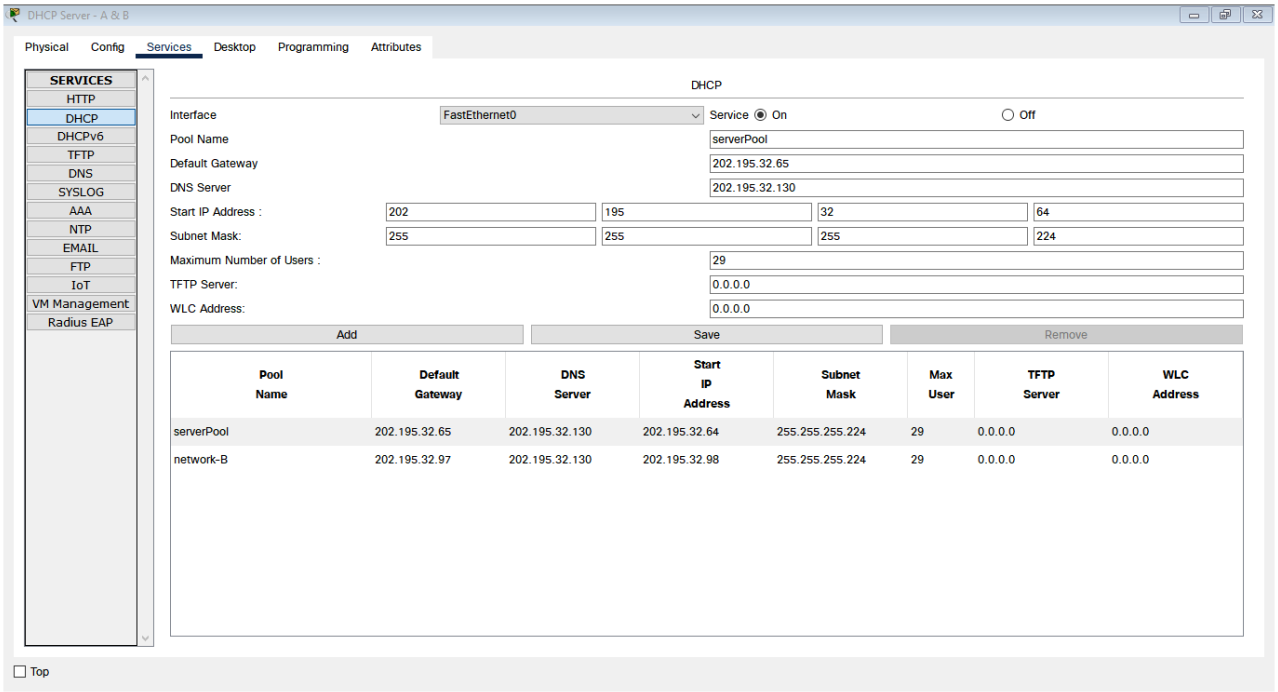
IP ADDRESS SUBNETS

NAME	NETWORK ADDRESS	SUBNET MASK
Network A	202.195.32.64	255.255.255.224
Network B	202.195.32.96	255.255.255.224
Network C	202.195.32.0	255.255.255.192
Network D	202.195.32.128	255.255.255.240

Dynamic IP Allocation using DHCP

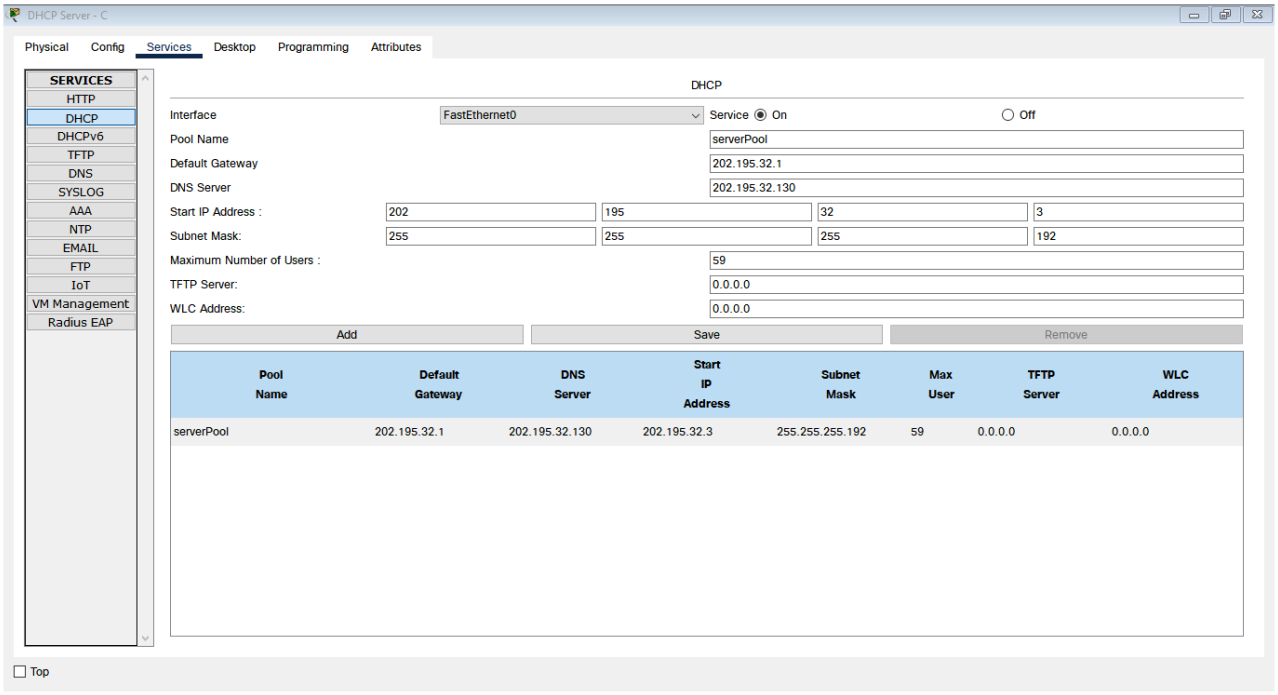
DHCP Server at Network A

- Server at Network A location will assigning dynamic IP address to VLAN 30 and VLAN 40 hosts respectively.
- Below pictures shows the two DHCP pools in server. First, **serverPool** assigns the IP addresses to the Network A (VLAN 30) hosts, second, **network-B** pool assigns hosts those are in Network B (VLAN 40).



DHCP Server at Network C

- Server at Network A location will assigning dynamic IP address to VLAN 30 and VLAN 40 hosts respectively.
- Below pictures shows the two DHCP pools in server. First, **serverPool** assigns the IP addresses to the Network C hosts.



IP ADDRESSES

Device	Interface	IP Address	Subnet Mask	Gateway
Router 1	FastEthernet 0/0.30	202.195.32.65	255.255.255.224	--
	FastEthernet 0/0.40	202.195.32.97	255.255.255.224	--
	FastEthernet 4/0	202.195.32.149	255.255.255.252	--
	FastEthernet 5/0	202.195.32.145	255.255.255.252	--
Router 2	FastEthernet 1/0	202.195.32.1	255.255.255.192	--
	FastEthernet 4/0	202.195.32.146	255.255.255.252	--
	FastEthernet 5/0	202.195.32.154	255.255.255.252	--
Router 3	GigabitEthernet 7/0	200.10.10.1	255.255.255.252	--
	FastEthernet 4/0	202.195.32.150	255.255.255.252	--
	FastEthernet 5/0	202.195.32.153	255.255.255.252	--
DHCP Sever Network A	FastEthernet 0	202.195.32.66	255.255.255.224	202.195.32.65
DHCP Server Network C	FastEthernet 0	202.195.32.2	255.255.255.192	202.195.32.1
Web Server	FastEthernet 0	202.195.32.131	255.255.255.240	202.195.32.129
DNS & TFTP	FastEthernet 0	202.195.32.130	255.255.255.240	202.195.32.129

VLAN TEST PLAN

```
VLAN Name                              Status    Ports
---- --------------------------------- --------- -------------------------------
1    default                           active    Fa0/5, Fa0/6, Fa0/7, Fa0/8
                                                 Fa0/9, Fa0/10, Fa0/11, Fa0/12
                                                 Fa0/13, Fa0/14, Fa0/15, Fa0/16
                                                 Fa0/17, Fa0/18, Fa0/19, Fa0/20
                                                 Fa0/21, Fa0/22, Fa0/23, Fa0/24
                                                 Gig0/1, Gig0/2
30   Network-A                         active    Fa0/2
40   Network-B                         active    Fa0/3
1002 fddi-default                      active
1003 token-ring-default                active
1004 fddinet-default                   active
1005 trnet-default                     active
ASW-1#
ASW-1#
```

(Fig. VLAN brief in ASW1)

```
VLAN Name                              Status    Ports
---- --------------------------------- --------- -------------------------------
1    default                           active    Fa0/5, Fa0/6, Fa0/7, Fa0/8
                                                 Fa0/9, Fa0/10, Fa0/11, Fa0/12
                                                 Fa0/13, Fa0/14, Fa0/15, Fa0/16
                                                 Fa0/17, Fa0/18, Fa0/19, Fa0/20
                                                 Fa0/21, Fa0/22, Fa0/23, Fa0/24
                                                 Gig0/1, Gig0/2
30   Network-A                         active    Fa0/2, Fa0/4
40   Network-B                         active    Fa0/3
1002 fddi-default                      active
1003 token-ring-default                active
1004 fddinet-default                   active
1005 trnet-default                     active
ASW-2#
```

(Fig. VLAN brief in ASW2)

```
ASW-1#show interface trunk
Port        Mode         Encapsulation  Status        Native vlan
Fa0/1       on           802.1q         trunking      1
Fa0/4       on           802.1q         trunking      1

Port        Vlans allowed on trunk
Fa0/1       1-1005
Fa0/4       1-1005

Port        Vlans allowed and active in management domain
Fa0/1       1,30,40
Fa0/4       1,30,40

Port        Vlans in spanning tree forwarding state and not pruned
Fa0/1       1,30,40
Fa0/4       1,30,40
```

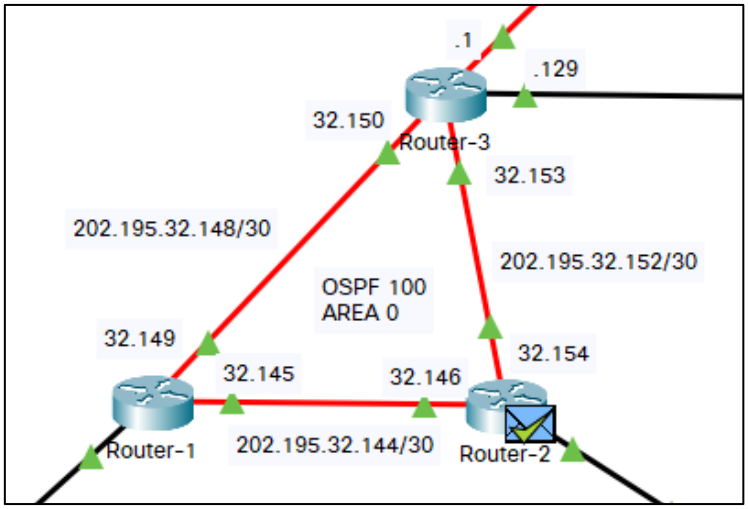
(Fig. Trunk interfaces in ASW1)

```
ASW-2#show interface trunk
Port        Mode         Encapsulation  Status        Native vlan
Fa0/1       on           802.1q         trunking      1

Port        Vlans allowed on trunk
Fa0/1       1-1005

Port        Vlans allowed and active in management domain
Fa0/1       1,30,40

Port        Vlans in spanning tree forwarding state and not pruned
Fa0/1       1,30,40

ASW-2#
```

(Fig. Trunk interface in ASW2)

Open Shortest Path First (OSPF)

In order to communicate between host devices on different networks there must be a network protocol. Hence OSPF protocol is used here for this purpose to do the internal routing. The following show the utilization of OSPF in project.



Event List

Vis.	Time(sec)	Last Device	At Device	Type
	0.743	--	Router-3	OSPF
	0.744	Router-3	Router-1	OSPF
	5.228	--	Router-1	OSPF
	5.229	Router-1	Router-3	OSPF
	5.335	--	Router-3	OSPF
	5.336	Router-3	ASW-4	OSPF
	5.337	ASW-4	Web-TFTP...	OSPF
	5.337	ASW-4	DNS Server	OSPF
	9.306	--	Router-1	OSPF
Visible	9.307	Router-1	Router-2	OSPF

Reset Simulation | Constant Delay | Captured to: 9.307 s

"OSPF" mentioned while carrying out simulation between inter - network

ACCESS-LIST (SECURITY):

To provide access control or security for the organization, we used access control list to Restrict host of Network A from exiting the network. Host of Network C should not able to access web server but can connect with internet. Hosts of Network B should not able to access internet.

```
Router-1#show access-lists
Standard IP access list 1
    10 permit host 202.195.32.66 (10 match(es))

Router-1#
```

```
Router-2#show ip access-lists
Extended IP access list BLOCK-CNET-WEB
    10 deny tcp 202.195.32.0 0.0.0.63 host 202.195.32.131 eq www (12 match(es))
    20 deny tcp 202.195.32.0 0.0.0.63 host 202.195.32.131 eq 443 (12 match(es))
    30 permit ip any any (16 match(es))

Router-2#
```

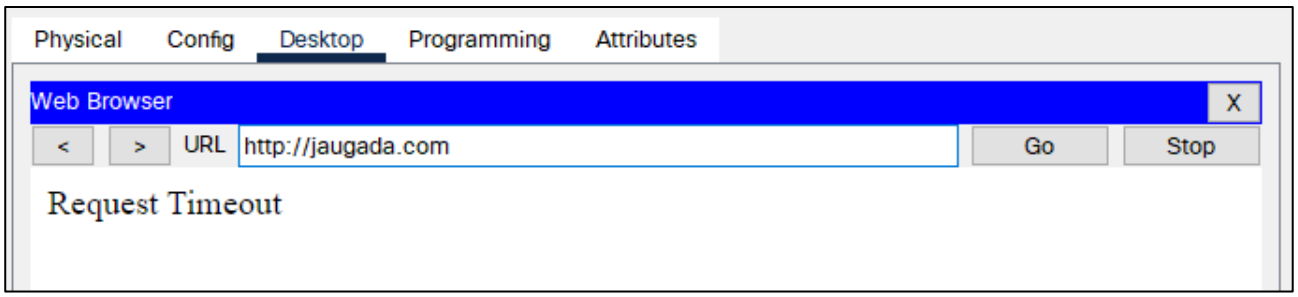
```
Router-3#show access-lists
Standard IP access list 10
    10 deny 202.195.32.96 0.0.0.31
    20 permit any (96 match(es))

Router-3#
```

SECURITY TEST PLAN

A host on Network A unable to exit the network. So it cannot ping the host that is present in Network B. The ACL restricting, so router tells: Destination host unreachable.

```
C:\>ping 202.195.32.98

Pinging 202.195.32.98 with 32 bytes of data:

Reply from 202.195.32.65: Destination host unreachable.
Reply from 202.195.32.65: Destination host unreachable.
Reply from 202.195.32.65: Destination host unreachable.
Reply from 202.195.32.65: Destination host unreachable.

Ping statistics for 202.195.32.98:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

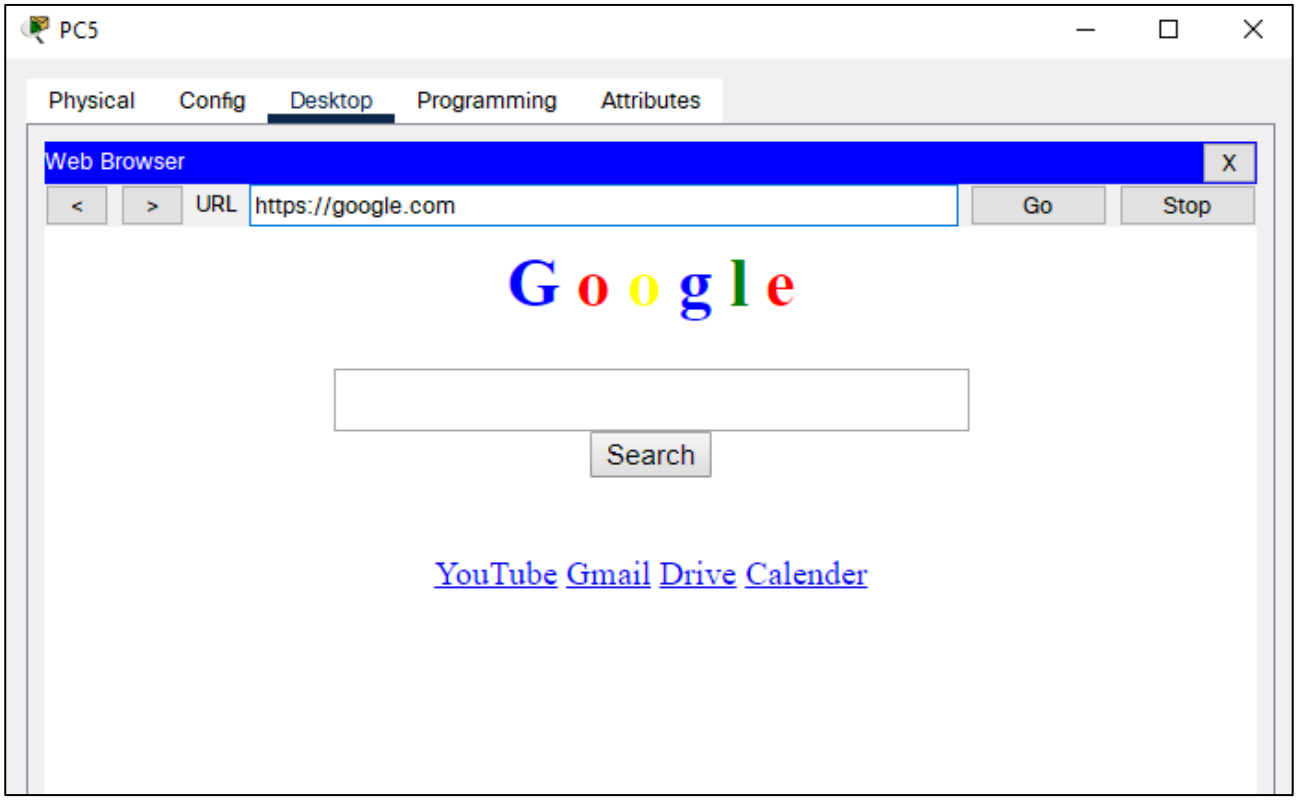
A host on Network C unable to access the Web server at 202.195.32.131 (jaugada.com). Below picture shows the output.



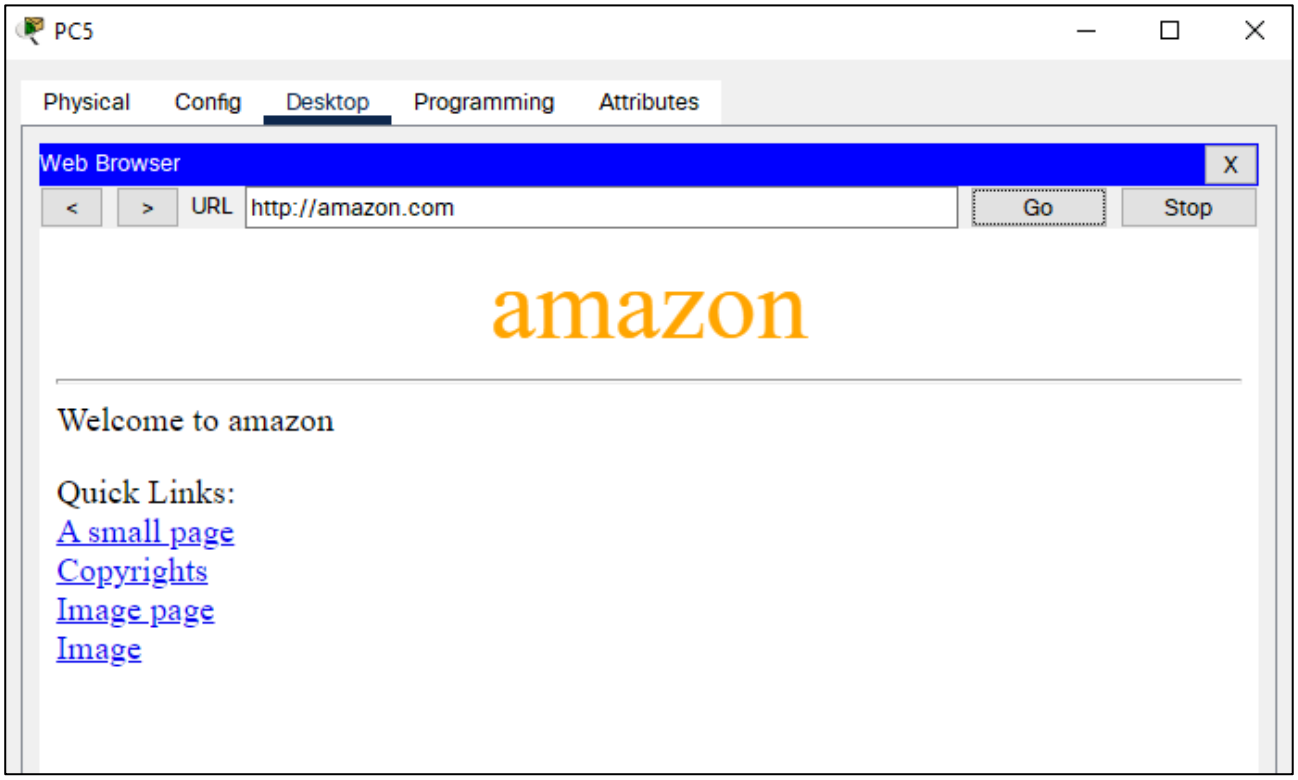
LET'S TRY TO ACCESS THE INTERNET

Access Google from Network C

When internal host wants to reach outside the network or access the internet, the traffic will be sent out the default static route which is configured on the Router 3 interface, which then send out to the ISP.



Access Amazon from Network C



CONCLUSION

Thus an enterprise network was built successfully with Cisco Packet Tracer implementing various network protocols and output was tested successfully.

Thank You!

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