PRACTICAL NO 2: Configure ACLs

The Cisco Access Control List (ACL) are used for filtering traffic based on a given filtering criteria on a router or switch interface. Based on the conditions supplied by the ACL, a packet is allowed or blocked from further movement.

Cisco ACLs are available for several types of routed protocols including IP, IPX, AppleTalk, XNS, DECnet, and others. However, we will be discussing ACLs pertaining to TCP/IP protocol only.

ACLs for TCP/IP traffic filtering are primarily divided into two types:

- Standard Access Lists, and
- Extended Access Lists

▯

Standard Access Control Lists:

Standard IP ACLs range from 1 to 99. A Standard Access List allows you to permit or deny traffic FROM specific IP addresses. The destination of the packet and the ports involved can be anything.

This is the command syntax format of a standard ACL.

access-list *access-list-number* {permit|deny}

{host|source source-wildcard|any} Standard
ACL example:

```
access-list 10 permit 192.168.2.0 0.0.0.255
```

This list allows traffic from all addresses in the range 192.168.2.0 to 192.168.2.255

Note that when configuring access lists on a router, you must identify each access list uniquely by assigning either a name or a number to the protocol's access list.

There is an implicit deny added to every access list. If you entered the command:

show access-list 10 The

output looks like:

```
access-list 10 permit 192.168.2.0 0.0.0.255 access-list 10 deny any
```

Extended Access Control Lists:

Extended IP ACLs allow you to permit or deny traffic from specific IP addresses to a specific destination IP address and port. It also allows you to have granular control by specifying controls for different types of protocols such as ICMP, TCP, UDP, etc within the ACL statements. Extended IP ACLs range from 100 to 199. In Cisco IOS Software Release 12.0.1, extended ACLs began to use additional numbers (2000 to 2699).

The syntax for IP Extended ACL is given below:
access-list access-list-number {deny | permit} protocol source source-wildcard *destination* destination-wildcard [precedence precedence]

Note that the above syntax is simplified, and given for general understanding only.

Extended ACL example:

access-list 110 - Applied to traffic leaving the office (outgoing) access-list
110 permit tcp 92.128.2.0 0.0.0.255 any eq 80

ACL 110 permits traffic originating from any address on the 92.128.2.0 network. The 'any' statement means that the traffic is allowed to have any destination address with the limitation of going to port 80. The value of 0.0.0.0/255.255.255.255 can be specified as 'any'.

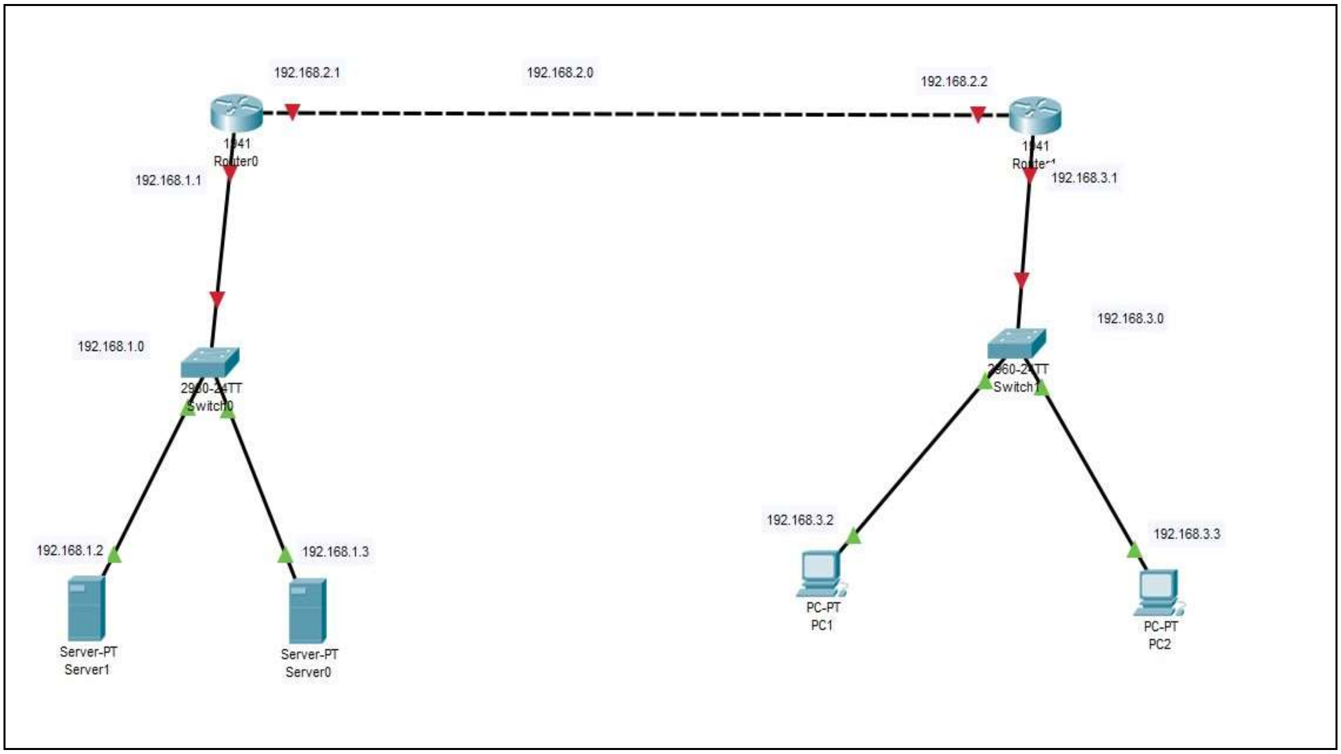
Applying an ACL to a router interface:

After the ACL is defined, it must be applied to the interface (inbound or outbound). The syntax for applying an ACL to a router interface is given below: interface <interface>
ip access-group {number|name} {in|out}

An Access List may be specified by a name or a number. "in" applies the ACL to the inbound traffic, and "out" applies the ACL on the outbound traffic.

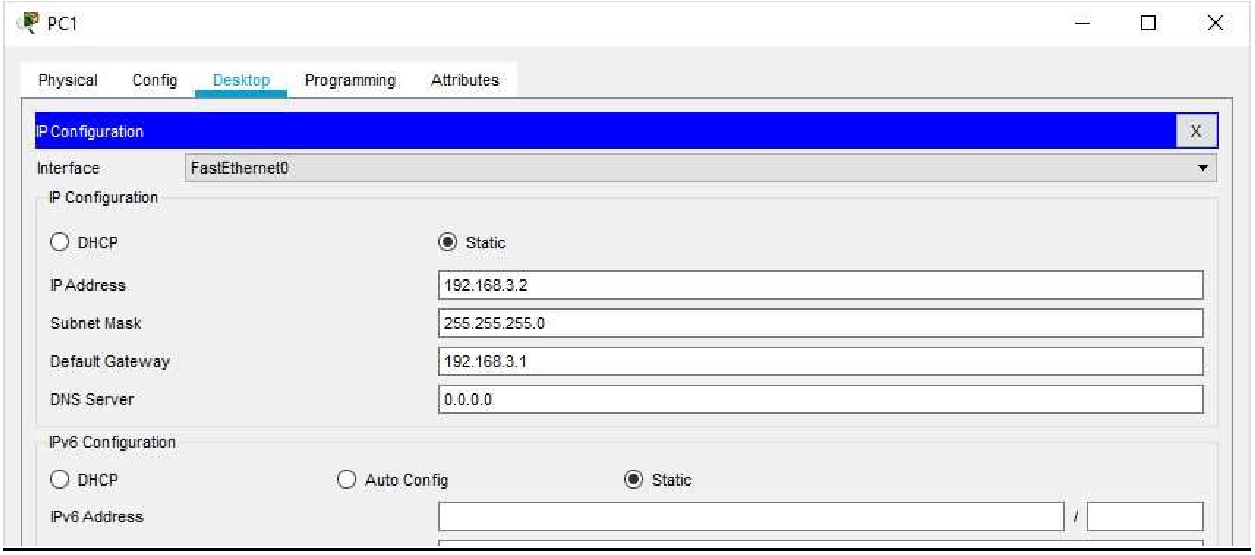
Example: To apply the standard ACL created in the previous example, use the following commands:
Rouer(config)#interface serial0
Rouer(config-if)#ip access-group 10 out

Consider the following topology



Part 1: Configure, Apply and Verify an Extended Numbered ACL

Configuring PC1



Interface: FastEthernet0

IP Configuration

○ DHCP ● Static

IP Address: 192.168.3.2

Subnet Mask: 255.255.255.0

Default Gateway: 192.168.3.1

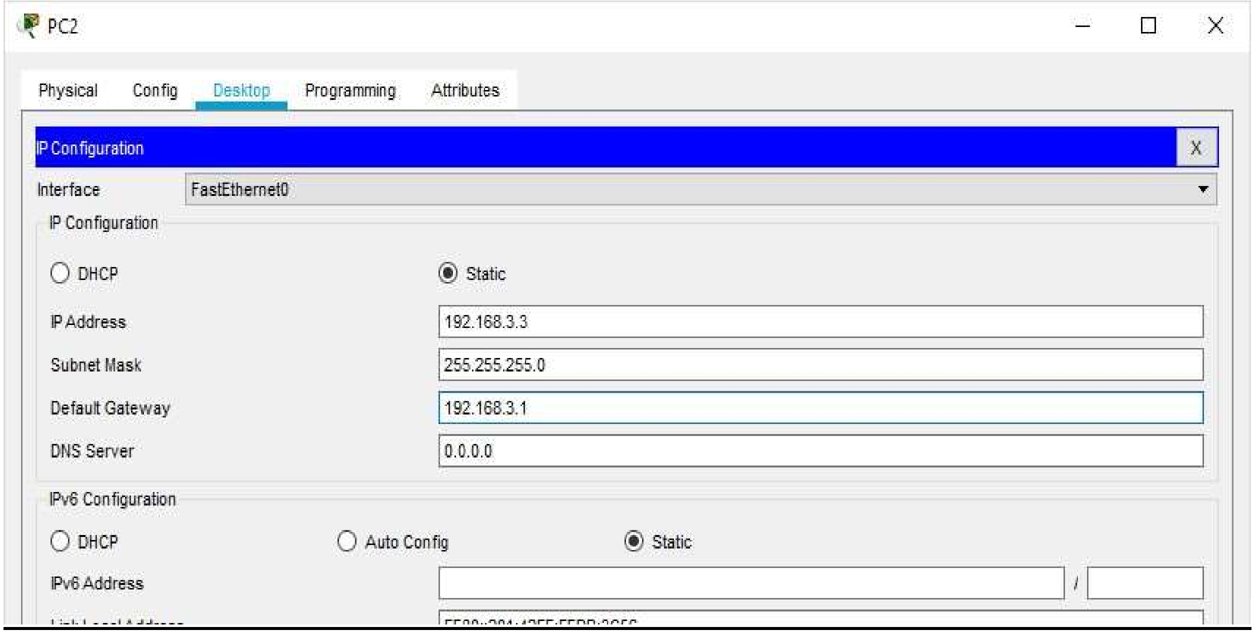
DNS Server: 0.0.0.0

IPv6 Configuration

○ DHCP ○ Auto Config ● Static

IPv6 Address: /

Configuring PC2



Interface: FastEthernet0

IP Configuration

○ DHCP ● Static

IP Address: 192.168.3.3

Subnet Mask: 255.255.255.0

Default Gateway: 192.168.3.1

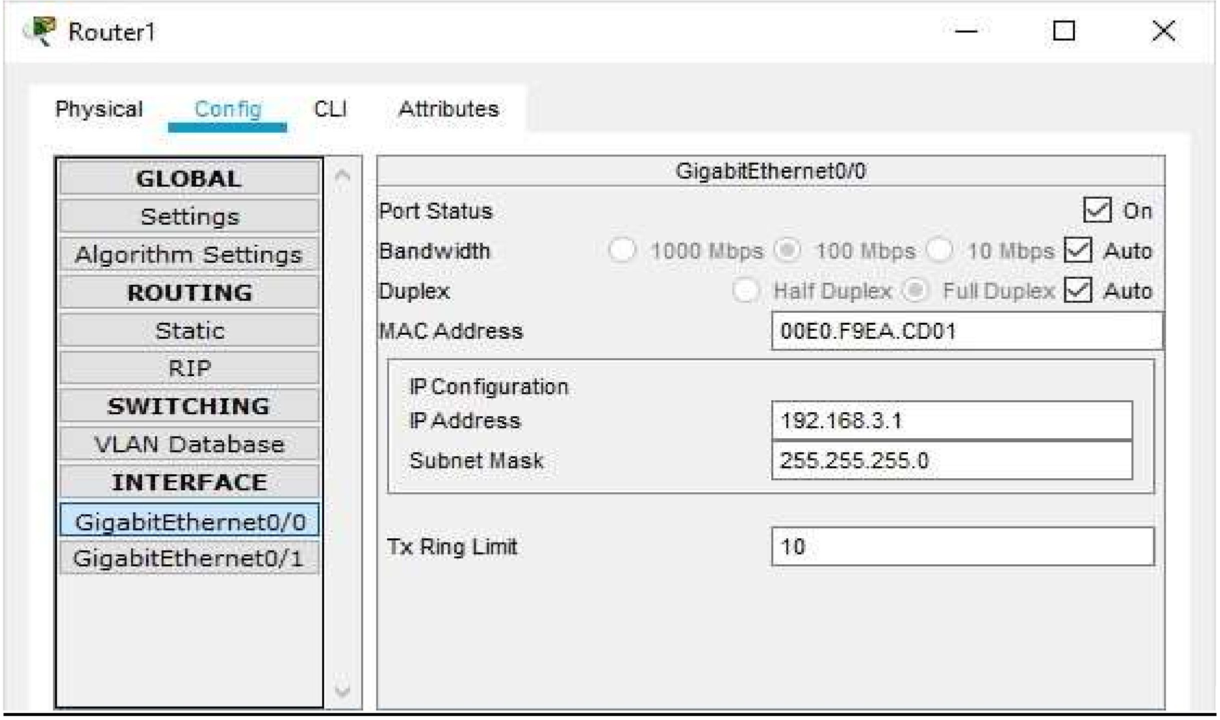
DNS Server: 0.0.0.0

IPv6 Configuration

○ DHCP ○ Auto Config ● Static

IPv6 Address: /

Configuring Router1



GigabitEthernet0/0

Port Status ☑ On

Bandwidth ○ 1000 Mbps ● 100 Mbps ○ 10 Mbps ☑ Auto

Duplex ○ Half Duplex ● Full Duplex ☑ Auto

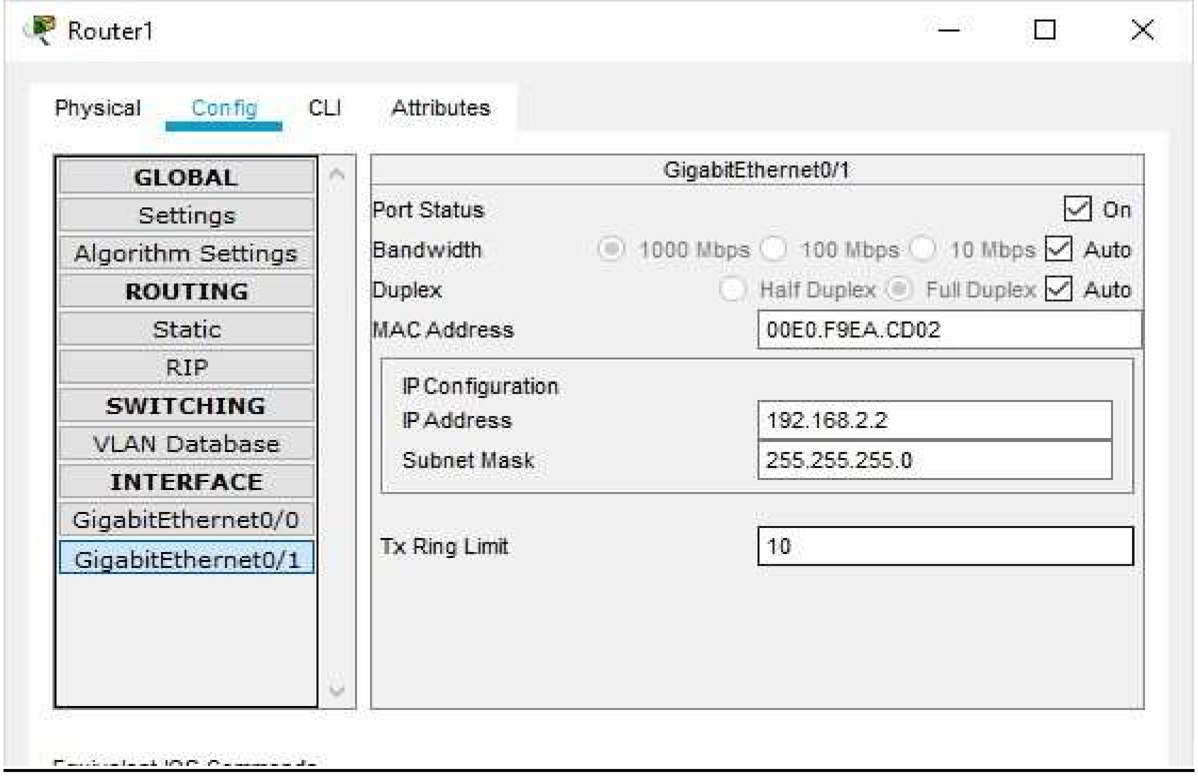
MAC Address 00E0.F9EA.CD01

IP Configuration

IP Address 192.168.3.1

Subnet Mask 255.255.255.0

Tx Ring Limit 10



GigabitEthernet0/1

Port Status ☑ On

Bandwidth ● 1000 Mbps ○ 100 Mbps ○ 10 Mbps ☑ Auto

Duplex ○ Half Duplex ● Full Duplex ☑ Auto

MAC Address 00E0.F9EA.CD02

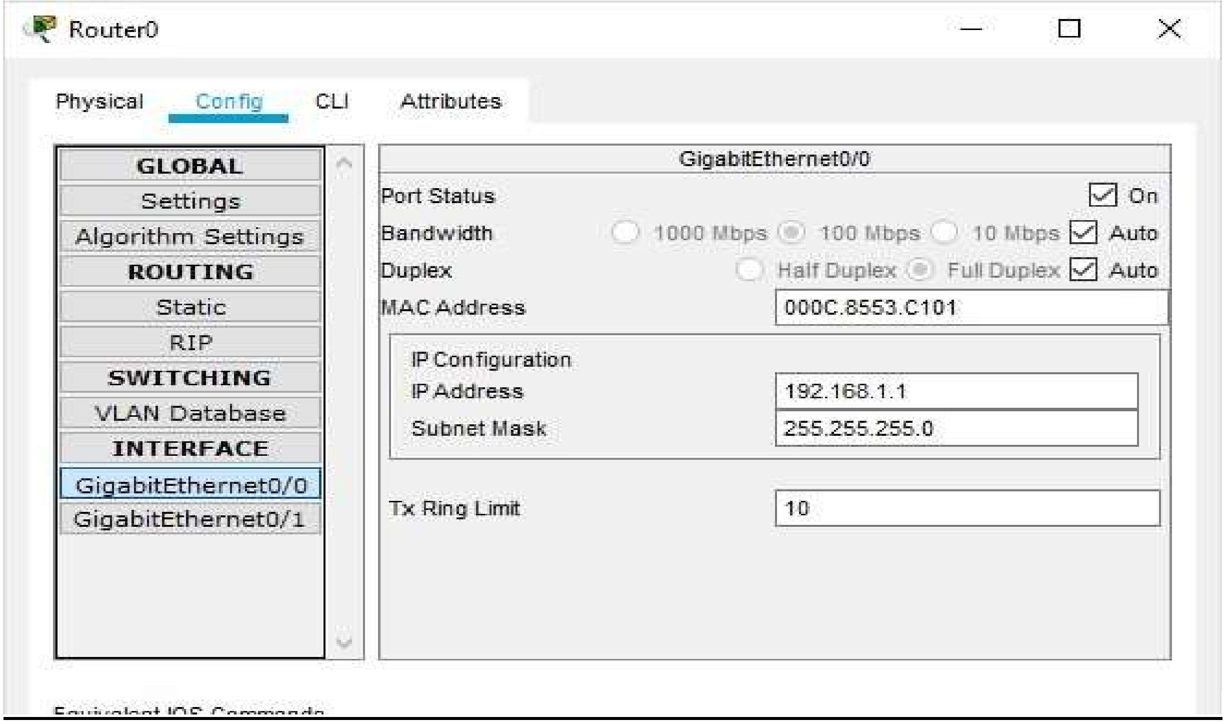
IP Configuration

IP Address 192.168.2.2

Subnet Mask 255.255.255.0

Tx Ring Limit 10

Configuring Router0



GigabitEthernet0/0

Port Status ☑ On

Bandwidth ○ 1000 Mbps ● 100 Mbps ○ 10 Mbps ☑ Auto

Duplex ○ Half Duplex ● Full Duplex ☑ Auto

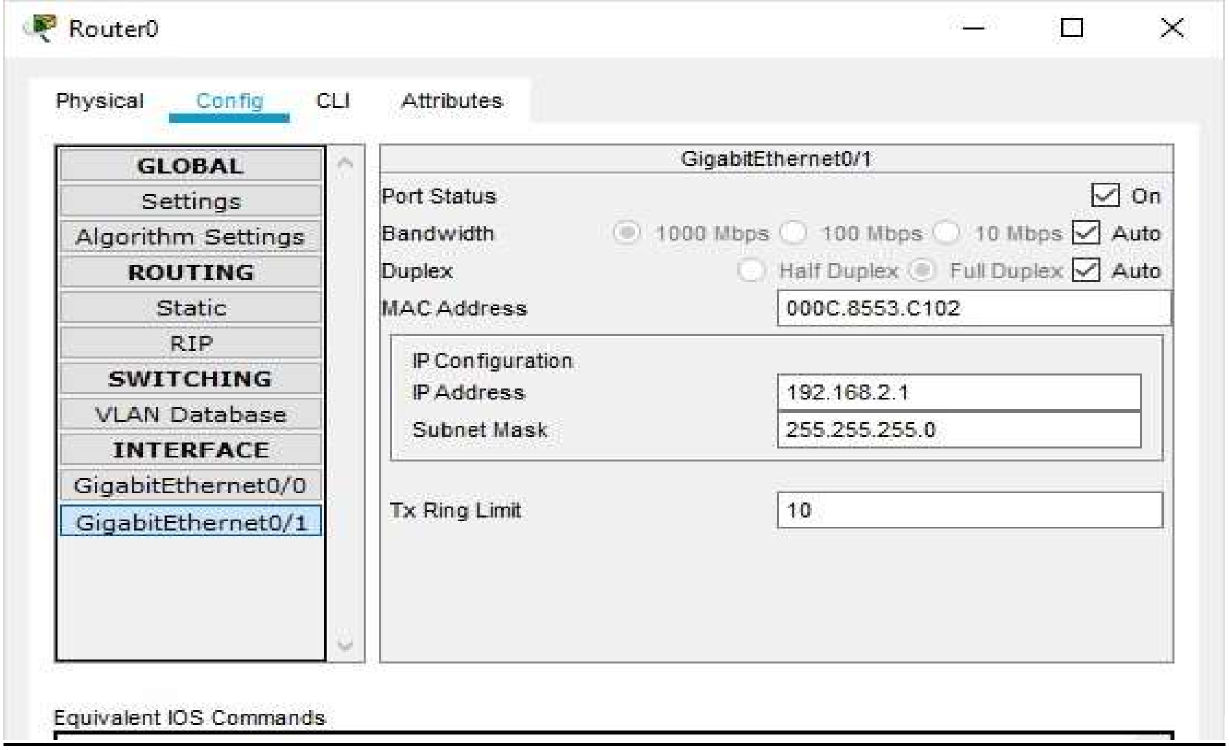
MAC Address 000C.8553.C101

IP Configuration

IP Address 192.168.1.1

Subnet Mask 255.255.255.0

Tx Ring Limit 10



GigabitEthernet0/1

Port Status ☑ On

Bandwidth ● 1000 Mbps ○ 100 Mbps ○ 10 Mbps ☑ Auto

Duplex ○ Half Duplex ● Full Duplex ☑ Auto

MAC Address 000C.8553.C102

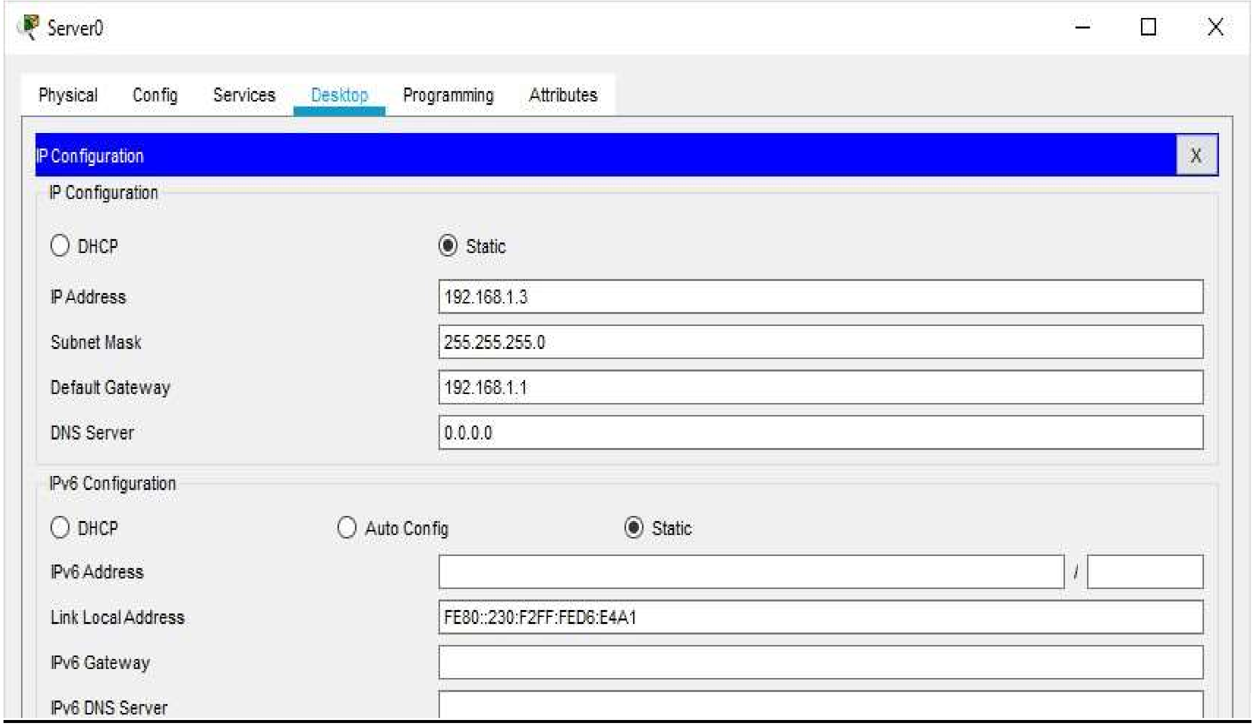
IP Configuration

IP Address 192.168.2.1

Subnet Mask 255.255.255.0

Tx Ring Limit 10

Configuring Server0



IP Configuration

○ DHCP ● Static

IP Address: 192.168.1.3

Subnet Mask: 255.255.255.0

Default Gateway: 192.168.1.1

DNS Server: 0.0.0.0

IPv6 Configuration

○ DHCP ○ Auto Config ● Static

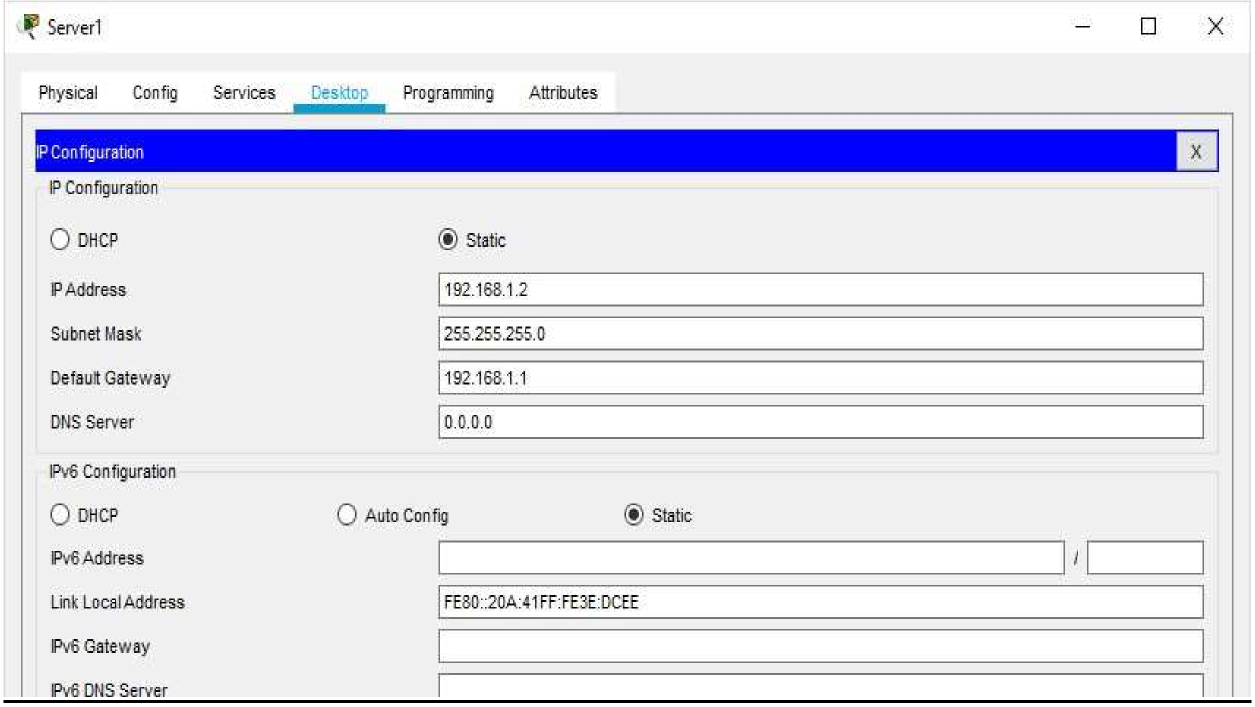
IPv6 Address: /

Link Local Address: FE80::230:F2FF:FED6:E4A1

IPv6 Gateway:

IPv6 DNS Server:

Configuring Server1



IP Configuration

○ DHCP ● Static

IP Address: 192.168.1.2

Subnet Mask: 255.255.255.0

Default Gateway: 192.168.1.1

DNS Server: 0.0.0.0

IPv6 Configuration

○ DHCP ○ Auto Config ● Static

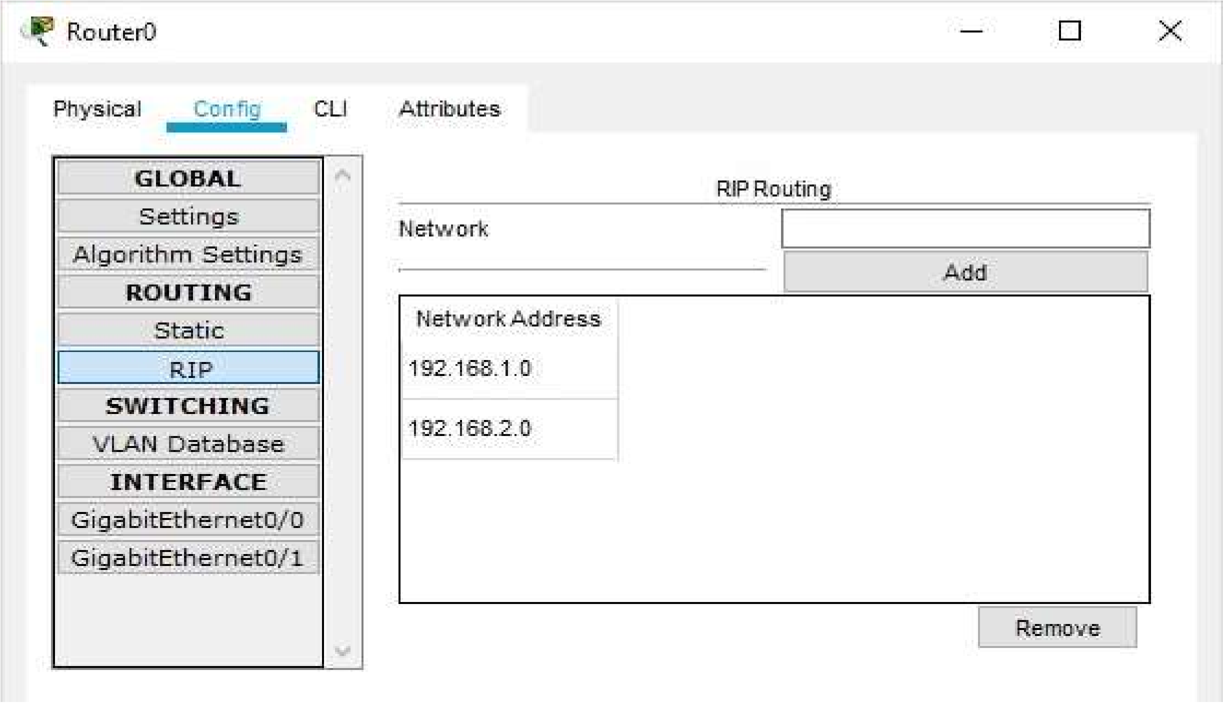
IPv6 Address: /

Link Local Address: FE80::20A:41FF:FE3E:DCEE

IPv6 Gateway:

IPv6 DNS Server:

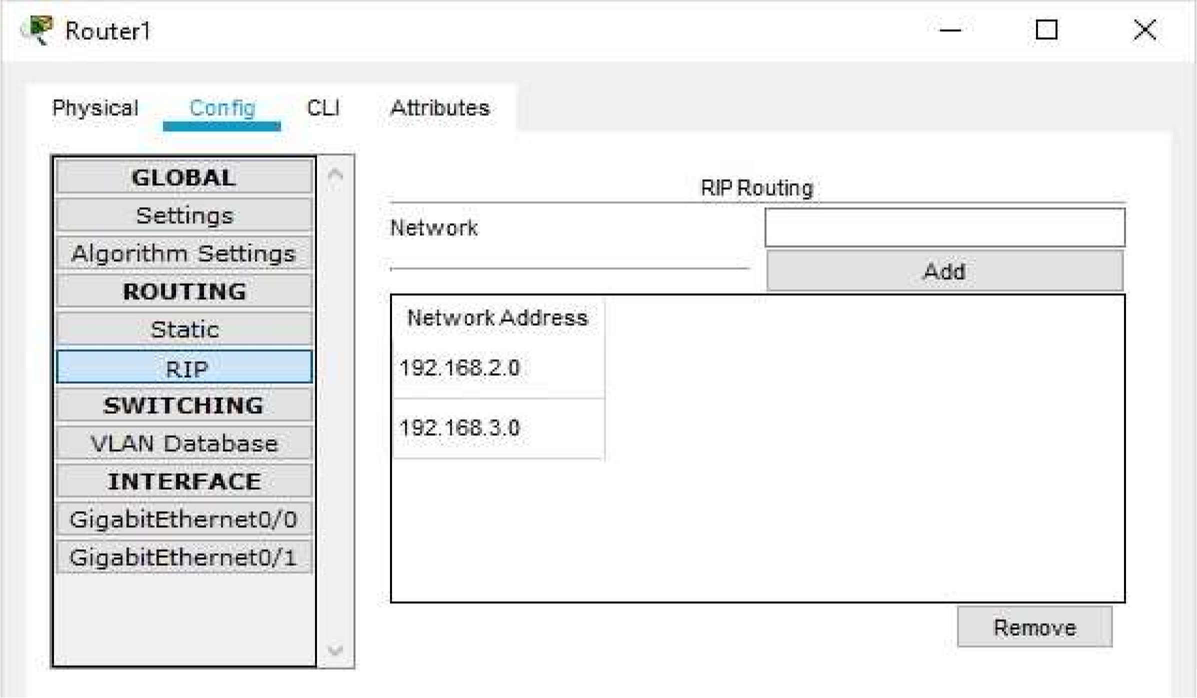
Set the RIP protocol on both the Routers as follows



RIP Routing

Network

Network Address
192.168.1.0
192.168.2.0



RIP Routing

Network

Network Address
192.168.2.0
192.168.3.0

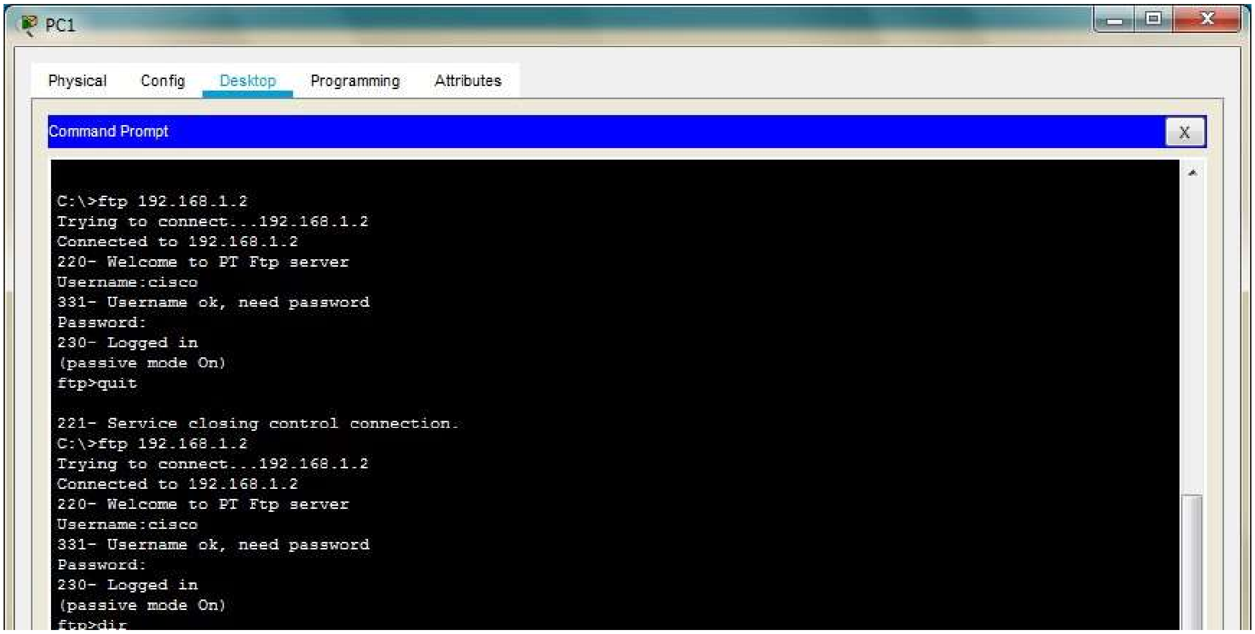
Check the connectivity by using the ping command

Part 1: Configure, Apply and Verify an Extended Numbered ACL

Type the following commands in Router1

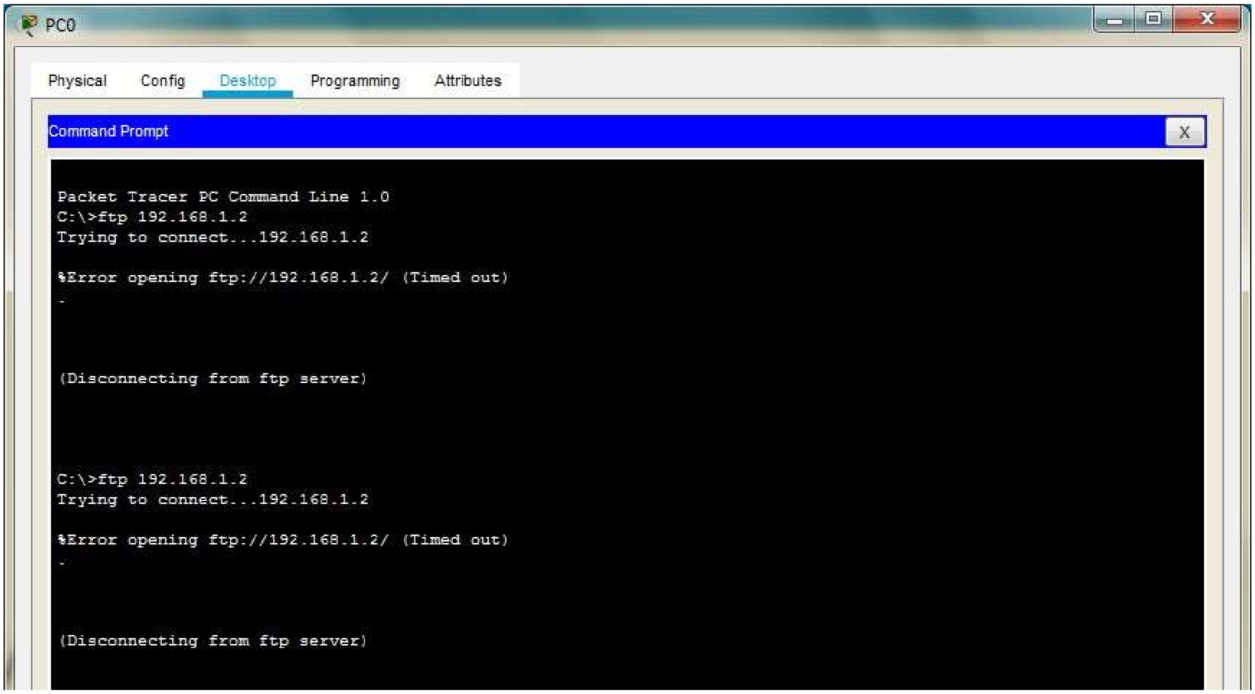
```
Router#configure  terminal
Router(config)#
Router(config)#access-list 100 permit tcp host 192.168.3.2 host 192.168.1.2 eq ftp
Router(config)#interface GigabitEthernet0/1
Router(config-if)#ip access-group 100 out
Router(config-if)#exit Router(config)#
```

Now verify the ftp (ftp 192.168.1.2) command from both the PCs, one would be successful (PC1) and other (PC0) would fail



```
C:\>ftp 192.168.1.2
Trying to connect...192.168.1.2
Connected to 192.168.1.2
220- Welcome to PT Ftp server
Username:cisco
331- Username ok, need password
Password:
230- Logged in
(passive mode On)
ftp>quit

221- Service closing control connection.
C:\>ftp 192.168.1.2
Trying to connect...192.168.1.2
Connected to 192.168.1.2
220- Welcome to PT Ftp server
Username:cisco
331- Username ok, need password
Password:
230- Logged in
(passive mode On)
ftp>dir
```



```
Packet Tracer PC Command Line 1.0
C:\>ftp 192.168.1.2
Trying to connect...192.168.1.2

%Error opening ftp://192.168.1.2/ (Timed out)
.



(Disconnecting from ftp server)




C:\>ftp 192.168.1.2
Trying to connect...192.168.1.2

%Error opening ftp://192.168.1.2/ (Timed out)
.



(Disconnecting from ftp server)
```

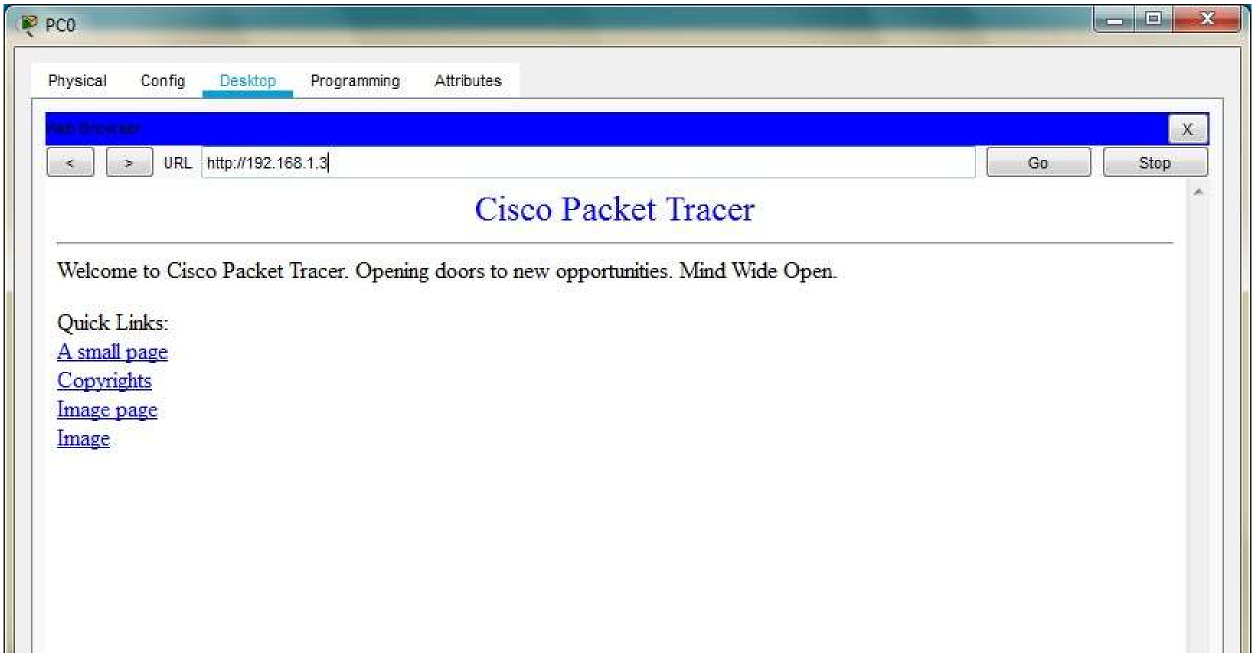
Part 2: Configure, Apply and Verify an Extended Named ACL

We use the same topology for this case

Type the following command in the CLI mode of Router1

```
Router>
Router>en
Router#configure terminal
Router(config)#ip access-list extended SMILE
Router(config-ext-nacl)#permit tcp host 192.168.3.3 host 192.168.1.3 eq www
Router(config-ext-nacl)#exit
Router(config)#
Router(config)#interface GigabitEthernet0/1
Router(config-if)#ip access-group SMILE out
Router(config-if)#exit
Router(config)#
```

Now verify the www (192.168.1.3) command from both the PCs browser, one would be successful (PC0) and other (PC1) would fail

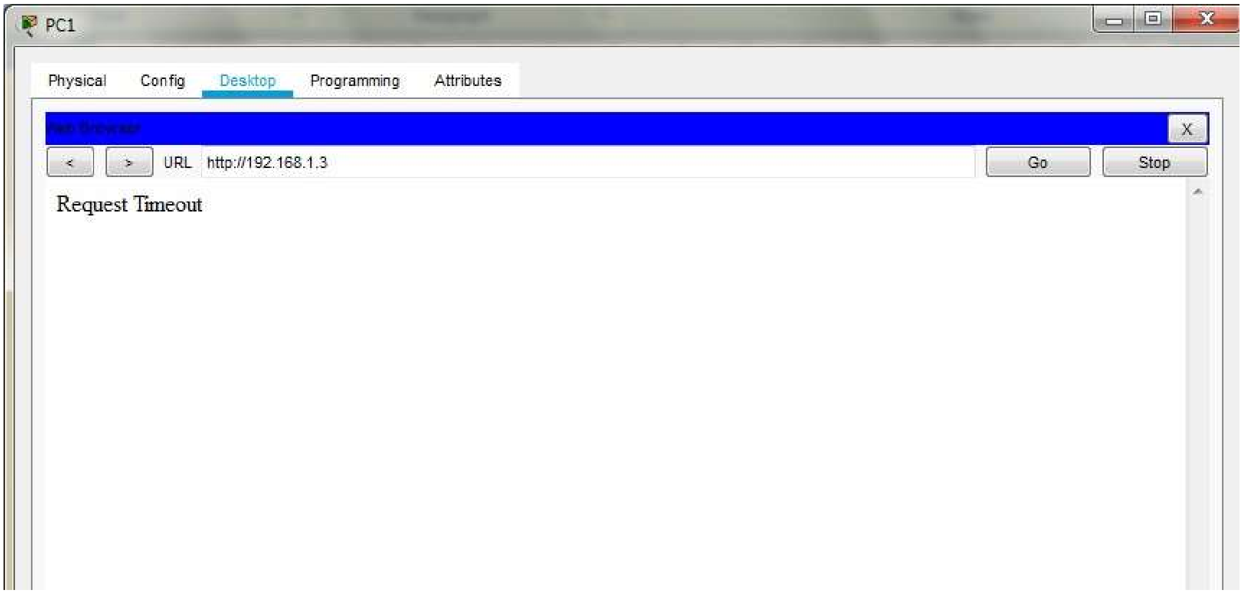


http://192.168.1.3

Cisco Packet Tracer

Welcome to Cisco Packet Tracer. Opening doors to new opportunities. Mind Wide Open.

Quick Links:
A small page
Copyrights
Image page
Image



http://192.168.1.3

Request Timeout

Hence Extended Numbered ACLs as well as Extended Named ACLs have been verified

PRACTICAL NO 3: Configure AAA Authentication on Cisco Routers

To provide a centralized management system for the authentication, authorization and accounting (AAA framework), Access Control Server (ACS) is used. For the communication between the client and the ACS server, two protocols are used namely TACACS+ and RADIUS.

TACACS+
Terminal Access Controller Access Control System (TACACS+) is Cisco proprietary protocol which is used for the communication of the Cisco client and Cisco ACS server. It uses TCP port number 49 which makes it reliable.

RADIUS –
Remote Access Dial In User Service (RADIUS) is an open standard protocol used for the communication between any vendor AAA client and ACS server. If one of the client or server is from any other vendor (other than Cisco) then we have to use RADIUS. It uses port number 1812 for authentication and authorization and 1813 for accounting.

TACACS+	RADIUS
Cisco proprietary protocol	open standard protocol
It uses TCP as transmission protocol	It uses UDP as transmission protocol
It uses TCP port number 49.	It uses UDP port number 1812 for authentication and authorization and 1813 for accounting.
Authentication, Authorization and Accounting is separated in TACACS+.	Authentication and Authorization is combined in RADIUS.
All the AAA packets are encrypted.	Only the passwords are encrypted while the other information such as username, accounting information etc are not encrypted.
Preferably used for ACS.	used when ISE is used