



**Department of Computer Science and Engineering**  
**Islamic University of Technology (IUT)**  
A subsidiary organ of OIC

**Laboratory Report**

CSE 4512: Computer Networks Lab

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**Title:** Configuring numbered standard ACL in Cisco Devices

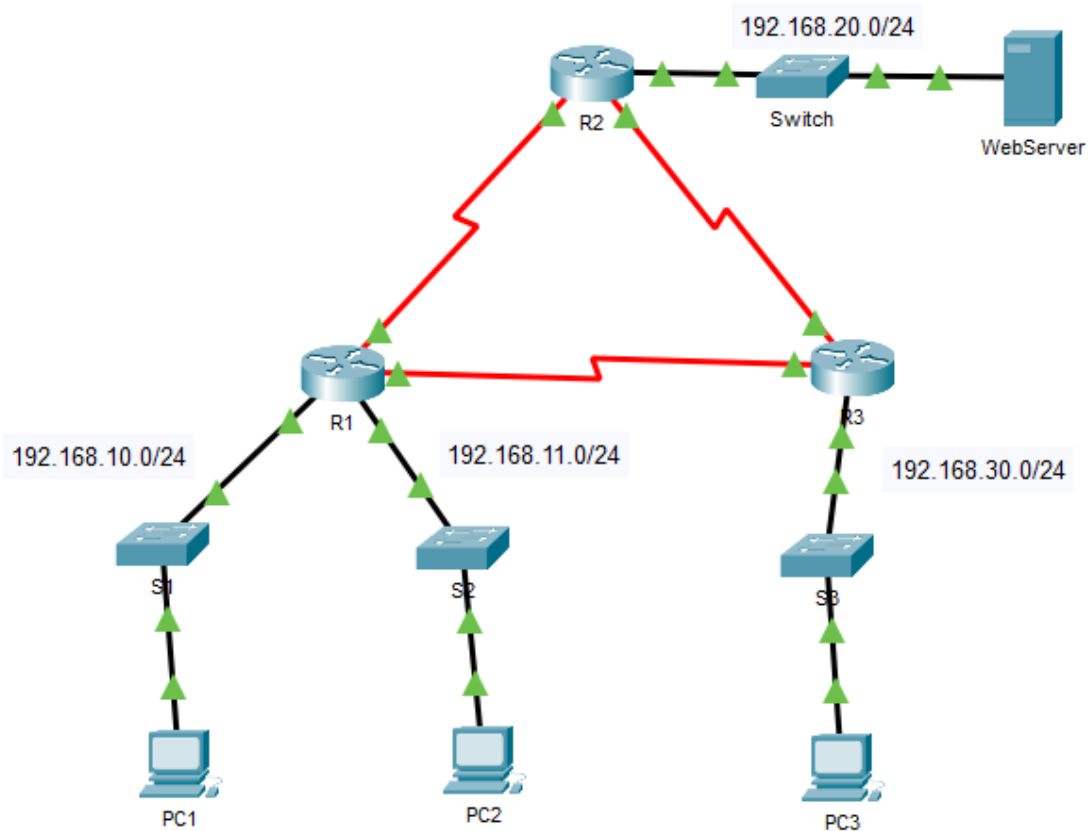
**Objective:**

1. Describe the concept of Access Control List (ACL)
2. Implement standard numbered ACL

**Devices/ software Used:**

1. Device: Windows PC
2. Software: Cisco Packet Tracer 7.3.0

**Diagram of the experiment(s):**

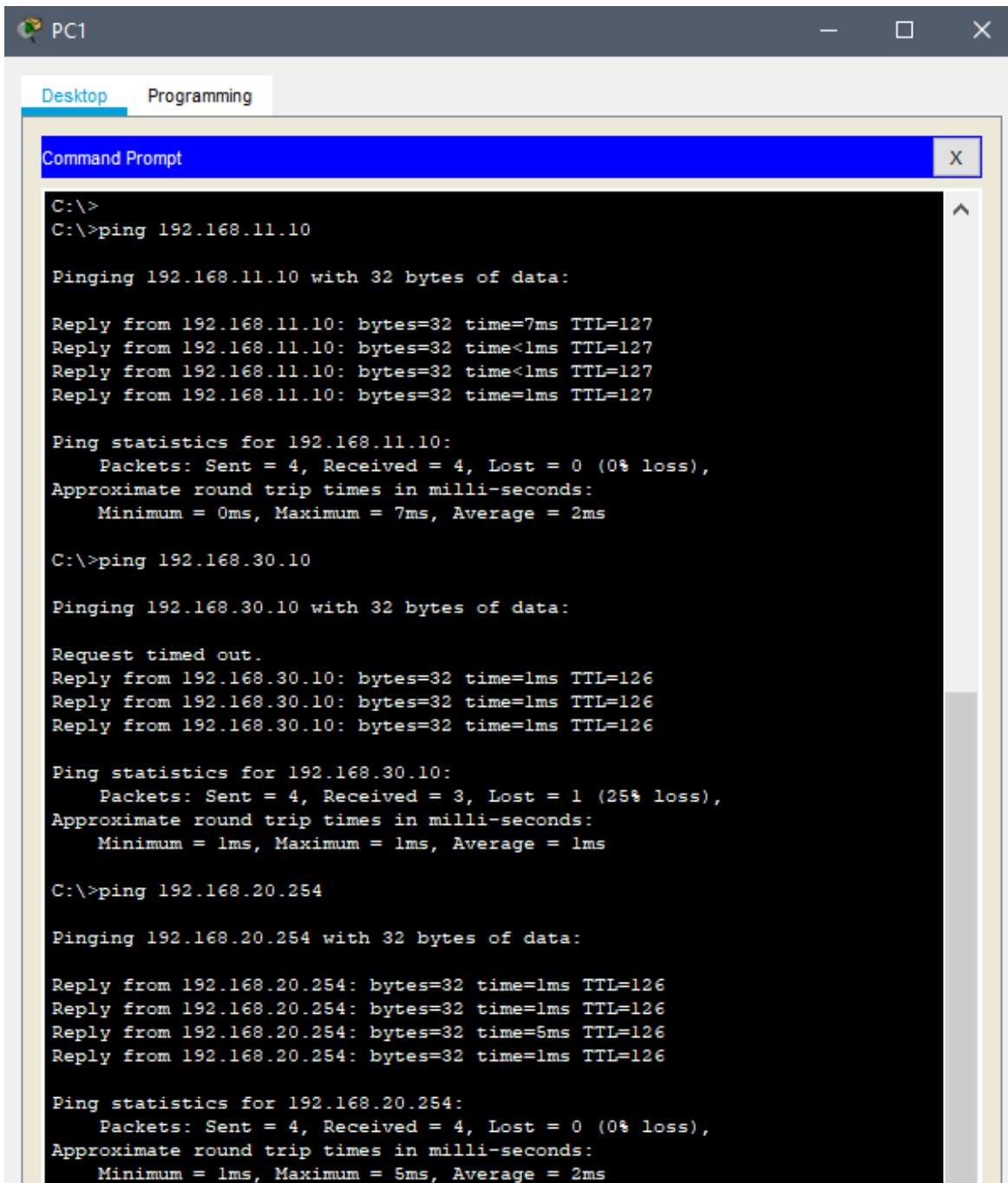


## Working Procedure:

### Part 1: Plan an ACL Implementation

#### Step 1: Investigate the current network configuration

From PC-1 (192.168.10.10) to other networks:



The screenshot shows a Windows PC desktop with a taskbar at the top containing a PC icon and window controls. Two tabs are open: 'Desktop' and 'Programming'. The 'Programming' tab is active, displaying a 'Command Prompt' window. The window has a blue title bar with the text 'Command Prompt' and a close button. The command prompt shows the following text:

```
C:\>
C:\>ping 192.168.11.10

Pinging 192.168.11.10 with 32 bytes of data:

Reply from 192.168.11.10: bytes=32 time=7ms TTL=127
Reply from 192.168.11.10: bytes=32 time<1ms TTL=127
Reply from 192.168.11.10: bytes=32 time<1ms TTL=127
Reply from 192.168.11.10: bytes=32 time=1ms TTL=127

Ping statistics for 192.168.11.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 7ms, Average = 2ms

C:\>ping 192.168.30.10

Pinging 192.168.30.10 with 32 bytes of data:

Request timed out.
Reply from 192.168.30.10: bytes=32 time=1ms TTL=126
Reply from 192.168.30.10: bytes=32 time=1ms TTL=126
Reply from 192.168.30.10: bytes=32 time=1ms TTL=126

Ping statistics for 192.168.30.10:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 1ms, Average = 1ms

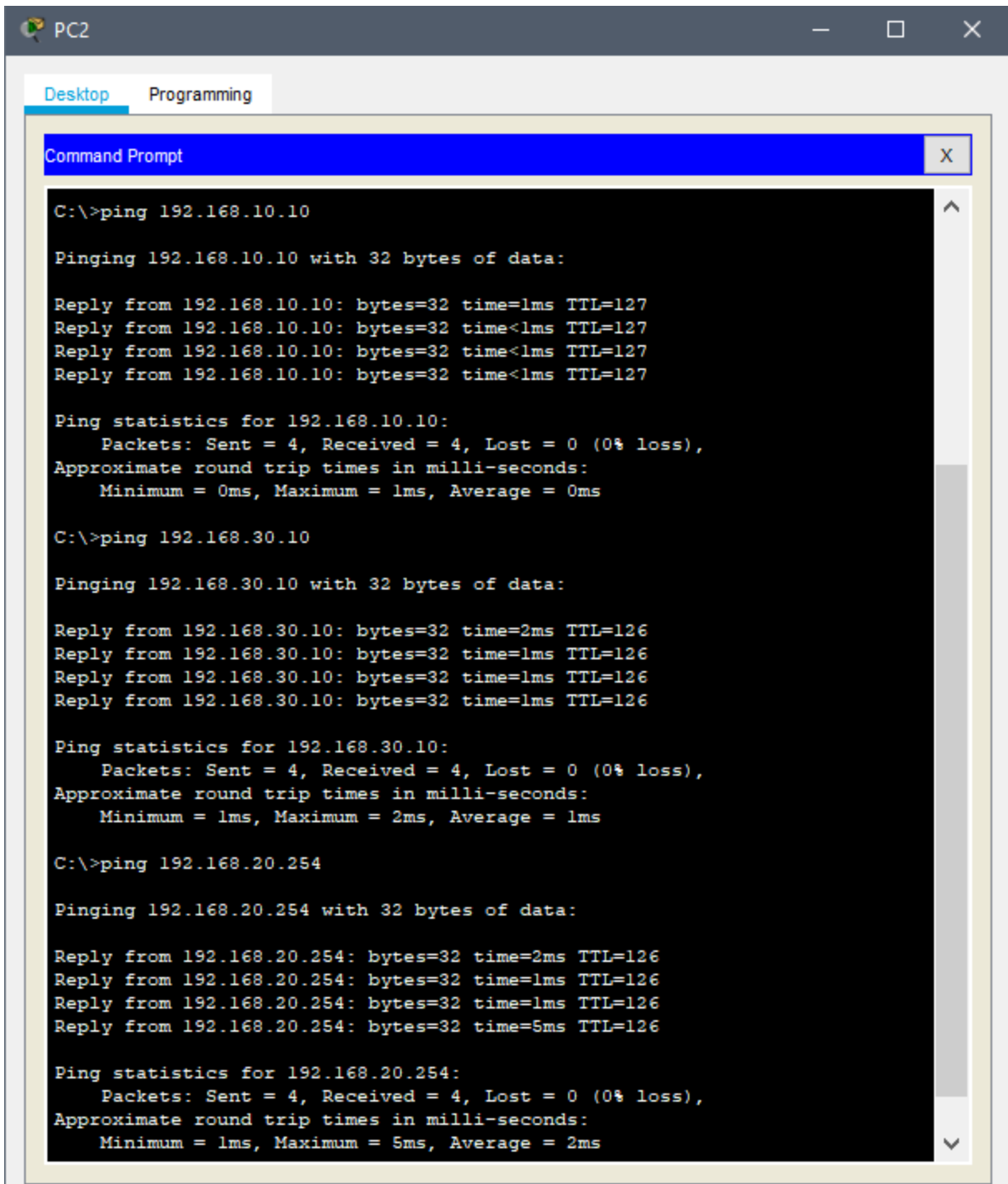
C:\>ping 192.168.20.254

Pinging 192.168.20.254 with 32 bytes of data:

Reply from 192.168.20.254: bytes=32 time=1ms TTL=126
Reply from 192.168.20.254: bytes=32 time=1ms TTL=126
Reply from 192.168.20.254: bytes=32 time=5ms TTL=126
Reply from 192.168.20.254: bytes=32 time=1ms TTL=126

Ping statistics for 192.168.20.254:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 5ms, Average = 2ms
```

From PC-2 (192.168.11.10) to other networks:



The screenshot shows a Windows desktop environment for PC2. The taskbar at the top has two tabs: 'Desktop' and 'Programming'. A 'Command Prompt' window is open, displaying the results of three ping commands. The first command is 'ping 192.168.10.10', which shows four successful replies with 32 bytes of data, a time of 1ms, and a TTL of 127. The second command is 'ping 192.168.30.10', showing four successful replies with 32 bytes of data, a time of 1ms, and a TTL of 126. The third command is 'ping 192.168.20.254', showing four successful replies with 32 bytes of data, a time of 5ms, and a TTL of 126. Each command is followed by a summary of ping statistics, including packets sent, received, lost, and approximate round trip times.

```
C:\>ping 192.168.10.10

Pinging 192.168.10.10 with 32 bytes of data:

Reply from 192.168.10.10: bytes=32 time=1ms TTL=127
Reply from 192.168.10.10: bytes=32 time<1ms TTL=127
Reply from 192.168.10.10: bytes=32 time<1ms TTL=127
Reply from 192.168.10.10: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.10.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>ping 192.168.30.10

Pinging 192.168.30.10 with 32 bytes of data:

Reply from 192.168.30.10: bytes=32 time=2ms TTL=126
Reply from 192.168.30.10: bytes=32 time=1ms TTL=126
Reply from 192.168.30.10: bytes=32 time=1ms TTL=126
Reply from 192.168.30.10: bytes=32 time=1ms TTL=126

Ping statistics for 192.168.30.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 2ms, Average = 1ms

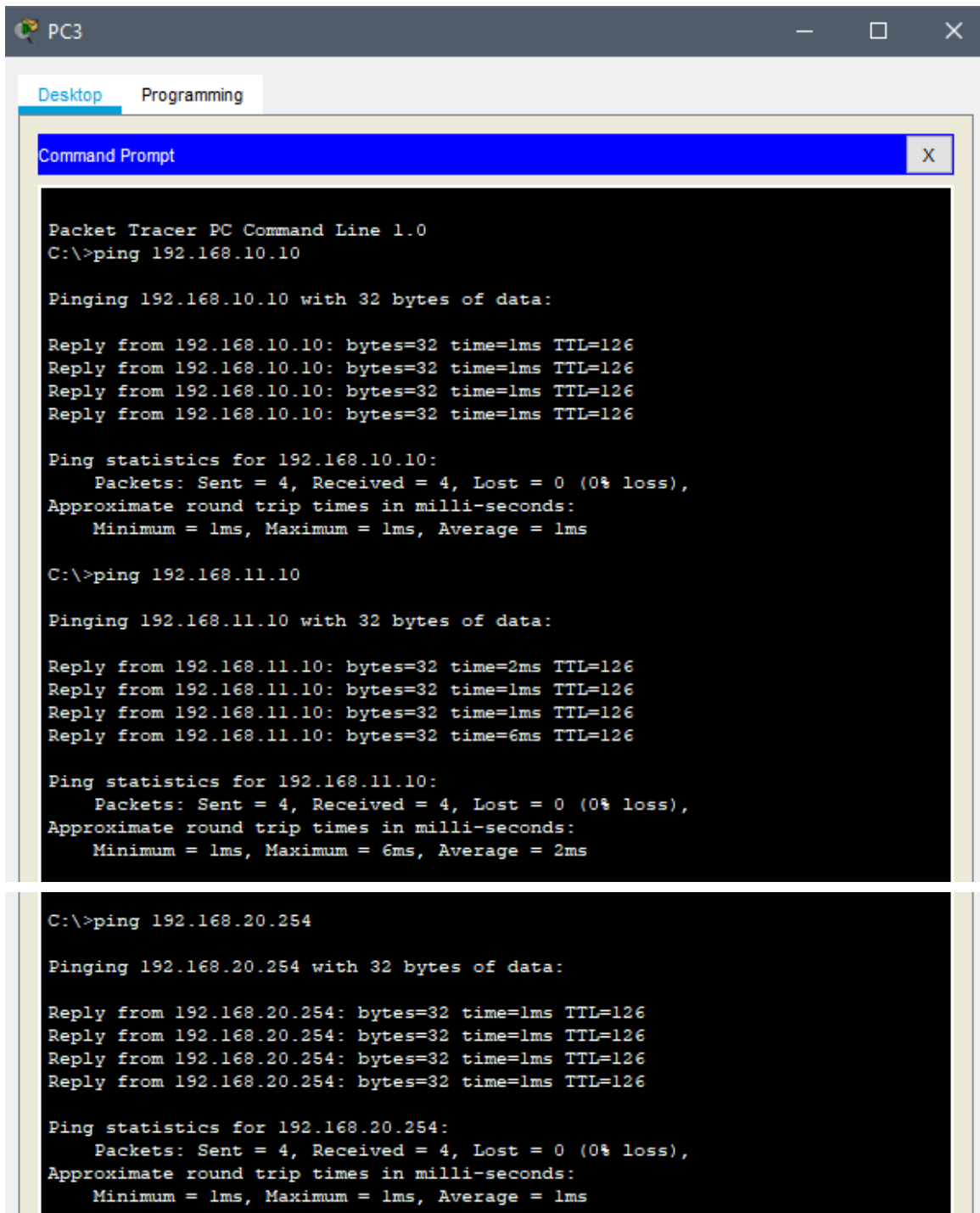
C:\>ping 192.168.20.254

Pinging 192.168.20.254 with 32 bytes of data:

Reply from 192.168.20.254: bytes=32 time=2ms TTL=126
Reply from 192.168.20.254: bytes=32 time=1ms TTL=126
Reply from 192.168.20.254: bytes=32 time=1ms TTL=126
Reply from 192.168.20.254: bytes=32 time=5ms TTL=126

Ping statistics for 192.168.20.254:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 5ms, Average = 2ms
```

From PC-3 (192.168.30.10) to other networks:



```
Packet Tracer PC Command Line 1.0
C:\>ping 192.168.10.10

Pinging 192.168.10.10 with 32 bytes of data:

Reply from 192.168.10.10: bytes=32 time=1ms TTL=126
Reply from 192.168.10.10: bytes=32 time=1ms TTL=126
Reply from 192.168.10.10: bytes=32 time=1ms TTL=126
Reply from 192.168.10.10: bytes=32 time=1ms TTL=126

Ping statistics for 192.168.10.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 1ms, Average = 1ms

C:\>ping 192.168.11.10

Pinging 192.168.11.10 with 32 bytes of data:

Reply from 192.168.11.10: bytes=32 time=2ms TTL=126
Reply from 192.168.11.10: bytes=32 time=1ms TTL=126
Reply from 192.168.11.10: bytes=32 time=1ms TTL=126
Reply from 192.168.11.10: bytes=32 time=6ms TTL=126

Ping statistics for 192.168.11.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 6ms, Average = 2ms

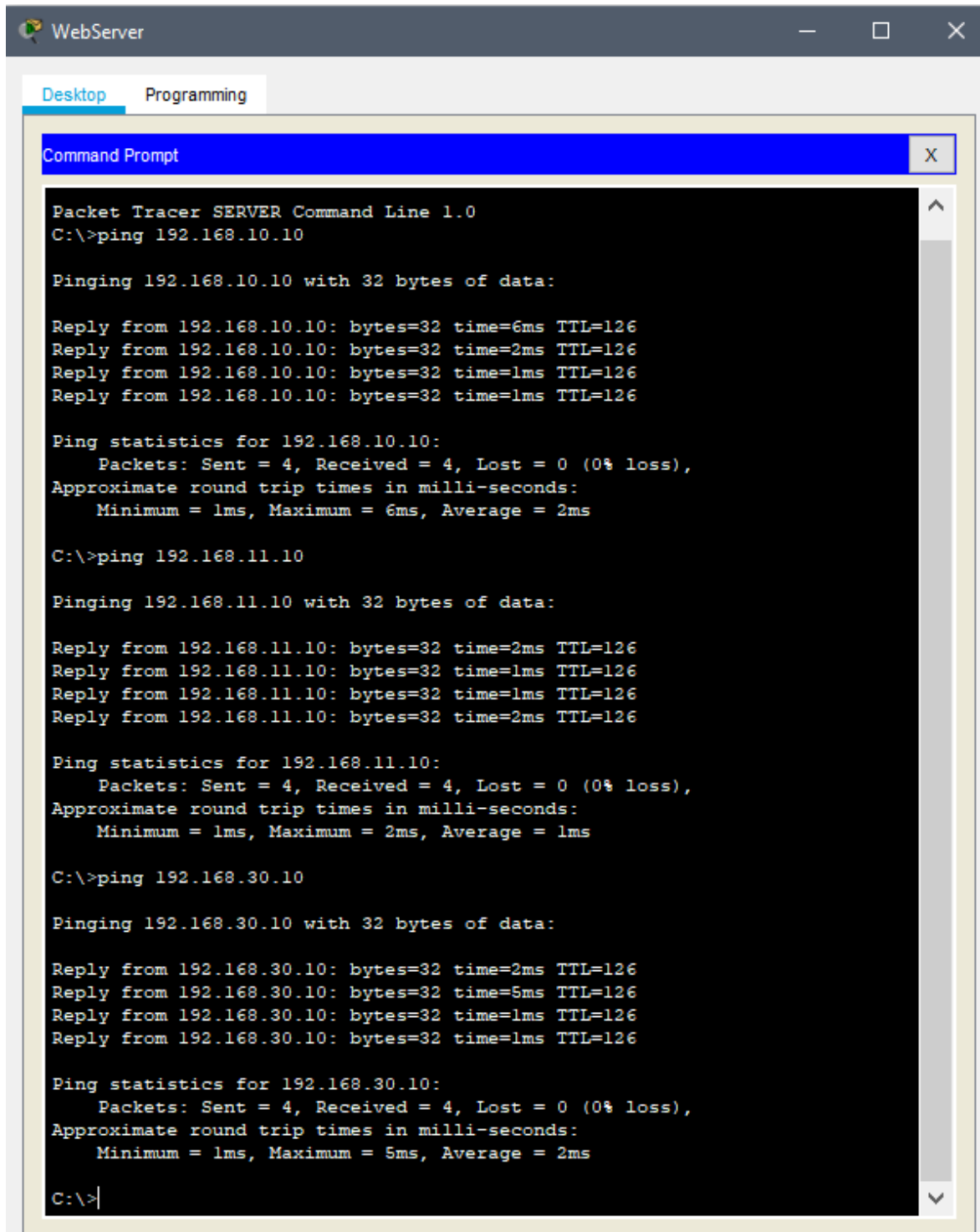
C:\>ping 192.168.20.254

Pinging 192.168.20.254 with 32 bytes of data:

Reply from 192.168.20.254: bytes=32 time=1ms TTL=126
Reply from 192.168.20.254: bytes=32 time=1ms TTL=126
Reply from 192.168.20.254: bytes=32 time=1ms TTL=126
Reply from 192.168.20.254: bytes=32 time=1ms TTL=126

Ping statistics for 192.168.20.254:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 1ms, Average = 1ms
```

From WebServer (192.168.20.254) to other networks:



The screenshot shows a Packet Tracer WebServer window with a Command Prompt open. The Command Prompt displays the results of three ping commands executed from the WebServer (192.168.20.254) to three different IP addresses: 192.168.10.10, 192.168.11.10, and 192.168.30.10. Each ping command shows four replies with varying round trip times and TTL values. The statistics for each ping show 4 packets sent, 4 received, and 0% loss.

```
Packet Tracer SERVER Command Line 1.0
C:\>ping 192.168.10.10

Pinging 192.168.10.10 with 32 bytes of data:

Reply from 192.168.10.10: bytes=32 time=6ms TTL=126
Reply from 192.168.10.10: bytes=32 time=2ms TTL=126
Reply from 192.168.10.10: bytes=32 time=1ms TTL=126
Reply from 192.168.10.10: bytes=32 time=1ms TTL=126

Ping statistics for 192.168.10.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 6ms, Average = 2ms

C:\>ping 192.168.11.10

Pinging 192.168.11.10 with 32 bytes of data:

Reply from 192.168.11.10: bytes=32 time=2ms TTL=126
Reply from 192.168.11.10: bytes=32 time=1ms TTL=126
Reply from 192.168.11.10: bytes=32 time=1ms TTL=126
Reply from 192.168.11.10: bytes=32 time=2ms TTL=126

Ping statistics for 192.168.11.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 2ms, Average = 1ms

C:\>ping 192.168.30.10

Pinging 192.168.30.10 with 32 bytes of data:

Reply from 192.168.30.10: bytes=32 time=2ms TTL=126
Reply from 192.168.30.10: bytes=32 time=5ms TTL=126
Reply from 192.168.30.10: bytes=32 time=1ms TTL=126
Reply from 192.168.30.10: bytes=32 time=1ms TTL=126

Ping statistics for 192.168.30.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 5ms, Average = 2ms

C:\>
```

## Step 2: Evaluate two network policies and plan ACL implementations

- a. The following network policies are implemented on R2:
  - The 192.168.11.0/24 network is not allowed access to the WebServer on the 192.168.20.0/24 network
  - All other access is permitted
- b. The following network policies are implemented on R3:
  - The 192.168.10.0/24 network is not allowed to communicate with the 192.168.30.0/24 network
  - All other access is permitted

## Part 2: Configure, Apply, and Verify a Standard ACL

### Step 1: Configure and apply a numbered standard ACL on R2

- a. We create an ACL using the number 1 on R2 with a statement that denies access to the 192.168.20.0/24 network from the 192.168.11.0/24 network.
- b. By default, an access list denies all traffic that does not match any rules. We permit the other networks by creating a second rule in ACL 1.
- c. Before applying an access list to an interface to filter traffic, it is a best practice to review the contents of the access list, in order to verify that it will filter traffic as expected.
- d. For the ACL to actually filter traffic, it must be applied to some router operation. We apply the ACL by placing it for outbound traffic on the GigabitEthernet 0/0 interface.

The following commands were used in R2:

```
R2>enable
R2#conf t
R2(config)#access-list 1 deny 192.168.11.0 0.0.0.255
R2(config)#access-list 1 permit any
R2(config)#end
R2#show access-lists
R2#conf t
R2(config)#int g0/0
R2(config-if)#ip access-group 1 out
R2(config-if)#exit
```

The screenshot of the commands executed is given below:

```
R2>enable
R2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#access-list 1 deny 192.168.11.0 0.0.0.255
R2(config)#access-list 1 permit any
R2(config)#end
R2#
%SYS-5-CONFIG_I: Configured from console by console

R2#show access-lists
Standard IP access list 1
    10 deny 192.168.11.0 0.0.0.255
    20 permit any

R2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#int g0/0
R2(config-if)#ip access-group 1 out
R2(config-if)#exit
R2(config)#exit
R2#
%SYS-5-CONFIG_I: Configured from console by console
```

## Step 2: Configure and apply a numbered standard ACL on R3

- Create an ACL using the number 1 on R3 with a statement that denies access to the 192.168.30.0/24 network from the PC1 (192.168.10.0/24) network.
- By default, an ACL denies all traffic that does not match any rules. To permit all other traffic, create a second rule for ACL 1.
- Verify that the access list is configured correctly.
- Apply the ACL by placing it for outbound traffic on the GigabitEthernet 0/0 interface.

The following commands were used in R3:

```
R3>en
R3#conf t
R3(config)#access-list 1 deny 192.168.10.0 0.0.0.255
R3(config)#access-list 1 permit any
R3(config)#end
R3#show access-lists
R3#conf t
R3(config)#int g0/0
R3(config-if)#ip access-group 1 out
R3(config-if)#exit
```



The screenshot of the commands executed is given below:

```
R3>en
R3#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#access-list 1 deny 192.168.10.0 0.0.0.255
R3(config)#access-list 1 permit any
R3(config)#end
R3#
%SYS-5-CONFIG_I: Configured from console by console

R3#show access-lists
Standard IP access list 1
 10 deny 192.168.10.0 0.0.0.255
 20 permit any

R3#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#int g0/0
R3(config-if)#ip access-group 1 out
```

### Step 3: Verify ACL configuration and functionality

- a. Enter the **show run** or **show ip interface gigabitethernet 0/0** command to verify the ACL placements. The screenshot of the executed command in **router R2** is given below:

```
R2#show ip int g0/0
GigabitEthernet0/0 is up, line protocol is up (connected)
 Internet address is 192.168.20.1/24
 Broadcast address is 255.255.255.255
 Address determined by setup command
 MTU is 1500 bytes
 Helper address is not set
 Directed broadcast forwarding is disabled
 Outgoing access list is 1
 Inbound access list is not set
 Proxy ARP is enabled
 Security level is default
 Split horizon is enabled
 ICMP redirects are always sent
 ICMP unreachable are always sent
 ICMP mask replies are never sent
 IP fast switching is disabled
 IP fast switching on the same interface is disabled
 IP Flow switching is disabled
 IP Fast switching turbo vector
 IP multicast fast switching is disabled
 IP multicast distributed fast switching is disabled
 Router Discovery is disabled
 IP output packet accounting is disabled
 IP access violation accounting is disabled
 TCP/IP header compression is disabled
 RTP/IP header compression is disabled
 Probe proxy name replies are disabled
 Policy routing is disabled
 Network address translation is disabled
 BGP Policy Mapping is disabled
 Input features: MCI Check
 WCCP Redirect outbound is disabled
 WCCP Redirect inbound is disabled
 WCCP Redirect exclude is disabled
```

The screenshot of the executed command in **router R3** is given below:

```
R3#show ip int g0/0
GigabitEthernet0/0 is up, line protocol is up (connected)
  Internet address is 192.168.30.1/24
  Broadcast address is 255.255.255.255
  Address determined by setup command
  MTU is 1500 bytes
  Helper address is not set
  Directed broadcast forwarding is disabled
  Outgoing access list is 1
  Inbound access list is not set
  Proxy ARP is enabled
  Security level is default
  Split horizon is enabled
  ICMP redirects are always sent
  ICMP unreachable are always sent
  ICMP mask replies are never sent
  IP fast switching is disabled
  IP fast switching on the same interface is disabled
  IP Flow switching is disabled
  IP Fast switching turbo vector
  IP multicast fast switching is disabled
  IP multicast distributed fast switching is disabled
  Router Discovery is disabled
  IP output packet accounting is disabled
  IP access violation accounting is disabled
  TCP/IP header compression is disabled
  RTP/IP header compression is disabled
  Probe proxy name replies are disabled
  Policy routing is disabled
  Network address translation is disabled
  BGP Policy Mapping is disabled
  Input features: MCI Check
  WCCP Redirect outbound is disabled
  WCCP Redirect inbound is disabled
  WCCP Redirect exclude is disabled
```

- b. With the two ACLs in place, network traffic is restricted according to the policies detailed. The following tests are used to verify ACL implementations:

**From 192.168.10.10 to 192.168.11.10, ping succeeds:**

```
C:\>ping 192.168.11.10

Pinging 192.168.11.10 with 32 bytes of data:

Reply from 192.168.11.10: bytes=32 time<1ms TTL=127
Reply from 192.168.11.10: bytes=32 time<1ms TTL=127
Reply from 192.168.11.10: bytes=32 time=1ms TTL=127
Reply from 192.168.11.10: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.11.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

From 192.168.10.10 to 192.168.20.254, ping succeeds:

```
C:\>ping 192.168.20.254

Pinging 192.168.20.254 with 32 bytes of data:

Reply from 192.168.20.254: bytes=32 time=2ms TTL=126
Reply from 192.168.20.254: bytes=32 time=1ms TTL=126
Reply from 192.168.20.254: bytes=32 time=1ms TTL=126
Reply from 192.168.20.254: bytes=32 time=1ms TTL=126

Ping statistics for 192.168.20.254:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 2ms, Average = 1ms
```

From 192.168.11.10 to 192.168.20.254, ping fails:

```
C:\>ping 192.168.20.254

Pinging 192.168.20.254 with 32 bytes of data:

Reply from 10.1.1.2: Destination host unreachable.
Reply from 10.1.1.2: Destination host unreachable.
Reply from 10.1.1.2: Destination host unreachable.
Reply from 10.1.1.2: Destination host unreachable.

Ping statistics for 192.168.20.254:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

From 192.168.10.10 to 192.168.30.10, ping fails:

```
C:\>ping 192.168.30.10

Pinging 192.168.30.10 with 32 bytes of data:

Reply from 10.3.3.2: Destination host unreachable.
Reply from 10.3.3.2: Destination host unreachable.
Reply from 10.3.3.2: Destination host unreachable.
Reply from 10.3.3.2: Destination host unreachable.

Ping statistics for 192.168.30.10:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

From 192.168.11.10 to 192.168.30.10, ping succeeds:

```
C:\>ping 192.168.30.10

Pinging 192.168.30.10 with 32 bytes of data:

Reply from 192.168.30.10: bytes=32 time=1ms TTL=126
Reply from 192.168.30.10: bytes=32 time=1ms TTL=126
Reply from 192.168.30.10: bytes=32 time=2ms TTL=126
Reply from 192.168.30.10: bytes=32 time=1ms TTL=126

Ping statistics for 192.168.30.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 2ms, Average = 1ms
```

From 192.168.30.10 to 192.168.20.254, ping succeeds:

```
C:\>ping 192.168.20.254

Pinging 192.168.20.254 with 32 bytes of data:

Reply from 192.168.20.254: bytes=32 time=1ms TTL=126
Reply from 192.168.20.254: bytes=32 time=1ms TTL=126
Reply from 192.168.20.254: bytes=32 time=1ms TTL=126
Reply from 192.168.20.254: bytes=32 time=5ms TTL=126

Ping statistics for 192.168.20.254:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 5ms, Average = 2ms
```

- c. Issue the **show access-lists** command again on routers **R2** and **R3**. You should see an output that indicates the number of packets that have matched each line of the access list. Note: The number of matches shown for your routers may be different, due to the number of pings that are sent and received.

The screenshots in **Router R2** is given below:

```
R2>en
R2#show access-lists
Standard IP access list 1
    10 deny 192.168.11.0 0.0.0.255 (4 match(es))
    20 permit any (8 match(es))
```

The screenshots in **Router R3** is given below:

```
R3>en
R3#show access-lists
Standard IP access list 1
    10 deny 192.168.10.0 0.0.0.255 (4 match(es))
    20 permit any (8 match(es))
```

## Questions:

### Task # 01:

1. The ping from 192.168.10.10 to 192.168.11.10 is successful or not?

**Ans:** Yes, the ping is successful.

2. The ping from 192.168.10.10 to 192.168.20.254 is successful or not?

**Ans:** Yes, the ping is successful.

3. The ping from 192.168.11.10 to 192.168.20.254 has failed or not?

**Ans:** Yes, the ping fails.

## Observation:

The implementation of ACL is successful and has been verified by pinging from the devices in different networks.

## Challenges (if any):

- I faced no major challenges in this lab