Module 5: ACLs for IPv4 Configuration

Enterprise Networking, Security, and Automation v7.0 (ENSA)

Module Objectives

Module Title: ACLs for IPv4 Configuration

Module Objective: Implement IPv4 ACLs to filter traffic and secure administrative access.

Topic Title	Topic Objective
Configure Standard IPv4 ACLs	Configure standard IPv4 ACLs to filter traffic to meet networking requirements.
Modify IPv4 ACLs	Use sequence numbers to edit existing standard IPv4 ACLs.
Secure VTY Ports with a Standard IPv4 ACL	Configure a standard ACL to secure VTY access.
Configure Extended IPv4 ACLs	Configure extended IPv4 ACLs to filter traffic according to networking requirements.

5.1 Configure Standard IPv4 ACLs

Configure Standard IPv4 ACLs

Create an ACL

All access control lists (ACLs) must be planned. When configuring a complex ACL, it is suggested that you:

- Use a **text editor** and write out the specifics of the policy to be implemented.
- **Add the IOS configuration commands** to accomplish those tasks.
- **Include remarks** to document the ACL.
- **Copy and paste** the commands onto the device.
- **Always thoroughly test** an ACL to ensure that it correctly applies the desired policy.

Configure Standard IPv4 ACLs
Numbered Standard IPv4 ACL Syntax

To create a numbered standard ACL, use the **access-list** command.

```
Router(config)# access-list access-list-number {deny | permit | remark text} source [source-wildcard]
[log]
```

Parameter	Description
access-list-number	Number range is 1 to 99 or 1300 to 1999
deny	Denies access if the condition is matched
permit	Permits access if the condition is matched
remark *text*	(Optional) text entry for documentation purposes
source	Identifies the source network or host address to filter
source-wildcard	(Optional) 32-bit wildcard mask that is applied to the source
log	(Optional) Generates and sends an informational message when the ACE is matched

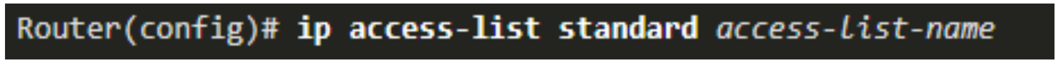
Note: Use the **no access-list** *access-list-number* global configuration command to remove a numbered standard ACL.

Configure Standard IPv4 ACLs

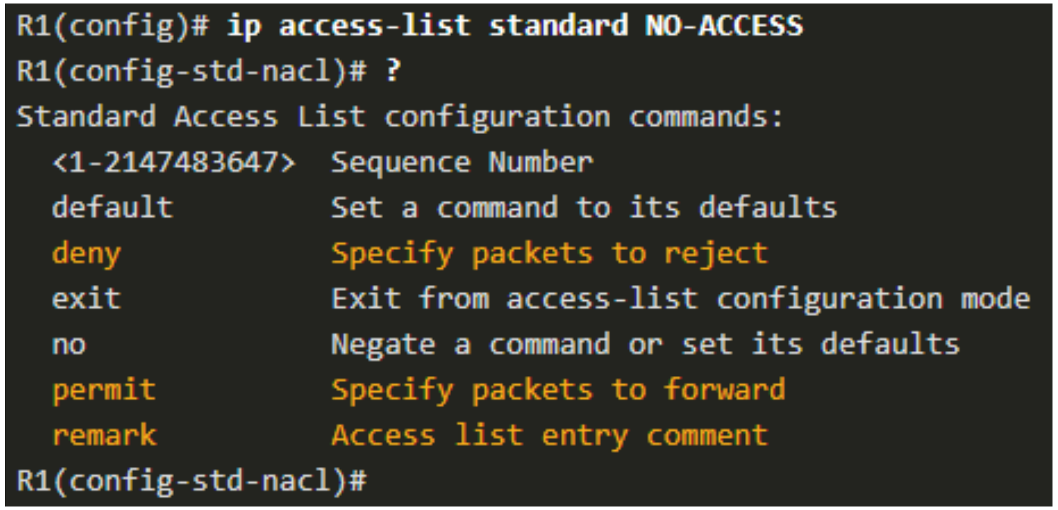
Named Standard IPv4 ACL Syntax

To create a named standard ACL, use the **ip access-list standard** command.

- ACL names are alphanumeric, case sensitive, and must be unique.
- Capitalizing ACL names is not required but makes them stand out when viewing the running-config output.



```
Router(config)# ip access-list standard access-list-name
```



```
R1(config)# ip access-list standard NO-ACCESS
R1(config-std-nacl)# ?
Standard Access List configuration commands:
  <1-2147483647>  Sequence Number
  default         Set a command to its defaults
  deny            Specify packets to reject
  exit            Exit from access-list configuration mode
  no              Negate a command or set its defaults
  permit          Specify packets to forward
  remark          Access list entry comment
R1(config-std-nacl)#
```

Configure Standard IPv4 ACLs
Apply a Standard IPv4 ACL

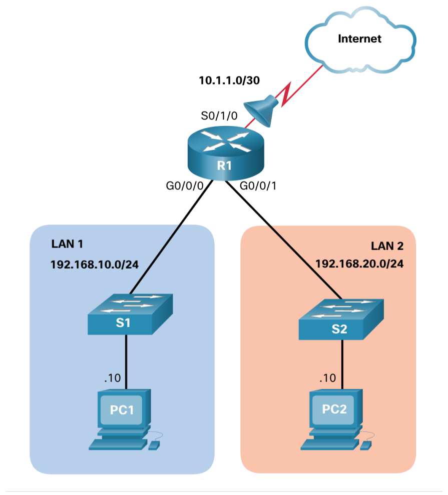
After a standard IPv4 ACL is configured, it must be linked to an interface or feature.

- The **ip access-group** command is used to bind a numbered or named standard IPv4 ACL to an interface.
- To remove an ACL from an interface, first enter the **no ip access-group** interface configuration command.

```
Router(config-if) # ip access-group {access-list-number | access-list-name} {in | out}
```

Configure Standard IPv4 ACLs
Numbered Standard ACL Example

The example ACL permits traffic from host 192.168.10.10 and all hosts on the 192.168.20.0/24 network out interface serial 0/1/0 on router R1.



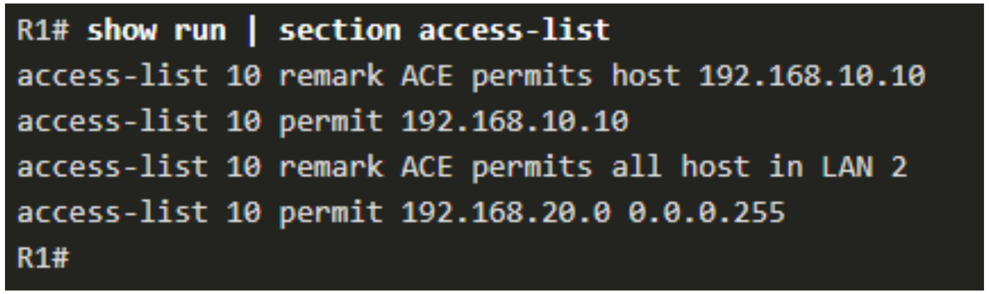
```
R1(config)# access-list 10 remark ACE permits ONLY host 192.168.10.10 to the internet
R1(config)# access-list 10 permit host 192.168.10.10
R1(config)# do show access-lists
Standard IP access list 10
    10 permit 192.168.10.10
R1(config)#
```

```
R1(config)# access-list 10 remark ACE permits all host in LAN 2
R1(config)# access-list 10 permit 192.168.20.0 0.0.0.255
R1(config)# do show access-lists
Standard IP access list 10
    10 permit 192.168.10.10
    20 permit 192.168.20.0, wildcard bits 0.0.0.255
R1(config)#
```

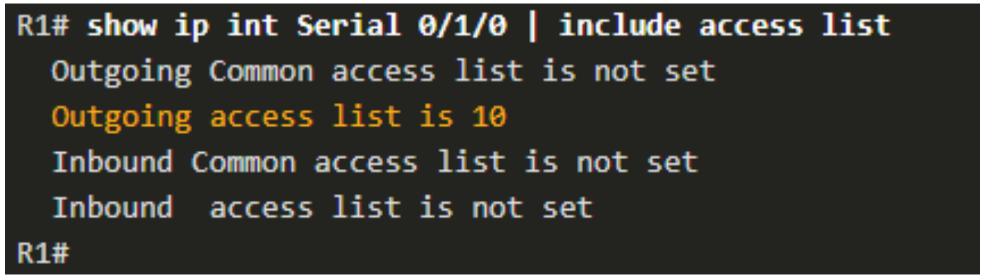
```
R1(config)# interface Serial 0/1/0
R1(config-if)# ip access-group 10 out
R1(config-if)# end
R1#
```

Configure Standard IPv4 ACLs
Numbered Standard ACL Example (Cont.)

- Use the **show running-config** command to review the ACL in the configuration.
- Use the **show ip interface** command to verify the ACL is applied to the interface.



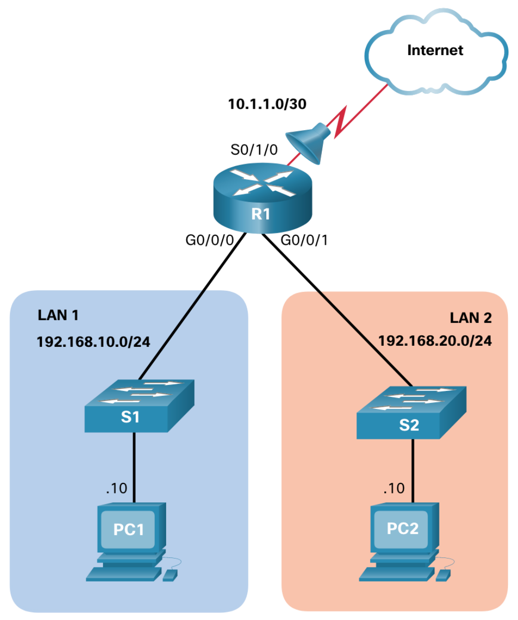
```
R1# show run | section access-list
access-list 10 remark ACE permits host 192.168.10.10
access-list 10 permit 192.168.10.10
access-list 10 remark ACE permits all host in LAN 2
access-list 10 permit 192.168.20.0 0.0.0.255
R1#
```



```
R1# show ip int Serial 0/1/0 | include access list
  Outgoing Common access list is not set
  Outgoing access list is 10
  Inbound Common access list is not set
  Inbound  access list is not set
R1#
```

Configure Standard IPv4 ACLs
Named Standard ACL Example

The example ACL permits traffic from host 192.168.10.10 and all hosts on the 192.168.20.0/24 network out interface serial 0/1/0 on router R1.

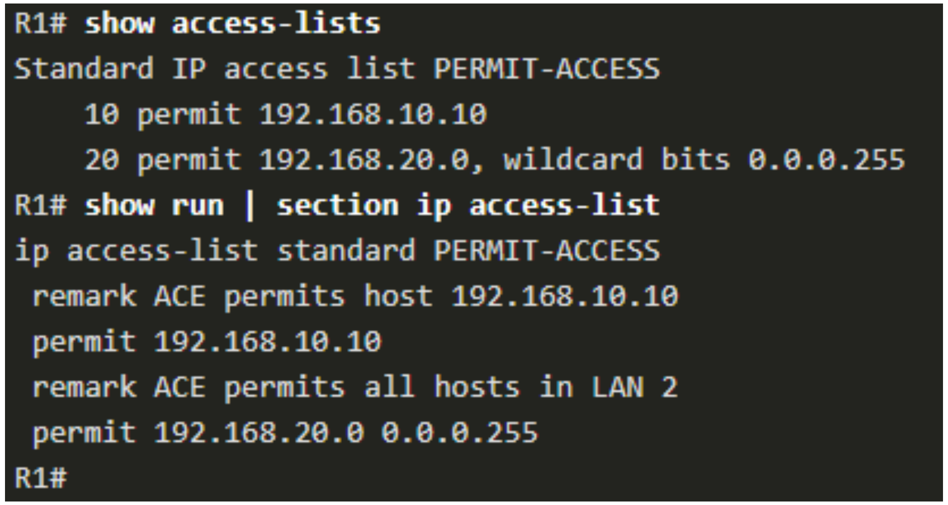


```
R1(config)# no access-list 10
R1(config)# ip access-list standard PERMIT-ACCESS
R1(config-std-nacl)# remark ACE permits host 192.168.10.10
R1(config-std-nacl)# permit host 192.168.10.10
R1(config-std-nacl)# remark ACE permits all hosts in LAN 2
R1(config-std-nacl)# permit 192.168.20.0 0.0.0.255
R1(config-std-nacl)# exit
R1(config)#
R1(config)# interface Serial 0/1/0
R1(config-if)# ip access-group PERMIT-ACCESS out
R1(config-if)# end
R1#
```

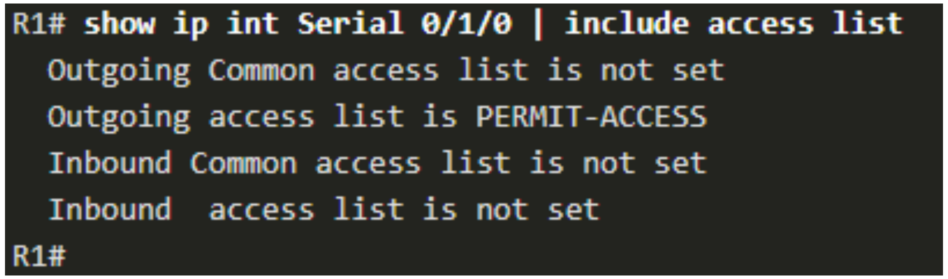
Configure Standard IPv4 ACLs

Named Standard ACL Example (Cont.)

- Use the **show access-list** command to review the ACL in the configuration.
- Use the **show ip interface** command to verify the ACL is applied to the interface.



```
R1# show access-lists
Standard IP access list PERMIT-ACCESS
    10 permit 192.168.10.10
    20 permit 192.168.20.0, wildcard bits 0.0.0.255
R1# show run | section ip access-list
ip access-list standard PERMIT-ACCESS
 remark ACE permits host 192.168.10.10
 permit 192.168.10.10
 remark ACE permits all hosts in LAN 2
 permit 192.168.20.0 0.0.0.255
R1#
```



```
R1# show ip int Serial 0/1/0 | include access list
  Outgoing Common access list is not set
  Outgoing access list is PERMIT-ACCESS
  Inbound Common access list is not set
  Inbound  access list is not set
R1#
```

Configure Standard IPv4 ACLs
Packet Tracer – Configure Numbered Standard IPv4 ACLs

In this Packet Tracer, you will complete the following objectives:

- Plan an ACL Implementation.
- Configure, Apply, and Verify a Standard ACL.

Packet Tracer – Configure Named Standard IPv4 ACLs

In this Packet Tracer, you will complete the following objectives:

- Configure and Apply a Named Standard ACL.
- Verify the ACL Implementation.

5.2 Modify IPv4 ACLs

Modify IPv4 ACLs

Two Methods to Modify an ACL

After an ACL is configured, it may need to be modified. ACLs with multiple ACEs can be complex to configure. Sometimes the configured ACE does not yield the expected behaviors.

There are **two methods** to use when modifying an ACL:

- Use a **text editor**.
- Use **sequence numbers**.

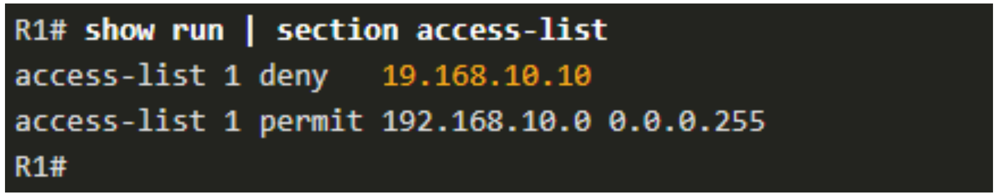
Modify IPv4 ACLs

Text Editor Method

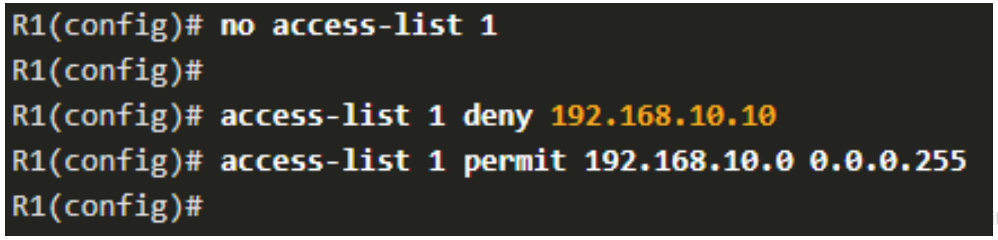
ACLs with multiple ACEs should be created in a text editor. This allows you to plan the required ACEs, create the ACL, and then paste it into the router interface. It also simplifies the tasks to edit and fix an ACL.

To correct an error in an ACL:

- **Copy** the ACL from the running configuration and paste it into the text editor.
- **Make** the necessary edits or changes.
- **Remove** the previously configured ACL on the router.
- **Copy and paste** the edited ACL back to the router.



```
R1# show run | section access-list
access-list 1 deny   19.168.10.10
access-list 1 permit 192.168.10.0 0.0.0.255
R1#
```



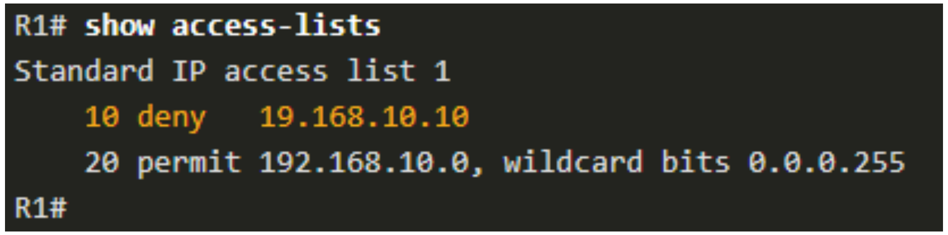
```
R1(config)# no access-list 1
R1(config)#
R1(config)# access-list 1 deny 192.168.10.10
R1(config)# access-list 1 permit 192.168.10.0 0.0.0.255
R1(config)#
```

Modify IPv4 ACLs

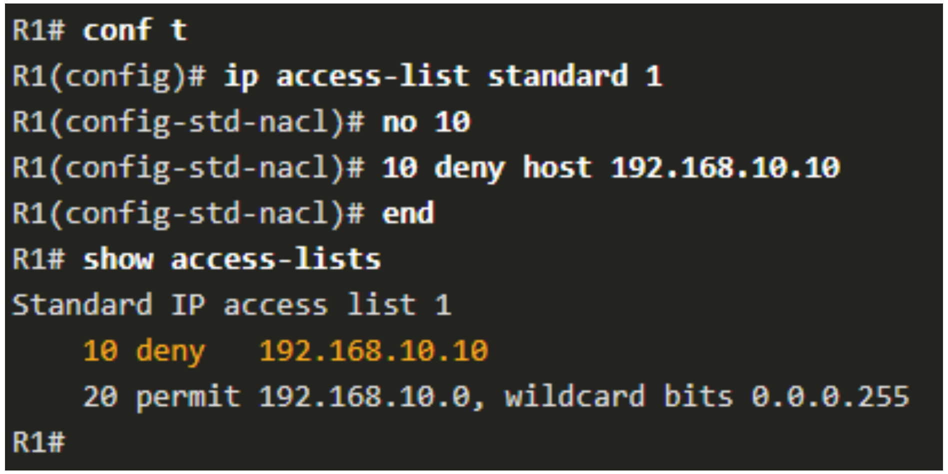
Sequence Number Method

An ACL ACE can be deleted or added using the ACL sequence numbers.

- Use the **ip access-list standard** command to edit an ACL.
- Statements cannot be overwritten using an existing sequence number. The current statement must be deleted first with the **no 10** command. Then the correct ACE can be added using sequence number.



```
R1# show access-lists
Standard IP access list 1
    10 deny   19.168.10.10
    20 permit 192.168.10.0, wildcard bits 0.0.0.255
R1#
```

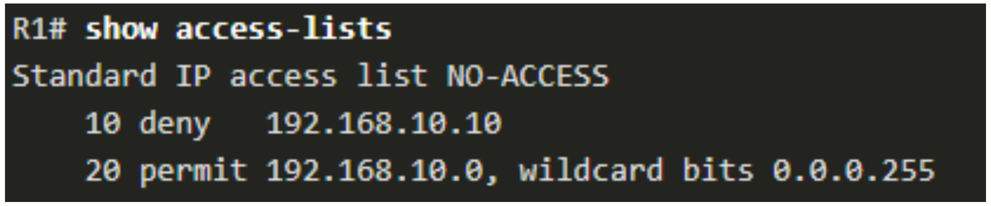


```
R1# conf t
R1(config)# ip access-list standard 1
R1(config-std-nacl)# no 10
R1(config-std-nacl)# 10 deny host 192.168.10.10
R1(config-std-nacl)# end
R1# show access-lists
Standard IP access list 1
    10 deny   192.168.10.10
    20 permit 192.168.10.0, wildcard bits 0.0.0.255
R1#
```

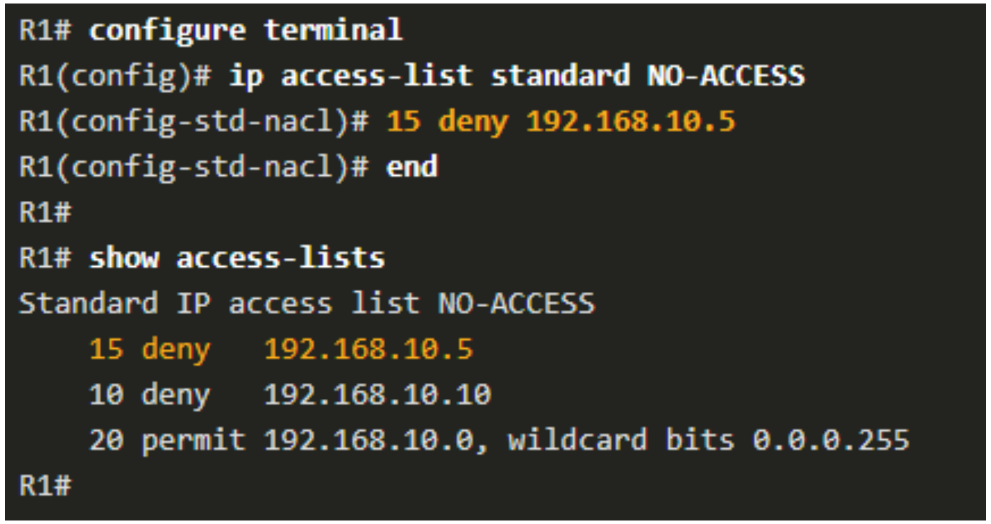
Modify IPv4 ACLs

Modify a Named ACL Example

Named ACLs can also use sequence numbers to delete and add ACEs. In the example an ACE is added to deny host 192.168.10.5.



```
R1# show access-lists
Standard IP access list NO-ACCESS
    10 deny   192.168.10.10
    20 permit 192.168.10.0, wildcard bits 0.0.0.255
```

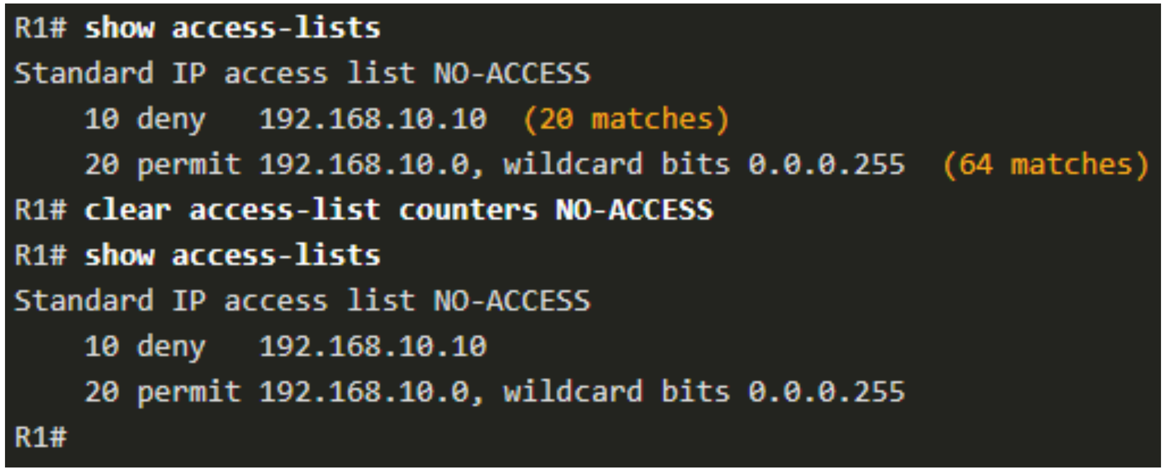


```
R1# configure terminal
R1(config)# ip access-list standard NO-ACCESS
R1(config-std-nacl)# 15 deny 192.168.10.5
R1(config-std-nacl)# end
R1#
R1# show access-lists
Standard IP access list NO-ACCESS
    15 deny   192.168.10.5
    10 deny   192.168.10.10
    20 permit 192.168.10.0, wildcard bits 0.0.0.255
R1#
```

Modify IPv4 ACLs
ACL Statistics

The **show access-lists** command in the example shows statistics for each statement that has been matched.

- The deny ACE has been matched 20 times and the permit ACE has been matched 64 times.
- Note that the implied deny any statement does not display any statistics. To track how many implicit denied packets have been matched, you must manually configure the **deny any** command.
- Use the **clear access-list counters** command to clear the ACL statistics.



```
R1# show access-lists
Standard IP access list NO-ACCESS
    10 deny   192.168.10.10  (20 matches)
    20 permit 192.168.10.0, wildcard bits 0.0.0.255  (64 matches)
R1# clear access-list counters NO-ACCESS
R1# show access-lists
Standard IP access list NO-ACCESS
    10 deny   192.168.10.10
    20 permit 192.168.10.0, wildcard bits 0.0.0.255
R1#
```

Modify IPv4 ACLs

Packet Tracer – Configure and Modify Standard IPv4 ACLs

In this Packet Tracer, you will complete the following objectives:

- Configure Devices and Verify Connectivity.
- Configure and Verify Standard Numbered and Named ACLs.
- Modify a Standard ACL.

5.3 Secure VTY Ports with a Standard IPv4 ACL

Secure VTY Ports with a Standard IPv4 ACL
The access-class Command

A standard ACL can secure remote administrative access to a device using the vty lines by implementing the following two steps:

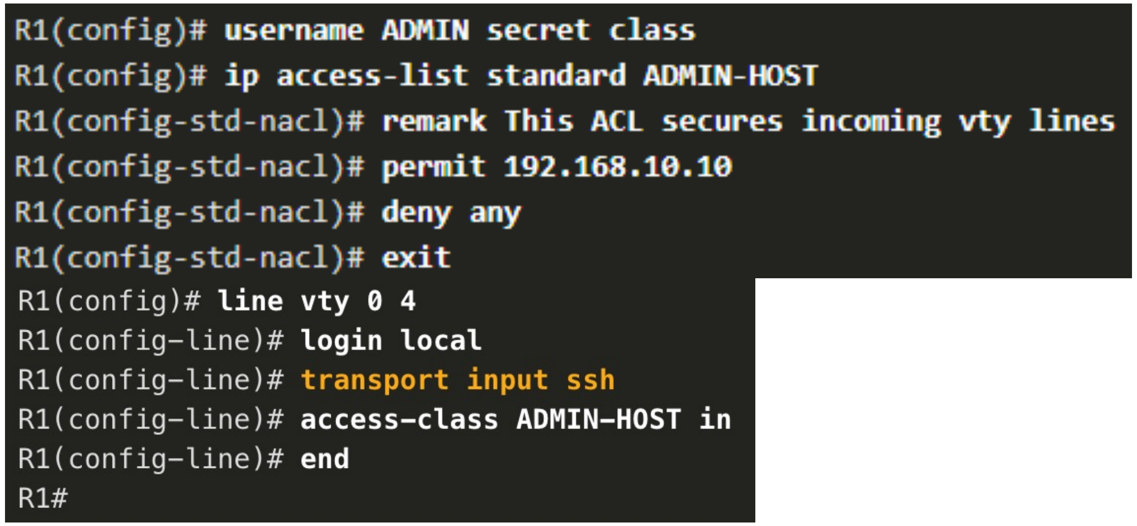
- **Create an ACL** to identify which administrative hosts should be allowed remote access.
- **Apply the ACL** to incoming traffic on the vty lines by using the **access-class** line command.

```
R1(config-line)# access-class {access-list-number | access-list-name} { in | out }
```

Secure VTY Ports with a Standard IPv4 ACL
Secure VTY Access Example

This example demonstrates how to configure an ACL to filter vty traffic.

- First, a local database entry for a user **ADMIN** and password **class** is configured.
- The vty lines on R1 are configured to use the local database for authentication, permit ssh traffic, and use the ADMIN-HOST ACL to restrict traffic.



```
R1(config)# username ADMIN secret class
R1(config)# ip access-list standard ADMIN-HOST
R1(config-std-nacl)# remark This ACL secures incoming vty lines
R1(config-std-nacl)# permit 192.168.10.10
R1(config-std-nacl)# deny any
R1(config-std-nacl)# exit
R1(config)# line vty 0 4
R1(config-line)# login local
R1(config-line)# transport input ssh
R1(config-line)# access-class ADMIN-HOST in
R1(config-line)# end
R1#
```

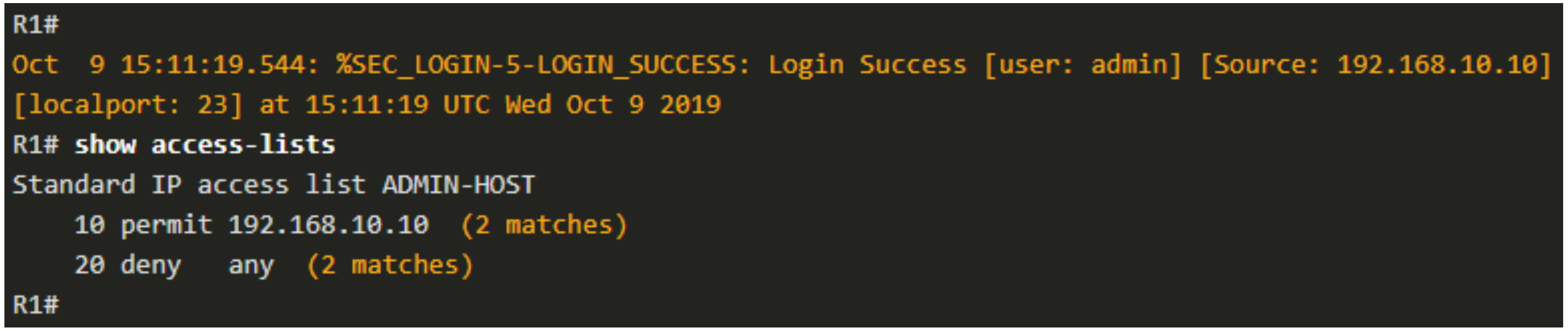
Secure VTY Ports with a Standard IPv4 ACL

Verify the VTY Port is Secured

After an ACL to restrict access to the vty lines is configured, it is important to verify it works as expected. (zie cursus 5.3.3.)

To verify the ACL statistics, issue the **show access-lists** command.

- The match in the permit line of the output is a result of a successful SSH connection by host with IP address 192.168.10.10.
- The match in the deny statement is due to the failed attempt to create a SSH connection from a device on another network.



```
R1#
Oct  9 15:11:19.544: %SEC_LOGIN-5-LOGIN_SUCCESS: Login Success [user: admin] [Source: 192.168.10.10]
[localport: 23] at 15:11:19 UTC Wed Oct 9 2019
R1# show access-lists
Standard IP access list ADMIN-HOST
    10 permit 192.168.10.10  (2 matches)
    20 deny   any  (2 matches)
R1#
```

5.4 Configure Extended IPv4 ACLs

Configure Extended IPv4 ACLs
Extended ACLs

Extended ACLs provide a **greater degree of control**. They can filter on source address, destination address, protocol (i.e., IP, TCP, UDP, ICMP), and port number.

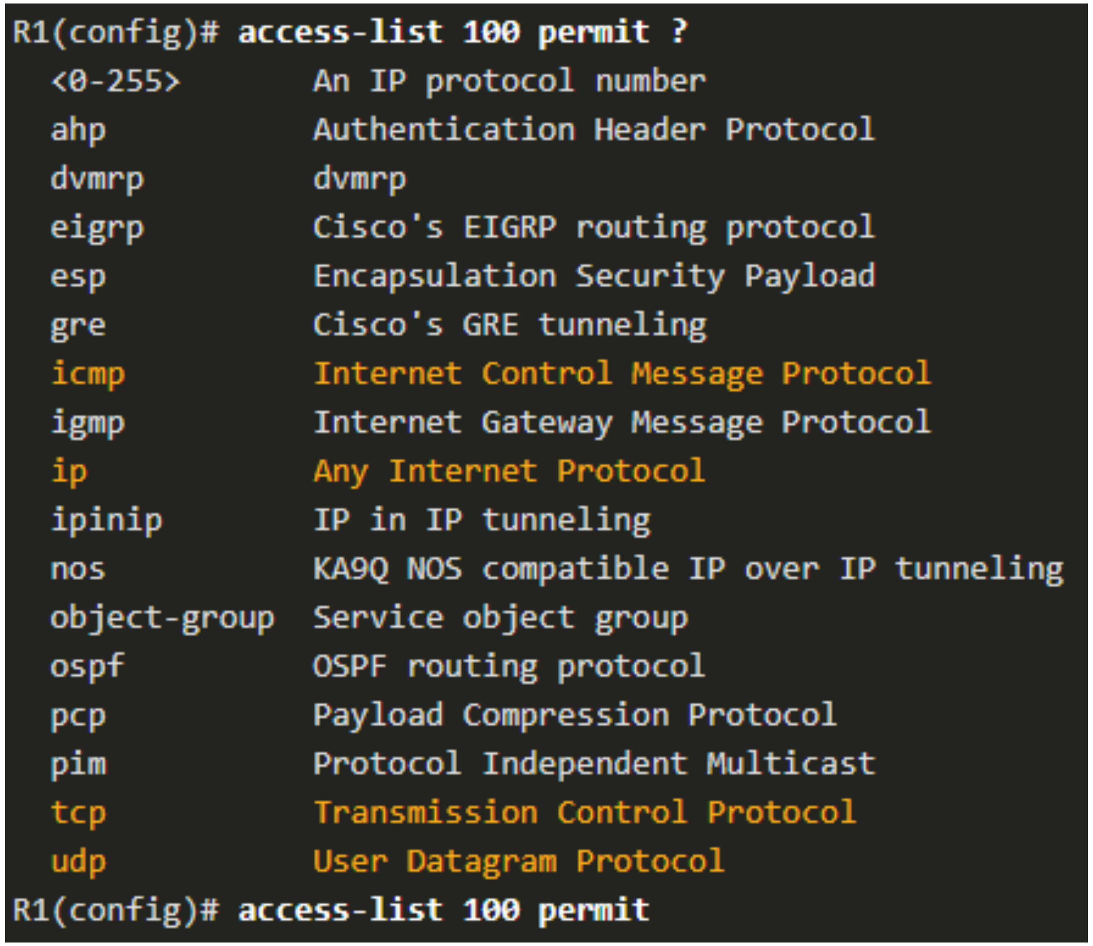
Extended ACLs can be created as:

- **Numbered Extended ACL** - Created using the **access-list** *access-list-number* global configuration command.
- **Named Extended ACL** - Created using the **ip access-list extended** *access-list-name*.

Configure Extended IPv4 ACLs
Protocols and Ports

Extended ACLs can **filter on internet protocols and ports**. Use the **?** to get help when entering a complex ACE. The four highlighted protocols are the **most popular** options.

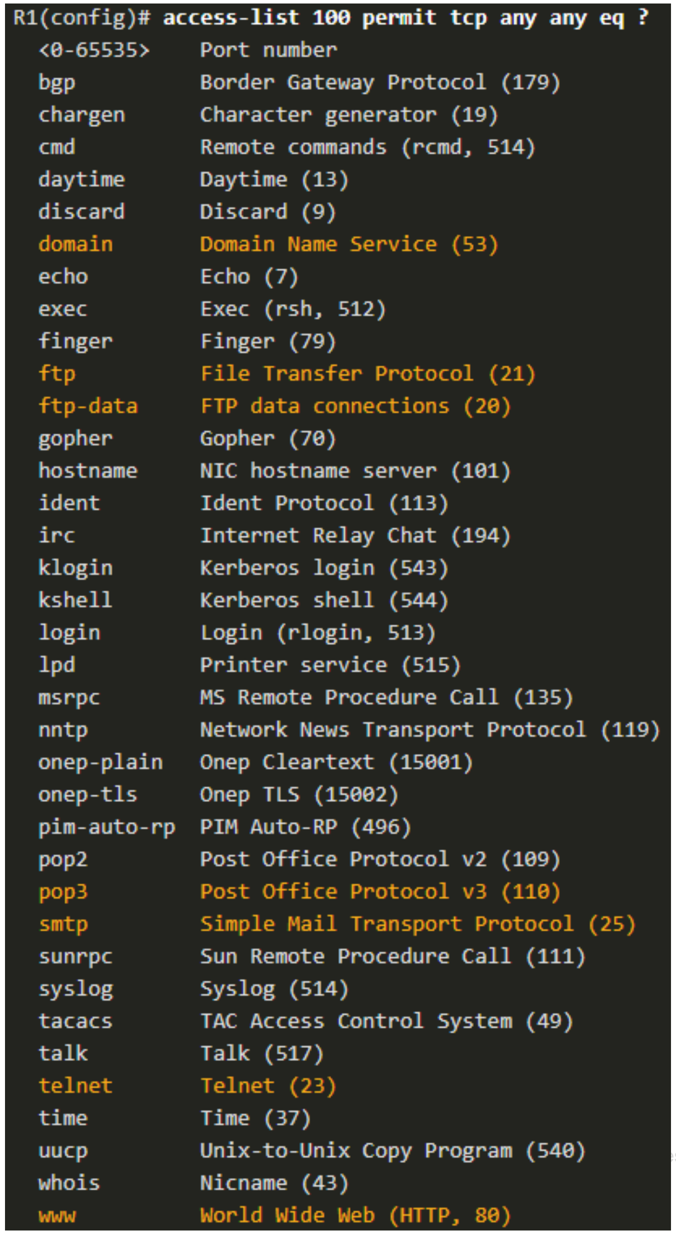
Protocol Options



```
R1(config)# access-list 100 permit ?
  <0-255>       An IP protocol number
  ahp           Authentication Header Protocol
  dvmrp         dvmrp
  eigrp         Cisco's EIGRP routing protocol
  esp           Encapsulation Security Payload
  gre           Cisco's GRE tunneling
  icmp          Internet Control Message Protocol
  igmp          Internet Gateway Message Protocol
  ip            Any Internet Protocol
  ipinip        IP in IP tunneling
  nos           KA9Q NOS compatible IP over IP tunneling
  object-group  Service object group
  ospf          OSPF routing protocol
  pcp           Payload Compression Protocol
  pim           Protocol Independent Multicast
  tcp           Transmission Control Protocol
  udp           User Datagram Protocol
R1(config)# access-list 100 permit
```

Configure Extended IPv4 ACLs
Protocols and Ports (Cont.)

Selecting a protocol influences port options. Many TCP port options are available, as shown in the output.



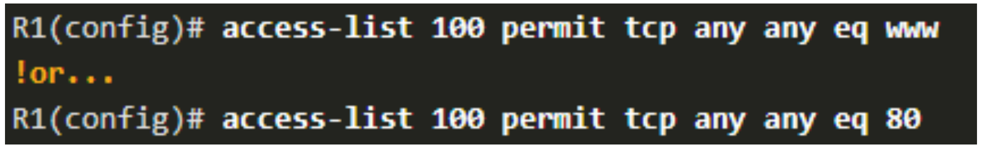
```
R1(config)# access-list 100 permit tcp any any eq ?
  <0-65535>    Port number
  bgp          Border Gateway Protocol (179)
  chargen      Character generator (19)
  cmd          Remote commands (rcmd, 514)
  daytime      Daytime (13)
  discard      Discard (9)
  domain       Domain Name Service (53)
  echo         Echo (7)
  exec         Exec (rsh, 512)
  finger       Finger (79)
  ftp          File Transfer Protocol (21)
  ftp-data     FTP data connections (20)
  gopher       Gopher (70)
  hostname     NIC hostname server (101)
  ident        Ident Protocol (113)
  irc          Internet Relay Chat (194)
  klogin       Kerberos login (543)
  kshell       Kerberos shell (544)
  login        Login (rlogin, 513)
  lpd          Printer service (515)
  msrpc        MS Remote Procedure Call (135)
  nntp         Network News Transport Protocol (119)
  onep-plain   Onep Cleartext (15001)
  onep-tls     Onep TLS (15002)
  pim-auto-rp  PIM Auto-RP (496)
  pop2         Post Office Protocol v2 (109)
  pop3         Post Office Protocol v3 (110)
  smtp         Simple Mail Transport Protocol (25)
  sunrpc       Sun Remote Procedure Call (111)
  syslog       Syslog (514)
  tacacs       TAC Access Control System (49)
  talk         Talk (517)
  telnet       Telnet (23)
  time         Time (37)
  uucp         Unix-to-Unix Copy Program (540)
  whois        Nicname (43)
  www          World Wide Web (HTTP, 80)
```

Configure Extended IPv4 ACLs

Protocols and Port Numbers Configuration Examples

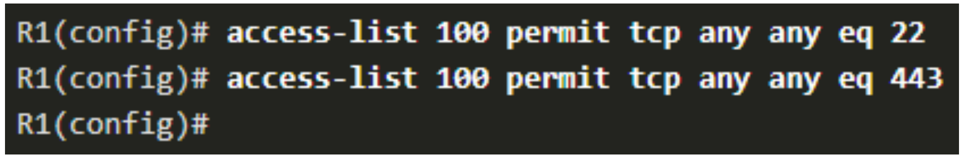
Extended ACLs can filter on different **port number** and **port name** options.

This example configures an extended ACL 100 to filter HTTP traffic. The first ACE uses the **www** port name. The second ACE uses the port number **80**. Both ACEs achieve exactly the same result.



```
R1(config)# access-list 100 permit tcp any any eq www
!or...
R1(config)# access-list 100 permit tcp any any eq 80
```

Configuring the **port number is required when there is not a specific protocol name** listed such as SSH (port number 22) or an HTTPS (port number 443), as shown in the next example.



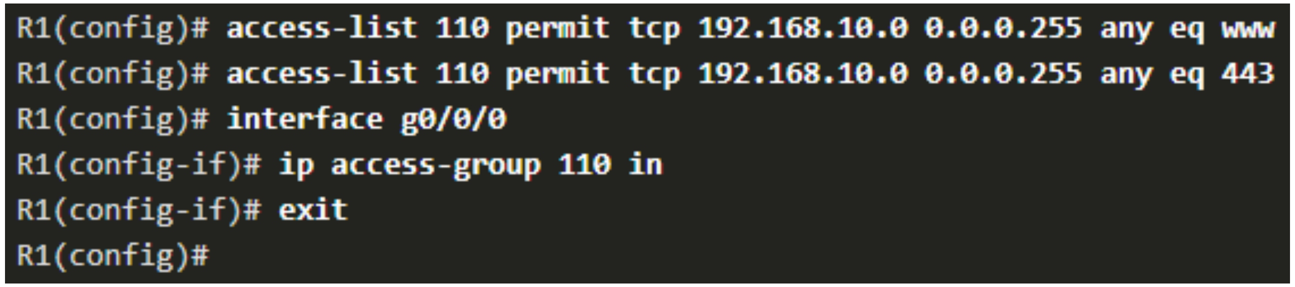
```
R1(config)# access-list 100 permit tcp any any eq 22
R1(config)# access-list 100 permit tcp any any eq 443
R1(config)#
```

Configure Extended IPv4 ACLs

Apply a Numbered Extended IPv4 ACL

In this example, **the ACL permits both HTTP and HTTPS traffic from the 192.168.10.0 network** to go to any destination.

Extended ACLs can be applied in various locations. However, they are **commonly applied close to the source**. Here ACL 110 is applied inbound on the R1 G0/0/0 interface.



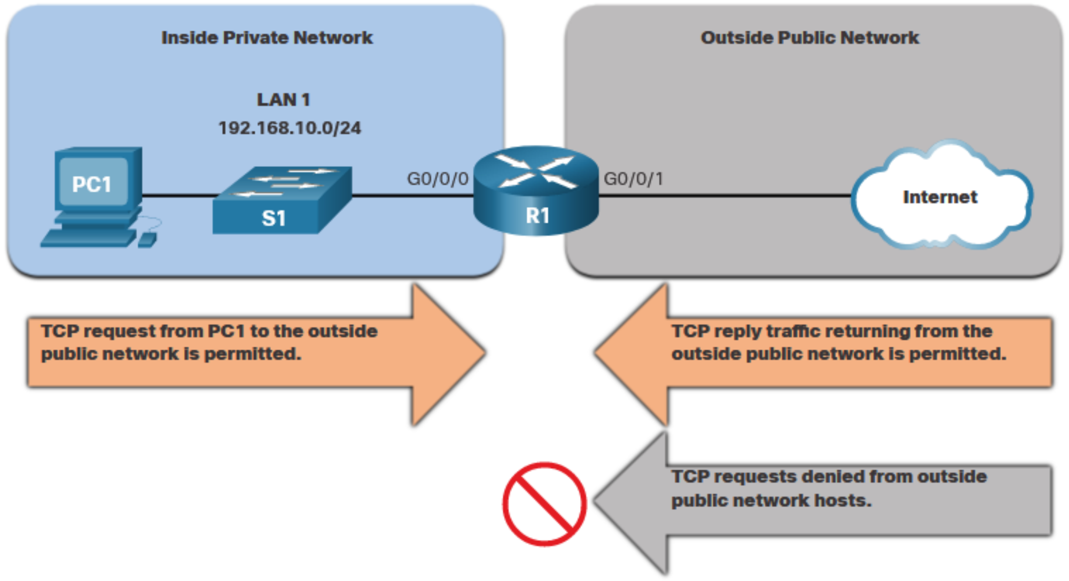
```
R1(config)# access-list 110 permit tcp 192.168.10.0 0.0.0.255 any eq www
R1(config)# access-list 110 permit tcp 192.168.10.0 0.0.0.255 any eq 443
R1(config)# interface g0/0/0
R1(config-if)# ip access-group 110 in
R1(config-if)# exit
R1(config)#
```

Configure Extended IPv4 ACLs

TCP Established Extended ACL

TCP can also perform basic **stateful firewall** services using the TCP **established** keyword.

- The **established** keyword enables inside traffic to exit the inside private network and permits the returning reply traffic to enter the inside private network.
- TCP traffic generated by an outside host and attempting to communicate with an inside host is denied.

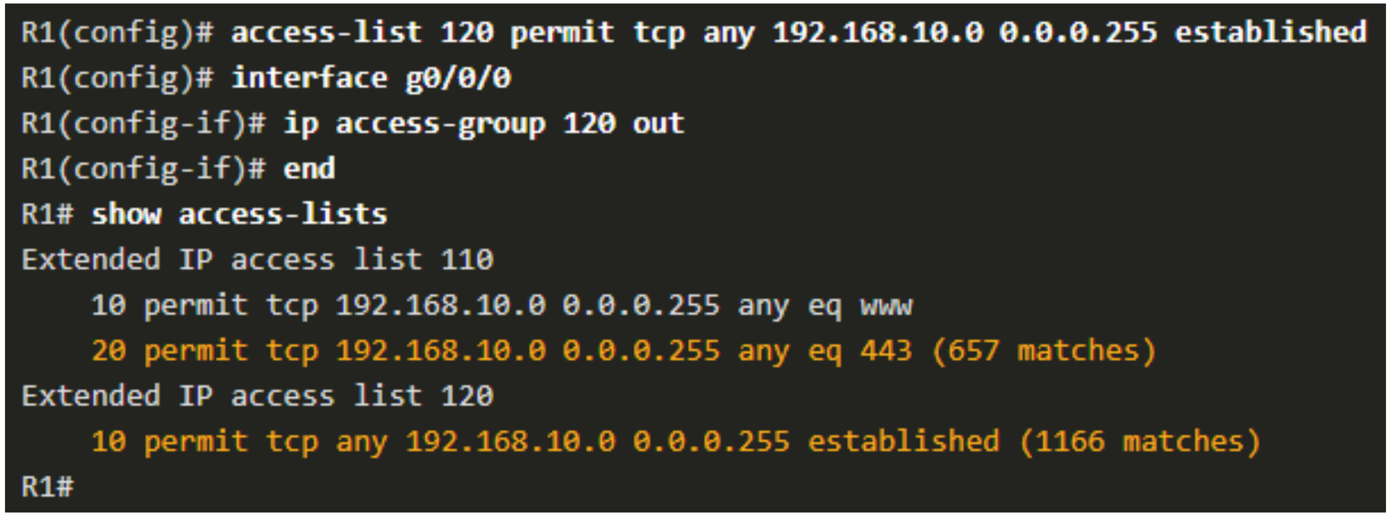

Inside Private Network
LAN 1
192.168.10.0/24
PC1
S1
G0/0/0
R1
G0/0/1
Outside Public Network
Internet
TCP request from PC1 to the outside public network is permitted.
TCP reply traffic returning from the outside public network is permitted.
TCP requests denied from outside public network hosts.

Configure Extended IPv4 ACLs

TCP Established Extended ACL (Cont.)

- ACL 120 is configured to **only permit returning web traffic to the inside hosts**. The ACL is then applied **outbound** on the R1 **G0/0/0** interface.
- The **show access-lists** command shows that inside hosts are accessing the secure web resources from the internet.

Note: A match occurs if the returning TCP segment has the ACK or reset (RST) flag bits set, indicating that the packet belongs to an existing connection.



```
R1(config)# access-list 120 permit tcp any 192.168.10.0 0.0.0.255 established
R1(config)# interface g0/0/0
R1(config-if)# ip access-group 120 out
R1(config-if)# end
R1# show access-lists
Extended IP access list 110
    10 permit tcp 192.168.10.0 0.0.0.255 any eq www
    20 permit tcp 192.168.10.0 0.0.0.255 any eq 443 (657 matches)
Extended IP access list 120
    10 permit tcp any 192.168.10.0 0.0.0.255 established (1166 matches)
R1#
```

Configure Extended IPv4 ACLs
Named Extended IPv4 ACL Syntax

Naming an ACL makes it easier to understand its function. To create a named extended ACL, use the **ip access-list extended** configuration command.

In the example, a named extended ACL called NO-FTP-ACCESS is created and the prompt changed to named extended ACL configuration mode. ACE statements are entered in the named extended ACL sub configuration mode.

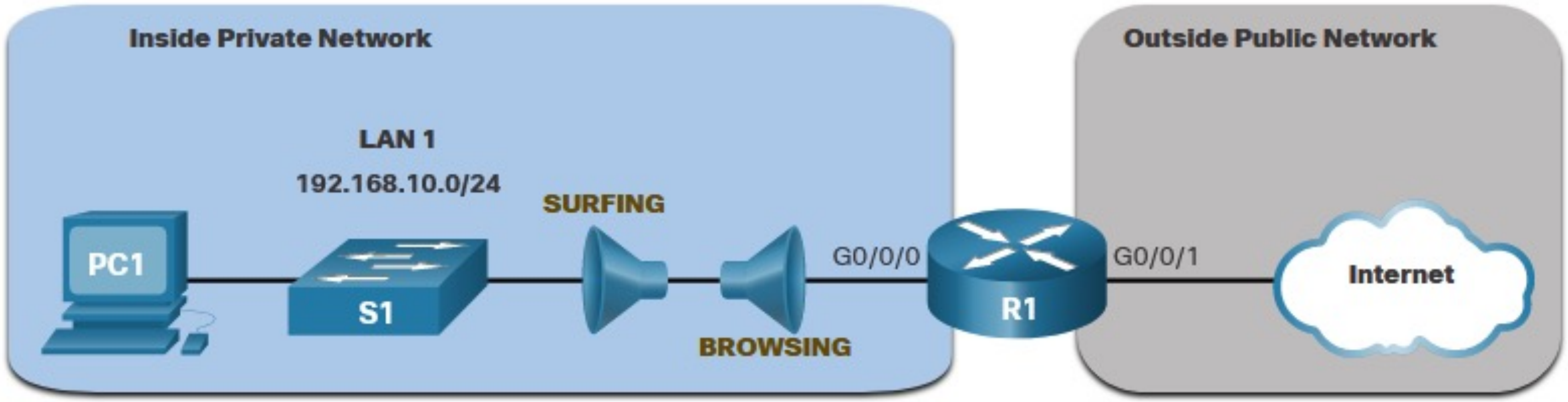
```
Router(config)# ip access-list extended access-list-name
```

```
R1(config)# ip access-list extended NO-FTP-ACCESS
R1(config-ext-nacl)#
```

Configure Extended IPv4 ACLs
Named Extended IPv4 ACL Example

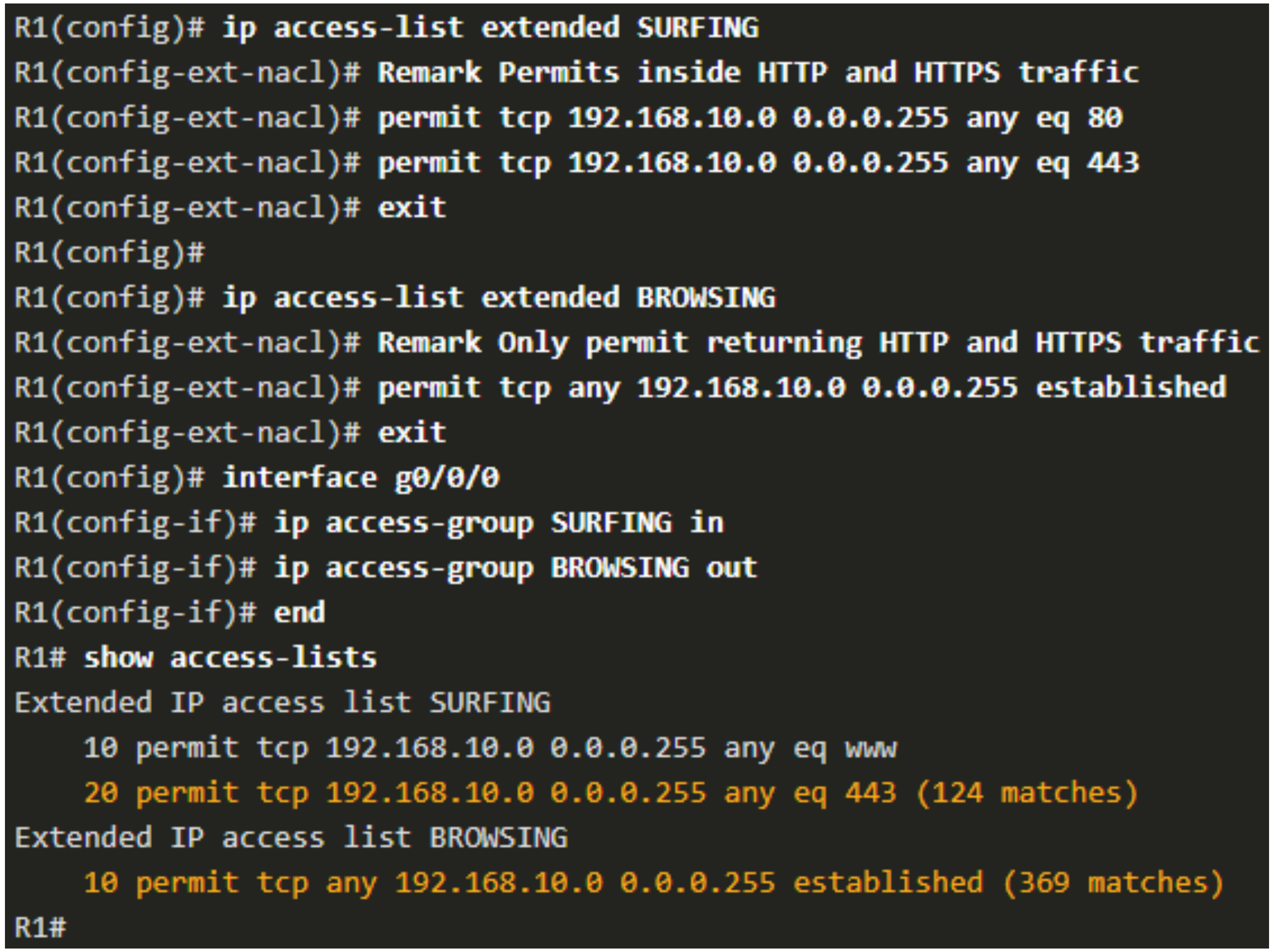
The topology below is used to demonstrate configuring and applying two named extended IPv4 ACLs to an interface:

- **SURFING** - This will permit inside HTTP and HTTPS traffic to exit to the internet.
- **BROWSING** - This will only permit returning web traffic to the inside hosts while all other traffic exiting the R1 G0/0/0 interface is implicitly denied.



Configure Extended IPv4 ACLs
Named Extended IPv4 ACL Example (Cont.)

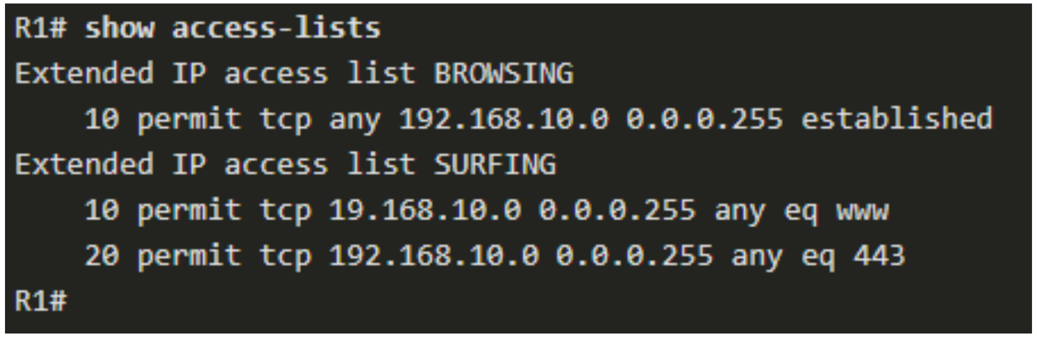
- The SURFING ACL permits HTTP and HTTPS traffic from inside users to exit the G0/0/1 interface connected to the internet. Web traffic returning from the internet is permitted back into the inside private network by the BROWSING ACL.
- The SURFING ACL is applied inbound and the BROWSING ACL is applied outbound on the R1 G0/0/0 interface.



```
R1(config)# ip access-list extended SURFING
R1(config-ext-nacl)# Remark Permits inside HTTP and HTTPS traffic
R1(config-ext-nacl)# permit tcp 192.168.10.0 0.0.0.255 any eq 80
R1(config-ext-nacl)# permit tcp 192.168.10.0 0.0.0.255 any eq 443
R1(config-ext-nacl)# exit
R1(config)#
R1(config)# ip access-list extended BROWSING
R1(config-ext-nacl)# Remark Only permit returning HTTP and HTTPS traffic
R1(config-ext-nacl)# permit tcp any 192.168.10.0 0.0.0.255 established
R1(config-ext-nacl)# exit
R1(config)# interface g0/0/0
R1(config-if)# ip access-group SURFING in
R1(config-if)# ip access-group BROWSING out
R1(config-if)# end
R1# show access-lists
Extended IP access list SURFING
    10 permit tcp 192.168.10.0 0.0.0.255 any eq www
    20 permit tcp 192.168.10.0 0.0.0.255 any eq 443 (124 matches)
Extended IP access list BROWSING
    10 permit tcp any 192.168.10.0 0.0.0.255 established (369 matches)
R1#
```

Configure Extended IPv4 ACLs
Named Extended IPv4 ACL Example (Cont.)

The show access-lists command is used to verify the ACL **statistics**. Notice that the permit secure HTTPS counters (i.e., eq 443) in the SURFING ACL and the return established counters in the BROWSING ACL have increased.



```
R1# show access-lists
Extended IP access list BROWSING
    10 permit tcp any 192.168.10.0 0.0.0.255 established
Extended IP access list SURFING
    10 permit tcp 19.168.10.0 0.0.0.255 any eq www
    20 permit tcp 192.168.10.0 0.0.0.255 any eq 443
R1#
```

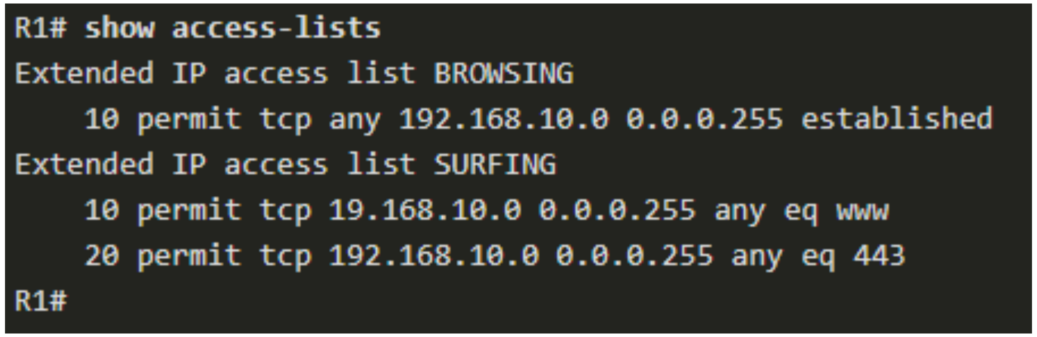
Configure Extended IPv4 ACLs

Edit Extended ACLs

An extended ACL can be edited using a **text editor** when many changes are required. Or, if the edit applies to one or two ACEs, then **sequence numbers** can be used.

Example:

- The ACE sequence number 10 in the SURFING ACL has an incorrect source IP networks address.



```
R1# show access-lists
Extended IP access list BROWSING
    10 permit tcp any 192.168.10.0 0.0.0.255 established
Extended IP access list SURFING
    10 permit tcp 19.168.10.0 0.0.0.255 any eq www
    20 permit tcp 192.168.10.0 0.0.0.255 any eq 443
R1#
```

Configure Extended IPv4 ACLs

Edit Extended ACLs (Cont.)

- To correct this error the original statement is removed with the **no** *sequence_#* command and the corrected statement is added replacing the original statement.
- The **show access-lists** command output verifies the configuration change.

```
R1# configure terminal
R1(config)# ip access-list extended SURFING
R1(config-ext-nacl)# no 10
R1(config-ext-nacl)# 10 permit tcp 192.168.10.0 0.0.0.255 any eq www
R1(config-ext-nacl)# end
```

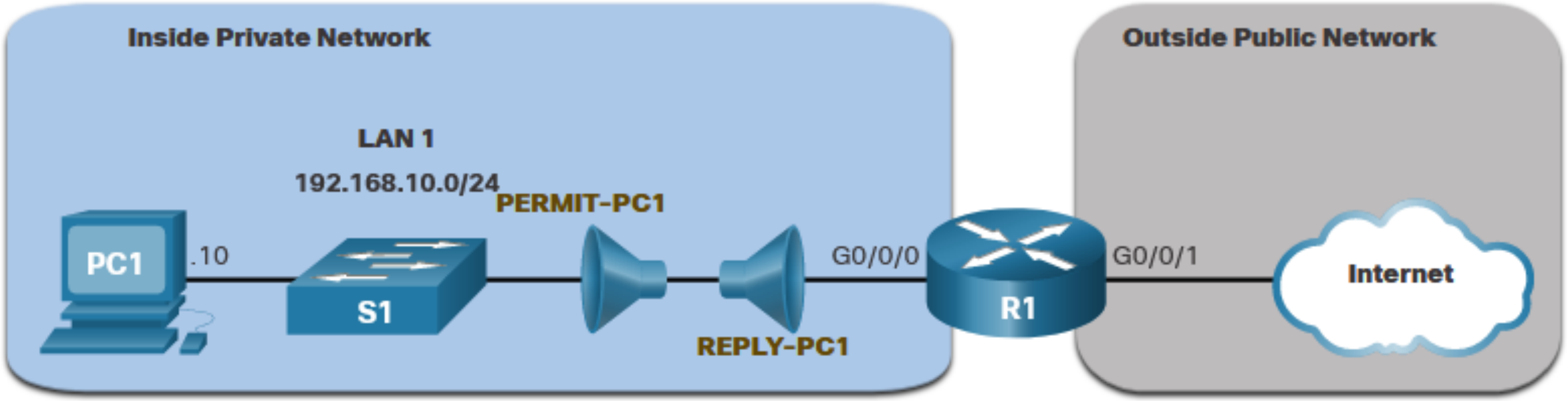
```
R1# show access-lists
Extended IP access list BROWSING
    10 permit tcp any 192.168.10.0 0.0.0.255 established
Extended IP access list SURFING
    10 permit tcp 192.168.10.0 0.0.0.255 any eq www
    20 permit tcp 192.168.10.0 0.0.0.255 any eq 443
R1#
```

Configure Extended IPv4 ACLs

Another Extended IPv4 ACL Example

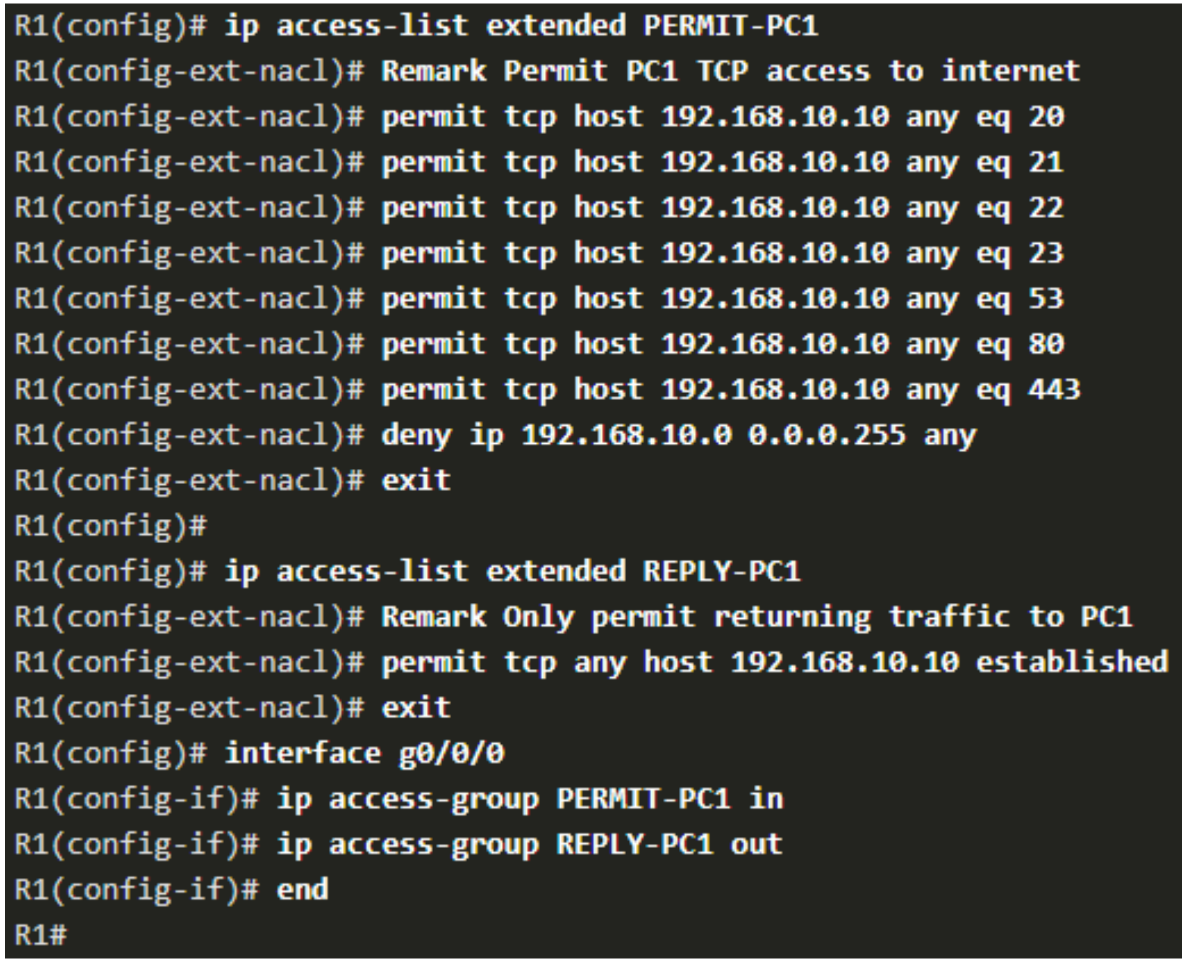
Two named extended ACLs will be created:

- **PERMIT-PC1** - This will only permit PC1 TCP access to the internet and deny all other hosts in the private network.
- **REPLY-PC1** - This will only permit specified returning TCP traffic to PC1 implicitly deny all other traffic.



Configure Extended IPv4 ACLs
Another Extended IPv4 ACL Example (Cont.)

- The **PERMIT-PC1** ACL permits PC1 (192.168.10.10) TCP access to the FTP, SSH, Telnet, DNS , HTTP, and HTTPS traffic.
- The **REPLY-PC1** ACL will permit return traffic to PC1.
- The **PERMIT-PC1** ACL is applied inbound and the **REPLY-PC1** ACL applied outbound on the R1 G0/0/0 interface.

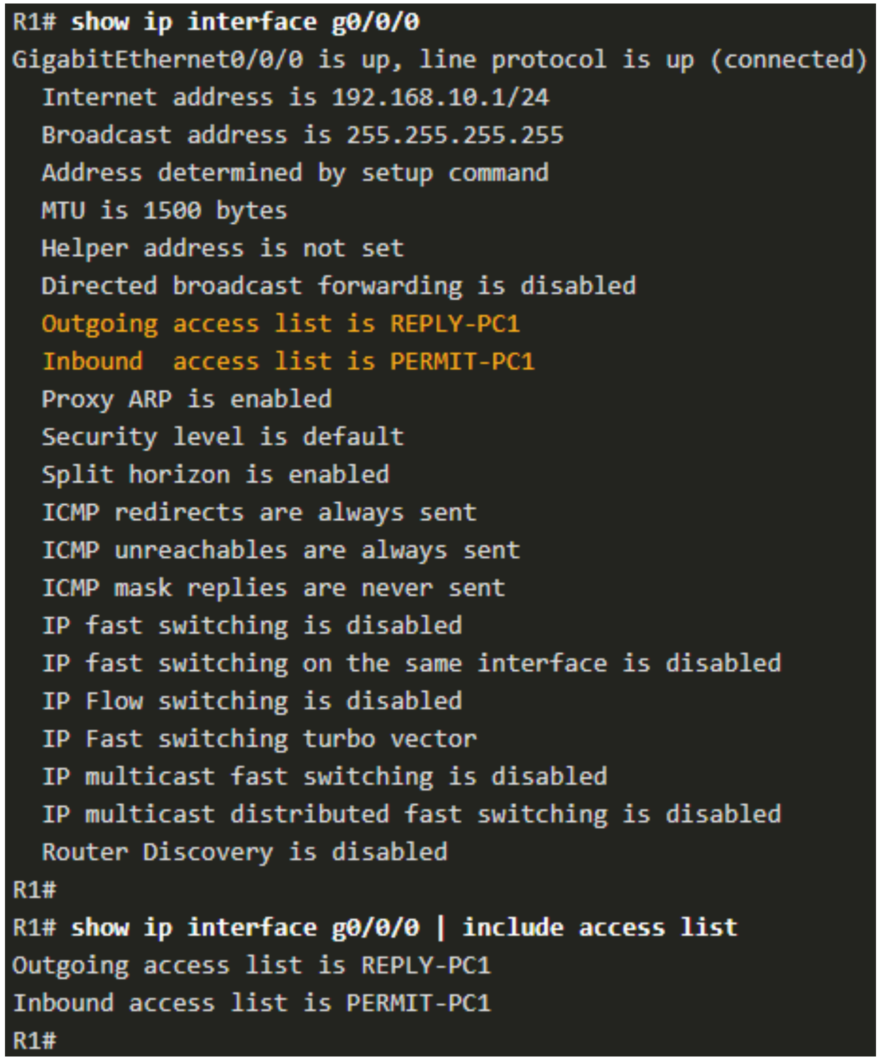


```
R1(config)# ip access-list extended PERMIT-PC1
R1(config-ext-nacl)# Remark Permit PC1 TCP access to internet
R1(config-ext-nacl)# permit tcp host 192.168.10.10 any eq 20
R1(config-ext-nacl)# permit tcp host 192.168.10.10 any eq 21
R1(config-ext-nacl)# permit tcp host 192.168.10.10 any eq 22
R1(config-ext-nacl)# permit tcp host 192.168.10.10 any eq 23
R1(config-ext-nacl)# permit tcp host 192.168.10.10 any eq 53
R1(config-ext-nacl)# permit tcp host 192.168.10.10 any eq 80
R1(config-ext-nacl)# permit tcp host 192.168.10.10 any eq 443
R1(config-ext-nacl)# deny ip 192.168.10.0 0.0.0.255 any
R1(config-ext-nacl)# exit
R1(config)#
R1(config)# ip access-list extended REPLY-PC1
R1(config-ext-nacl)# Remark Only permit returning traffic to PC1
R1(config-ext-nacl)# permit tcp any host 192.168.10.10 established
R1(config-ext-nacl)# exit
R1(config)# interface g0/0/0
R1(config-if)# ip access-group PERMIT-PC1 in
R1(config-if)# ip access-group REPLY-PC1 out
R1(config-if)# end
R1#
```

Configure Extended IPv4 ACLs

Verify Extended ACLs

The **show ip interface** command is used to verify the ACL on the interface and the direction in which it was applied.



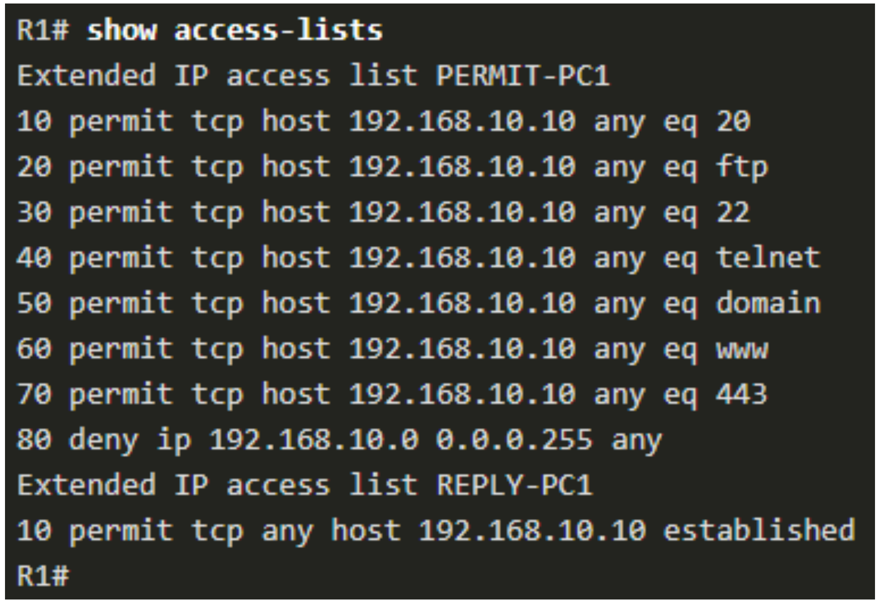
```
R1# show ip interface g0/0/0
GigabitEthernet0/0/0 is up, line protocol is up (connected)
  Internet address is 192.168.10.1/24
  Broadcast address is 255.255.255.255
  Address determined by setup command
  MTU is 1500 bytes
  Helper address is not set
  Directed broadcast forwarding is disabled
  Outgoing access list is REPLY-PC1
  Inbound  access list is PERMIT-PC1
  Proxy ARP is enabled
  Security level is default
  Split horizon is enabled
  ICMP redirects are always sent
  ICMP unreachables 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
R1#
R1# show ip interface g0/0/0 | include access list
Outgoing access list is REPLY-PC1
Inbound access list is PERMIT-PC1
R1#
```

Configure Extended IPv4 ACLs

Verify Extended ACLs (Cont.)

The **show access-lists** command can be used to confirm that the ACLs work as expected. The command displays statistic counters that increase whenever an ACE is matched.

Note: Traffic must be generated to verify the operation of the ACL.

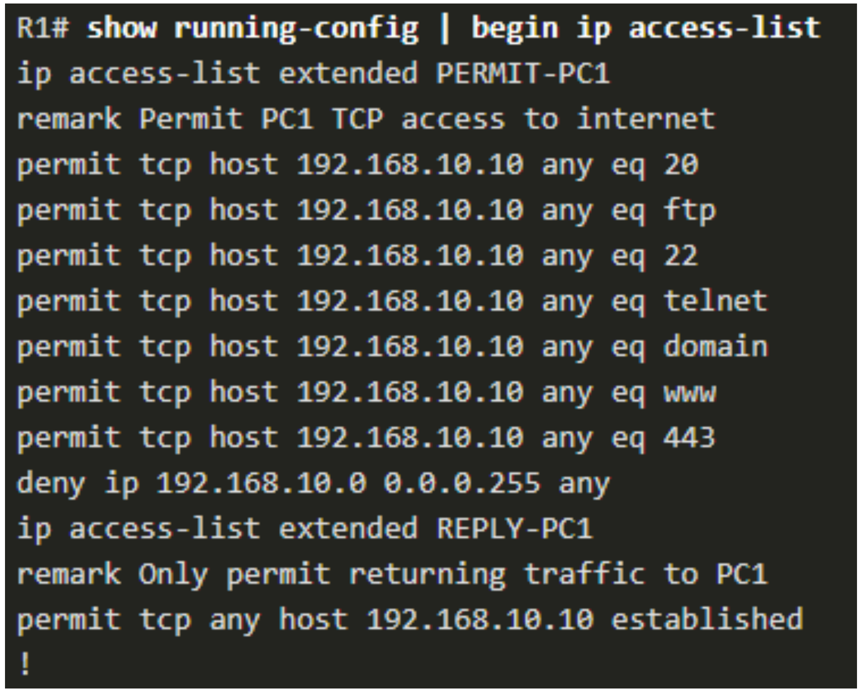


```
R1# show access-lists
Extended IP access list PERMIT-PC1
10 permit tcp host 192.168.10.10 any eq 20
20 permit tcp host 192.168.10.10 any eq ftp
30 permit tcp host 192.168.10.10 any eq 22
40 permit tcp host 192.168.10.10 any eq telnet
50 permit tcp host 192.168.10.10 any eq domain
60 permit tcp host 192.168.10.10 any eq www
70 permit tcp host 192.168.10.10 any eq 443
80 deny ip 192.168.10.0 0.0.0.255 any
Extended IP access list REPLY-PC1
10 permit tcp any host 192.168.10.10 established
R1#
```

Configure Extended IPv4 ACLs

Verify Extended ACLs (Cont.)

The **show running-config** command can be used to validate what was configured. The command also displays configured remarks.



```
R1# show running-config | begin ip access-list
ip access-list extended PERMIT-PC1
remark Permit PC1 TCP access to internet
permit tcp host 192.168.10.10 any eq 20
permit tcp host 192.168.10.10 any eq ftp
permit tcp host 192.168.10.10 any eq 22
permit tcp host 192.168.10.10 any eq telnet
permit tcp host 192.168.10.10 any eq domain
permit tcp host 192.168.10.10 any eq www
permit tcp host 192.168.10.10 any eq 443
deny ip 192.168.10.0 0.0.0.255 any
ip access-list extended REPLY-PC1
remark Only permit returning traffic to PC1
permit tcp any host 192.168.10.10 established
!
```

Packet Tracer – Configure Extended IPv4 ACLs - Scenario 1

In this Packet Tracer, you will complete the following objectives:

- Configure, Apply, and Verify an Extended Numbered IPv4 ACL.
- Configure, Apply, and Verify an Extended Named IPv4 ACL.

Configure Extended IPv4 ACLs

Packet Tracer – Configure Extended IPv4 ACLs - Scenario 2

In this Packet Tracer, you will complete the following objectives:

- Configure a Named Extended IPv4 ACL.
- Apply and Verify the Extended IPv4 ACL.