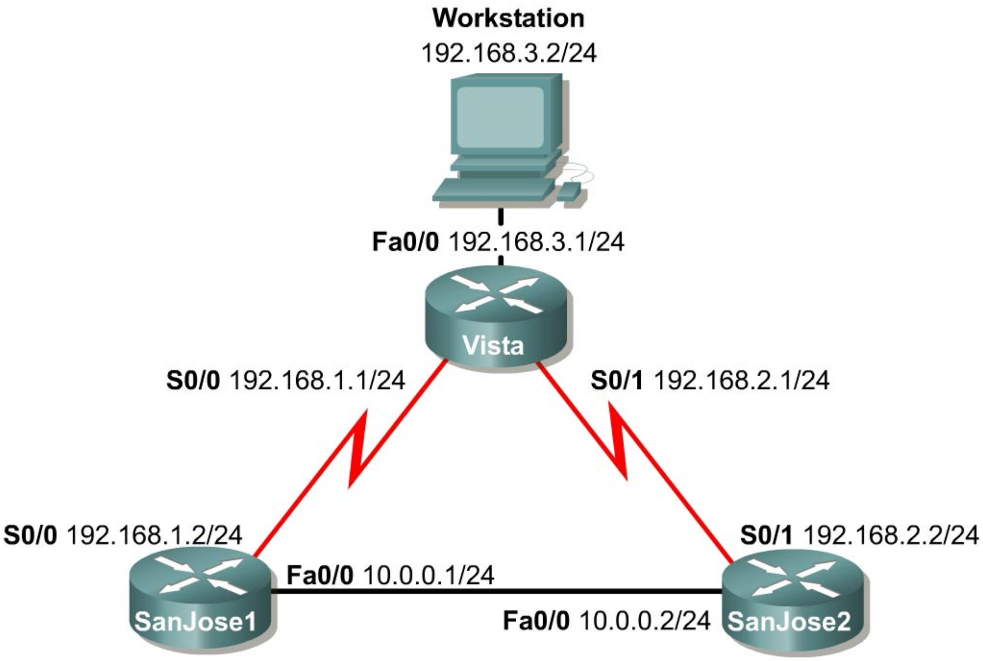
Lab 1.4.3 Introductory Lab 3 - Access Control List Basics and Extended Ping



Objective

This lab activity reviews the basics of standard and extended access lists, which are used extensively in the CCNP curriculum.

Scenario

The LAN users connected to the Vista router are concerned about access to their network from hosts on network 10.0.0.0. Use a standard access list to block all access to Vista's LAN from network 10.0.0.0/24.

After removing the standard access list, use an extended ACL to block network 192.168.3.0 host access to Web servers on the 10.0.0.0/24 network.

Step 1

Build and configure the network according to the diagram. Use RIP v1 and enable updates on all active interfaces with the appropriate `network` commands. The commands necessary to configure RIP v1 are as follows:

```
SanJose1(config)#router rip
SanJose1(config-router)#network 192.168.1.0
SanJose1(config-router)#network 10.0.0.0
Vista(config)#router rip
Vista(config-router)#network 192.168.1.0
Vista(config-router)#network 192.168.2.0
SanJose2(config)#router rip
SanJose2(config-router)#network 192.168.2.0
SanJose2(config-router)#network 10.0.0.0
```

Use the **`ping`** command to verify the work and test connectivity between all interfaces. Once you have verified connectivity, save your configurations for reuse in Labs 1.5.1 and 1.5.2.

Step 2

Check the routing table on Vista using the **`show ip route`** command. Vista should have all four networks in its table. Troubleshoot, if necessary.

Access Control List Basics

Access Control Lists (ACLs) are simple but powerful tools. When the access list is configured, each statement in the list is processed by the router in the order in which it was created. If an individual packet meets the criteria of a statement, the permit or deny is applied to that packet, and no further list entries are checked. The next packet to be checked starts again at the top of the list.

It is not possible to reorder statements, skip statements, edit statements, or delete statements from a numbered access list. With numbered access lists, any attempt to delete a single statement results in the deletion of the entire list. Named ACLs (NACLs) do allow for the deletion of individual statements.

The following concepts apply to both standard and extended access lists:

Two step process. First, the access list is created with one or more **`access-list`** commands while in global configuration mode. Second, the access list is applied to or referenced by other commands, such as the **`access-group`** command, to apply an ACL to an interface. An example would be the following:

```
Vista#config t
Vista(config)#access-list 50 deny 10.0.0.0 0.0.0.255
Vista(config)#access-list 50 permit any
Vista(config)#interface fastethernet 0/0
Vista(config-if)#ip access-group 50 out
Vista(config-if)#^Z
```

Syntax and Keywords

The basic syntax for creating an access list entry is as follows:

```
router(config)#access-list acl-number {permit | deny}...
```

The **`permit`** command allows packets matching the specified criteria to be accepted for whatever application the access list is being used. The **`deny`** command discards packets matching the criteria on that line.

Two important keywords that can be used with IP addresses and the **`access list`** command are **`any`** and **`host`**. The keyword **`any`** matches all hosts on all networks, equivalent to **`0.0.0.0 255.255.255.255`**. The keyword **host** can be used with an IP address to indicate a single host address. The syntax is `host` *`ip-address`*, such as `host 192.168.1.10`. This is treated exactly the same as 192.168.1.10 0.0.0.0.

Implicit deny statement. Every access list contains a final 'deny' statement that matches all packets. This is called the implicit deny. Because the implicit deny statement is not visible in `show` command output, it is often overlooked, with serious consequences. As an example, consider the following single line access list:

```
Router(config)#access-list 75 deny host 192.168.1.10
```

Access-list 75 clearly denies all traffic sourced from the host, 192.168.1.10. What might not be obvious is that all other traffic will be discarded as well, because the `deny any` is the final statement in any access list.

At least one permit statement is required. There is no requirement that an ACL contain a `deny` statement. If nothing else, the `deny any` statement takes care of that. But if there are no `permit` statements, the effect will be the same as if there were only a single `deny any` statement.

Wildcard mask. In identifying IP addresses, ACLs use a wildcard mask instead of a subnet mask. Initially, they might look like the same thing, but closer observation reveals that they are very different. Remember that a binary 0 in a wildcard bitmask instructs the router to match the corresponding bit in the IP address.

In/out. When deciding whether an ACL should be applied to inbound or outbound traffic, always view things from the perspective of the router. Determine whether traffic is coming into the router, inbound, or leaving the router, outbound.

Applying ACLs. Extended ACLs should be applied as close to the source as possible, thereby conserving network resources. It is necessary for standard ACLs to be applied as close to the destination as possible, because the standard ACL can match only at the source address of a packet.

Step 3

On the Vista router, create the following standard ACL and apply it to the LAN interface:

```
Vista#config t

Vista(config)#access-list 50 deny 10.0.0.0 0.0.0.255

Vista(config)#access-list 50 permit any

Vista(config)#interface fastethernet 0/0

Vista(config-if)#ip access-group 50 out

Vista(config-if)#^Z
```

Try `pinging` 192.168.3.2 from SanJose1.

The ping should be successful. This result might be unexpected, because all traffic from the 10.0.0.0/8 network was blocked. The ping is successful because, even though it came from SanJose1, it is not sourced from the 10.0.0.0/8 network. A `ping` or `traceroute` from a router uses the closest interface to the destination as the source address. Therefore, the `ping` is coming from the 192.168.1.0/24, SanJose1's Serial 0/0.

In order to test the ACL from SanJose1, use the extended `ping` command to specify a specific source interface.

Step 4

On SanJose1, issue the following commands. Remember that the extended **`ping`** works only in privileged mode.

```
SanJose1#ping 192.168.3.2
Sending 5, 100-byte ICMP Echos to 192.168.3.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/4/4 ms
SanJose1#
SanJose1#ping
Protocol [ip]:
Target IP address: 192.168.3.2
Repeat count [5]:
Datagram size [100]:
Timeout in seconds [2]:
Extended commands [n]: y
Source address or interface: 10.0.0.1
Type of service [0]:
Set DF bit in IP header? [no]:
Validate reply data? [no]:
Data pattern [0xABCD]:
Loose, Strict, Record, Timestamp, Verbose[none]:
Sweep range of sizes [n]:
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.3.2, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)
```

Step 5

Standard ACLs are numbered 1-99. IOS Release 12.0 also allows standard lists to be numbered 1300–1699. Extended ACLs are numbered 100-199. IOS Release 12.0 allows lists to be numbered 2000-2699. Extended ACLs can be used to enforce highly specific criteria for filtering packets. In this step, configure an extended ACL to block access to a Web server.

Before proceeding, issue the **`no access-list 50`** and **`no ip access-group 50`** commands on the Vista router to remove the ACL configured previously.

Now, configure both SanJose1 and SanJose 2 to act as Web servers, by using the **`ip http server`** command, shown as follows:

```
SanJose1(config)#ip http server
SanJose2(config)#ip http server
```

From the workstation at 192.168.3.2, use a Web browser to view the Web servers on both routers at 10.0.0.1 and 10.0.0.2. The Web login requires that the enable secret password for the router be entered as the password.

After verifying the Web connectivity between the workstation and the routers, proceed to Step 6.

Step 6

On the Vista router, enter the following commands:

```
Vista(config)#access-list 101 deny tcp 192.168.3.0 0.0.0.255 10.0.0.0
0.0.0.255 eq www

Vista(config)#access-list 101 deny tcp 192.168.3.0 0.0.0.255 any eq ftp

Vista(config)#access-list 101 permit ip any any

Vista(config)#interface fastethernet 0/0

Vista(config-if)#ip access-group 101 in
```

From the workstation at 192.168.3.2, again attempt to view the Web servers at 10.0.0.1 and 10.0.0.2. Both attempts should fail.

> **Note:** It may be necessary to click on the browser REFRESH button so that the screen display will not come from the browsers cache.

Next, browse SanJose1 at 192.168.1.2. Why is this not blocked?

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