CCNA 200-301, Volume 2

Chapter 2

Basic IPv4 Access Control Lists

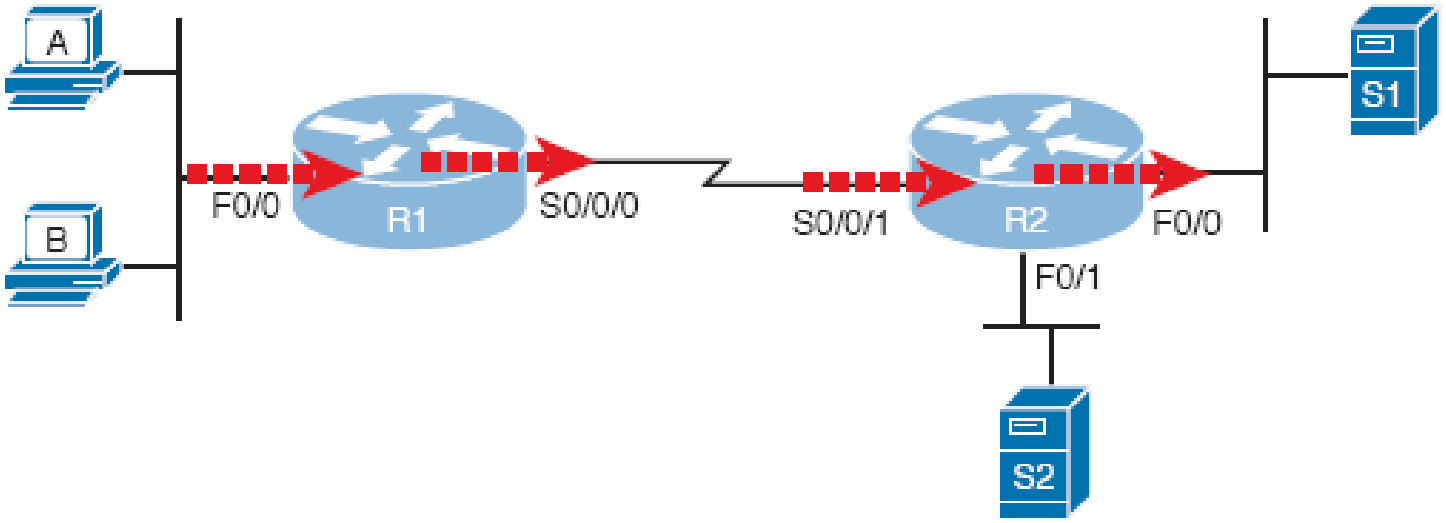
Objectives

- Configure and verify access control lists

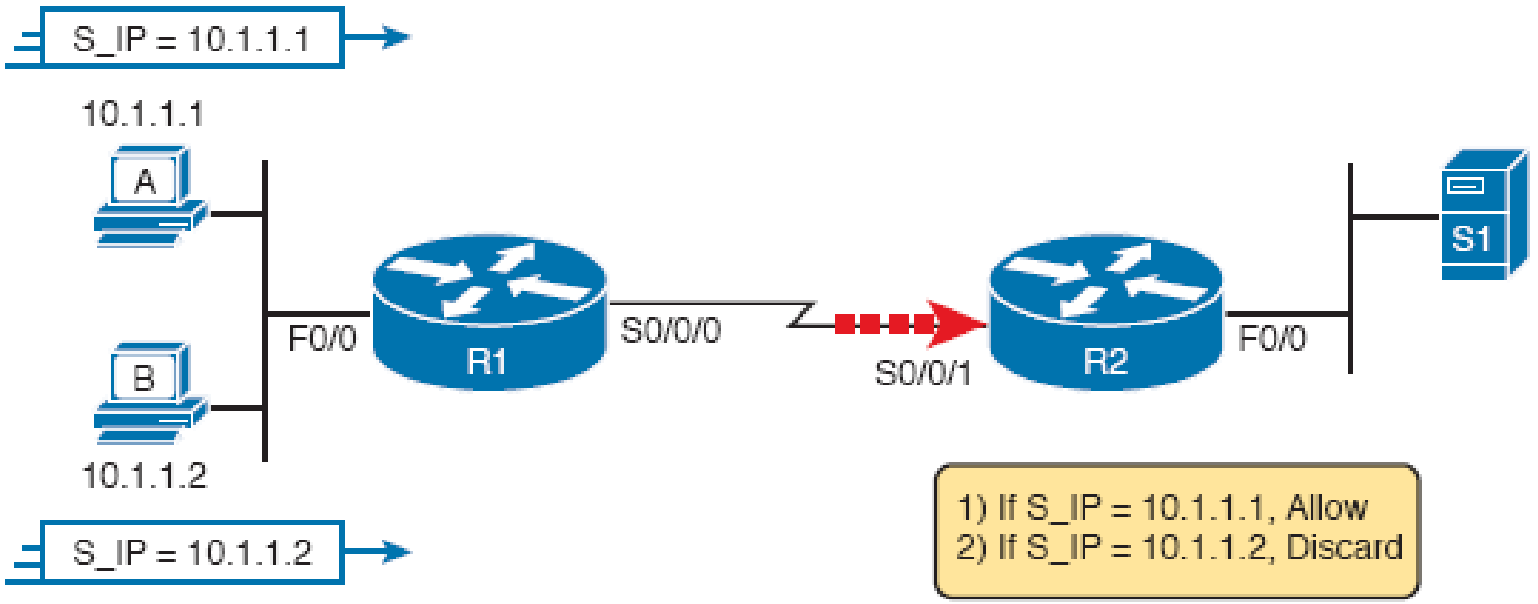
IPv4 Access Control List Basics

- IPv4 access control lists give network engineers a way to identify different types of packets.
- ACL configurations list values that the router can see in the IP, ICMP, TCP, and UDP (and other) headers.
- IPv4 ACLs perform many functions in Cisco routers, including packet filtering and QoS.

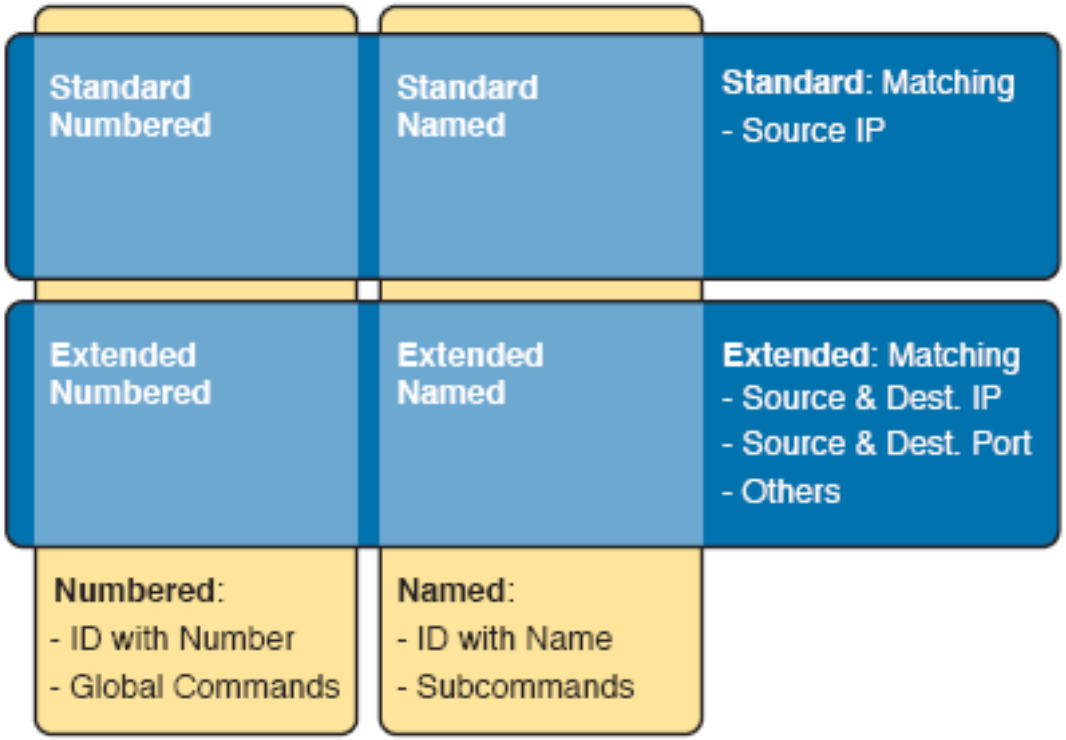
Locations to Filter Packets from Hosts A and B Going Toward Server S1



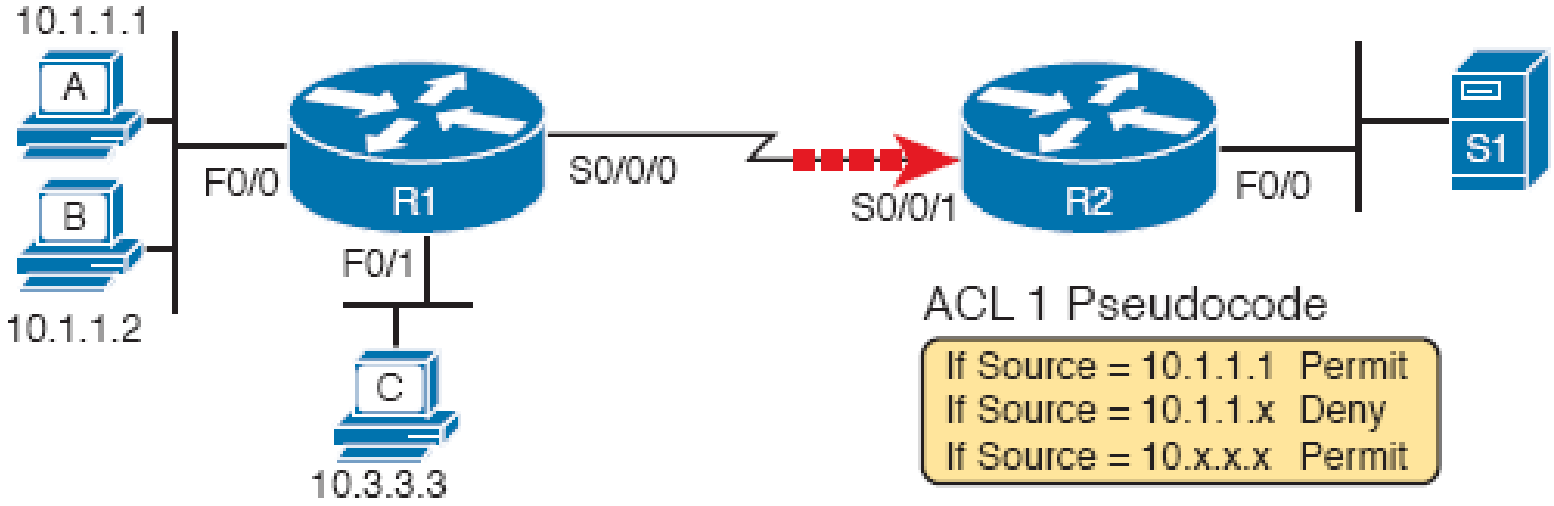
Pseudocode to Demonstrate ACL Command-Matching Logic



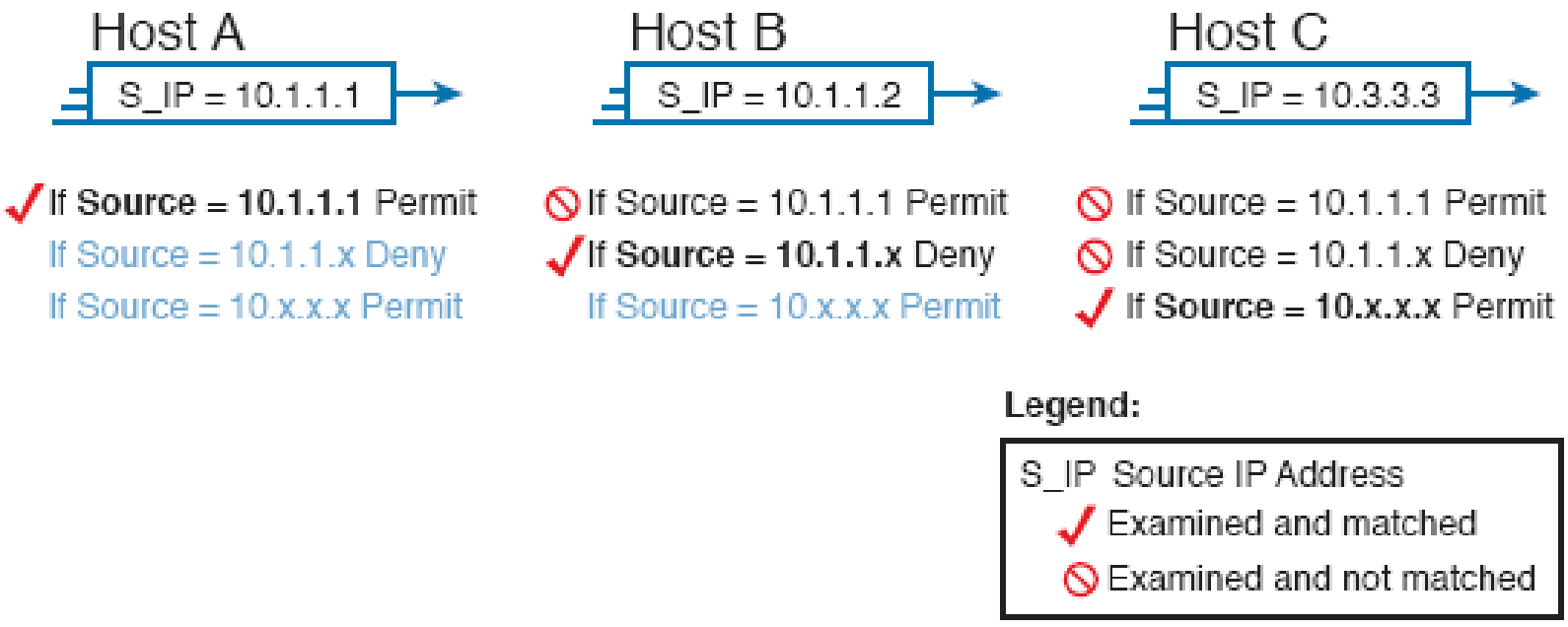
Comparisons of IP ACL Types



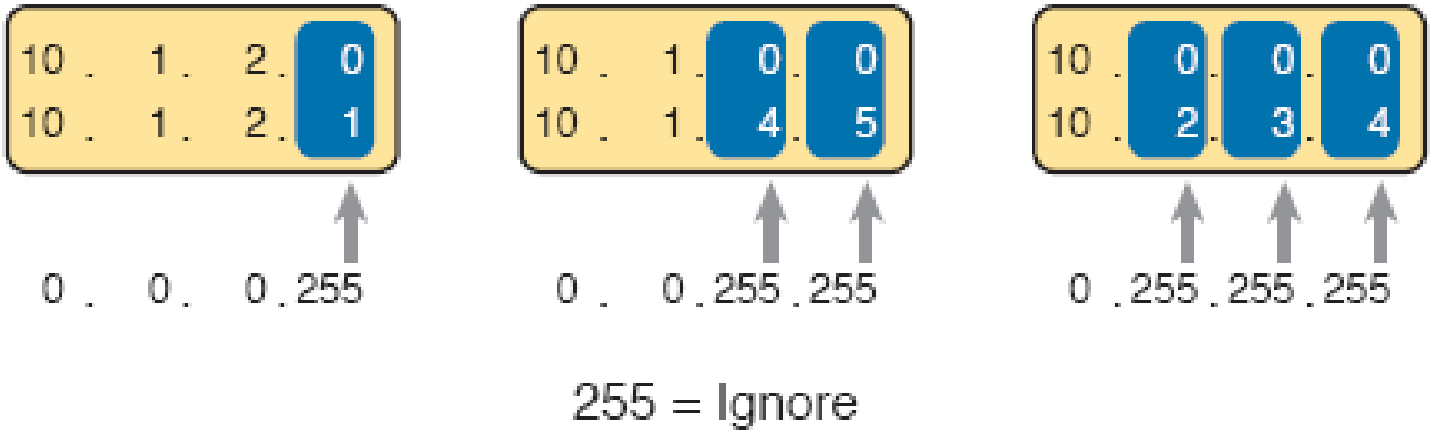
Backdrop for Discussion of List Process with IP ACLs



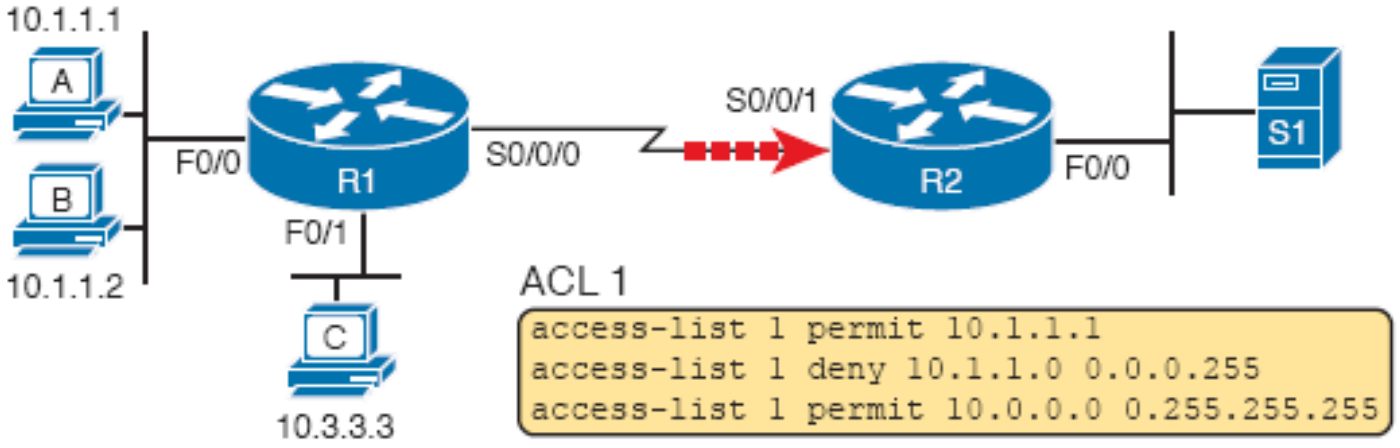
ACL Items Compared for Packets from Hosts A, B, and C on Previous Slide



Logic for WC Masks 0.0.0.255, 0.0.255.255, and 0.255.255.255



Syntactically Correct ACL Replaces Pseudocode



Binary Wildcard Mask Example

- For subnet 172.16.8.0 255.255.252.0, use the subnet number as the address parameter and do the following math to find the wildcard mask:

```
  255.255.255.255
- 255.255.252.0
-----------------
    0.   0.   3.255
```

Matching Any/All Addresses

- In some cases, one ACL command can be used to match any and all packets that reach that point in the ACL using the *any* keyword.
- Example: access-list 1 permit any.
- All Cisco IP ACLs end with an implicit *deny any*.

Implementing Standard IP ACLs

- Step 1: Plan the location and direction on that interface
- Step 2: Configuration one or more access-list global configuration commands to create the ACL
- Step 3: Enable the ACL on the chosen router interface, in the correct direction, using the ip access-group *number* {in | out} interface subcommand.

Standard Numbered ACL Example 1 Configuration

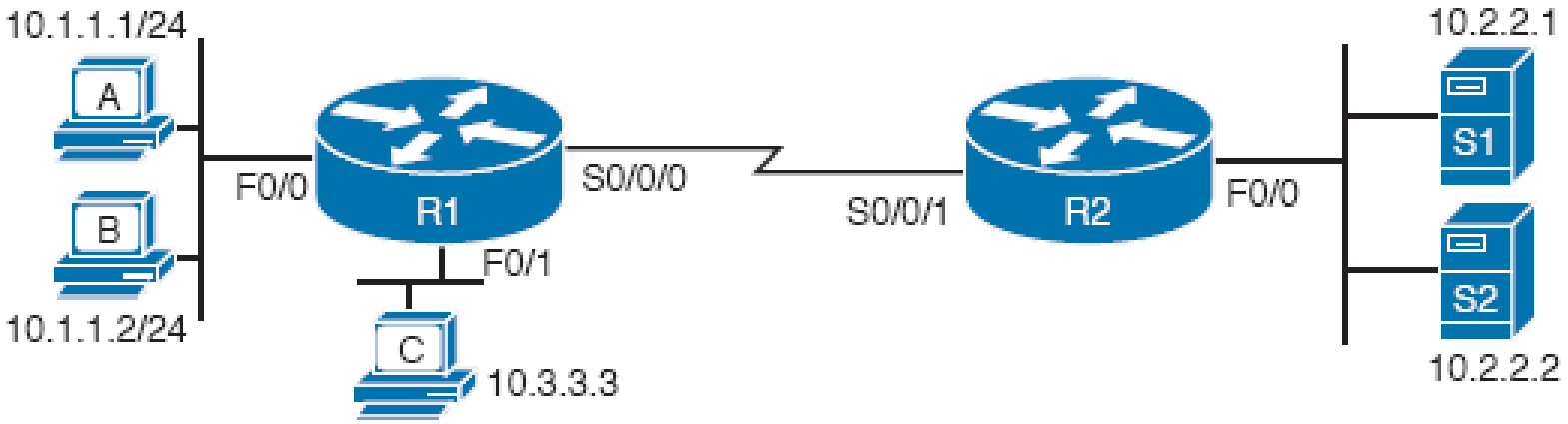
```
R2# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)# access-list 1 permit 10.1.1.1
R2(config)# access-list 1 deny 10.1.1.0 0.0.0.255
R2(config)# access-list 1 permit 10.0.0.0 0.255.255.255
R2(config)# interface S0/0/1
R2(config-if)# ip access-group 1 in
R2(config-if)# ^Z
R2# show running-config
! Lines omitted for brevity

access-list 1 permit 10.1.1.1
access-list 1 deny 10.1.1.0 0.0.0.255
access-list 1 permit 10.0.0.0 0.255.255.255
```

ACL *show* Commands on R2

```
R2# show ip access-lists
Standard IP access list 1
    10 permit 10.1.1.1 (107 matches)
    20 deny   10.1.1.0, wildcard bits 0.0.0.255 (4 matches)
    30 permit 10.0.0.0, wildcard bits 0.255.255.255 (10 matches)
R2# show access-lists
Standard IP access list 1
    10 permit 10.1.1.1 (107 matches)
    20 deny   10.1.1.0, wildcard bits 0.0.0.255 (4 matches)
    30 permit 10.0.0.0, wildcard bits 0.255.255.255 (10 matches)
R2# show ip interface s0/0/1
Serial0/0/1 is up, line protocol is up
  Internet address is 10.1.2.2/24
  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
  Multicast reserved groups joined: 224.0.0.9
  Outgoing access list is not set
  Inbound  access list is 1
! Lines omitted for brevity
```

Standard Numbered ACL Example 2

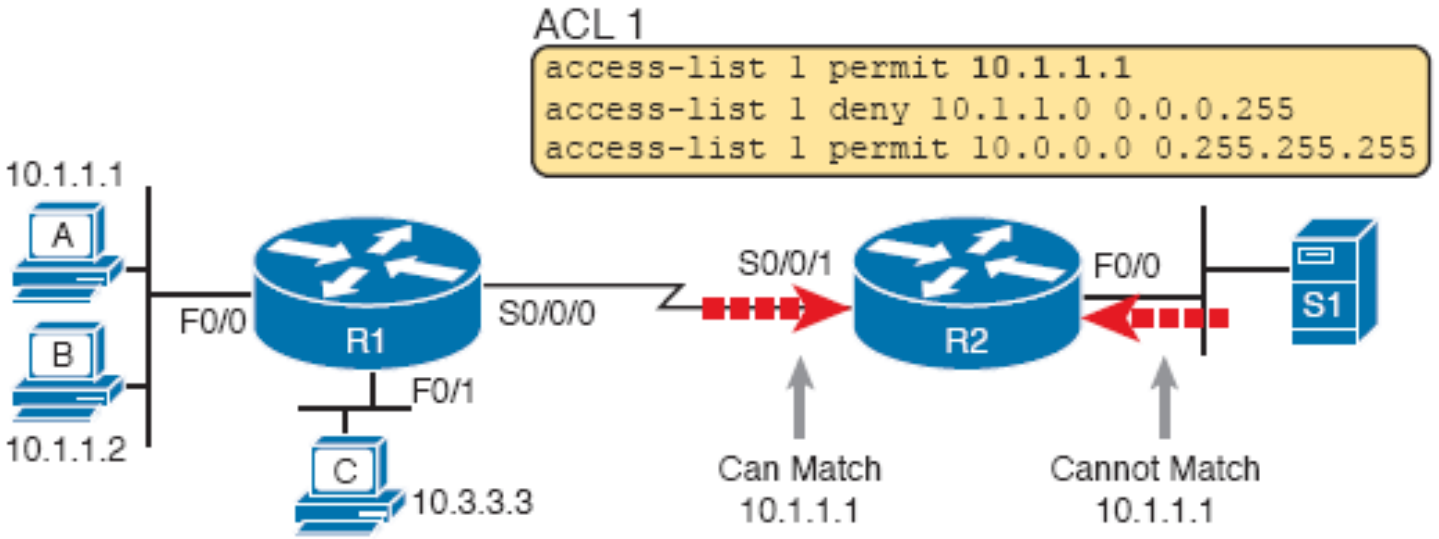


Creating Log Messages for ACL Statistics

```
R1# show running-config
! lines removed for brevity
access-list 2 remark This ACL permits server S1 traffic to host A's subnet
access-list 2 permit 10.2.2.1 log
!
interface F0/0
 ip access-group 2 out

R1#
Feb  4 18:30:24.082: %SEC-6-IPACCESSLOGNP: list 2 permitted 0 10.2.2.1 -> 10.1.1.1, 1
  packet
```

Example of Checking the Interface and Direction for an ACL



Building One-Line Standard ACLs: Practice

Problem	Criteria
1	Packets from 172.16.5.4
2	Packets from hosts with 192.168.6 as the first three octets
3	Packets from hosts with 192.168 as the first two octets
4	Packets from any host
5	Packets from subnet 10.1.200.0/21
6	Packets from subnet 10.1.200.0/27
7	Packets from subnet 172.20.112.0/23
8	Packets from subnet 172.20.112.0/26
9	Packets from subnet 192.168.9.64/28
10	Packets from subnet 192.168.9.64/30

Reverse Engineering from ACL to Address Range

- With the command **access-list 1 permit 172.16.200.0 0.0.7.255**, the low end of the range is 172.16.200.0.
- To find the high end of the range, add this number to the WC mask, as shown here:

```
172.16.200.0
+ 0.  0.   7.255
---------------
172.16.207.255
```

Finding IP Addresses/Ranges Matching by Existing ACLs

Problem	Criteria
1	**access-list 1 permit 10.7.6.5**
2	**access-list 2 permit 192.168.4.0 0.0.0.127**
3	**access-list 3 permit 192.168.6.0 0.0.0.31**
4	**access-list 4 permit 172.30.96.0 0.0.3.255**
5	**access-list 5 permit 172.30.96.0 0.0.0.63**
6	**access-list 6 permit 10.1.192.0 0.0.0.31**
7	**access-list 7 permit 10.1.192.0 0.0.1.255**
8	**access-list 8 permit 10.1.192.0 0.0.63.255**

IOS Changing the Address Field in an **access-list** Command

```
R2# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)# access-list 21 permit 10.1.1.1 0.0.255.255
R2(config)# ^Z
R2#
R2# show ip access-lists
Standard IP access list 21
    10 permit 10.1.0.0, wildcard bits 0.0.255.255
```