

## IPv4 Unicast, Broadcast, and Multicast

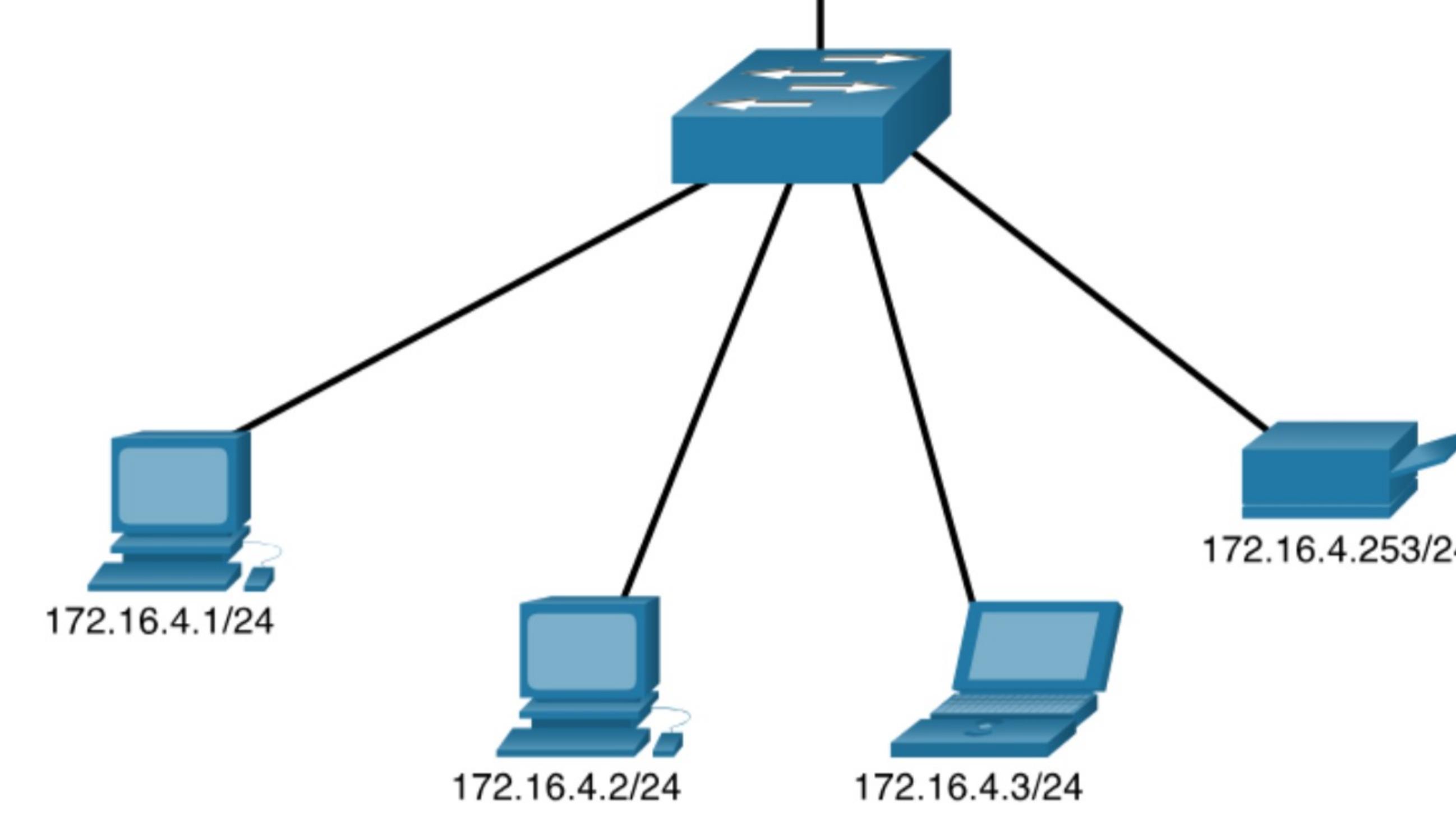
### Unicast

In the previous topic you learned about the structure of an IPv4 address; each has a network portion and a host portion. There are different ways to send a packet from a source device, and these different transmissions affect the destination IPv4 addresses.

Unicast transmission refers to one device sending a message to one other device in one-to-one communications.

A unicast packet has a destination IP address that is a unicast address which goes to a single recipient. A source IP address can only be a unicast address, because the packet can only originate from a single source. This is regardless of whether the destination IP address is a unicast, broadcast or multicast.

Play the animation to see an example of unicast transmission.



Note: In this course, all communication between devices is unicast unless otherwise noted.

IPv4 unicast host addresses are in the address range of 1.0.0.1 to 223.255.255.255. However, within this range are many addresses that are reserved for special purposes. These special purpose addresses will be discussed later in this module.

### Broadcast

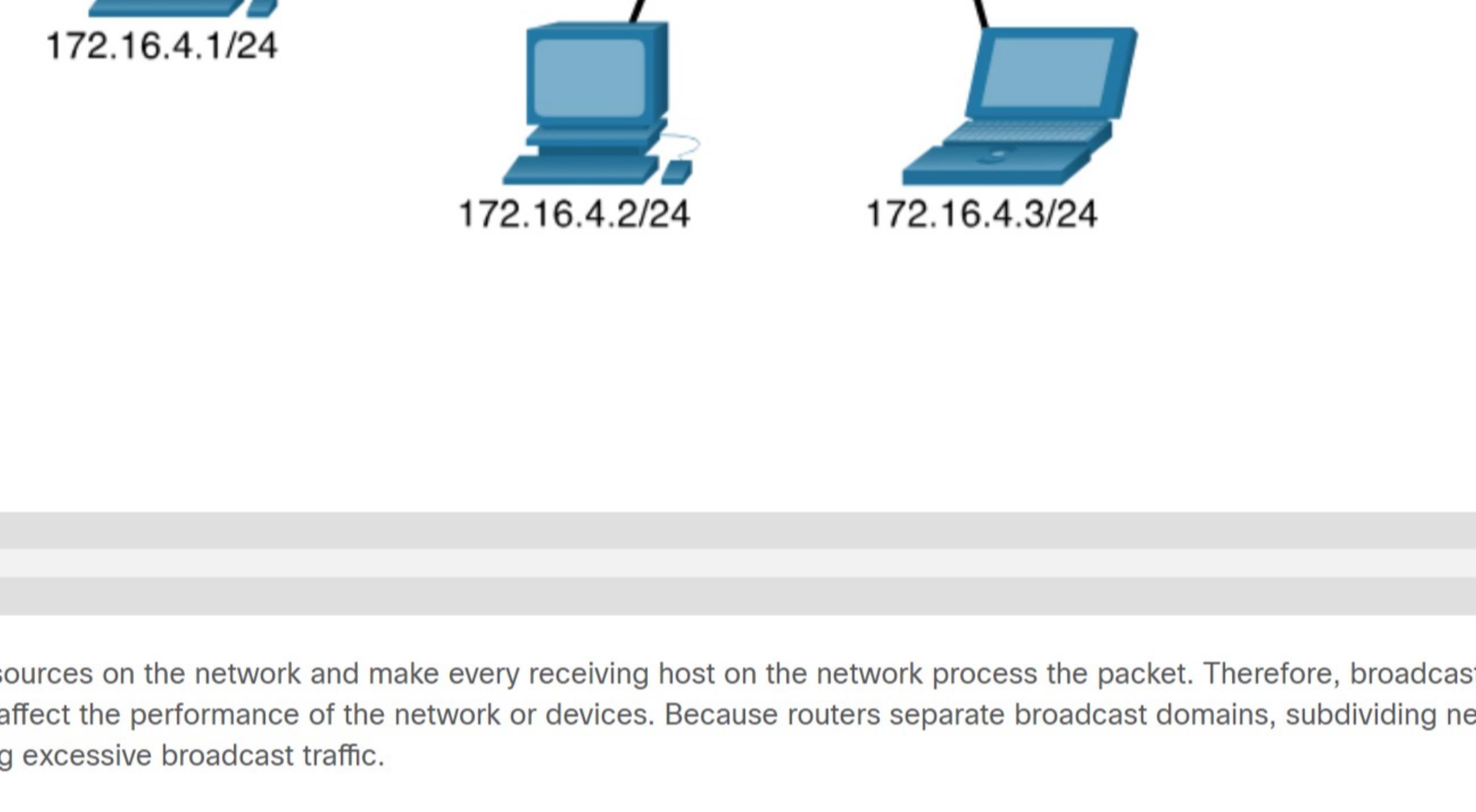
Broadcast transmission refers to a device sending a message to all the devices on a network in one-to-all communications.

A broadcast packet has a destination IP address with all ones (1s) in the host portion, or 32 one (1) bits.

Note: IPv4 uses broadcast packets. However, there are no broadcast packets with IPv6.

A broadcast packet must be processed by all devices in the same broadcast domain. A broadcast domain identifies all hosts on the same network segment. A broadcast may be directed or limited. A directed broadcast is sent to all hosts on a specific network. For example, a host on the 172.16.4.0/24 network sends a packet to 172.16.4.255. A limited broadcast is sent to 255.255.255.255. By default, routers do not forward broadcasts.

Play the animation to see an example of a limited broadcast transmission.



Broadcast packets use resources on the network and make every receiving host on the network process the packet. Therefore, broadcast traffic should be limited so it does not adversely affect the performance of the network or devices. Because routers separate broadcast domains, subdividing networks can improve network performance by eliminating excessive broadcast traffic.

#### IP Directed Broadcasts

In addition to the 255.255.255.255 broadcast address, there is a broadcast IPv4 address for each network. Called a directed broadcast, this address uses the highest address in the network, which is the address where all the host bits are 1s. For example, the directed broadcast address for 192.168.1.0/24 is 192.168.1.255. This address allows communication to all the hosts in that network. To send data to all the hosts in a network, a host can send a single packet that is addressed to the broadcast address of the network.

A device that is not directly connected to the destination network forwards an IP directed broadcast in the same way it would forward unicast IP packets destined to a host on that network. When a directed broadcast packet reaches a router that is directly connected to the destination network, that packet is broadcast on the destination network.

Note: Because of security concerns and prior abuse from malicious users, directed broadcasts are turned off by default starting with Cisco IOS Release 12.0 with the global configuration command `no ip directed-broadcasts`.

### Multicast

Multicast transmission reduces traffic by allowing a host to send a single packet to a selected set of hosts that subscribe to a multicast group.

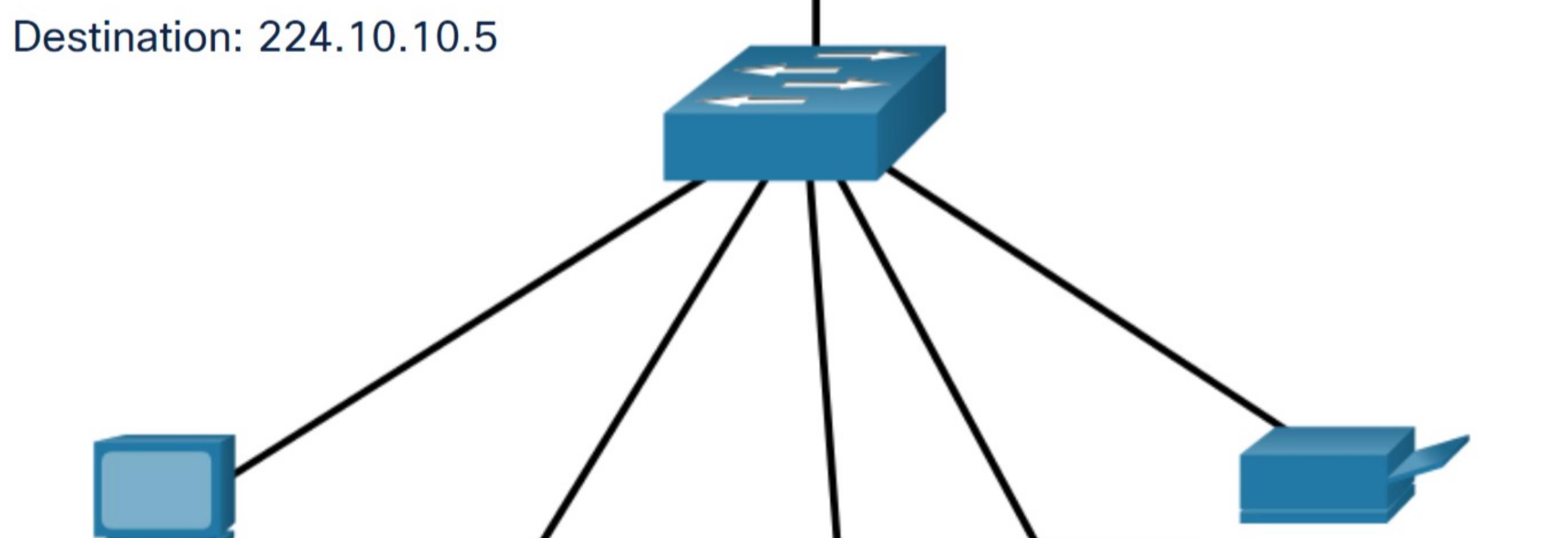
A multicast packet is a packet with a destination IP address that is a multicast address. IPv4 has reserved the 224.0.0.0 to 239.255.255.255 addresses as a multicast range.

Hosts that receive particular multicast packets are called multicast clients. The multicast clients use services requested by a client program to subscribe to the multicast group.

Each multicast group is represented by a single IPv4 multicast destination address. When an IPv4 host subscribes to a multicast group, the host processes packets addressed to this multicast address, and packets addressed to its uniquely allocated unicast address.

Routing protocols such as OSPF use multicast transmissions. For example, routers enabled with OSPF communicate with each other using the reserved OSPF multicast address 224.0.0.5. Only devices enabled with OSPF will process these packets with 224.0.0.5 as the destination IPv4 address. All other devices will ignore these packets.

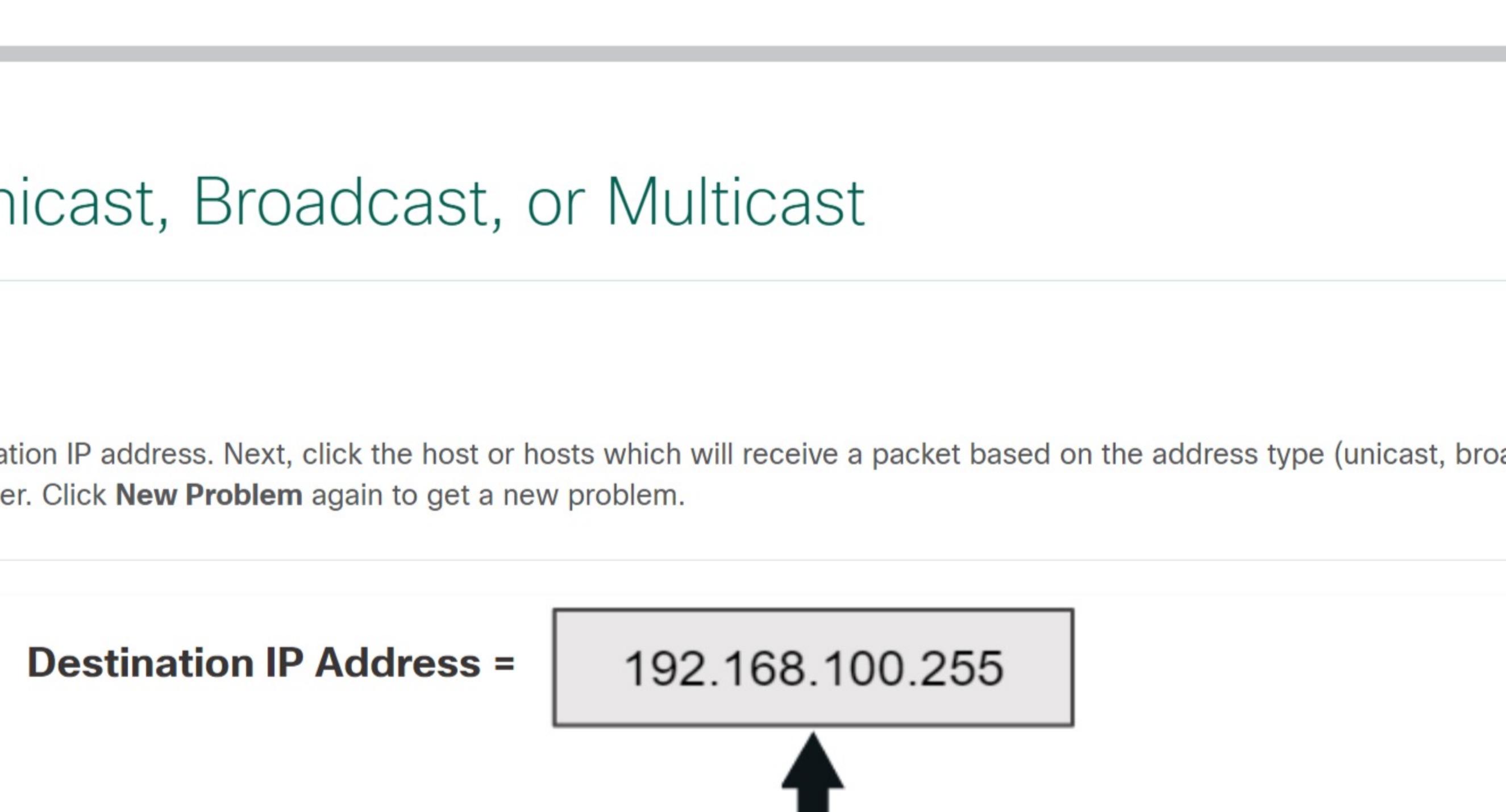
The animation demonstrates clients accepting multicast packets.



### Activity - Unicast, Broadcast, or Multicast

#### Instructions:

Click Start to see a destination IP address. Next, click the host or hosts which will receive a packet based on the address type (unicast, broadcast, or multicast). Click Check to verify your answer. Click New Problem again to get a new problem.



New Problem

Check