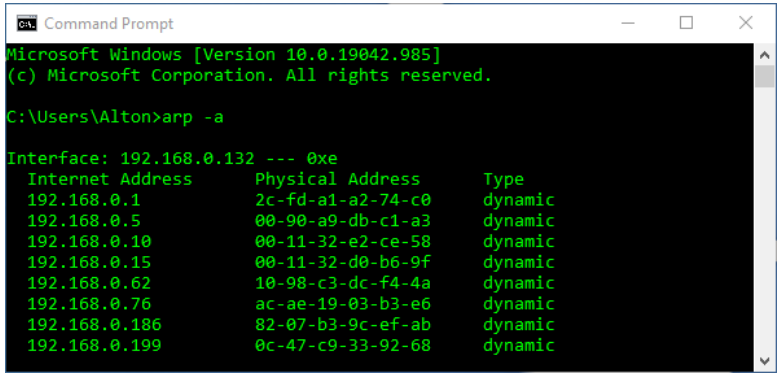
Address Resolution Protocol (ARP)

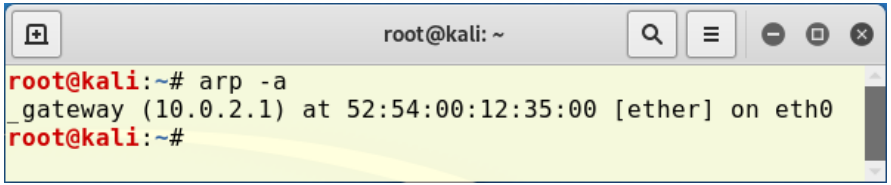
INSTRUCTOR ALTON

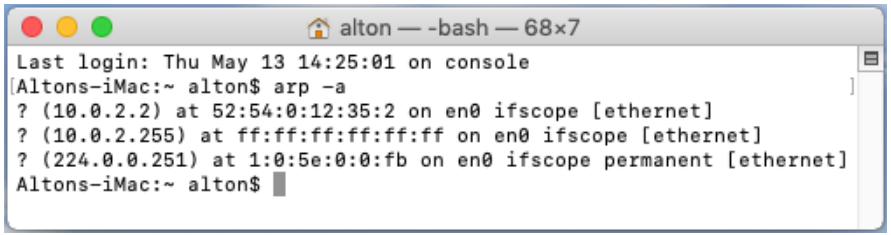
Address Resolution Protocol (ARP)

- Resolves IP address to MAC Addresses
- Finds the hardware address of a host from a know IP address
  - And vice versa (RARP)

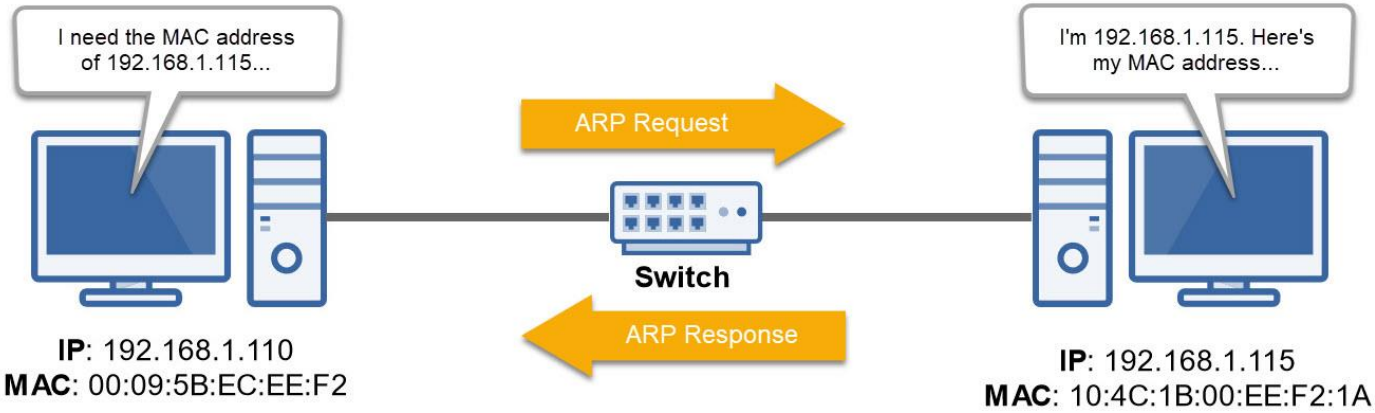
ARP Command: arp -a







ARP Diagram

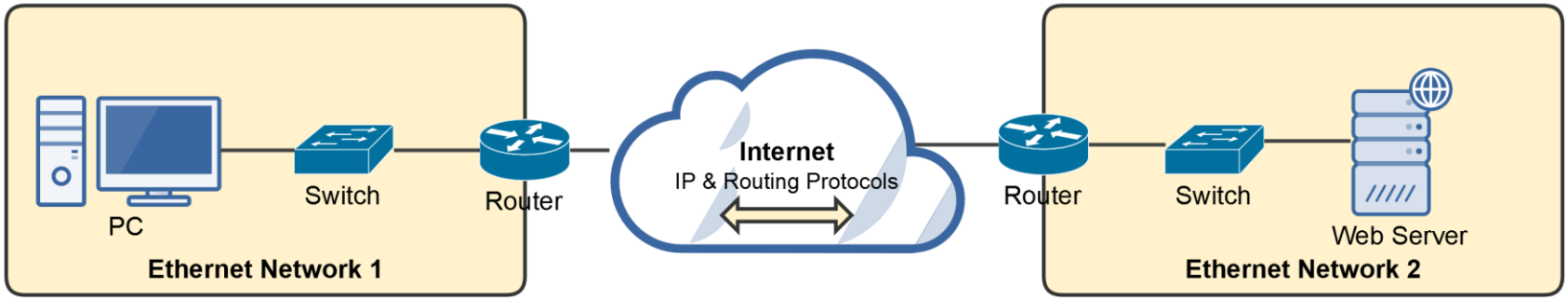


If a computer knows a device's IP address but not its MAC address, it'll send a **broadcast** message to all devices on the LAN asking which device is assigned that MAC address.

The Internet Protocol (IP)

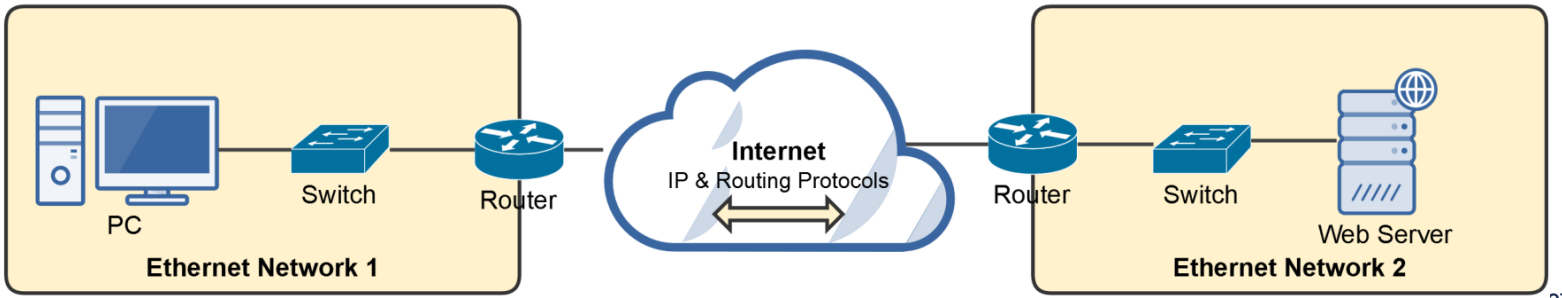
The Internet Protocol (IP)

- An OSI Layer 3 protocol that defines routing and logical addressing of packets that allow data to traverse WANs and the Internet.
- It specifies the formatting of packets and the logical addressing schema
  - **IP addresses**: IPv4 and IPv6
- Its job is to connect different OSI Layer 2 (switched) networks together.
- Provides end-to-end connectivity from one Layer 2 network to another via routers.



The Internet Protocol (IP)

- It's connectionless and, therefore, unreliable (similar to UDP).
  - No continued connection.
- Each packet sent is independent of each other packet.
  - TCP and other protocols provide a means to reassemble them properly.
- Packets don't always follow the same path to their destination.
  - They're sent via the most efficient route.
- Doesn't provide any error recovery or sequencing functionality.
  - That's the job of other protocols.



Internet Control Message Protocol (ICMP)

Internet Control Message Protocol (ICMP)

- OSI Layer 3 Internet Protocol (IP) companion “error reporting” protocol within the TCP/IP suite of protocols.
- Just like IP, it’s connectionless.
- Used to generate error messages to the source IP address when network issues prevent the delivery of a packet.
- Typically used by routers to report packet delivery issues, and, most importantly, it can report errors but not correct them.
- Commonly used by IT administrators to troubleshoot network connections with command-line utilities, including ping, pathping, and traceroute.
- For IPv6, it is also used for:
    - Neighbor Solicitation and Advertisement Messages (Similar to ARP)
    - Router Solicitation and Advertisement Messages

(Some) ICMP Message Types

- **Echo Request, Echo Reply**: Tests destination accessibility and status. A host sends an *Echo Request* and listens for a corresponding *Echo Reply*. Commonly done using the **ping** command.
- **Destination Unreachable**: Sent by a router when it can't deliver an IP packet.
- **Source Quench**: Sent by a host or router if it's receiving too much data than it can handle. The message requests that the source reduces its rate of data transmission.
- **Redirect Message**: Sent by a router if it receives a packet that should have been sent to a different router. The message includes the IP address to which future packets should be sent and is used to optimize the routing.
- **Time Exceeded**: Sent by a router if a packet has reached the maximum limit of routers through which it can travel.
- **Router Advertisement, Router Solicitation (IPv6)**: Allow hosts to discover the existence of routers. Routers periodically multicast their IP addresses via *Router Advertisement* messages. Hosts may also request a router IP address by broadcasting a *Router Solicitation* message, then wait for a router to reply with a *Router Advertisement*.