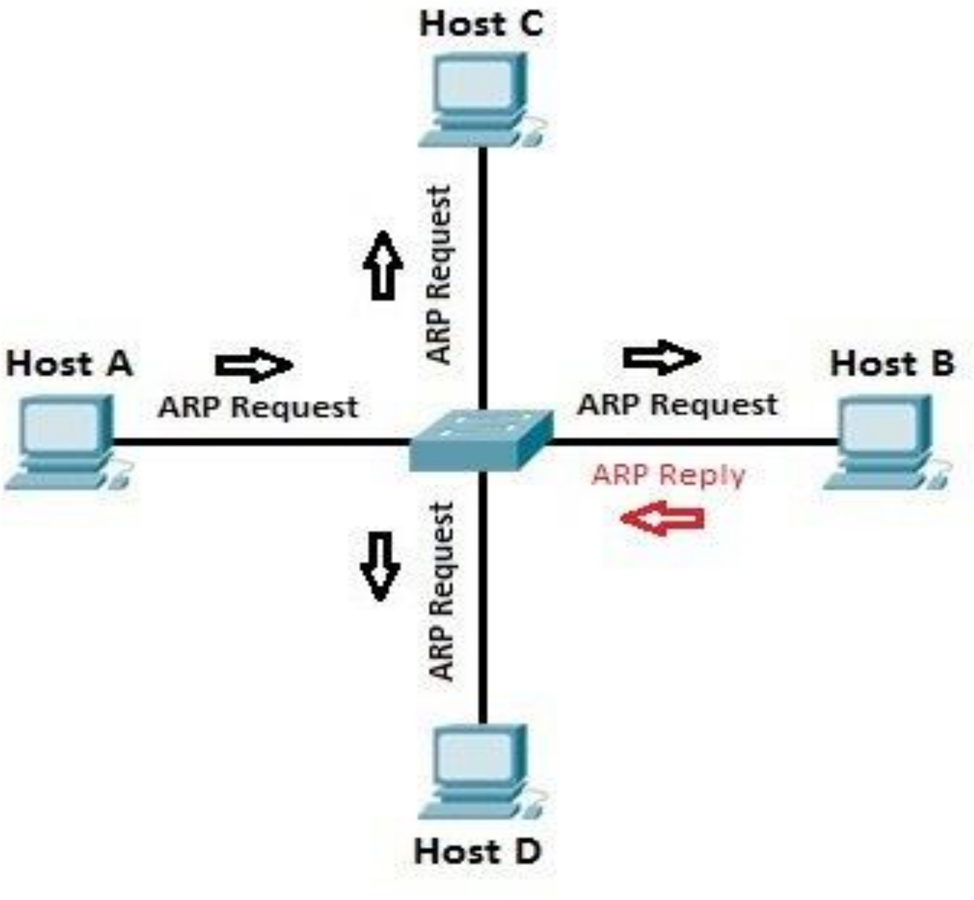
ARP (Address Resolution Protocol) explained

ARP (Address Resolution Protocol) is a network protocol used to find out the hardware (MAC) address of a device from an IP address. It is used when a device wants to communicate with some other device on a local network (for example on an Ethernet network that requires physical addresses to be known before sending packets). The sending device uses ARP to translate IP addresses to MAC addresses. The device sends an ARP request message containing the IP address of the receiving device. All devices on a local network segment see the message, but only the device that has that IP address responds with the ARP reply message containing its MAC address. The sending device now has enough information to send the packet to the receiving device.

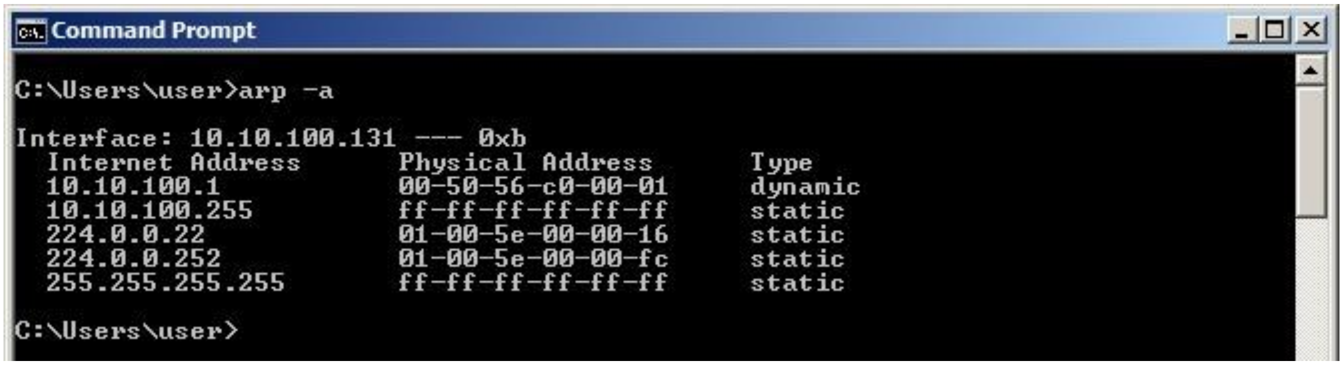
ARP request packets are sent to the broadcast addresses (FF:FF:FF:FF:FF:FF for the Ethernet broadcasts and 255.255.255.255 for the IP broadcast).

Here is the explanation of the ARP process:



Let’s say that Host A wants to communicate with host B. Host A knows the IP address of host B, but it doesn’t know the host B’s MAC address. In order to find out the MAC address of host B, host A sends an ARP request, listing the host B’s IP address as the destination IP address and the MAC address of FF:FF:FF:FF:FF:FF (Ethernet broadcast). Switch will forward the frame out all interfaces (except the incoming interface). Each device on the segment will receive the packet, but because the destination IP address is host B’s IP address, only host B will reply with the ARP reply packet, listing its MAC address. Host A now has enough information to send the traffic to host B.

All operating systems maintain ARP caches that are checked before sending an ARP request message. Each time a host needs to send a packet to another host on the LAN, it first checks its ARP cache for the correct IP address and matching MAC address. The addresses will stay in the cache for a couple of minutes. You can display ARP entries in Windows by using the *arp -a* command:



```
C:\Users\user>arp -a

Interface: 10.10.100.131 --- 0xb
  Internet Address      Physical Address      Type
  10.10.100.1           00-50-56-c0-00-01     dynamic
  10.10.100.255         ff-ff-ff-ff-ff-ff     static
  224.0.0.22            01-00-5e-00-00-16     static
  224.0.0.252           01-00-5e-00-00-fc     static
  255.255.255.255       ff-ff-ff-ff-ff-ff     static

C:\Users\user>
```

DHCP & DNS

DHCP (Dynamic Host Configuration Protocol)

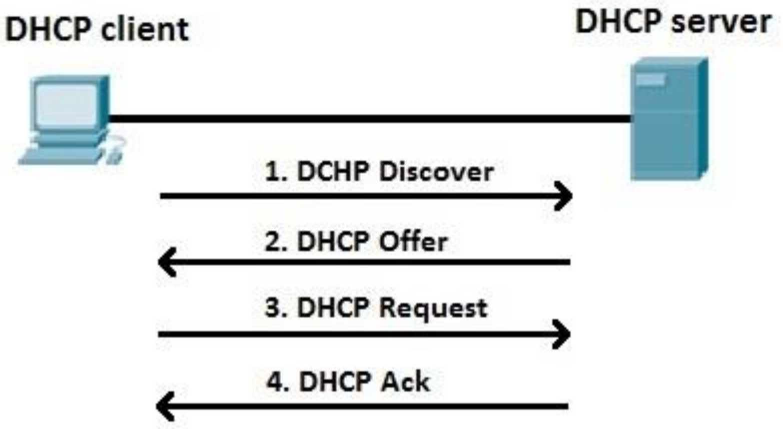
DHCP is a network protocol that is used to assign various network parameters to a device. This greatly simplifies administration of a network, since there is no need to assign static network parameters for each device.

DHCP is a client-server protocol. A client is a device that is configured to use DHCP to request network parameters from a DHCP server. DHCP server maintains a pool of available IP addresses and assignes one of them to the host. A DHCP server can also provide some other parameters, such as:

- subnet mask
- default gateway
- domain name
- DNS server

DHCP process explained:

DHCP client goes through the four step process:



1: A DHCP client sends a broadcast packet (DHCP Discover) to discover DHCP servers on the LAN segment.

2: The DHCP servers receive the DHCP Discover packet and respond with DHCP Offer packets, offering IP addressing information.

3: If the client receives the DHCP Offer packets from multiple DHCP servers, the first DHCP Offer packet is accepted. The client responds by broadcasting a DHCP Request packet, requesting the network parameters from the server that responded first.

4: The DHCP server approves the lease with a DHCP Acknowledgement packet. The packet includes the lease duration and other configuration information.