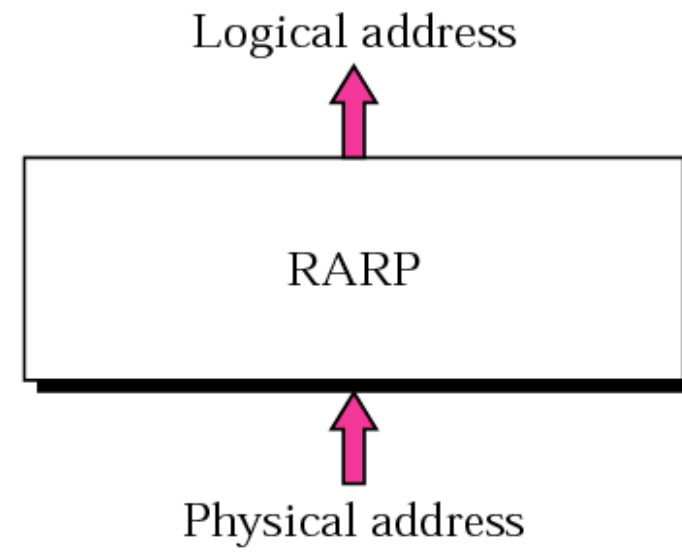
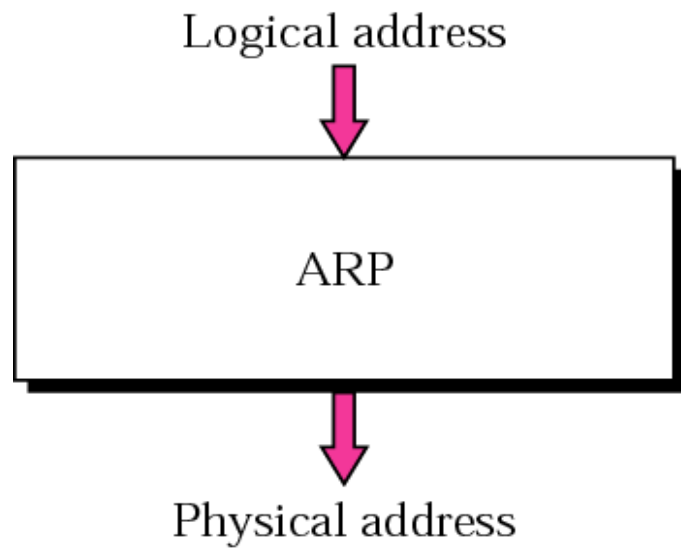


Translation of Addresses

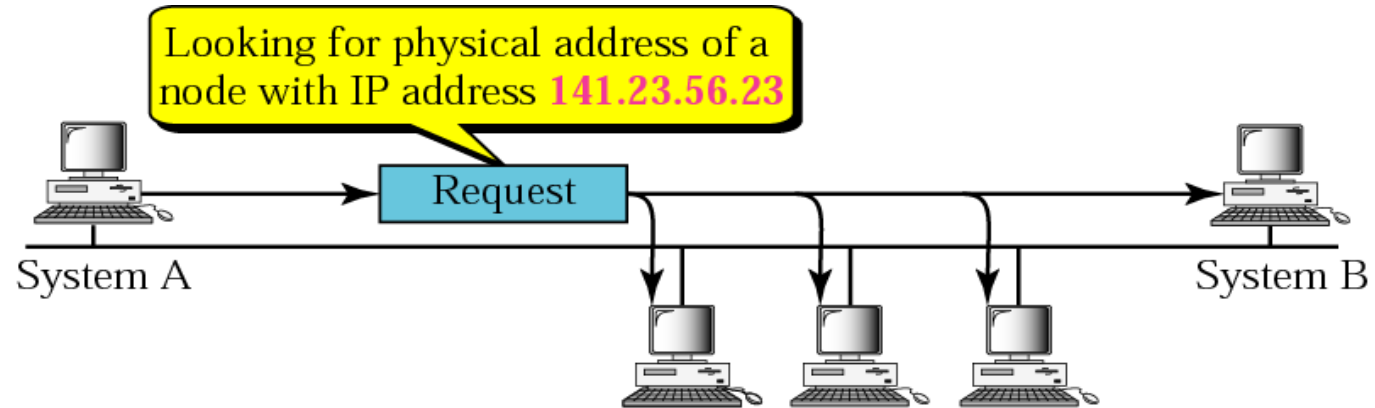
- Translation between IP addresses and MAC addresses
Address Resolution Protocol (ARP) for IPv4
Neighbor Discovery Protocol (NDP) for IPv6
- Translation between IP addresses and domain names
(Domain Name System (DNS))



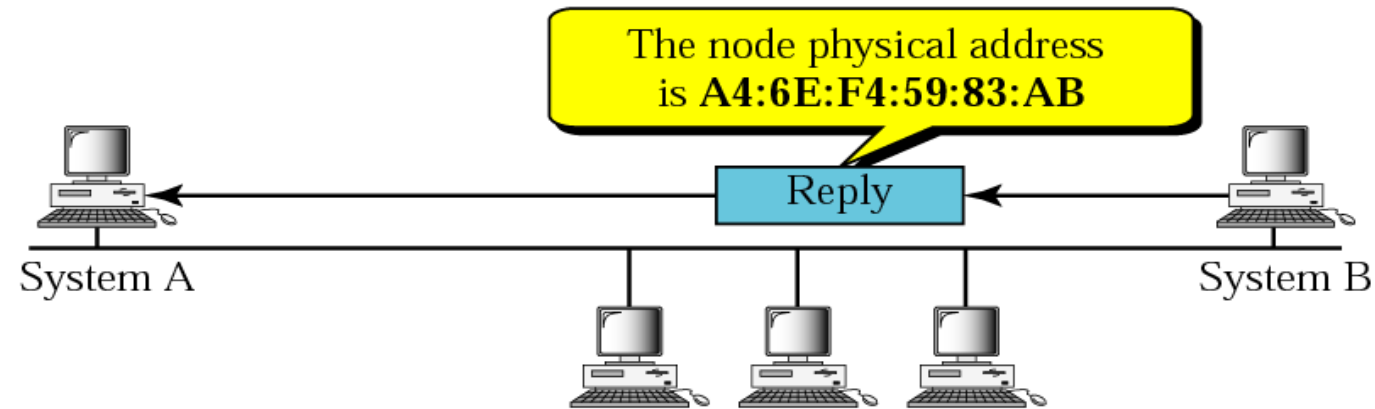
What is ARP used for?

- Suppose want to send a packet over (say) an Ethernet.
- We only know the destination's IP address to build the Ethernet frame we have to know the Ethernet address that the destination has.

This is what ARP does: Find the hardware address corresponding to an IP address



a. ARP request is broadcast

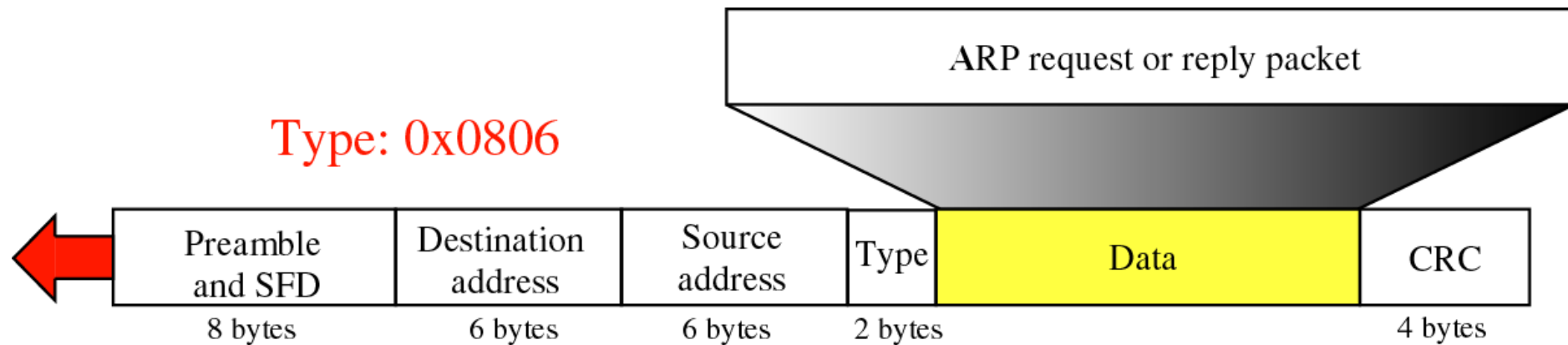


b. ARP reply is unicast

ARP packet

| | | |
|---|-----------------|--|
| Hardware Type | | Protocol Type |
| Hardware length | Protocol length | Operation Request 1, Reply 2 |
| Sender hardware address (For example, 6 bytes for Ethernet) | | |
| Sender protocol address (For example, 4 bytes for IP) | | |
| Target hardware address (For example, 6 bytes for Ethernet) (It is not filled in a request) | | |
| Target protocol address (For example, 4 bytes for IP) | | |

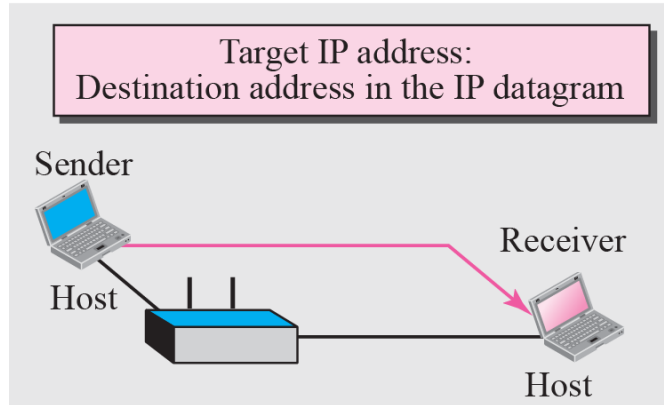
Encapsulation of ARP packet



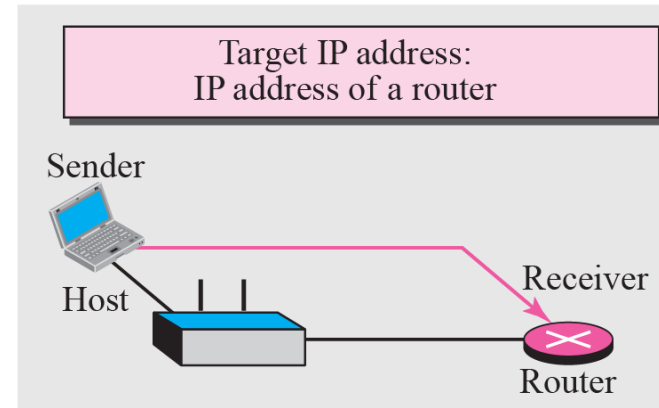
The **preamble** of an Ethernet packet consists of a 56-bit (seven-byte) pattern of alternating 1 and 0 bits, allowing devices on the network to easily synchronize their receiver clocks

SFD: Start Frame Delimiter

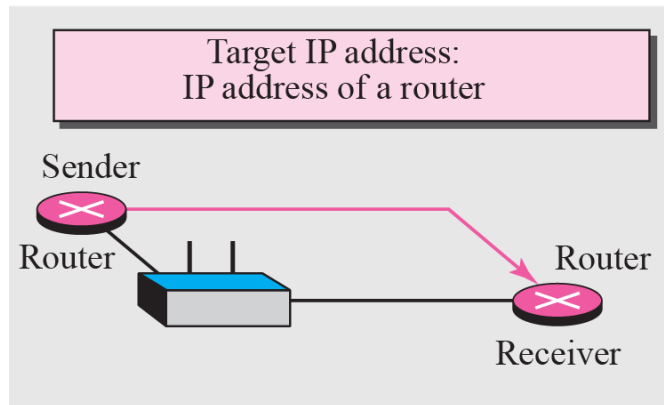
Case 1: A host has a packet to send to a host on the same network.



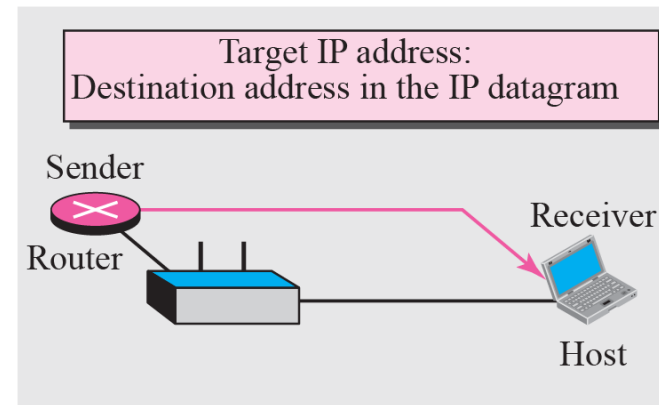
Case 2: A host has a packet to send to a host on another network.



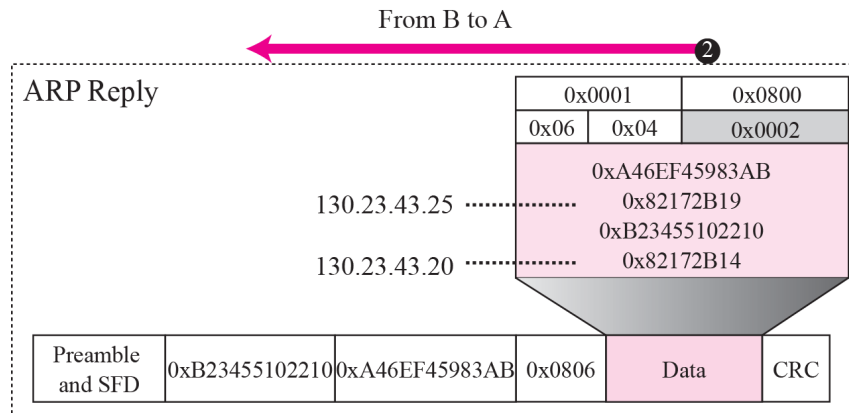
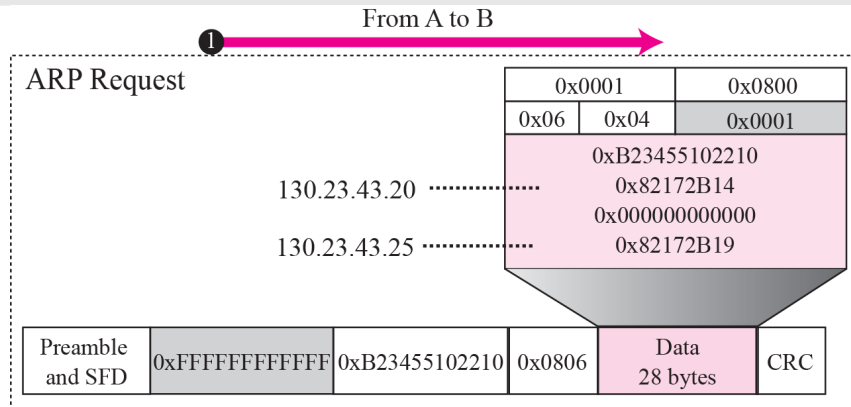
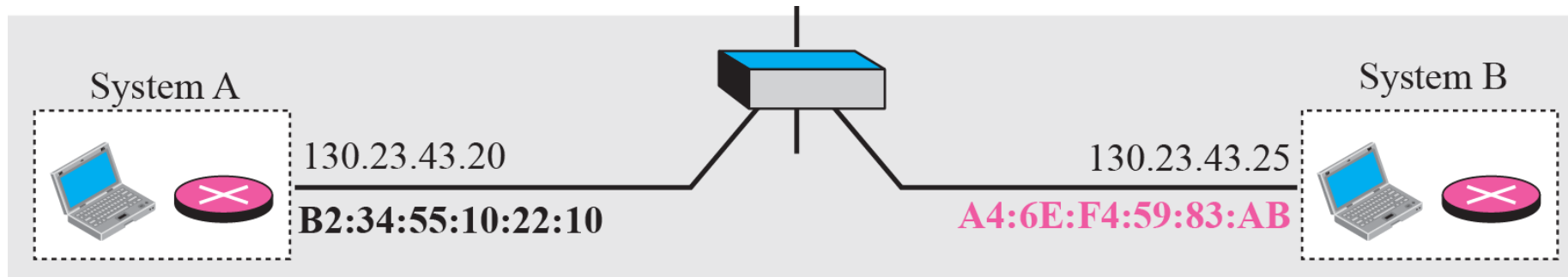
Case 3: A router has a packet to send to a host on another network.

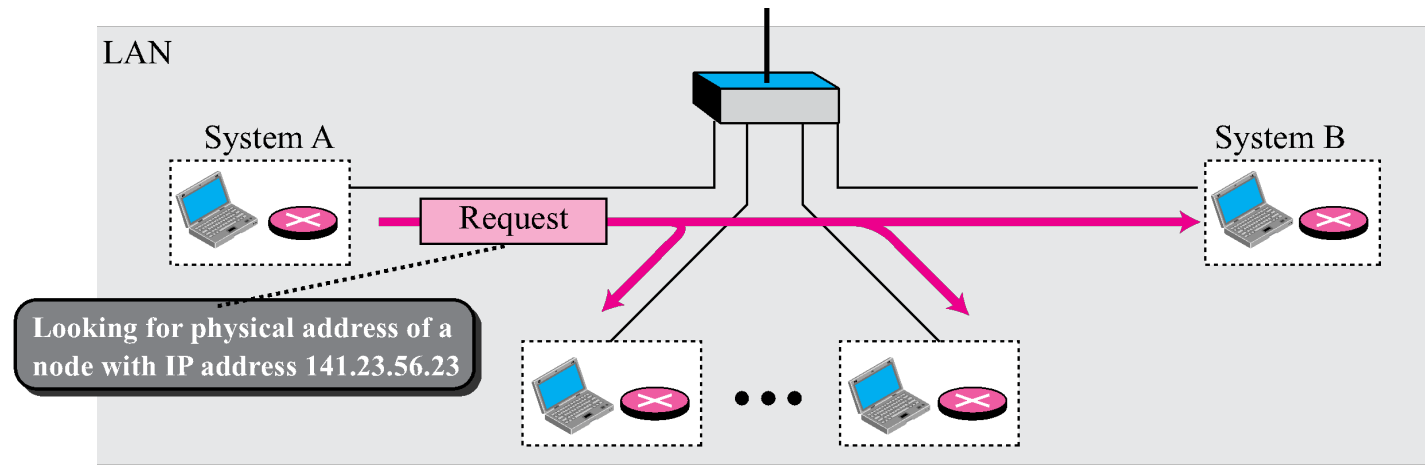


Case 4: A router has a packet to send to a host on the same network.

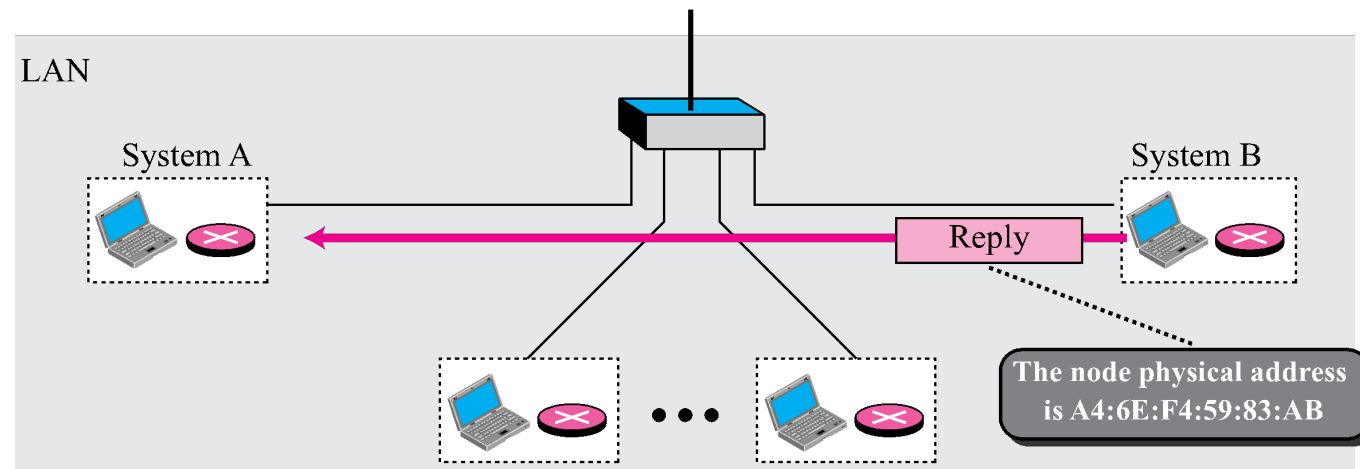


A host with IP address 130.23.43.20 and physical address 0xB23455102210 has a packet to send to another host with IP address 130.23.43.25 and physical address 0xA46EF45983AB. The two hosts are on the same Ethernet network. Show the ARP request and reply packets encapsulated in Ethernet frames.





a. ARP request is multicast



b. ARP reply is unicast

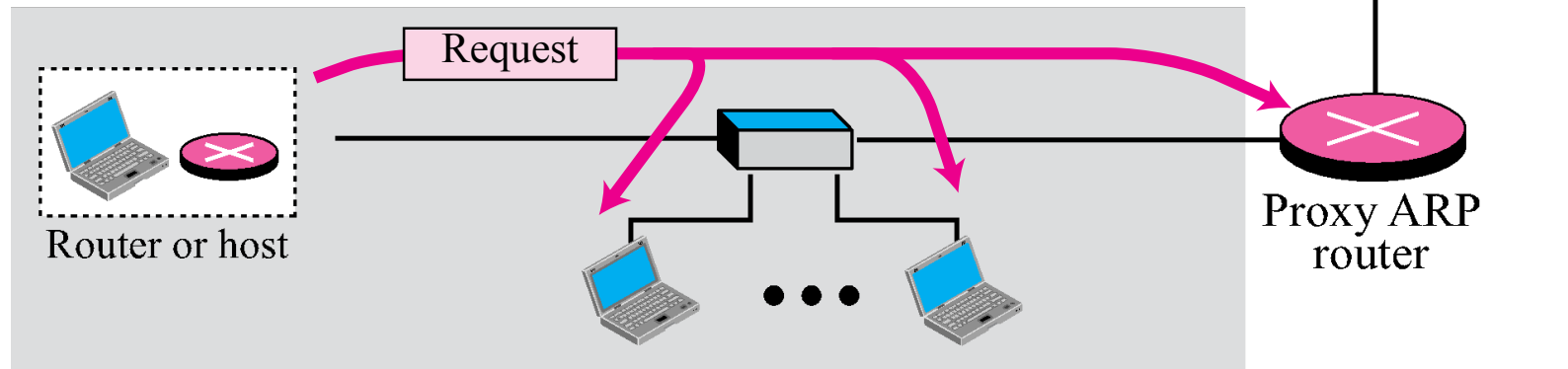
Proxy Arp

- Host or router responds to ARP Request that arrives from one of its connected networks for a host that is on another of its connected networks

The proxy ARP router replies to any ARP request received for destinations 141.23.56.21, 141.23.56.22, and 141.23.56.23.

Added subnetwork

141.23.56.21 141.23.56.22 141.23.56.23



ARP Command

- To display table

```
arp -a
```

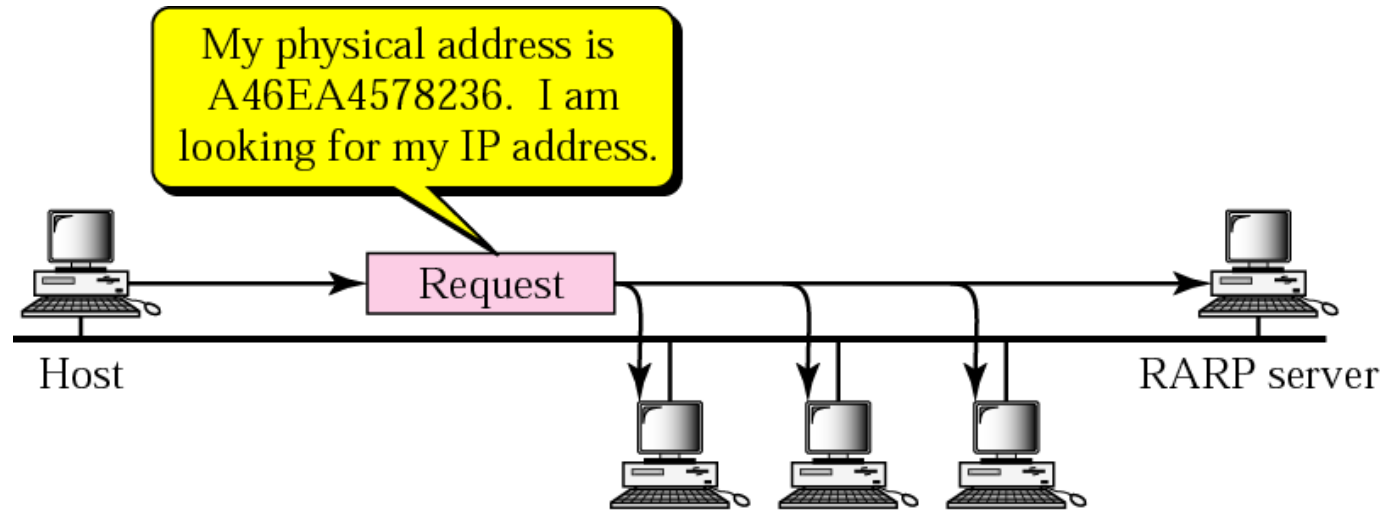
- To enter manually (Static Entry)

```
arp -s 192.168.1.2 00-FE-FE-FE-FE-FE
```

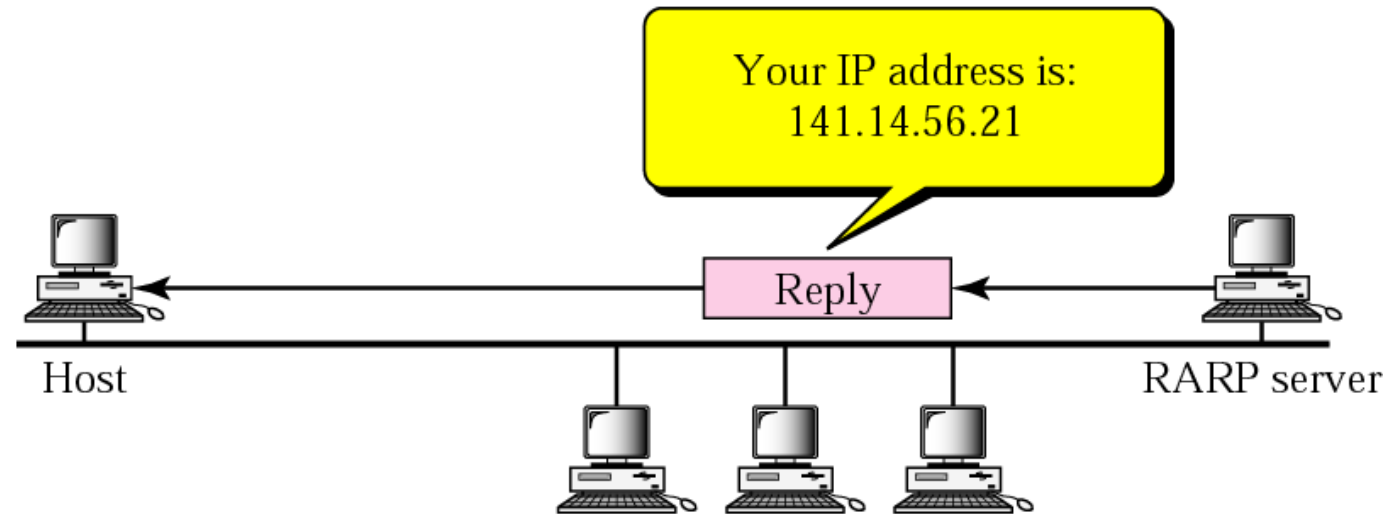
- To delete entry

```
arp -d 192.168.1.2
```

RARP Operation



a. RARP request is broadcast



b. RARP reply is unicast

RARP packet

| Hardware type | | Protocol type |
|--|-----------------|---------------------------------|
| Hardware length | Protocol length | Operation Request 3, Reply 4 |
| Sender hardware address (For example, 6 bytes for Ethernet) | | |
| Sender protocol address (For example, 4 bytes for IP) (It is not filled for request) | | |
| Target hardware address (For example, 6 bytes for Ethernet) (It is not filled for request) | | |
| Target protocol address (For example, 4 bytes for IP) (It is not filled for request) | | |

Encapsulation of RARP packet

