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# Chapter 5:

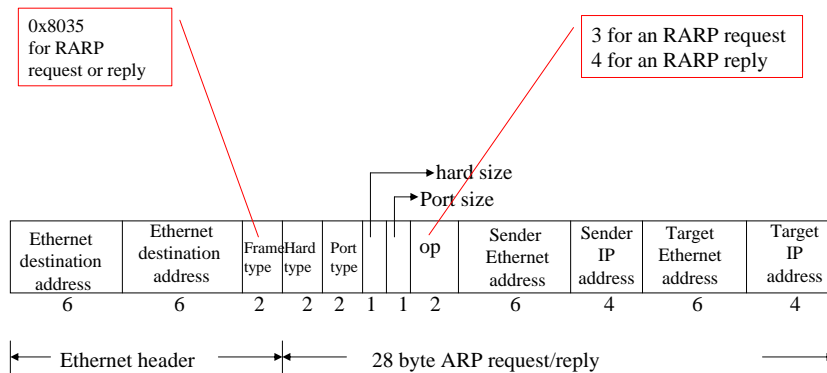
## RARP: Reverse Address Resolution Protocol

### Introduction

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- ❑ When system with a local disk is bootstrapped, it normally obtains its IP address from a configuration file that's read from a disk file.
- ❑ But a system without a disk, such as an X terminal or a diskless workstation, how to get the IP address?
- ❑ The principle of RARP is for the diskless system to read its unique hardware address from the interface card and send an RARP request asking for someone to reply with the diskless system's IP address.

## RARP Packet Format



## RARP Examples

### ❑ Event 1:

- ❖ We force the host *sun* to bootstrap from the network, instead of its local disk.
- ❖ If we run an RARP server and *tcpdump* on the host *bsd1*. We use the *-e* flag to have *tcpdump* print the hardware address

### ❑ Output:

```

1  0.0          8:0:20:3:f6:42 ff:ff:ff:ff:ff:ff rarp 60:
    rarp who-is 8:0:20:3:f6:42 tell 8:0:20:3:f6:42
2  0.13 (0.13) 0:0:c0:6f:2d:40 8:0:20:3:f6:42 rarp 42:
    rarp reply 8:0:20:3:f6:42 at sun
3  0.14 (0.01) 8:0:20:3:f6:42 0:0:c0:6f:2d:40 ip 65:
    sun.26999>bsd1.tftp:23
    RRQ"8CFC0D21.SUN4C"
  
```

## RARP Examples (Cont.)

### ❑ Event 2:

- ❖ If there is on RARP server on the network, the destination address of each packet is the Ethernet broadcast address.
- ❖ Note the frequency of the retransmissions – doubling effect.
  - Increasing the timeout value is a better approach than using the same value.

## RARP Examples (Cont.)

### ❑ Output:

1	0.0	8:0:20:3:f6:42 ff:ff:ff:ff:ff:ff rarp 60: rarp who-is 8:0:20:3:f6:42 tell 8:0:20:3:f6:42
2	6.55 (6.55)	8:0:20:3:f6:42 ff:ff:ff:ff:ff:ff rarp 60: rarp who-is 8:0:20:3:f6:42 tell 8:0:20:3:f6:42
3	15.52 (8.97)	8:0:20:3:f6:42 ff:ff:ff:ff:ff:ff rarp 60: rarp who-is 8:0:20:3:f6:42 tell 8:0:20:3:f6:42
4	29.32 (13.80)	8:0:20:3:f6:42 ff:ff:ff:ff:ff:ff rarp 60: rarp who-is 8:0:20:3:f6:42 tell 8:0:20:3:f6:42
5	52.78 (23.46)	8:0:20:3:f6:42 ff:ff:ff:ff:ff:ff rarp 60: rarp who-is 8:0:20:3:f6:42 tell 8:0:20:3:f6:42
6	95.58 (42.80)	8:0:20:3:f6:42 ff:ff:ff:ff:ff:ff rarp 60: rarp who-is 8:0:20:3:f6:42 tell 8:0:20:3:f6:42

## RARP Examples (Cont.)

1 21	7	100.92 (5.34)	8:0:20:3:f6:42 ff:ff:ff:ff:ff:ff rarp 60: rarp who-is 8:0:20:3:f6:42 tell 8:0:20:3:f6:42
2 42	8	107.47 (6.55)	8:0:20:3:f6:42 ff:ff:ff:ff:ff:ff rarp 60: rarp who-is 8:0:20:3:f6:42 tell 8:0:20:3:f6:42
4 83	9	116.44 (8.97)	8:0:20:3:f6:42 ff:ff:ff:ff:ff:ff rarp 60: rarp who-is 8:0:20:3:f6:42 tell 8:0:20:3:f6:42
9 64	10	130.24 (13.80)	8:0:20:3:f6:42 ff:ff:ff:ff:ff:ff rarp 60: rarp who-is 8:0:20:3:f6:42 tell 8:0:20:3:f6:42
19 33	11	153.70 (23.46)	8:0:20:3:f6:42 ff:ff:ff:ff:ff:ff rarp 60: rarp who-is 8:0:20:3:f6:42 tell 8:0:20:3:f6:42
	12	196.49 (42.79)	8:0:20:3:f6:42 ff:ff:ff:ff:ff:ff rarp 60: rarp who-is 8:0:20:3:f6:42 tell 8:0:20:3:f6:42

## RARP Server Design

### ❑ RARP Servers as User Processes

- ❖ An RARP server provides the mapping from a **hardware address** to an **IP address** for many hosts.
- ❖ This mapping is contained in a disk file (normally **/etc/ethers**).
- ❖ Since kernels normally don't read and parse disk files, the function of an RARP server is provided as a user process, not as part of the kernel's TCP/IP implementation.

## RARP Server Design (Cont.)

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### ❑ Multiple RARP Servers per Network

- ❖ The RARP requests are sent as hardware-level broadcast. This means they are not forwarded by routers
- ❖ To allow diskless systems to bootstrap even when the RARP server host is down, multiple RARP servers are provided on a single network.
- ❖ As the number of services increases, the network traffic increases, since every server sends an RARP reply for RARP request.
- ❖ There is a chance that each RARP server can try to respond at about the same time, increasing the probability of collisions on an Ethernet.

## Summary

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- ❑ RARP is used by many diskless systems to obtain their IP address when bootstrapped.
- ❑ The RARP packet format is nearly identical to the ARP packet.
- ❑ An RARP request is broadcast, and the reply is normally unicast.
- ❑ Problems with RARP include its use of a link-layer broadcast, preventing most routers from forwarding an RARP request, and the minimal information returned: just the system's IP address.