

Computer Networks and Internets

《计算机网络与因特网》课件

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PART IV Internetworking

Chapter 23 (1)

Binding Protocol

Addresses (ARP)

(地址解析协议)

23.1 Introduction

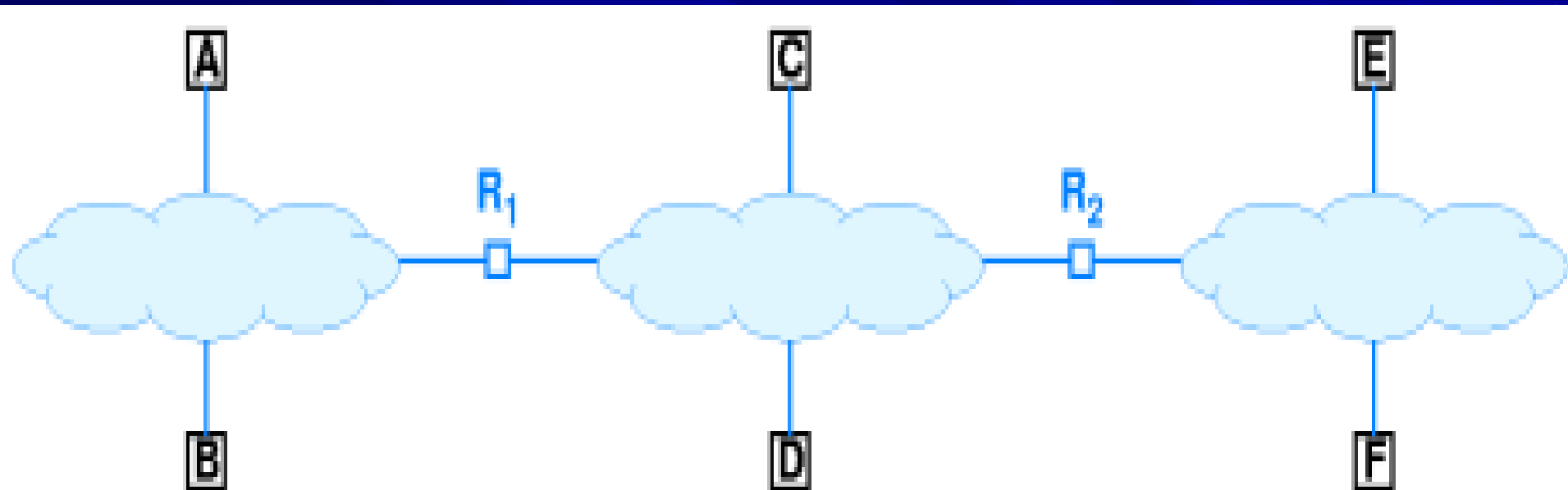
- IP addressing scheme used to assign high-level protocol addresses to hosts and routers.
- IP addresses are virtual.
- Neither local nor wide area network hardware understands IP addressing.
- A frame transmitted across a physical network must contain the hardware address of the destination.

23.2 Protocol Addresses and Packet Delivery 协议地址和包传递

- Software in each host or router uses the protocol destination address to select a next hop for the packet.
- The protocol address of the next hop must be translated to an equivalent hardware address before a packet can be sent.

23.3 Address Resolution地址解析

- Translation from a computer's protocol address to an equivalent hardware address is known as address resolution.
- Address resolution is local to a network.
- A computer never resolves the address of a computer on a remote network.



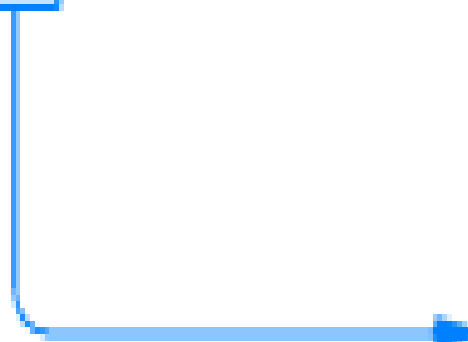
23.4 Address Resolution Techniques地址解析技术

- Table lookup(查表)
- Close-form computation(相近形式计算)
- Message exchange(消息交换)

23.5 Address Resolution With Table Lookup 查表法地址解析

IP Address	Hardware Address
197.15.3.2	0A:07:4B:12:82:36
197.15.3.3	0A:9C:28:71:32:8D
197.15.3.4	0A:11:C3:68:01:99
197.15.3.5	0A:74:59:32:CC:1F
197.15.3.6	0A:04:BC:00:03:28
197.15.3.7	0A:77:81:0E:52:FA

197.15.3.5



A0:14:52:44:F2:91

0A:07:4B:12:82:36

0A:9C:28:71:32:8D

0A:11:C3:68:01:99

0A:74:59:32:CC:1F

0A:04:BC:00:03:28

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Figure 19.3 An example of direct lookup for a class C network. The host portion of an address is used as an array index.

23.7 Address Resolution With Message Exchange

消息交换法地址解析

- One computer sends a message that requests an address binding,
- Another computer sends a reply that contains the requested information.
- One or more servers are assigned the task of answering address resolution requests .
- A computer broadcasts a request, if an incoming request matches a computer's address, the computer responds.

Feature	Type Of Resolution
Useful with any hardware	T
Address change affects all hosts	T
Protocol address independent of hardware address	T, D
Hardware address must be smaller than protocol address	C
Protocol address determined by hardware address	C
Requires hardware broadcast	D
Adds traffic to a network	D
Produces resolution with minimum delay	T, C
Implementation is more difficult	D

Figure 19.4 Comparison of address resolution using a table lookup (*T*), closed-form computation (*C*), and dynamic message exchange (*D*).

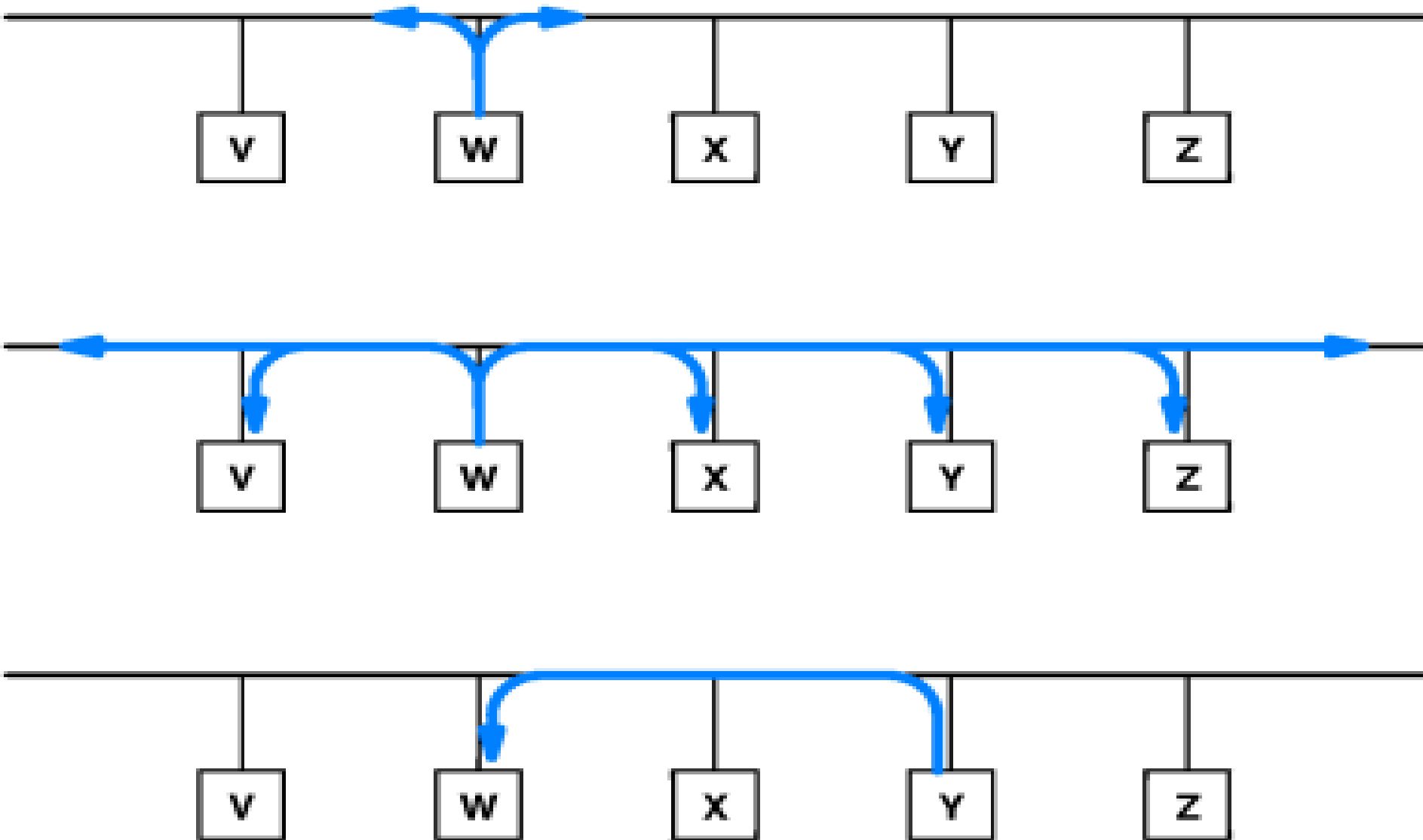
23.8 Address Resolution Protocol

地址解析协议

- TCP/IP protocol suite includes an ARP
- The ARP standard defines two basic message types:
 - A request and a response.

23.9 ARP Message Delivery

ARP消息传递



23.10 ARP Message Format

0		8		16		24		31	
HARDWARE ADDRESS TYPE				PROTOCOL ADDRESS TYPE					
HADDR LEN		PADDR LEN		OPERATION					
SENDER HADDR (first 4 octets)									
SENDER HADDR (last 2 octets)				SENDER PADDR (first 2 octets)					
SENDER PADDR (last 2 octets)				TARGET HADDR (first 2 octets)					
TARGET HADDR (last 4 octets)									
TARGET PADDR (all 4 octets)									

23.11 Sending An ARP Message

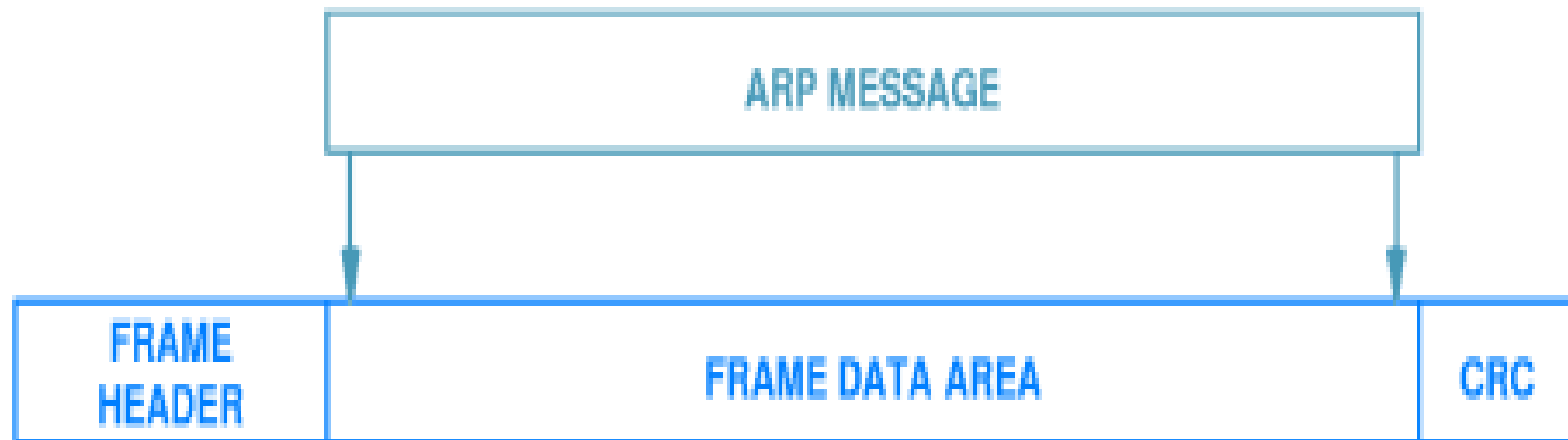


Figure 19.7 Illustration of an ARP message encapsulated in an Ethernet frame. The entire ARP message travels in the data area of the frame; the network hardware neither interprets nor modifies contents of the ARP message.

23.12 Identifying ARP Frames

Dest. Address	Source Address	Frame Type	Data In Frame
		806	complete ARP message

Figure 19.8 Illustration of the type field in an Ethernet header used to specify the frame contents. A value of *0x806* informs the receiver that the frame contains an ARP message.

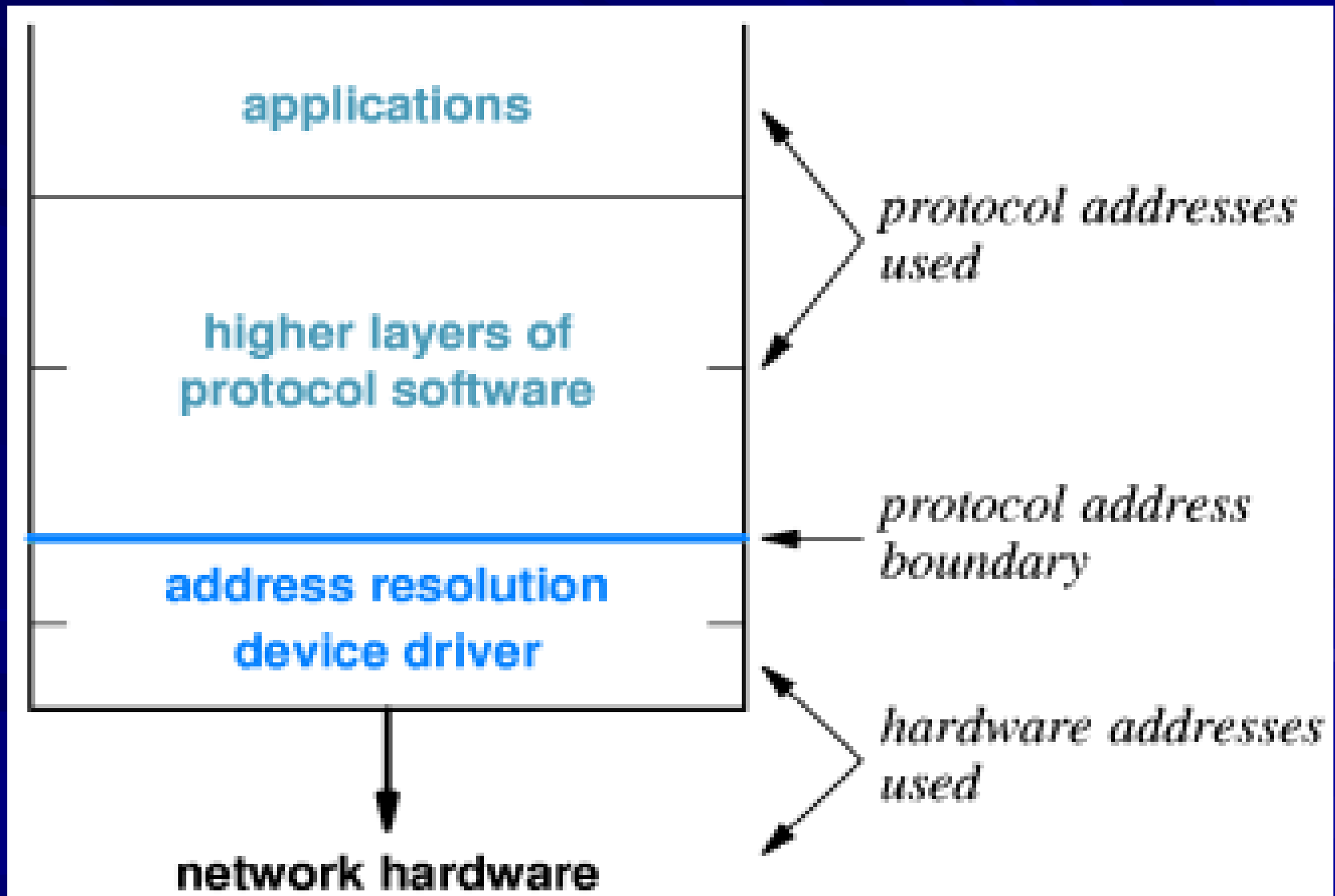
23.13 Caching ARP Responses

- To reduce network traffic, ARP software extracts and saves the information from a response so it can be used for subsequent packets.

23.14 Processing An Incoming ARP Message

- To replace the previously stored binding.
- To examine the OPERATION field.
- If the message is a request,?.
- If the message is a response,?
- Address resolution software hides the details of physical addressing,
- Allowing software in higher layers to use protocol addressing.

23.15 Layering, Address Resolution, Protocol Address



作业

- 简述2种地址解析的方法的原理。
- 简述ARP发送和接收端的操作过程。