Figure 7.9 *ARP components*

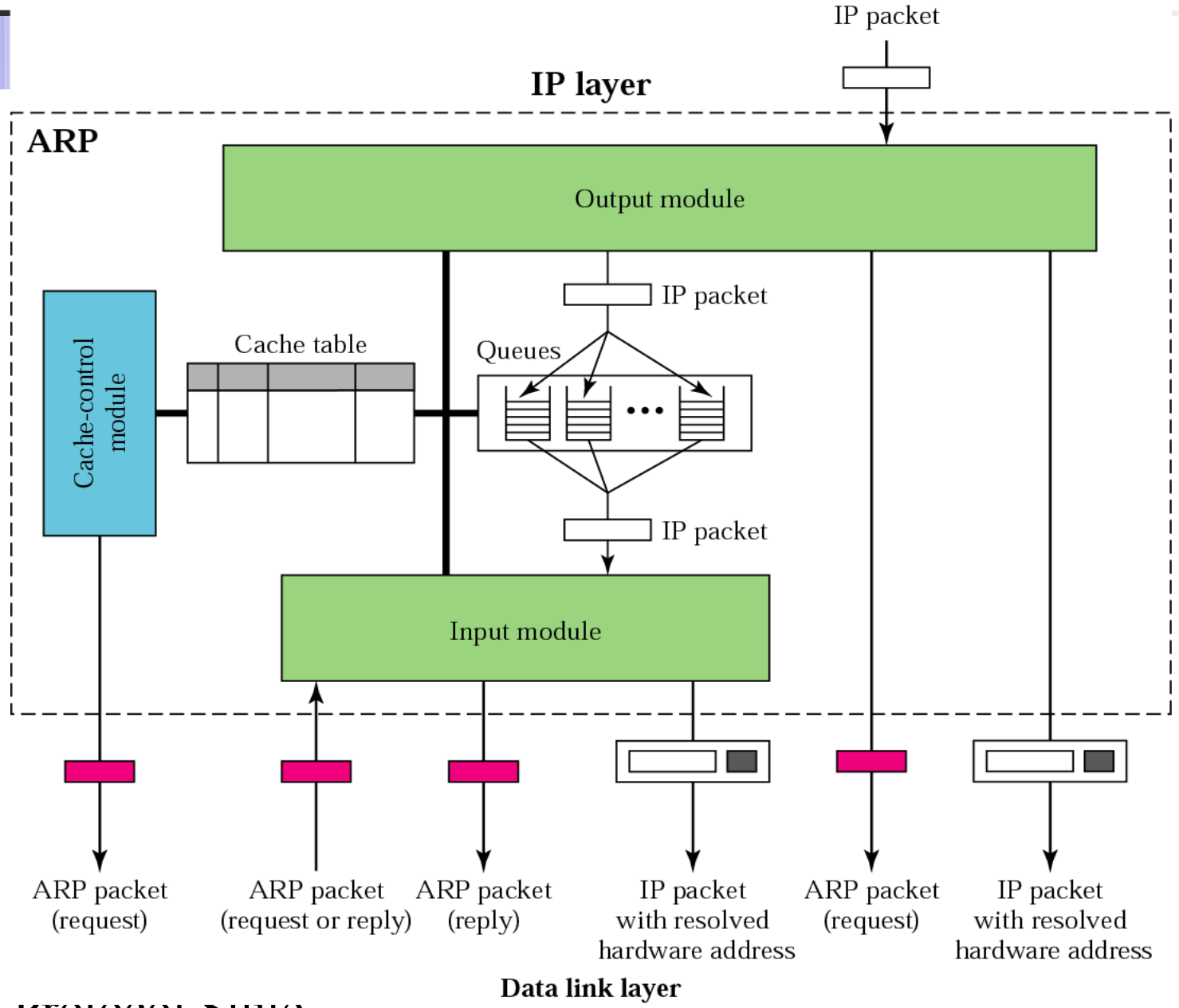

Table 7.1 Original Cache Table used for examples

State	*Queue*	*Attempt*	*Time-Out*	*Protocol Addr.*	*Hardware Addr.*
R	5		900	180.3.6.1	ACAE32457342
P	2	2		129.34.4.8	
P	14	5		201.11.56.7	
R	8		450	114.5.7.89	457342ACAE32
P	12	1		220.55.5.7	
F					
R	9		60	19.1.7.82	4573E3242ACA
P	18	3		188.11.8.71	

Example 2

The ARP output module receives an IP datagram (from the IP layer) with the next-hop IP address 114.5.7.89. It checks the cache table and finds that an entry exists for this IP address with the RESOLVED state (R in the table). It extracts the hardware address, which is 457342ACAE32, and sends the IP datagram and the hardware address to the data link layer for transmission. The cache table remains the same.

Example 3

20 seconds later, the ARP output module receives an IP datagram (from the IP layer) with the next-hop IP address 116.1.7.22. It checks the cache table and does not find this IP address in the table. The module adds an entry to the table with the state PENDING and the ATTEMPT value 1. It creates a new queue for this IP address and enqueues the IP datagram. It then sends an ARP request to find a physical address for this IP address. The new cache table is shown in Table 7.2.

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Table 7.2 Updated Cache Table for Example 3

State	Queue	Attempt	Time-Out	Protocol Addr.	Hardware Addr.
R	5		900	180.3.6.1	ACAE32457342
P	2	2		129.34.4.8	
P	14	5		201.11.56.7	
R	8		450	114.5.7.89	457342ACAE32
P	12	1		220.55.5.7	
P	23	1		116.1.7.22	
R	9		60	19.1.7.82	4573E3242ACA
P	18	3		188.11.8.71	

Example 4

15 seconds later, the ARP input module receives an ARP packet with the sender protocol (IP) address 188.11.8.71. The module checks the table and finds this address. It changes the state of the entry to RESOLVED and sets the time-out value to 900. The module then adds the sender hardware address E34573242ACA to the entry. Now it accesses queue 18 and sends all the IP datagrams in this queue, one by one, to the data link layer. The new cache table is shown in Table 7.3.

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Table 7.3 Updated Cache Table for Example 4

State	*Queue*	*Attempt*	*Time-Out*	*Protocol Addr.*	*Hardware Addr.*
R	5		900	180.3.6.1	ACAE32457342
P	2	2		129.34.4.8	
P	14	5		201.11.56.7	
R	8		450	114.5.7.89	457342ACAE32
P	12	1		220.55.5.7	
P	23	1		116.1.7.22	
R	9		60	19.1.7.82	4573E3242ACA
R	18		900	188.11.8.71	E34573242ACA

Example 5

25 seconds later the cache-control module updates every entry. The time-out values for the first three resolved entries are decreased by 60. The time-out value for the last resolved entry is decreased by 25. The state of the next-to-the last entry is changed to FREE because the time-out is 0. For each of the four pending entries, the value of ATTEMPT is increased by 1. The value of ATTEMPT for the pending entry with the IP address 201.11.56.7 exceeded the maximum. The corresponding state is changed to FREE, the queue is deleted, and an ICMP message is sent to the original destination. See Table 7.4.

Table 7.4 Updated Cache Table for Example 5

State	*Queue*	*Attempt*	*Time-Out*	*Protocol Addr.*	*Hardware Addr.*
R	5		840	180.3.6.1	ACAE32457342
P	2	3		129.34.4.8	
F					
R	8		390	114.5.7.89	457342ACAE32
P	12	2		220.55.5.7	
P	23	2		116.1.7.22	
F					
R	18		875	188.11.8.71	E34573242ACA