Topics Discussed in the Section

- ✓ **Rationale for Change**
  - ❖ **Larger Address Space**
  - ❖ **Better Header Format**
  - ❖ **New Options**
  - ❖ **Allowance for Extension**
  - ❖ **Support for Resource Allocation**
  - ❖ **Support for Security**
- ✓ **Reason for Delay in Adoption**
  - ❖ **Classless Addressing**
  - ❖ **DHCP for Dynamic Addressing**
  - ❖ **NAT**

27-2 PACKET FORMAT

The IPv6 packet is shown in Figure 27.1. Each packet is composed of a mandatory base header followed by the payload. The payload consists of two parts: optional extension headers and data from an upper layer. The base header occupies 40 bytes, whereas the extension headers and data from the upper layer contain up to 65,535 bytes of information.

Figure 27.1 *IPv6 datagram*

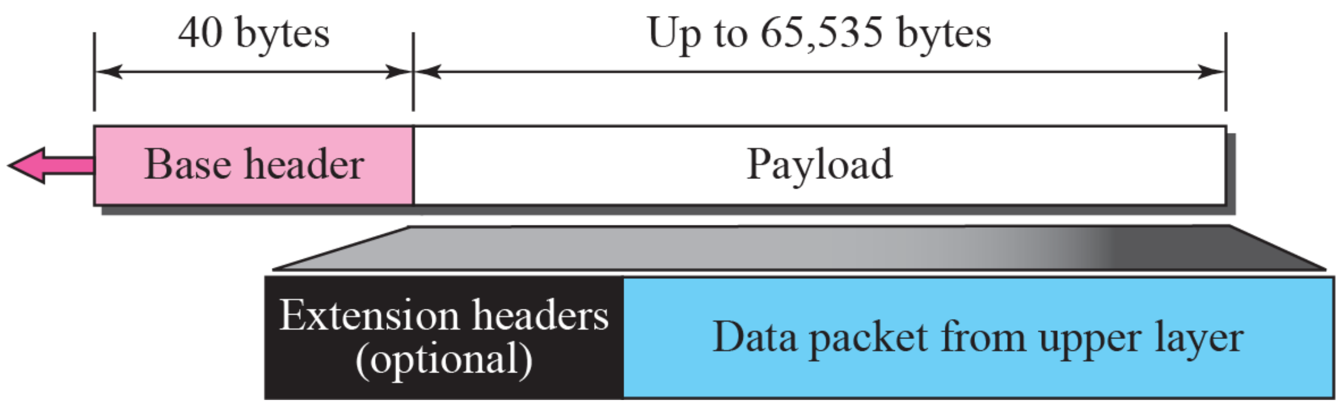
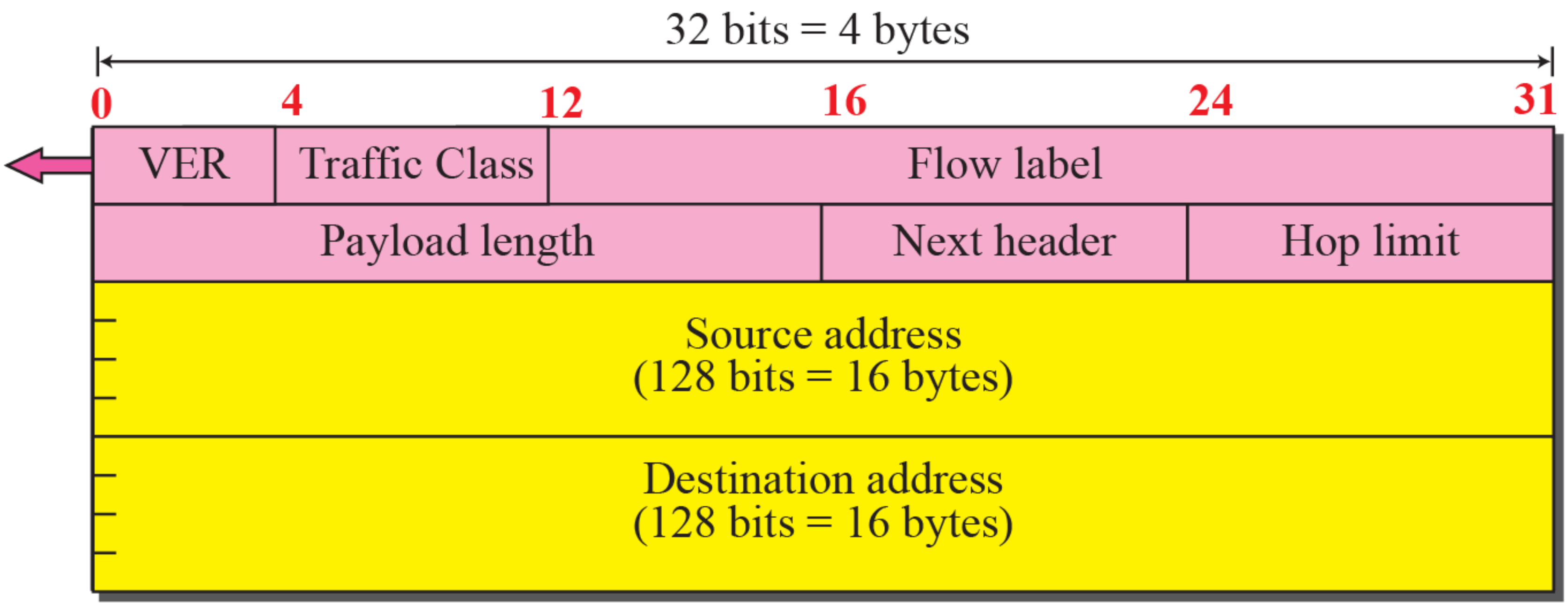


Figure 27.2 *Format of the base header*

Traffic Class is same as Service Class in Ipv4



Base Header Size is 40 bytes (fixed) and excludes Extension Header.
Payload Length is the length of the IPv6 packet minus the Base Header.
HOP limit is same as TTL in IPv4

Comparison between IPv4 and IPv6 Headers

The following shows the comparison between IPv4 and IPv6 headers.

- The header length field is eliminated in IPv6 because the length of the header is fixed in this version.
- The service type field is eliminated in IPv6. The traffic class and flow label fields together take over the function of the service type field.
- The total length field is eliminated in IPv6 and replaced by the payload length field.
- The identification, flag, and offset fields are eliminated from the base header in IPv6. They are included in the fragmentation extension header.
- The TTL field is called hop limit in IPv6.
- The protocol field is replaced by the next header field.
- The header checksum is eliminated because the checksum is provided by upper layer protocols; it is therefore not needed at this level.
- The option fields in IPv4 are implemented as extension headers in IPv6.

Table 27.1 *Next Header Codes*

Code	*Next Header*	*Code*	*Next Header*
0	Hop-by-hop option	44	Fragmentation
2	ICMP	50	Encrypted security payload
6	TCP	51	Authentication
17	UDP	59	Null (No next header)
43	Source routing	60	Destination option

Figure 27.3 *Extension header format*

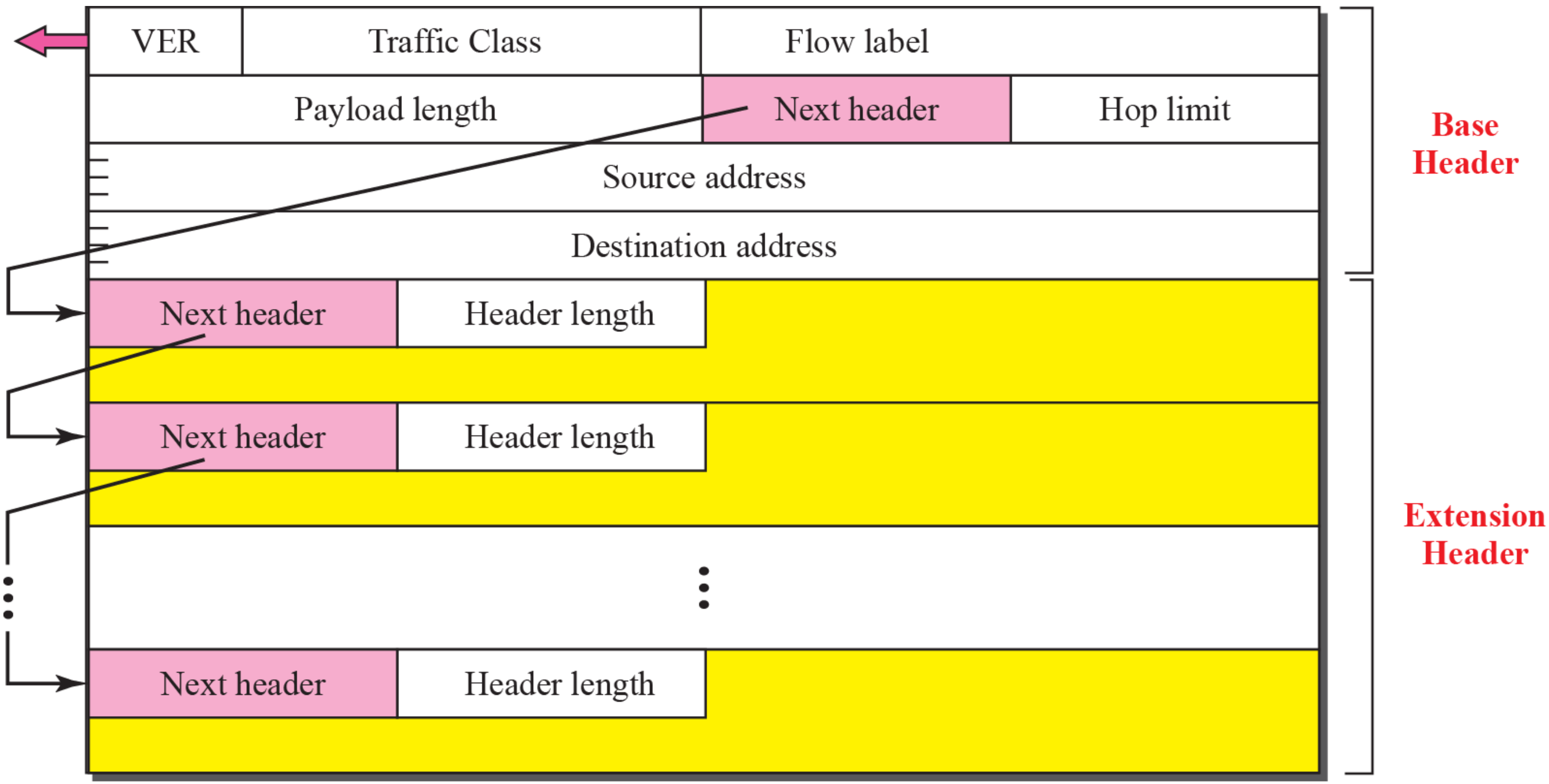


Figure 27.4 *Extension header types*

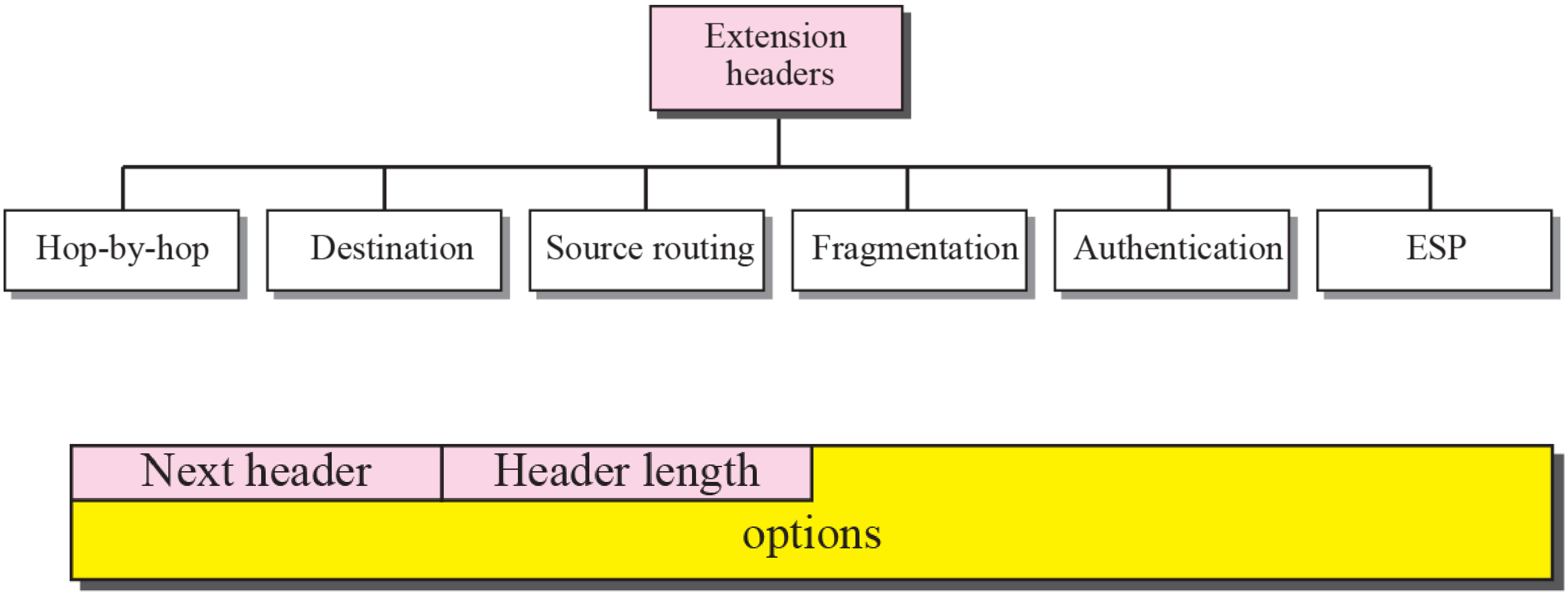


Figure 27.6 *The format of the option in a hop-by-hop option header*

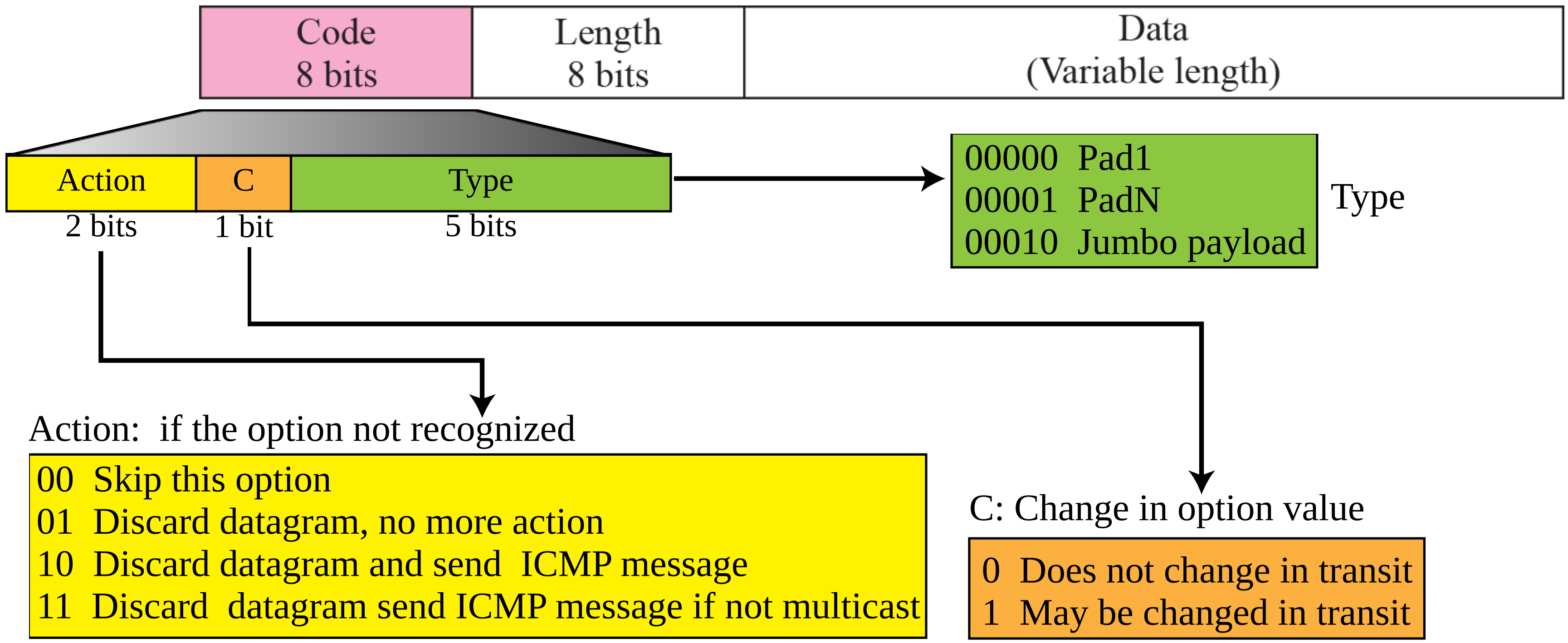


Figure 27.7 *Pad1*

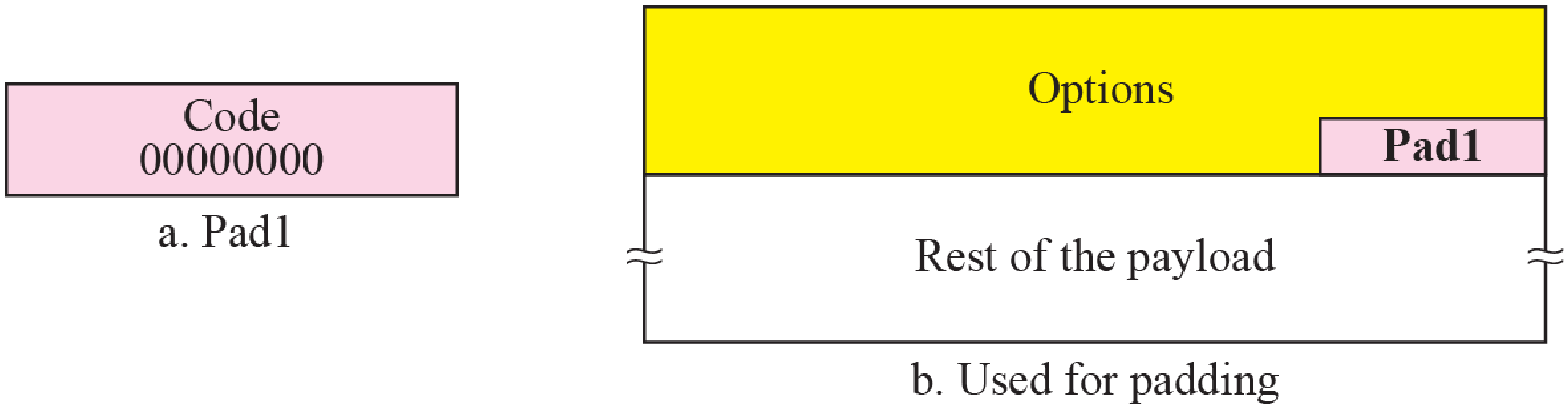


Figure 27.8 *PadN*

Figure 27.9 *Jumbo payload*

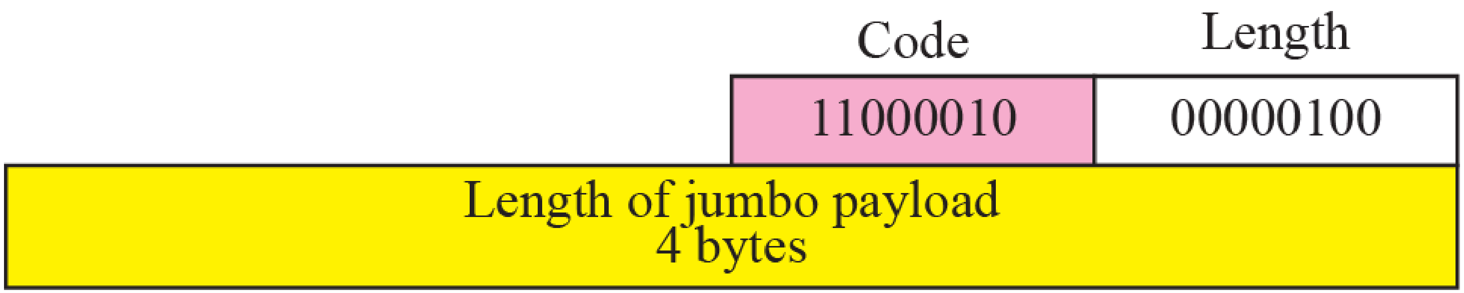


Figure 27.10 *Source routing*

Next header	Header length	Type	Addresses left
Reserved	Strict/loose mask		
First address			
Second address			
⋮			
Last address			

Figure 27.11 ***Source routing example***

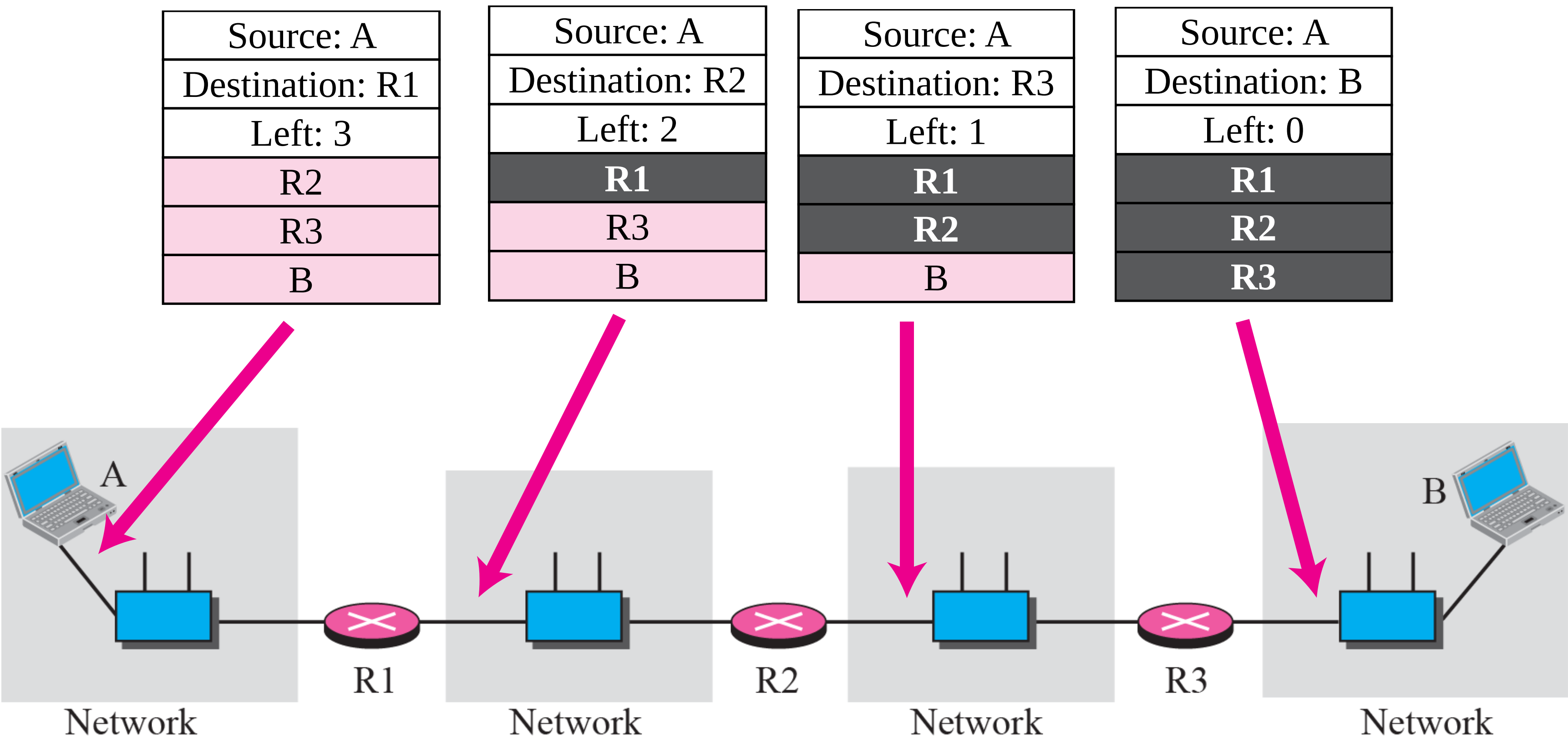


Figure 27.12 *Fragmentation and Authentication*

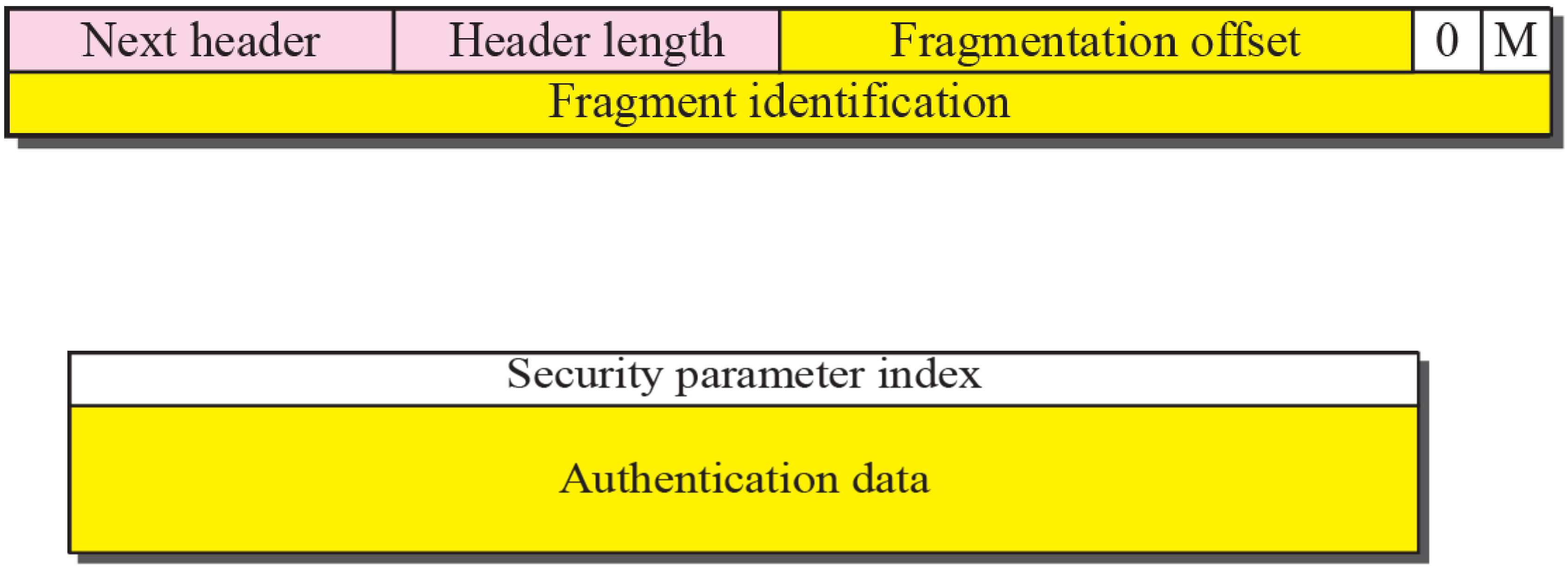
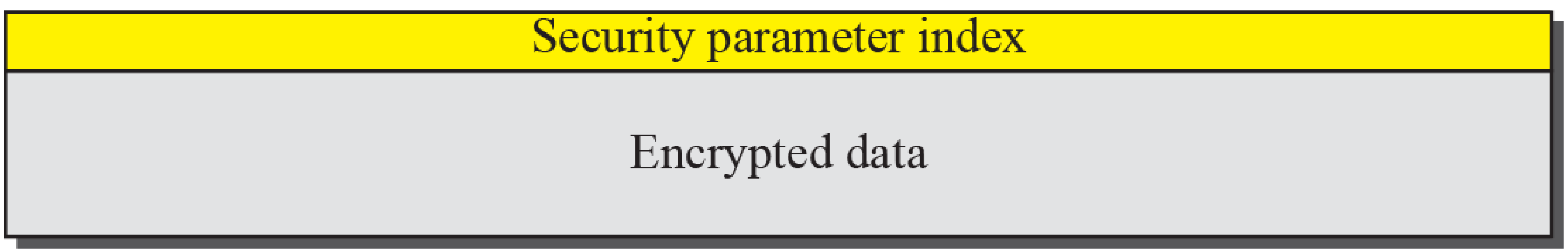


Figure 27.14 *Calculation of authentication data*



27-3 TRANSITION FROM IPv4 TO IPv6

Because of the huge number of systems on the Internet, the transition from IPv4 to IPv6 cannot happen suddenly. It will take a considerable amount of time before every system in the Internet can move from IPv4 to IPv6. The transition must be smooth to prevent any problems between IPv4 and IPv6 systems. Three strategies have been devised by the IETF to help the transition (see Figure 27.16).

Figure 27.16 *Three transition strategies*

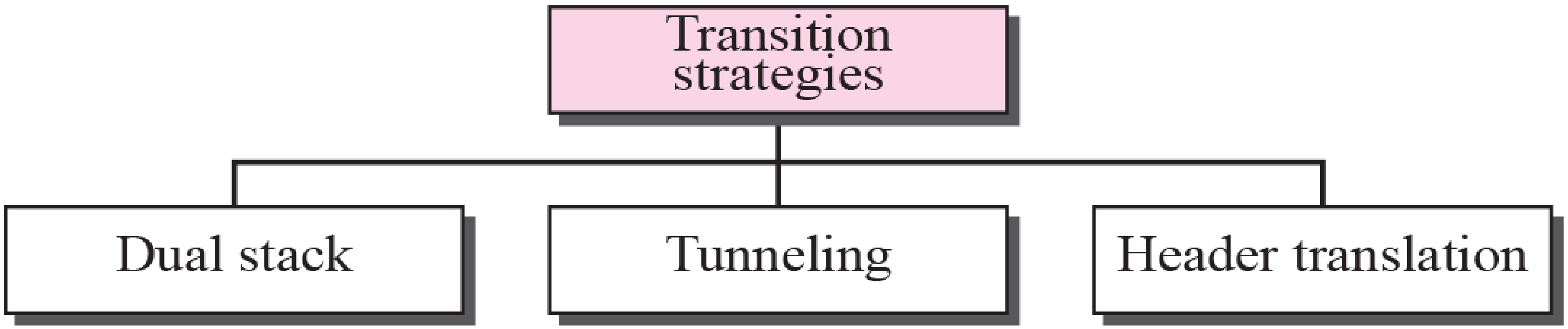


Figure 27.17 *Dual stack*

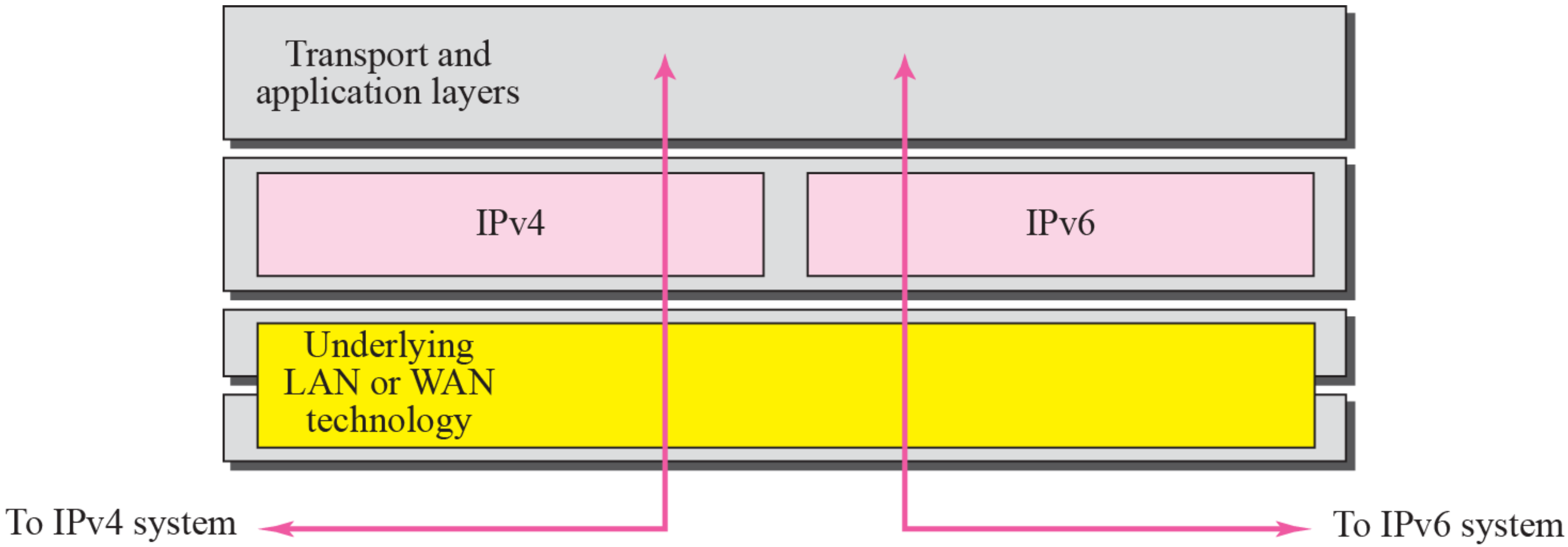


Figure 27.18 *Tunneling strategy*

Ipv4 Header Encapsulates the IPv6 Header

Only Applicable if source and dest are v6 and intermediate medium is v4

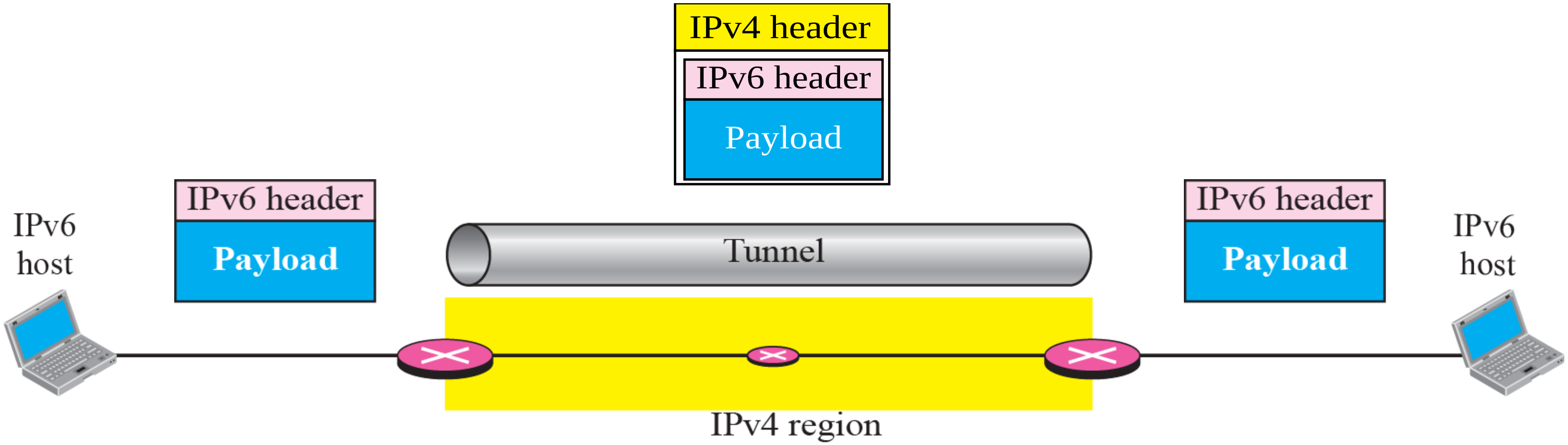


Figure 27.19 *Header translation strategy*