

8.3

OPTIONS

Figure 8-10

Option format

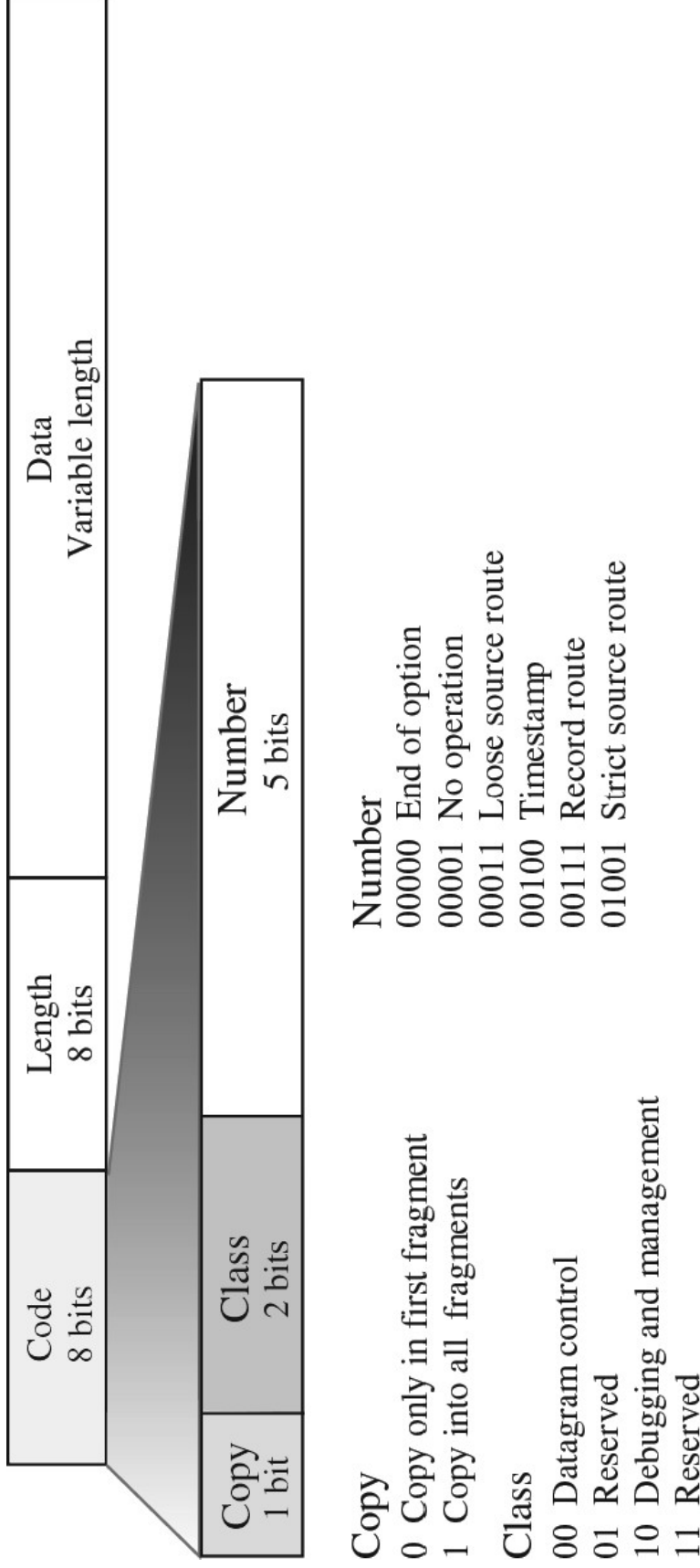


Figure 8-11

Categories of options

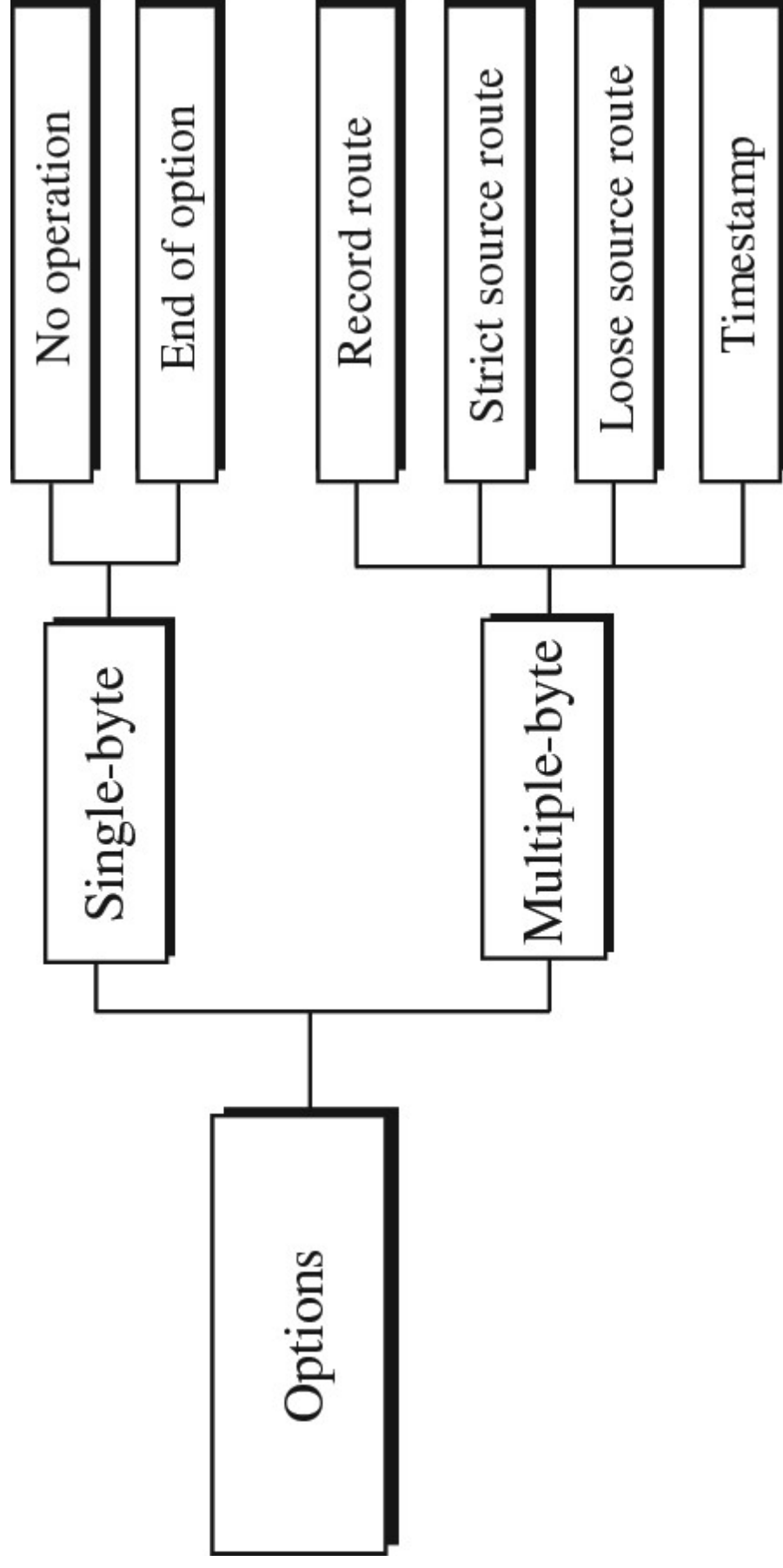


Figure 8-12

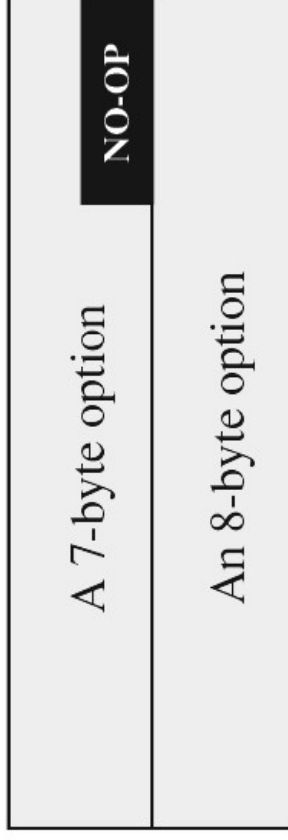
No operation option

Code: 1 00000001

a. No operation option



b. Used to align beginning of an option



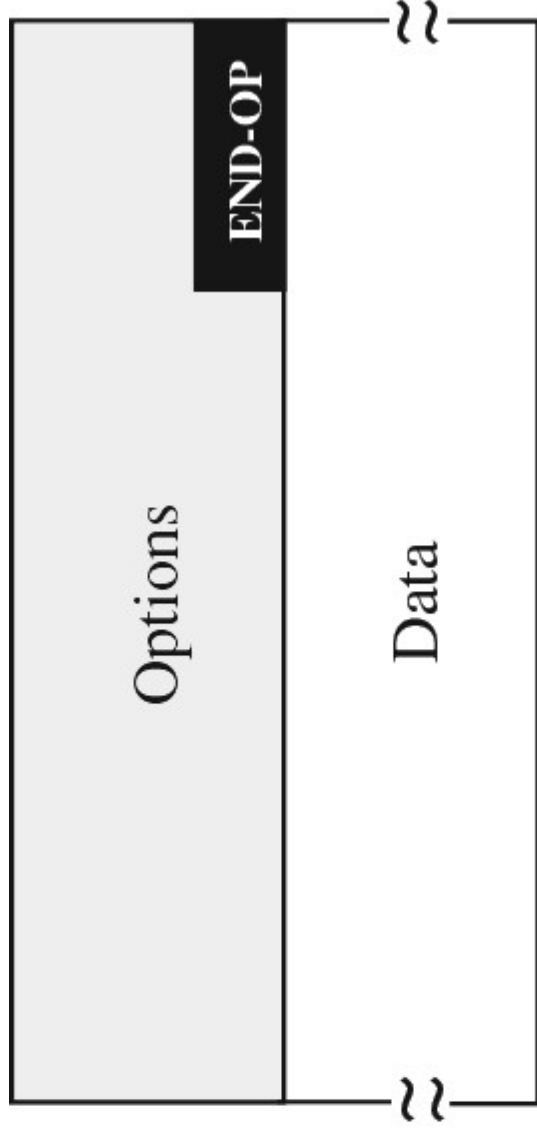
c. Used to align the next option

Figure 8-13

End of option option

Code: 0
00000000

a. End of option



b. Used for padding

Figure 8-14

Record route option

Code: 7 00000111	Length (Total length)	Pointer
First IP address (Empty when started)		
Second IP address (Empty when started)		
• • •		
Last IP address (Empty when started)		

Figure 8-15

Record route concept

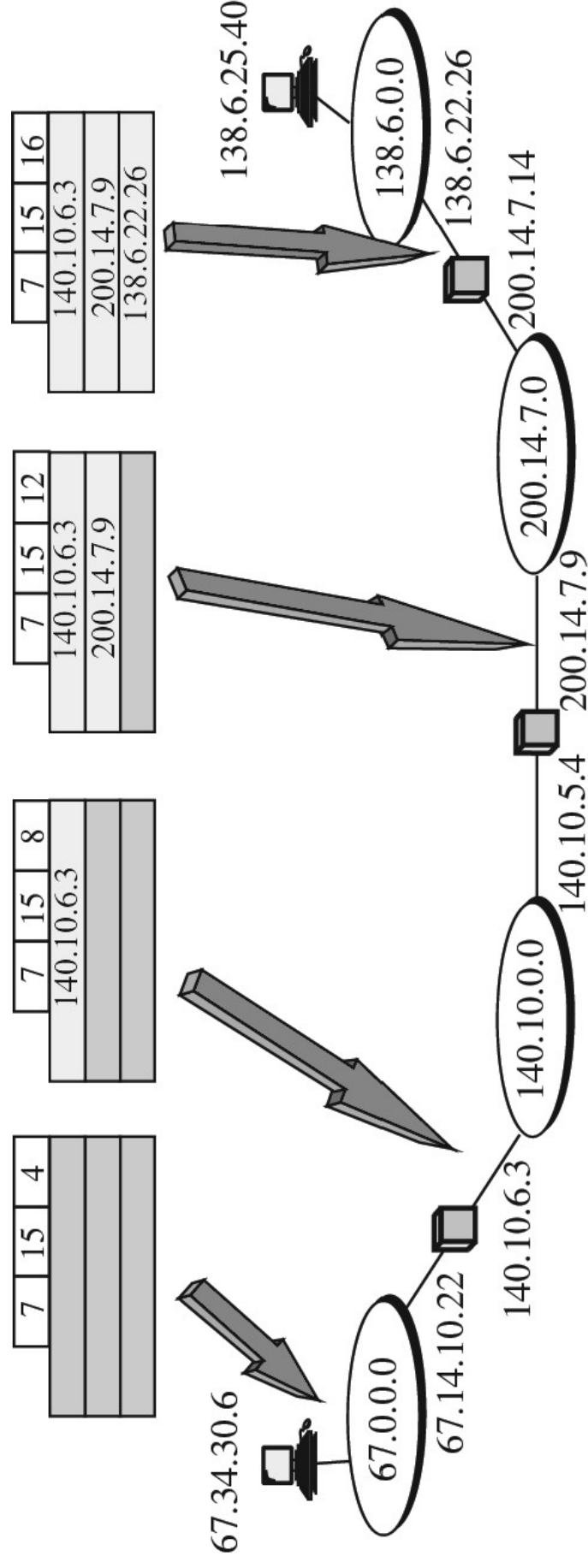


Figure 8-16

Strict source route option

Code: 137 10001001	Length (Total length)	Pointer
First IP address (Filled when started)		
Second IP address (Filled when started)		
• • •		
Last IP address (Filled when started)		

Figure 8-17

Strict source route concept

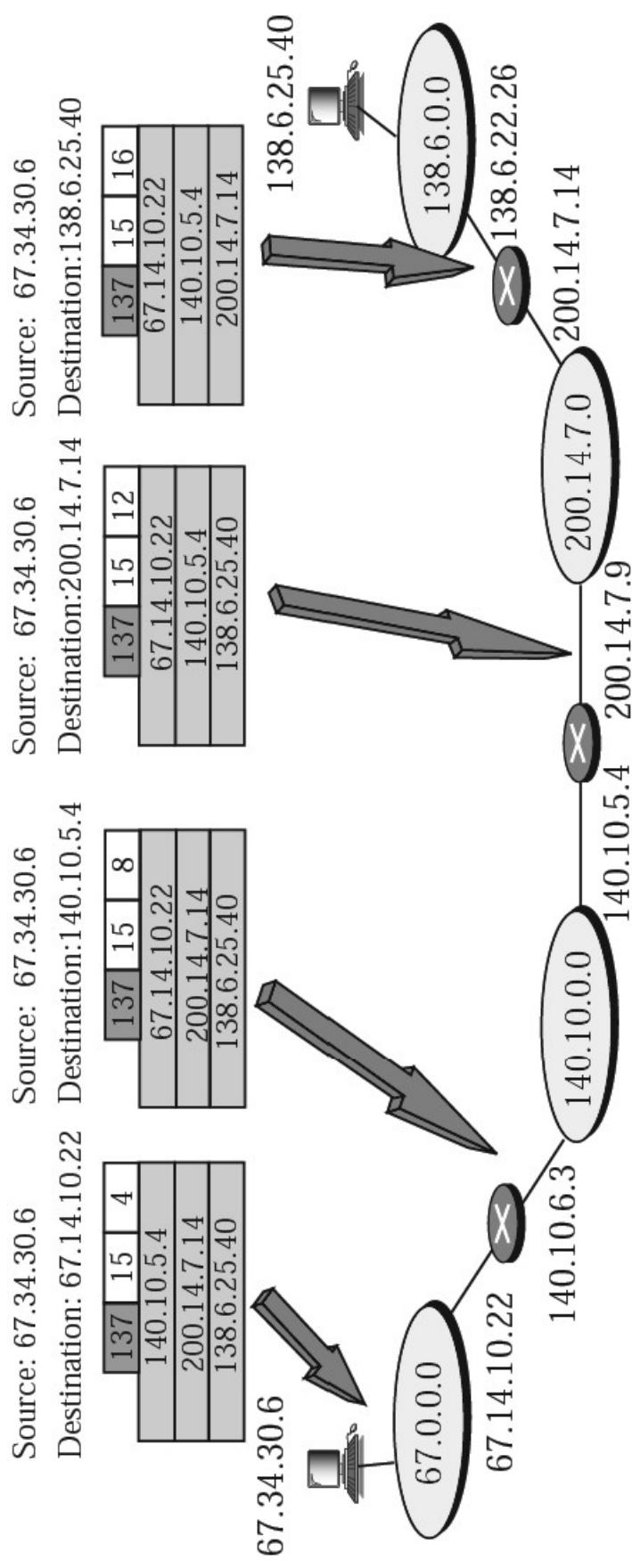


Figure 8-18

Loose source route option

Code: 131 10000011	Length (Total length)	Pointer
First IP address (Filled when started)		
Second IP address (Filled when started)		
• • •		
Last IP address (Filled when started)		

Figure 8-19

Timestamp option

Code: 68 01000100	Length (Total length)	Pointer	O-Flow 4 bits	Flags 4 bits
First IP address				
Second IP address				
• • •				
Last IP address				

Figure 8-20

Use of flag in timestamp

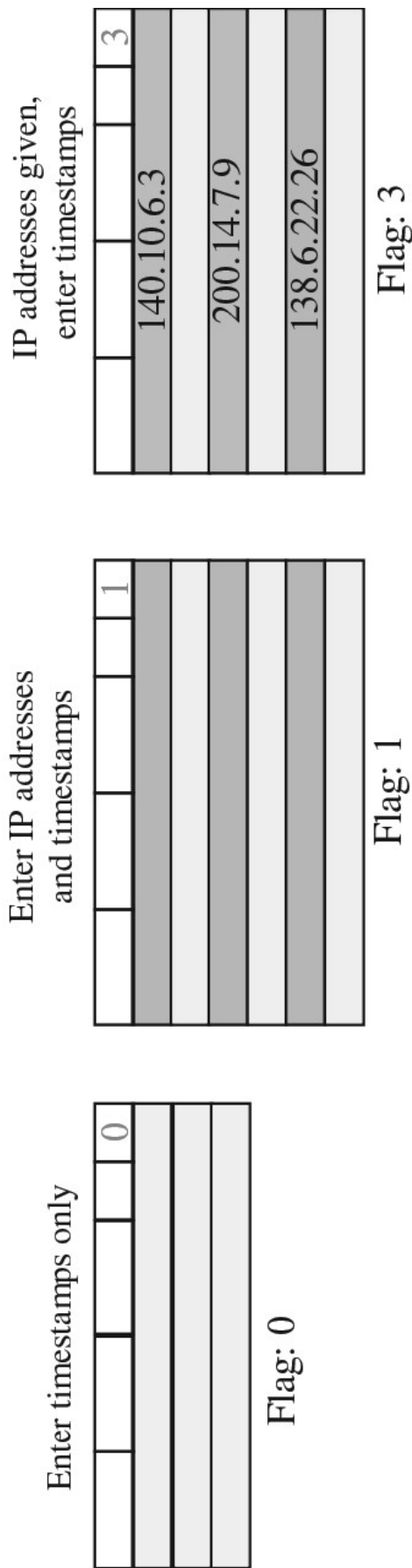
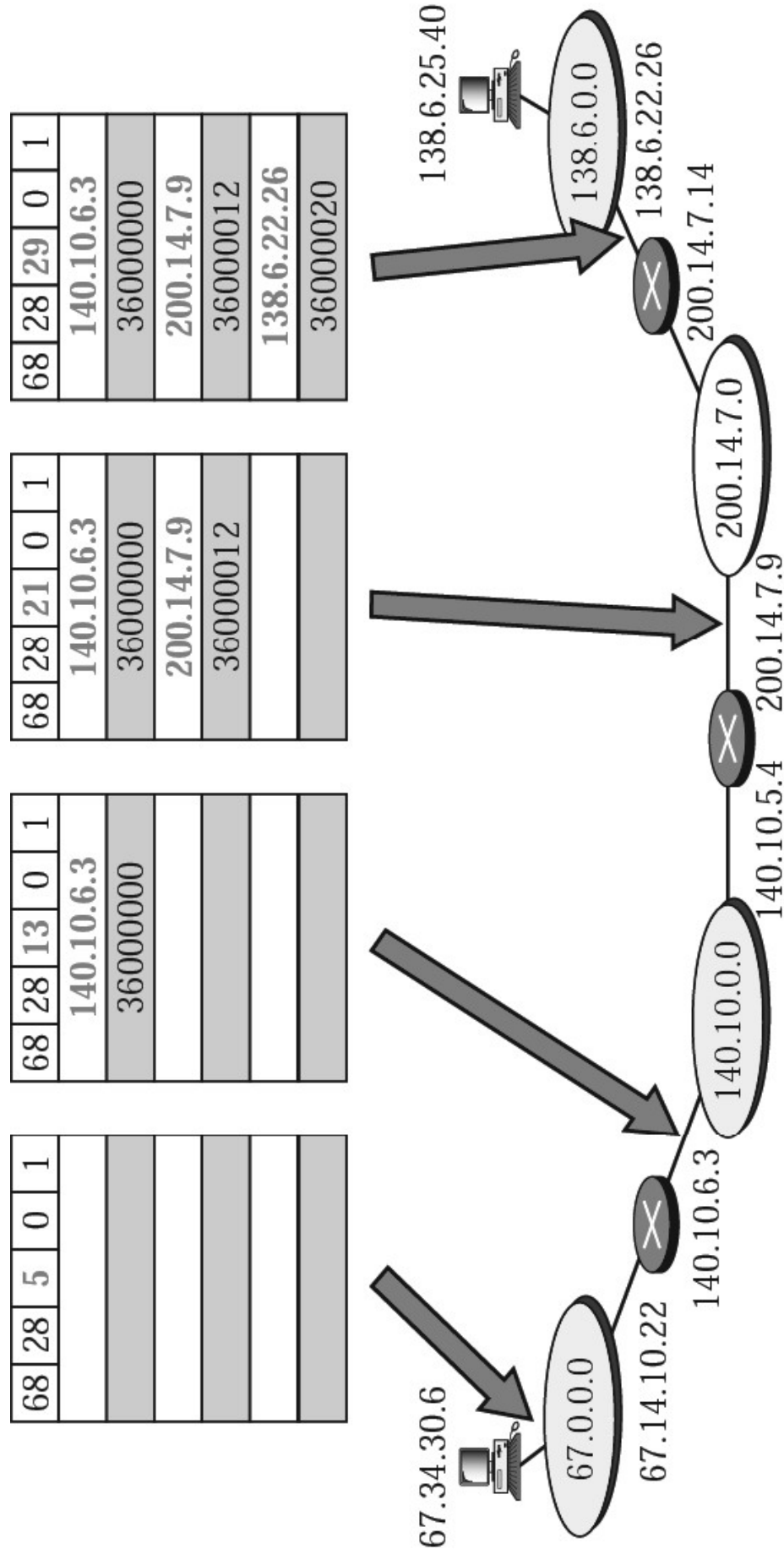


Figure 8-21

Timestamp concept



Example 10

Which of the six options must be copied to each fragment?

Solution

We look at the first (left-most) bit of the code for each option.

No operation: Code is **00000001**; no copy.

End of option: Code is **00000000**; no copy.

Record route: Code is **00000111**; no copy.

Strict source route: Code is **10001001**; copied.

Loose source route: Code is **10000011**; copied.

Timestamp: Code is **01000100**; no copy.

Example 11

Which of the six options are used for datagram control and which are used for debugging and management?

Solution

We look at the second and third (left-most) bits of the code.

No operation: Code is 00000001; control.

End of option: Code is 00000000; control.

Record route: Code is 00000111; control.

Strict source route: Code is 10001001; control.

Loose source route: Code is 10000011; control.

Timestamp: Code is 01000100; debugging

8.4

CHECKSUM

Note

To create the checksum the sender does the following:

- 1. The packet is divided into k sections, each of n bits.*
- 2. All sections are added together using one's complement arithmetic.*
- 3. The final result is complemented to make the checksum.*

Figure 8-22

Checksum concept

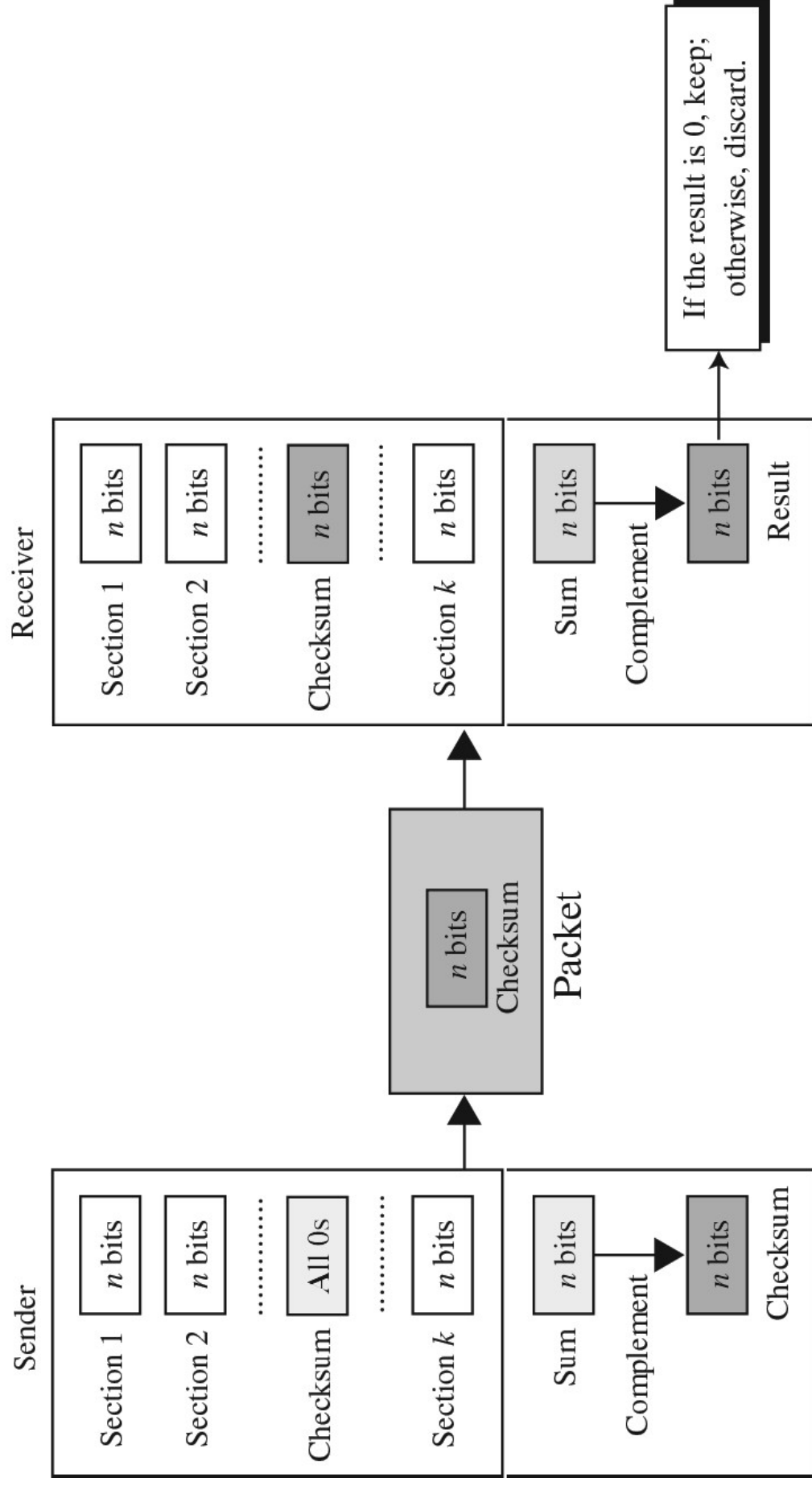


Figure 8-23

Checksum in one's complement arithmetic

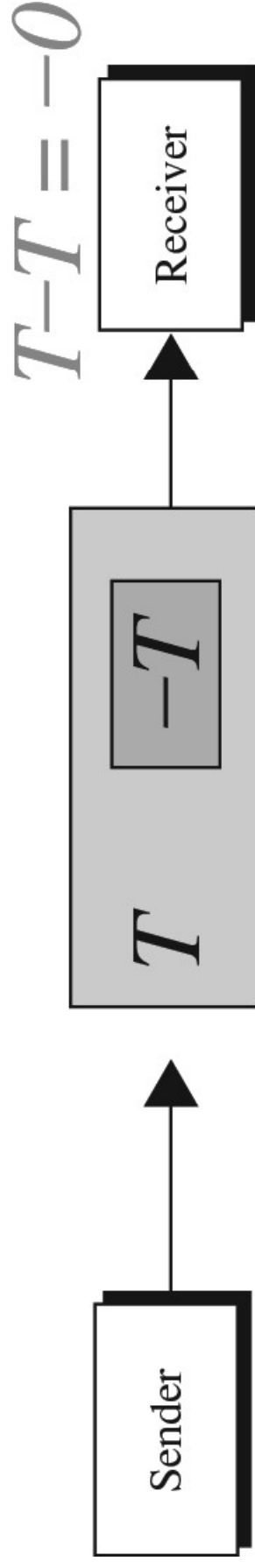


Figure 8-24

Example of checksum calculation in binary

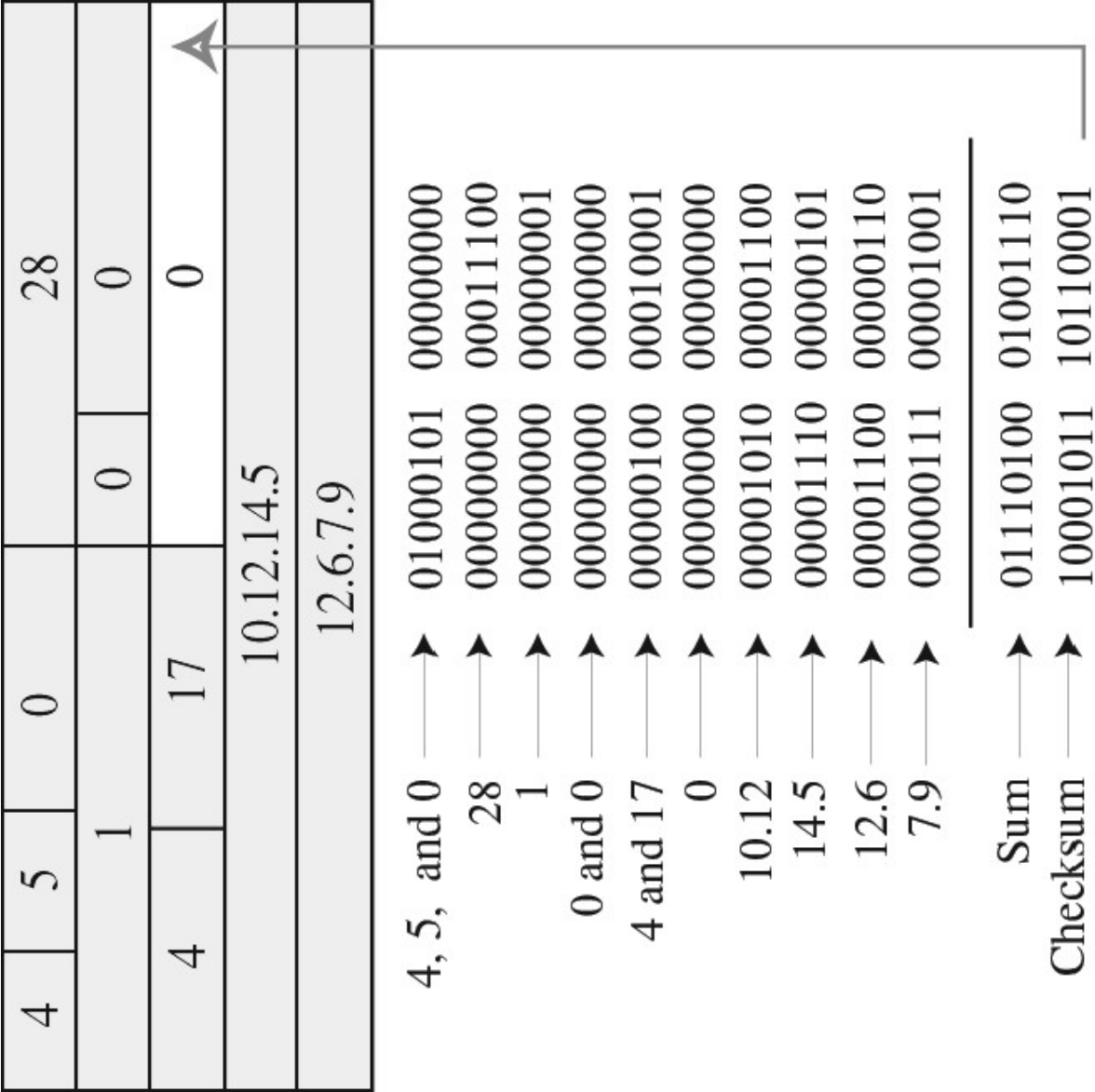
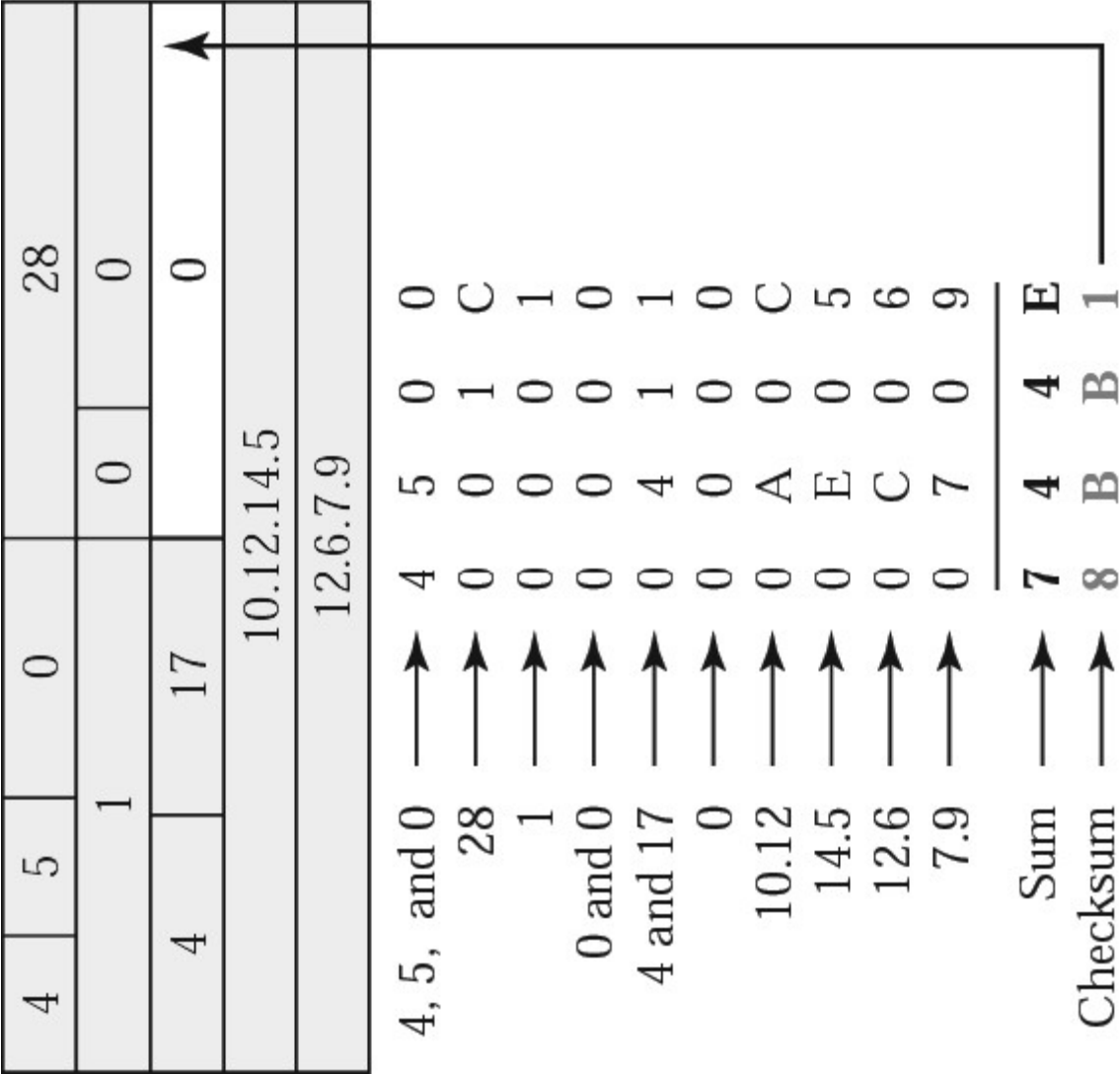


Figure 8-25

Example of checksum calculation in hexadecimal



Note

Check Appendix C for a detailed description of checksum calculation and the handling of carries.

8.5

IP PACKAGE

Figure 8-26

IP components

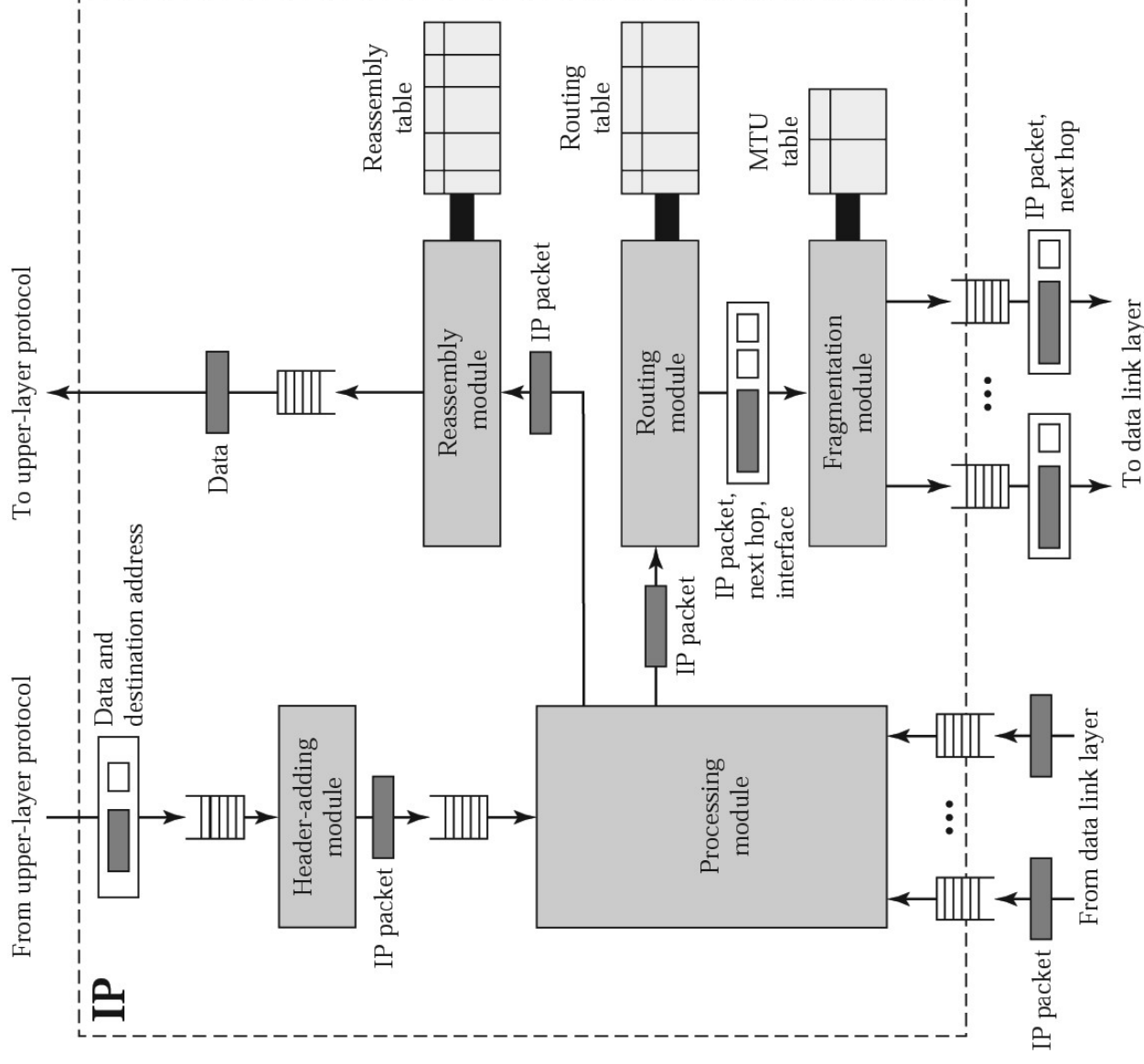


Figure 8-27

MTU table

Interface Number	MTU
.....	
.....	
.....	

Figure 8-28

Reassembly table

