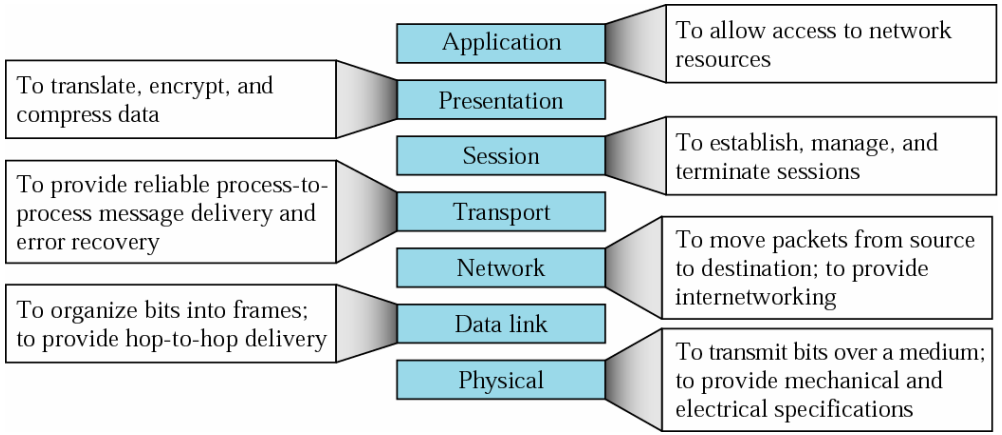
Material You May Bring to Any Test

Mohamed Aboutabl

CS-461 Spring 2003

Summary of OSI layers
Figure 2.14



Token Ring Data frame
Figure 3.9

SD Start delimiter (flag)
AC Access control (priority)
FC Frame control (frame type)
ED End delimiter (flag)
FS Frame status

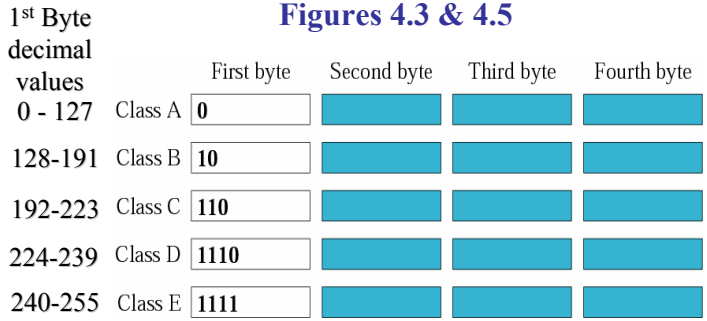
SD	AC	FC	Destination address	Source address	Data	CRC	ED	FS
1 byte	1 byte	1 byte	6 bytes	6 bytes	Up to 4500 bytes	4 bytes	1 byte	1 byte

Ethernet frame
Figure 3.4

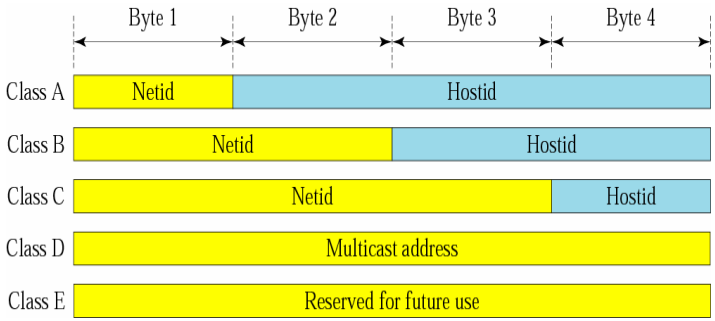
Preamble 56 bits of alternating 1s and 0s.
SFD Start field delimiter, flag (10101011)

Preamble	SFD	Destination address	Source address	Length PDU	Data and padding	CRC
7 bytes	1 byte	6 bytes	6 bytes	2 bytes		4 bytes

Finding the class of an IP address
Figures 4.3 & 4.5



Netid and hostid



Special Addresses
Table 4.3

Special Address	NetID	HostID	Source or Destination
Network Address	Specific	All 0s	None
Direct Broadcast Address	Specific	All 1s	Destination
Limited Broadcast Address	All 1s	All 1s	Destination
This Host on *This* Network	All 0s	All 0s	Source
Specific Host on This Network	All 0s	Specific	Destination
Loopback Address	127	Any	Destination

Default Masks

Class	Mask in dotted-decimal
A	255.0.0.0
B	255.255.0.0
C	255.255.255.0

Prefix Lengths and the Mask
Table 5.1

/n	Mask	/n	Mask	/n	Mask	/n	Mask
/1	128.0.0.0	/9	255.128.0.0	/17	255.255.128.0	/25	255.255.255.128
/2	192.0.0.0	/10	255.192.0.0	/18	255.255.192.0	/26	255.255.255.192
/3	224.0.0.0	/11	255.224.0.0	/19	255.255.224.0	/27	255.255.255.224
/4	240.0.0.0	/12	255.240.0.0	/20	255.255.240.0	/28	255.255.255.240
/5	248.0.0.0	/13	255.248.0.0	/21	255.255.248.0	/29	255.255.255.248
/6	252.0.0.0	/14	255.252.0.0	/22	255.255.252.0	/30	255.255.255.252
/7	254.0.0.0	/15	255.254.0.0	/23	255.255.254.0	/31	255.255.255.254
/8	255.0.0.0	/16	255.255.0.0	/24	255.255.255.0	/32	255.255.255.255

Routing Table

Mask	Destination address	Next-hop address	Flags	Reference count	Use	Interface
255.0.0.0	124.0.0.0	145.6.7.23	UG	4	20	m2 ....

Flags

U The router is up and running.

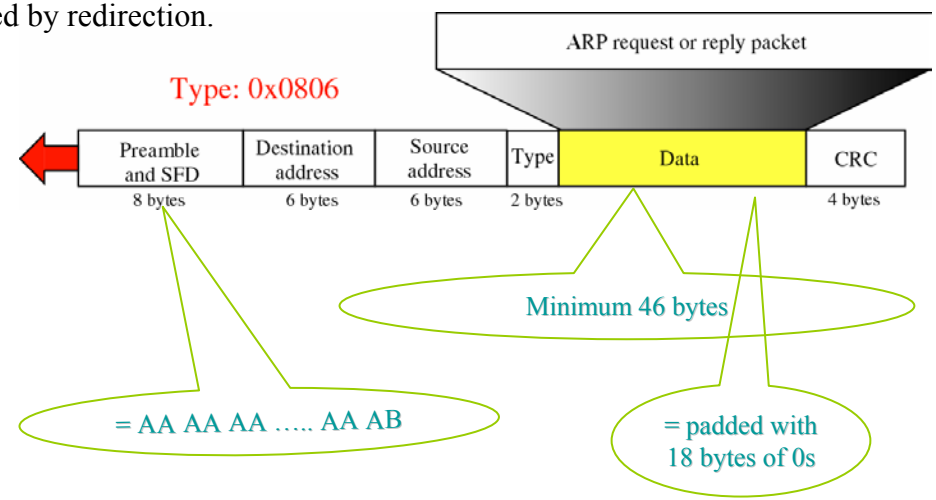
G The destination is in another network.

H Host-specific address.

D Added by redirection.

M Modified by redirection.

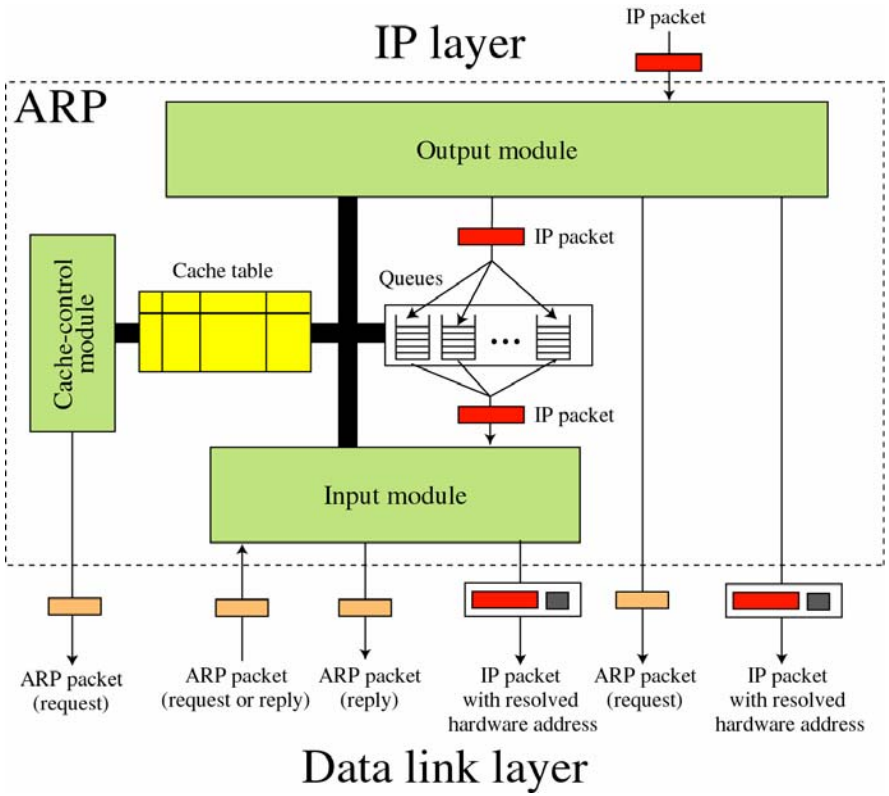
Encapsulation of ARP packet



ARP packet

Hardware Type = 1 for Ethernet		Protocol Type = 0x0800 in IPv4
Hardware length	Protocol length	Operation Request 1, Reply 2
Sender hardware address (For example, 6 bytes for Ethernet)		
Sender protocol address (For example, 4 bytes for IP)		
Target hardware address (For example, 6 bytes for Ethernet) (It is not filled in a request)		
Target protocol address (For example, 4 bytes for IP)		

ARP Software Package

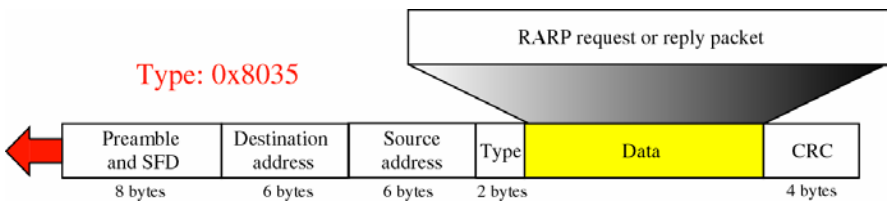


ARP Cache Table					
State	Queue	No of Attempts	Time-Out (seconds)	Protocol Address	Hardware Address

RARP packet
Figure 7.11

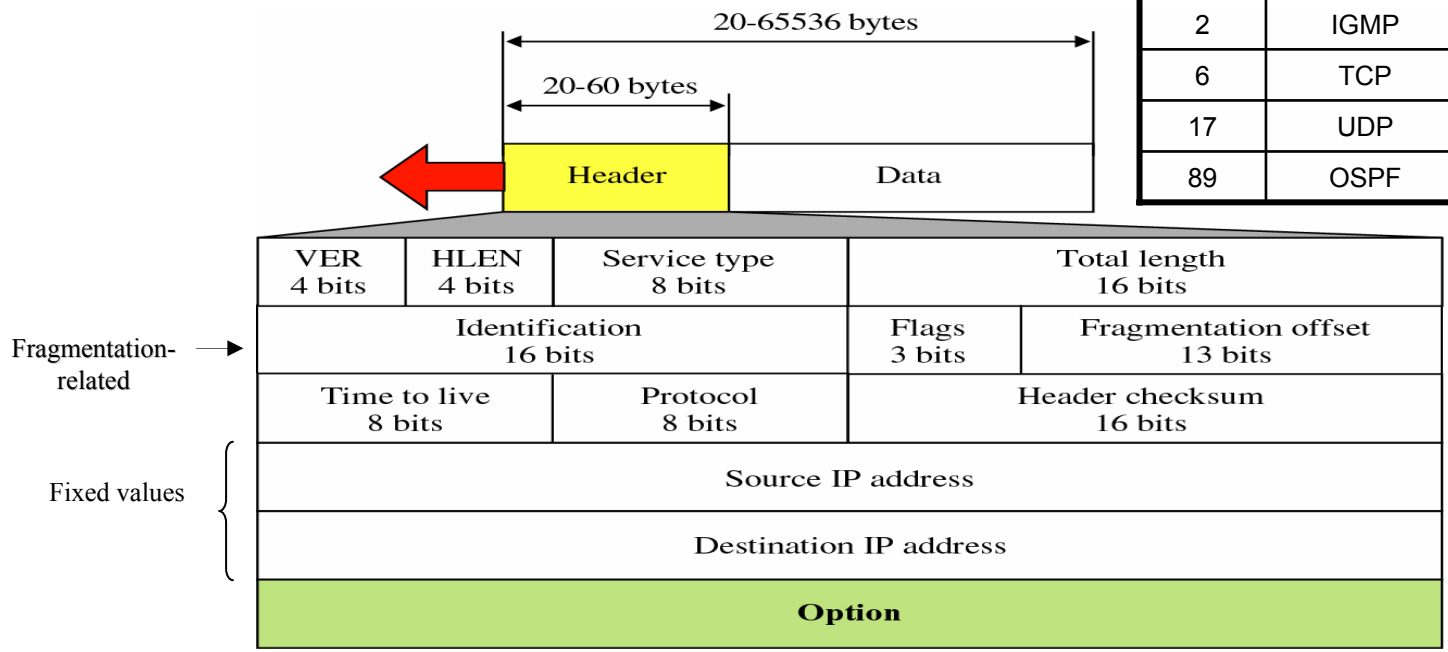
Hardware type		Protocol type
Hardware length	Protocol length	Operation Request 3, Reply 4
Sender hardware address (For example, 6 bytes for Ethernet)		
Sender protocol address (For example, 4 bytes for IP) (It is not filled for request)		
Target hardware address (For example, 6 bytes for Ethernet) (It is not filled for request)		
Target protocol address (For example, 4 bytes for IP) (It is not filled for request)		

Encapsulation of RARP packet
Figure 7.12

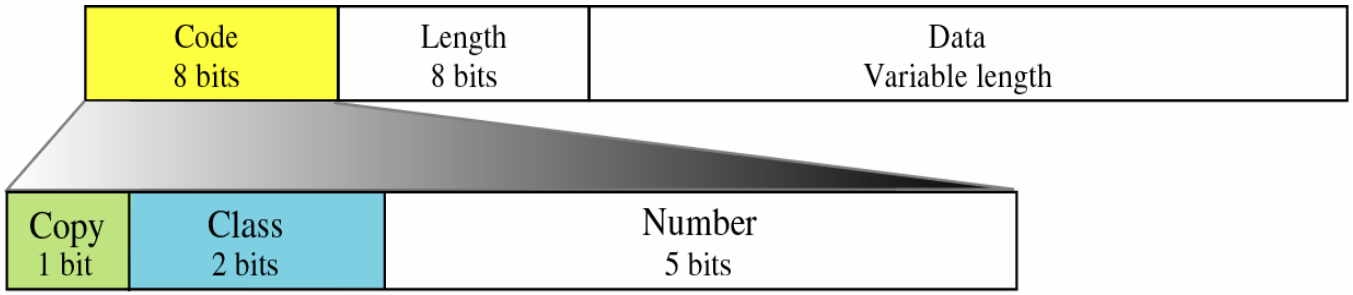


IP datagram
Figure 8.2

Value	Protocol
1	ICMP
2	IGMP
6	TCP
17	UDP
89	OSPF



IP Options



Copy

0 Copy only in first fragment
1 Copy into all fragments

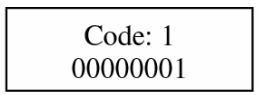
Class

00 Datagram control
01 Reserved
10 Debugging and management
11 Reserved

Number

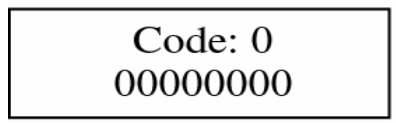
00000 End of option
00001 No operation
00011 Loose source route
00100 Timestamp
00111 Record route
01001 Strict source route

No operation **option**



a. No operation option

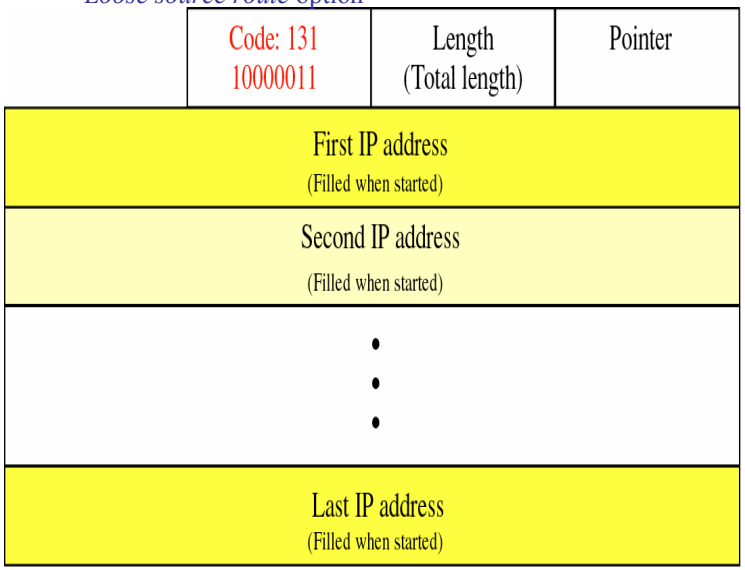
End of option **option**



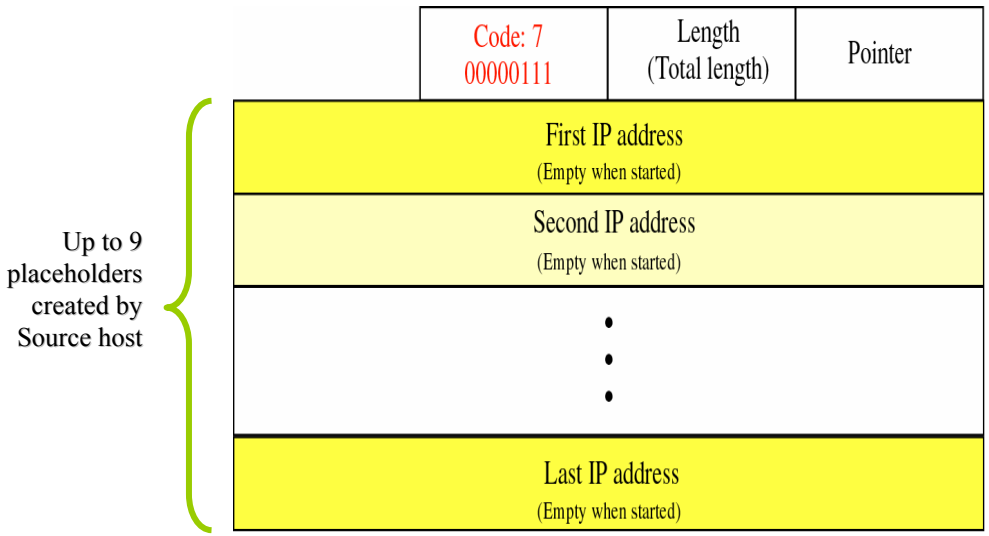
a. End of option

IP Options

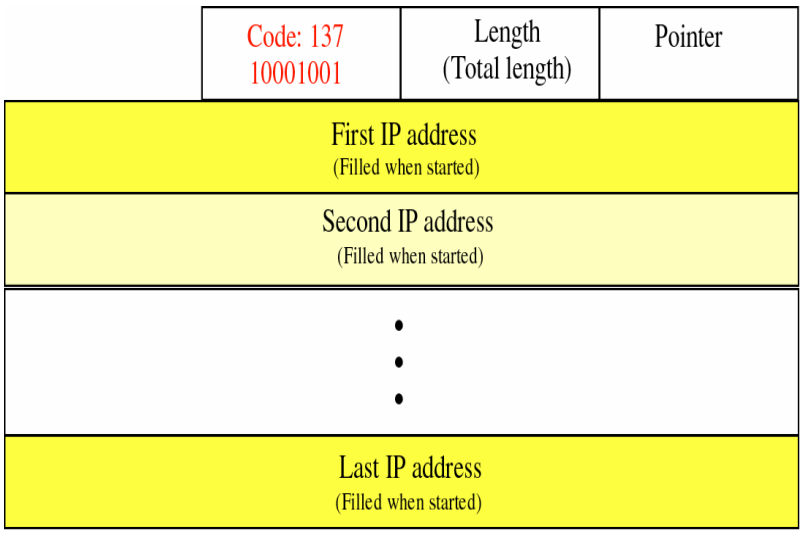
Loose source route option



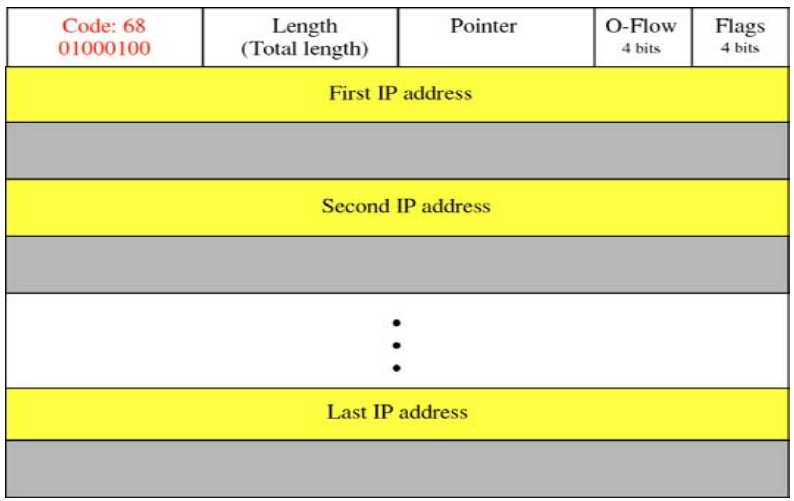
Record route option



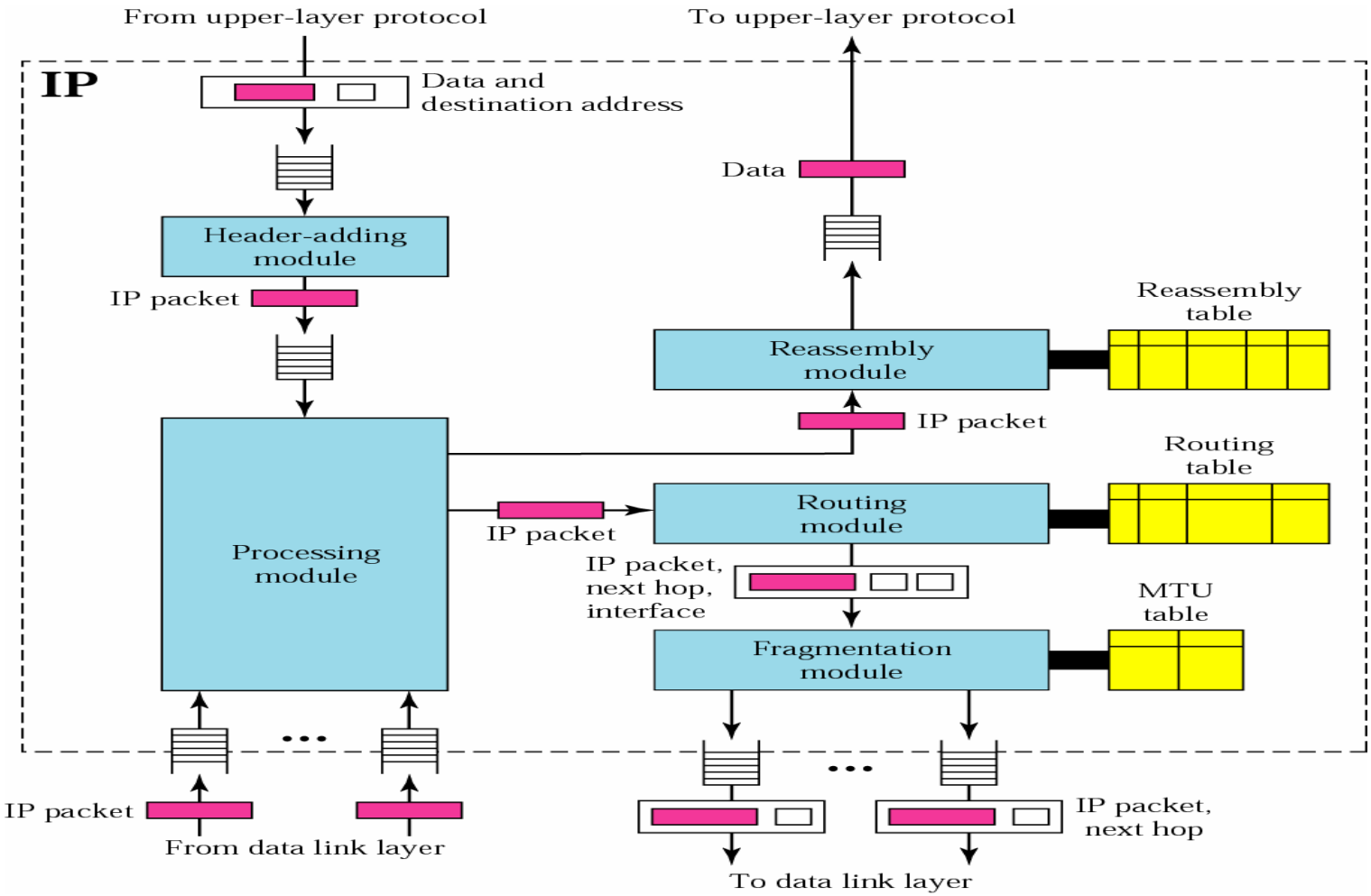
Strict source route option



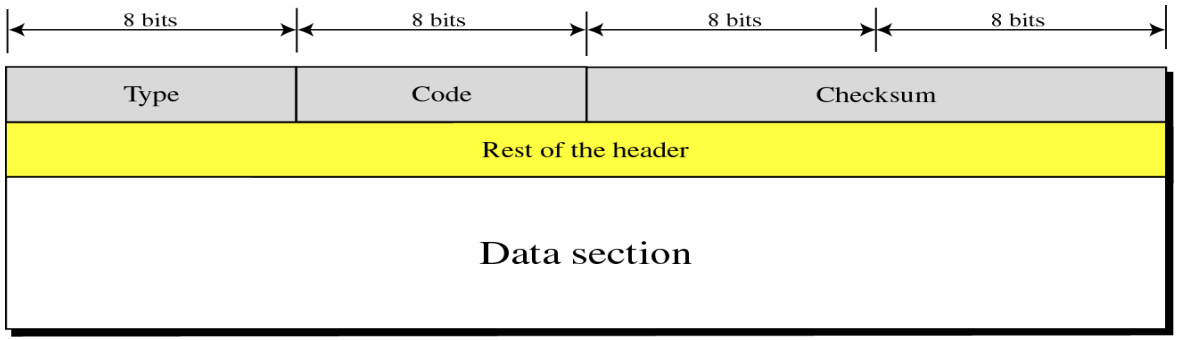
Timestamp option



IP PACKAGE

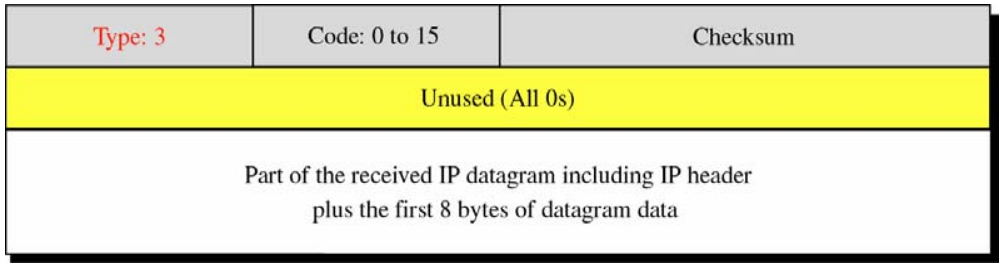

From upper-layer protocol
To upper-layer protocol
IP
Data and destination address
Data
Header-adding module
IP packet
Reassembly table
Reassembly module
IP packet
Routing table
Routing module
Processing module
IP packet
IP packet, next hop, interface
MTU table
Fragmentation module
IP packet
From data link layer
IP packet, next hop
To data link layer

ICMP MESSAGES



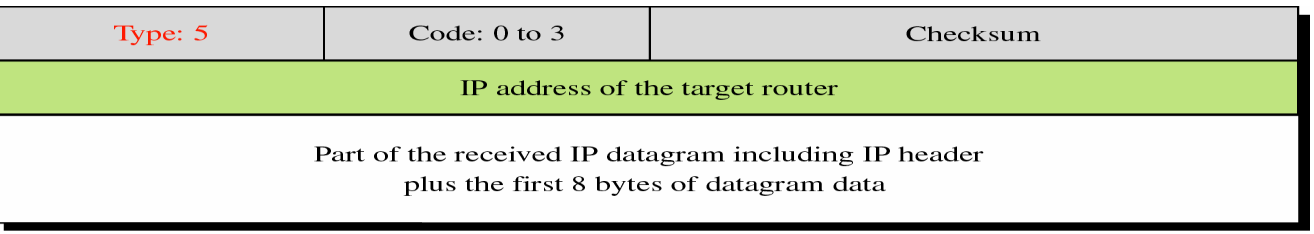
Category	*Type*	*Message*
Error-reporting messages	3	Destination unreachable
	4	Source quench
	11	Time exceeded
	12	Parameter problem
	5	Redirection
Query messages	8 or 0	Echo request or reply
	13 or 14	Timestamp request or reply
	17 or 18	Address mask request or reply
	10 or 9	Router solicitation or advertisement

ICMP Destination-unreachable format



Code	Error	Code	Error
0	Network unreachable	8	Isolated Source Host
1	Host unreachable	9	Comm. with destination network prohibited
2	Protocol unreachable	10	Comm. with destination host prohibited
3	Port unreachable	11	Network unreachable – Type of Service
4	Fragmentation required, but prohibited	12	Host unreachable – Type of Service
5	Source routing is infeasible	13	Host unreachable – Administrative Filter
6	Unknown destination network	14	Host unreachable – Precedence violated
7	Unknown destination host	15	Host unreachable – Precedence cut off

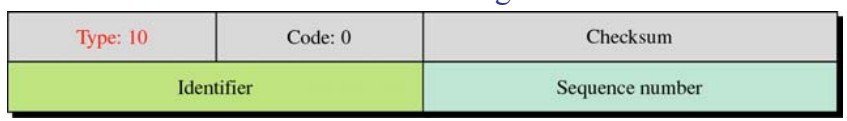
Redirection message format



Code 0: Network specific
Code 1: Host specific

Code 2: Network specific (specified service)
Code 3: Host specific (specified service)

Router solicitation message format



ICMP Messages

Echo Request & Reply

8: Echo request
0: Echo reply

Type: 8 or 0	Code: 0	Checksum
Identifier		Sequence number
Optional data Sent by the request message; repeated by the reply message		

17: Request
18: Reply

Type: 17 or 18	Code: 0	Checksum
Identifier		Sequence number
Address mask		

13: request
14: reply

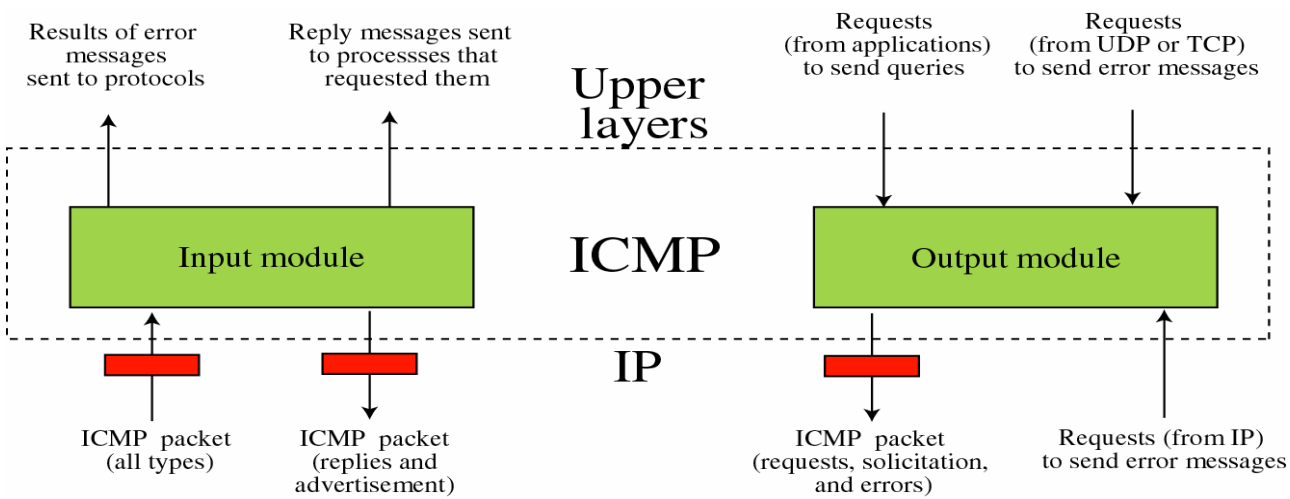
Timestamp-request and timestamp-reply message

Type: 13 or 14	Code: 0	Checksum
Identifier		Sequence number
Original timestamp		
Receive timestamp		
Transmit timestamp		

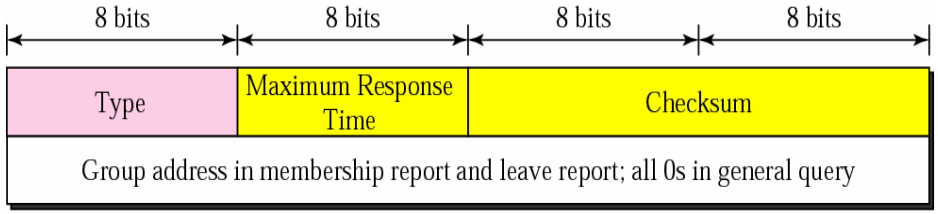
Mask-request and mask-reply message format

Router advertisement message format

Type: 9	Code: 0	Checksum
Number of addresses	Address entry size	Lifetime
Router address 1		
Address preference 1		
Router address 2		
Address preference 2		
.		
.		
.		

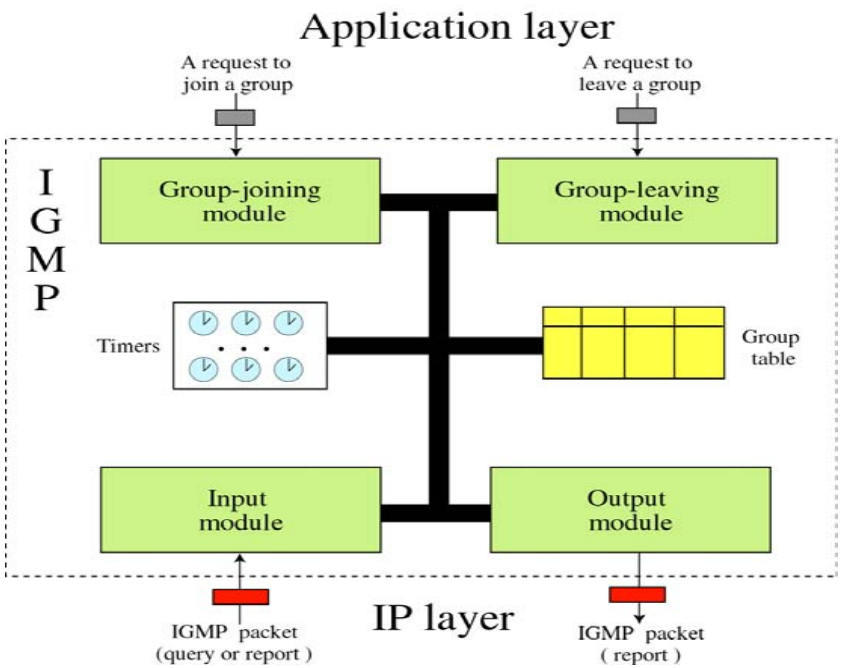


IGMP



Type	*Value*
General or Special Query	*0x11* or 0001 0001
Membership Report	*0x16* or 0001 0110
Leave Report	*0x17* or 0001 0111

Type	*Destination IP address*
General or Special Query	224.0.0.1 All systems on this subnet
Membership Report	The multicast address of the group
Leave Report	224.0.0.2 All routers on this subnet

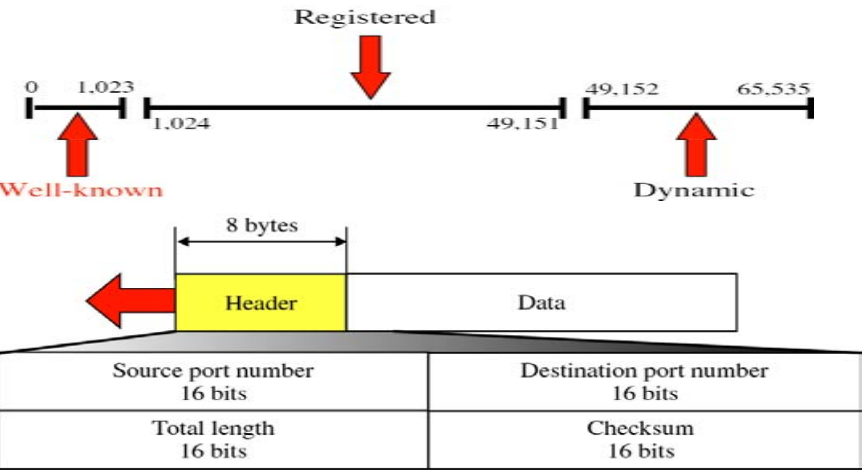


Group table

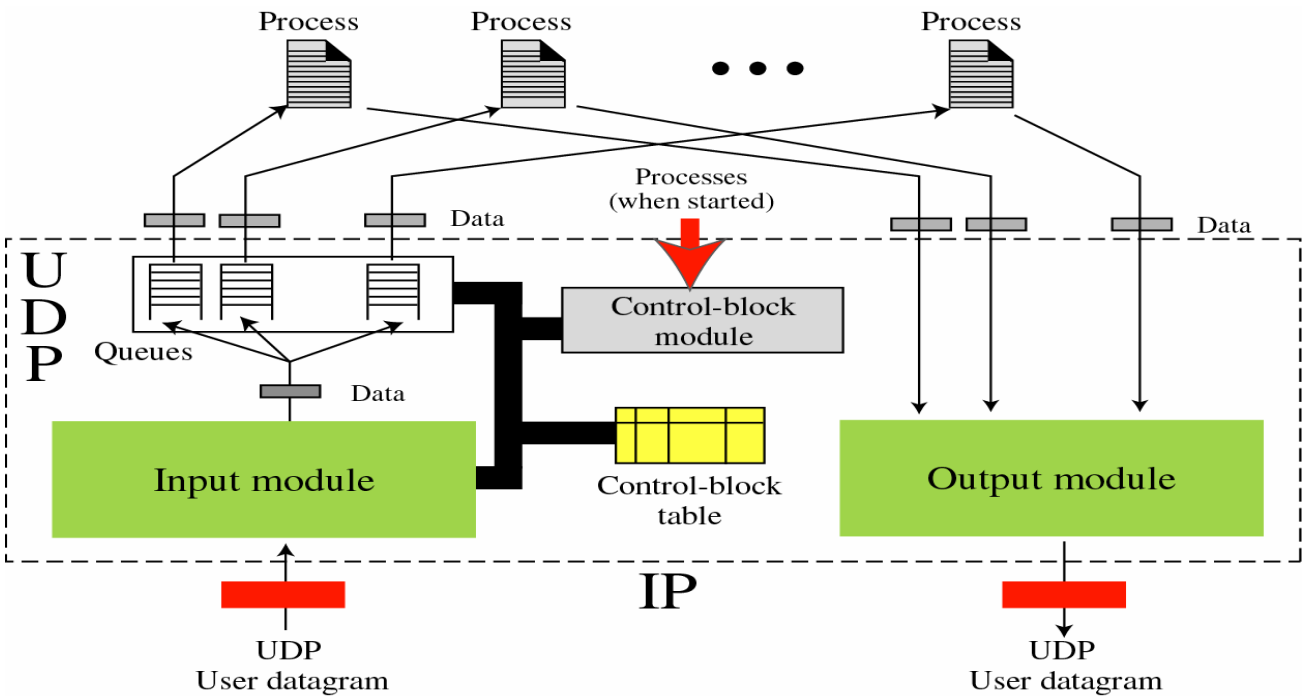
State	Interface No.	Group Address	Reference Count
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....

UDP

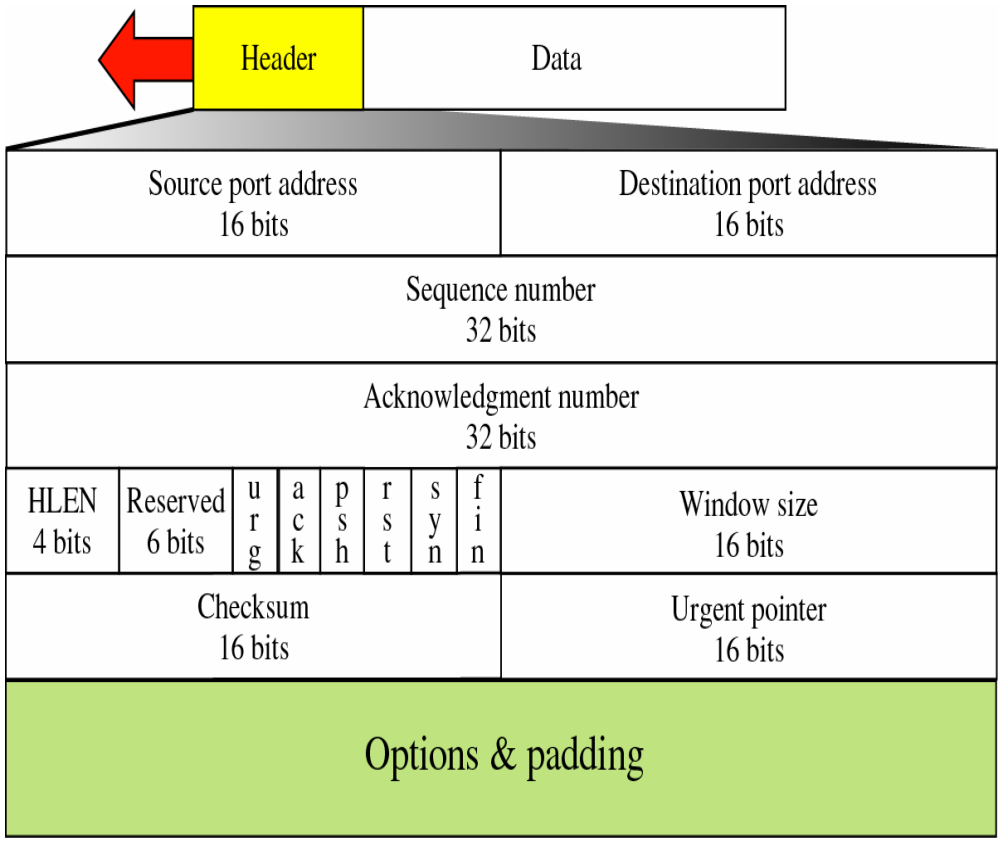
IANA Port Number Ranges



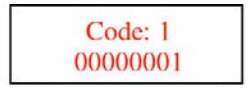
Port	Protocol	Description
7	Echo	Echoes a received datagram back to sender
9	Discard	Discards any datagram it receives
13	Daytime	Returns the date and time
17	Quote	Returns a quote of the day
111	RPC	Remote procedure call
123	NTP	Network Time Protocol
161	SNMP	Simple Network Management Protocol



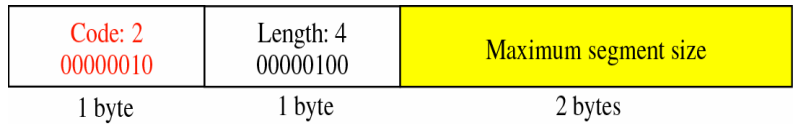
TCP



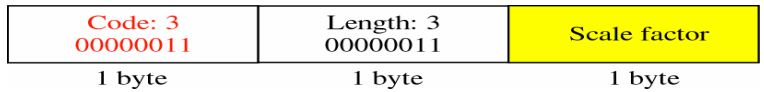
a. End of option



a. No operation option

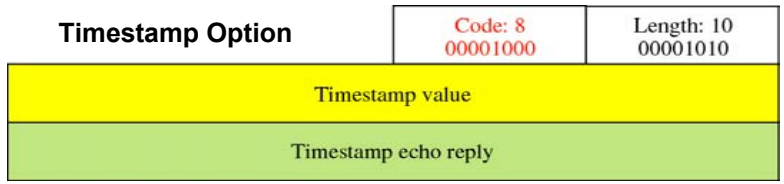


Maximum segment size Option

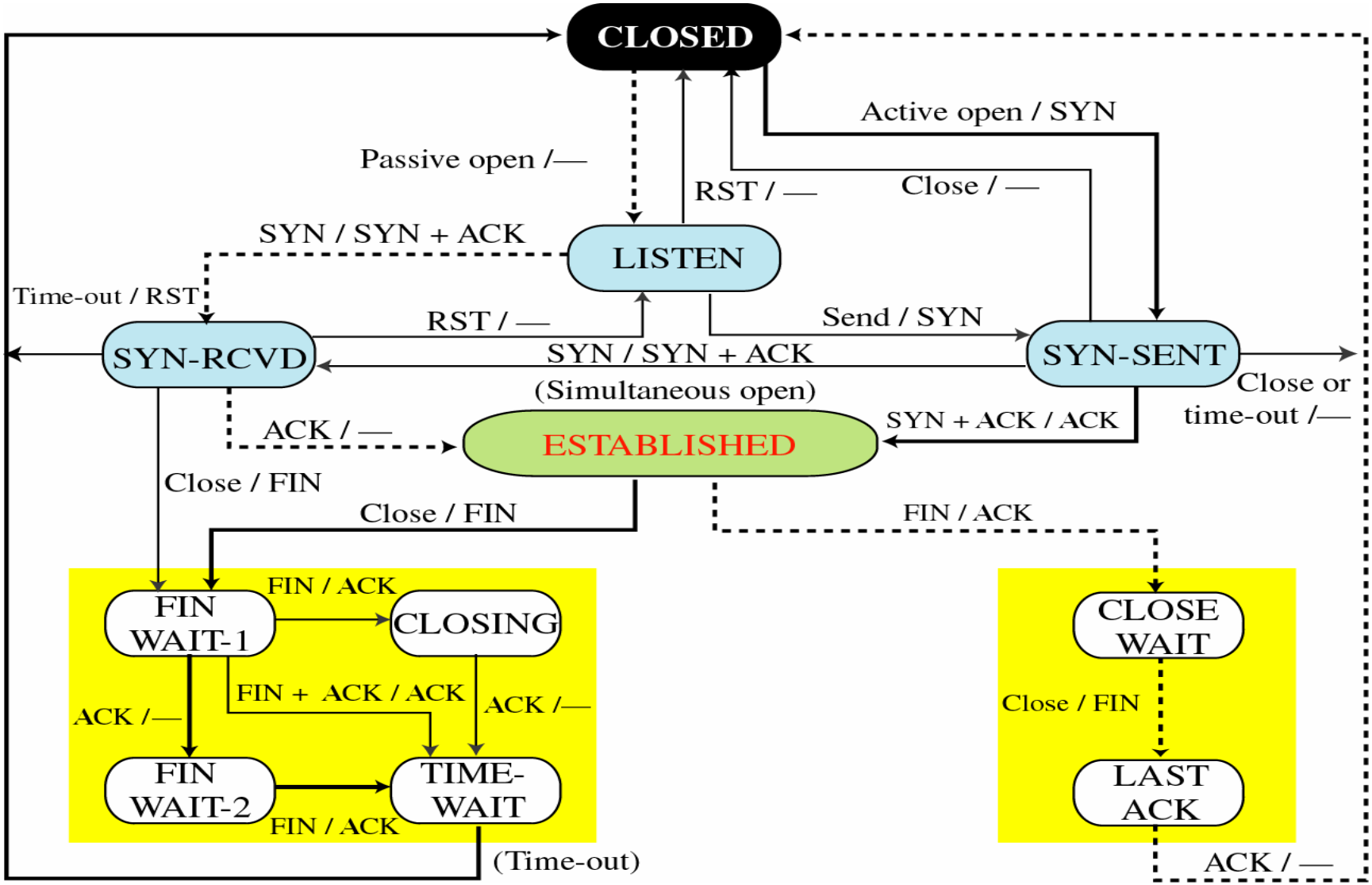


Window scale factor Option

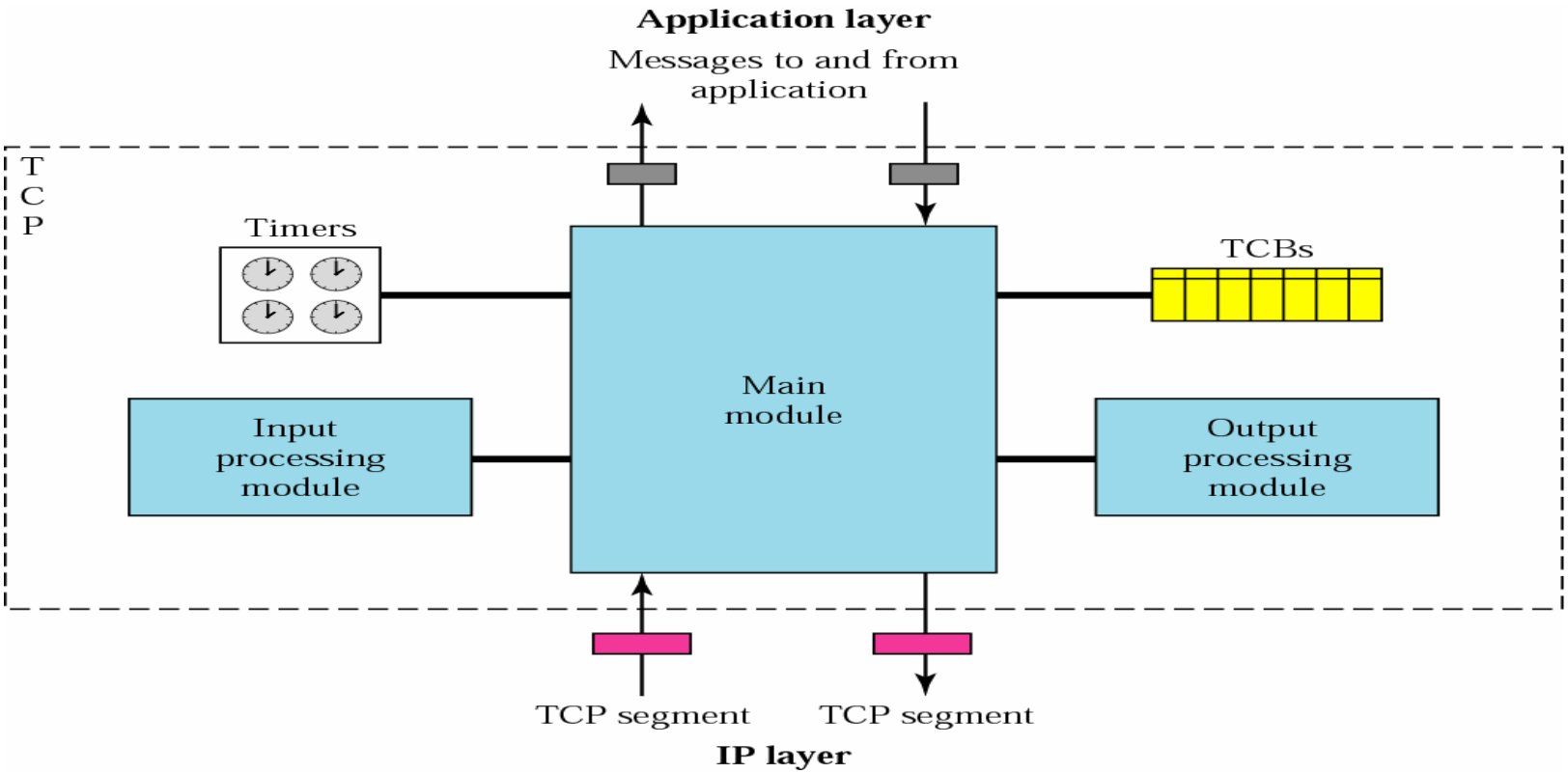
Timestamp Option

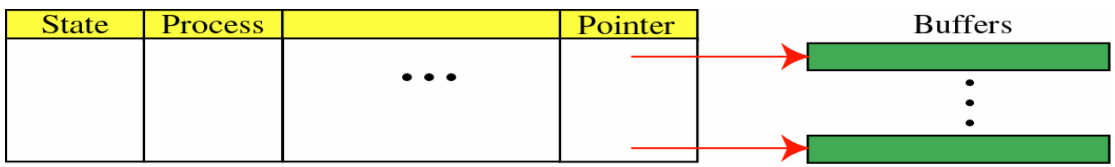


TCP State Diagram



TCP Package


Application layer
Messages to and from application
T
C
P
Timers
TCBs
Main module
Input processing module
Output processing module
TCP segment
TCP segment
IP layer


State
Process
Pointer
Buffers