
TCP/IP

-
- ✍ **TCP/IP**
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 - ✍ **TCP/IP**
 - ✍ **TCP/IP**
 - ✍ **Internet Protocol _ IP Address**
 - ✍ **Internet Protocol _ Subnet Mask**
 - ✍ **Internet Protocol _ ARP(Address Resolution Protocol)**
 - ✍ **Internet Protocol _ RARP(Reverse Address Resolution Protocol)**
 - ✍ **Internet Protocol _ Header**
 - ✍ **Internet Protocol _ Routing**
 - ✍ **Transport Layer – TCP & UDP**
 - ✍ **Transport Layer – TCP**
 - ✍ **Transport Layer – UDP**

TCP/IP



1960 ARPA(Advanced Research Project Agency)

ARPANet

DARPA Internet protocol suite

OPEN Protocol

TCP/IP Berkeley UNIX

PC

LAN WAN

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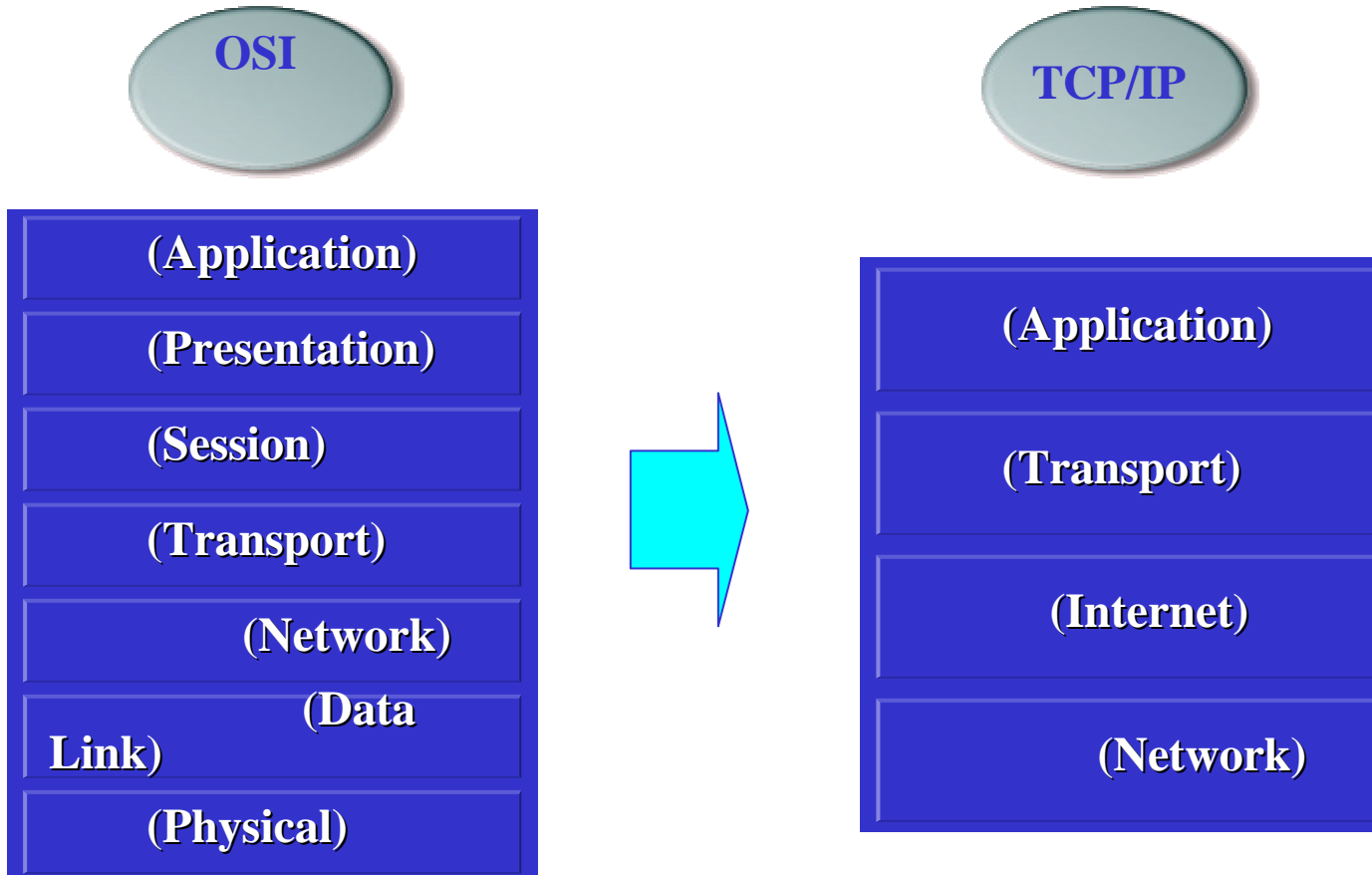
TCP & IP

TCP/IP



IP

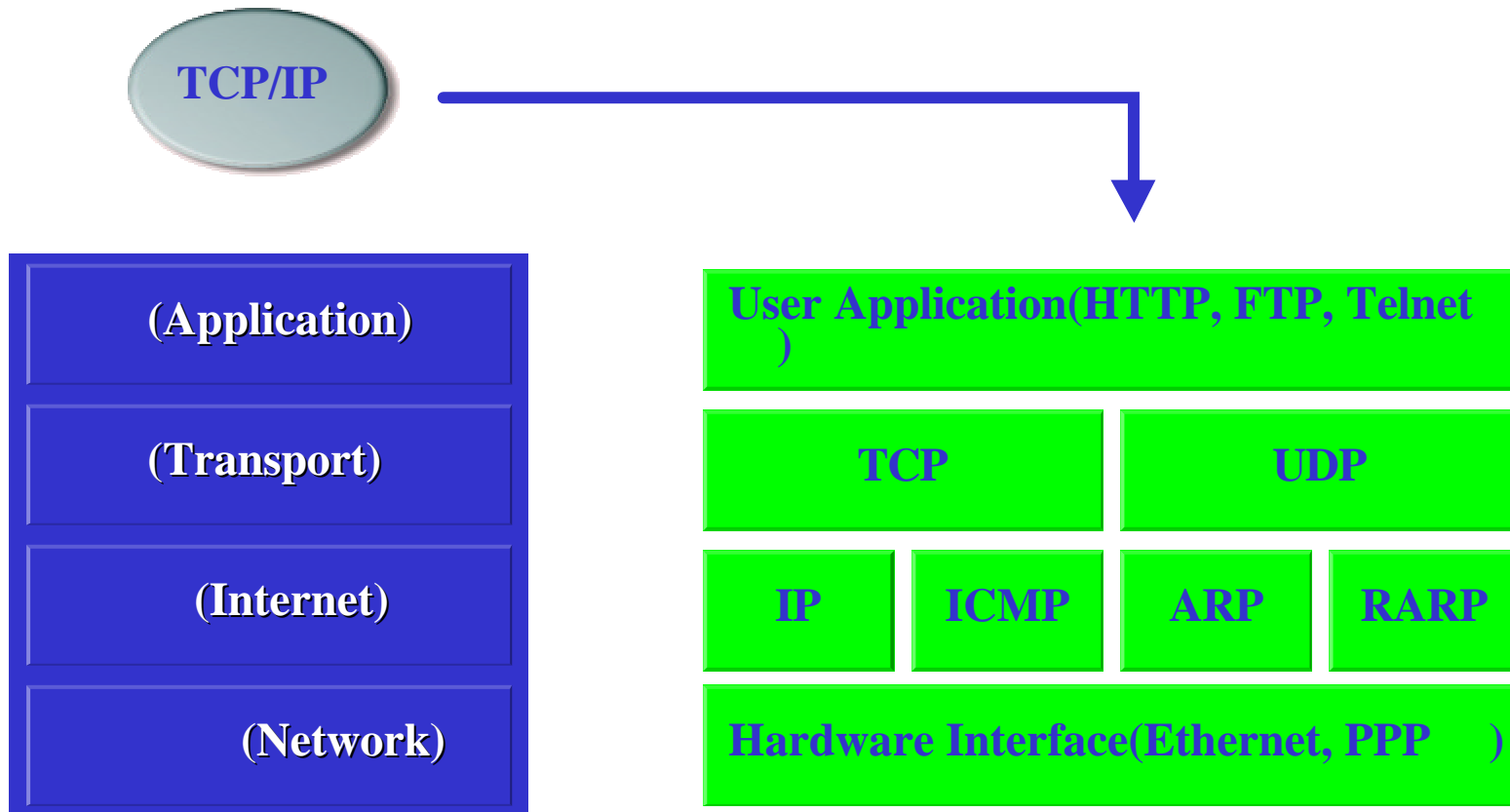
OSI



TCP/IP

✍ RFC 1180

✍



TCP/IP

✎ Network Layer()

✎ OSI

✎ 48bit MAC(Media Access Control) Address

✎ IP ARP/RARP

✎ Internet Layer()

✎ IP(Internet Protocol)

- TCP, UDP, ICMP

✎ ICMP(Internet Control Message Protocol)

-

✎ ARP(Address Resolution Protocol)

- IP Hardware

✎ RARP(Reverse ARP)

- Hardware IP

TCP/IP

Transport Layer()

TCP(Transmission Control Protocol)

-
- full-duplex, byte stream
- TCP .

UDP(User Data Protocol)

-
- UDP datagram

Application Layer()

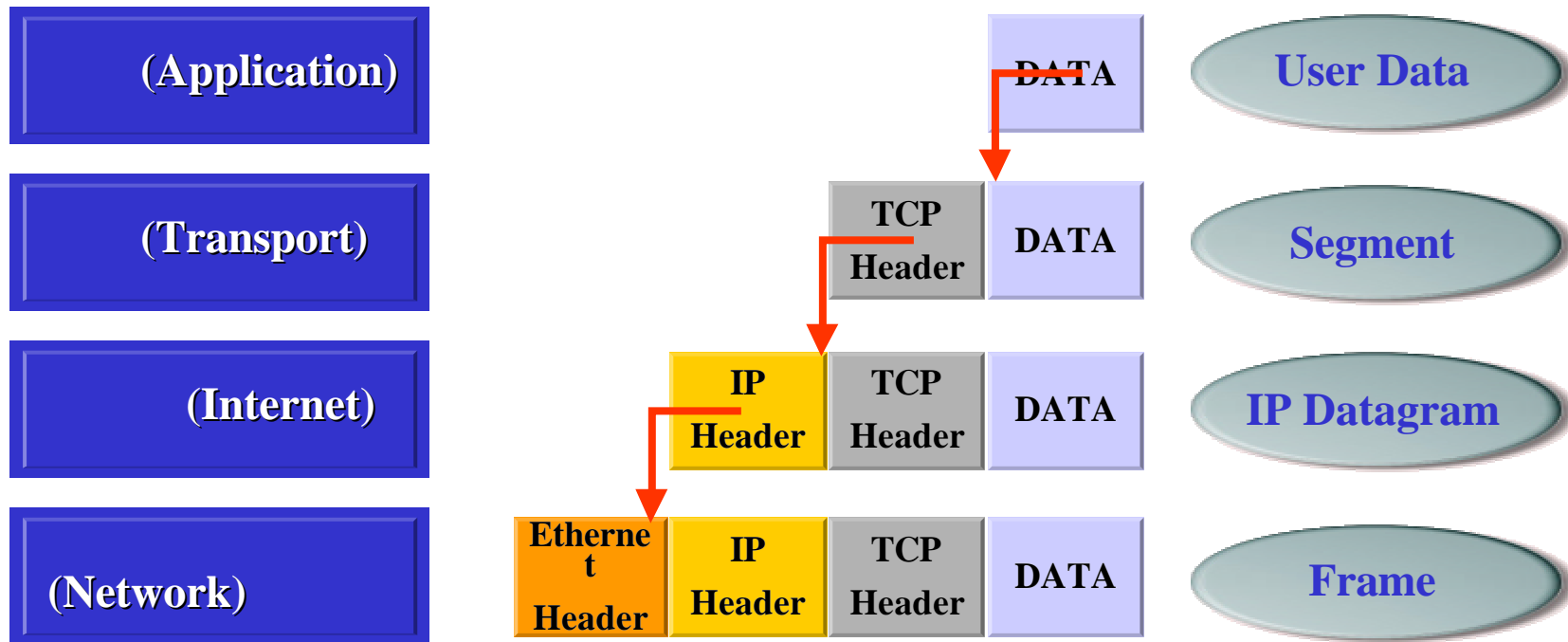


HTTP, Telnet, FTP, SMTP, POP3

TCP/IP



Header 가



Internet Protocol _ IP Address

✍ IPv4

✍ Internet Address 32

- 2
- IP 4 10
-

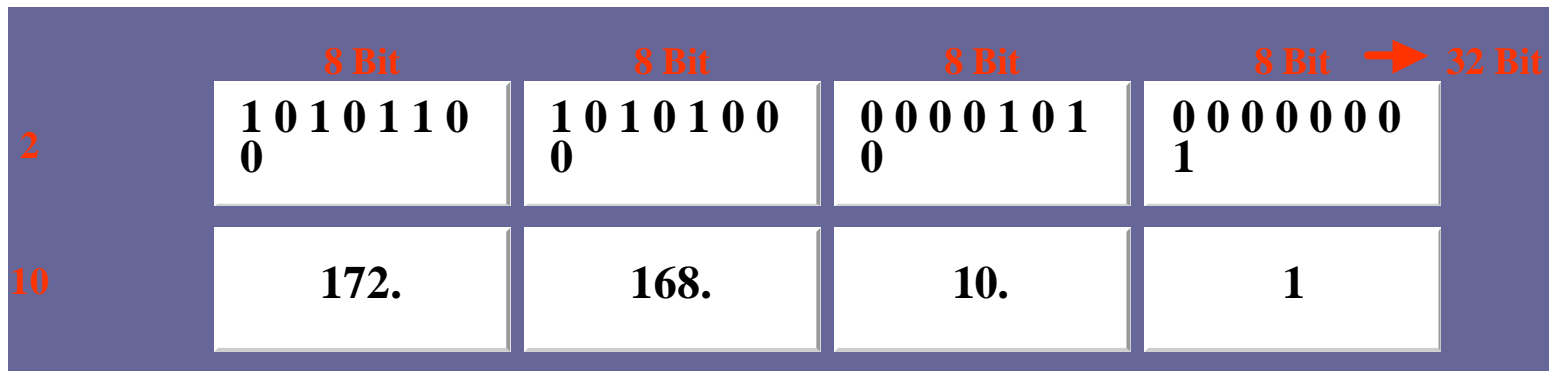
✍ Network ID Host ID



IP

✍ IP NIC(Network Information Center)

- Network ID NIC
- Host ID Local



Internet Protocol _ IP Address

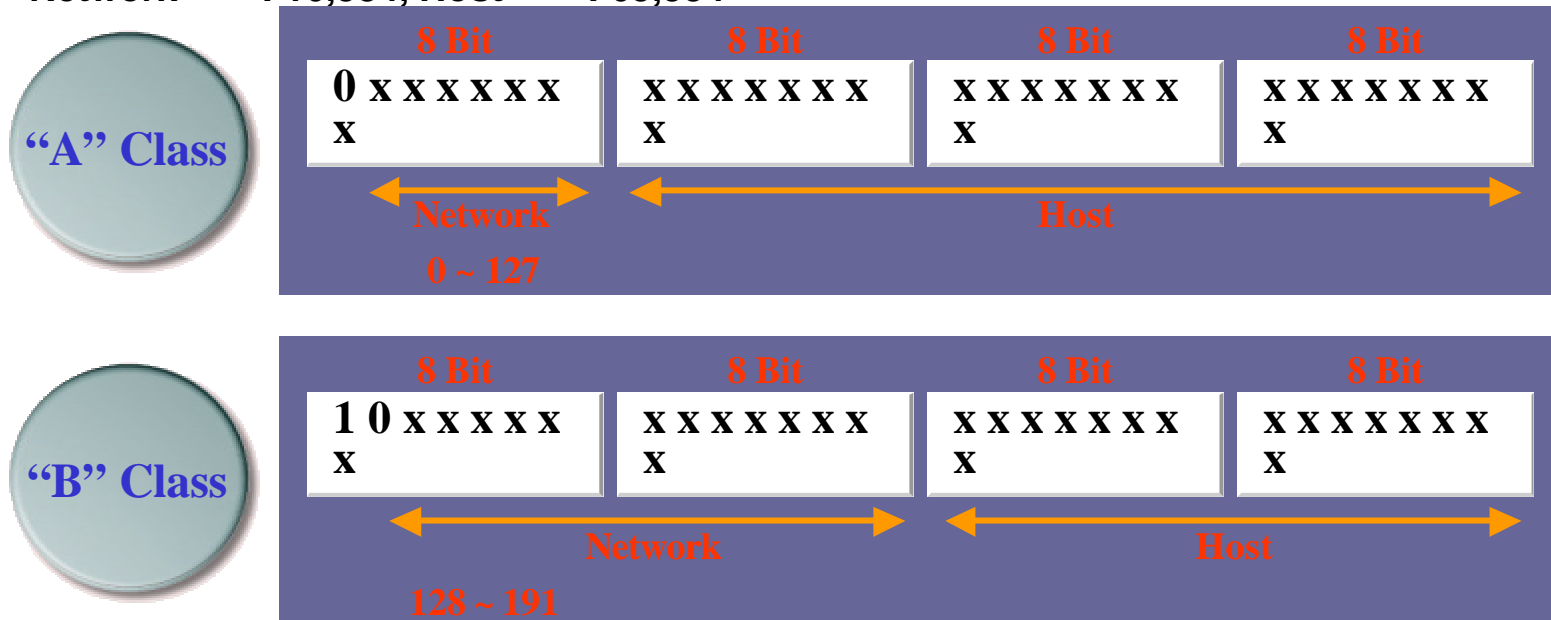
✍ IP

✍ “A” Class

- Bit가 “0”
- Network : 126, Host : 16,777,214

✍ “B” Class

- Bit가 “1 0”
- Network : 16,384, Host : 65,534



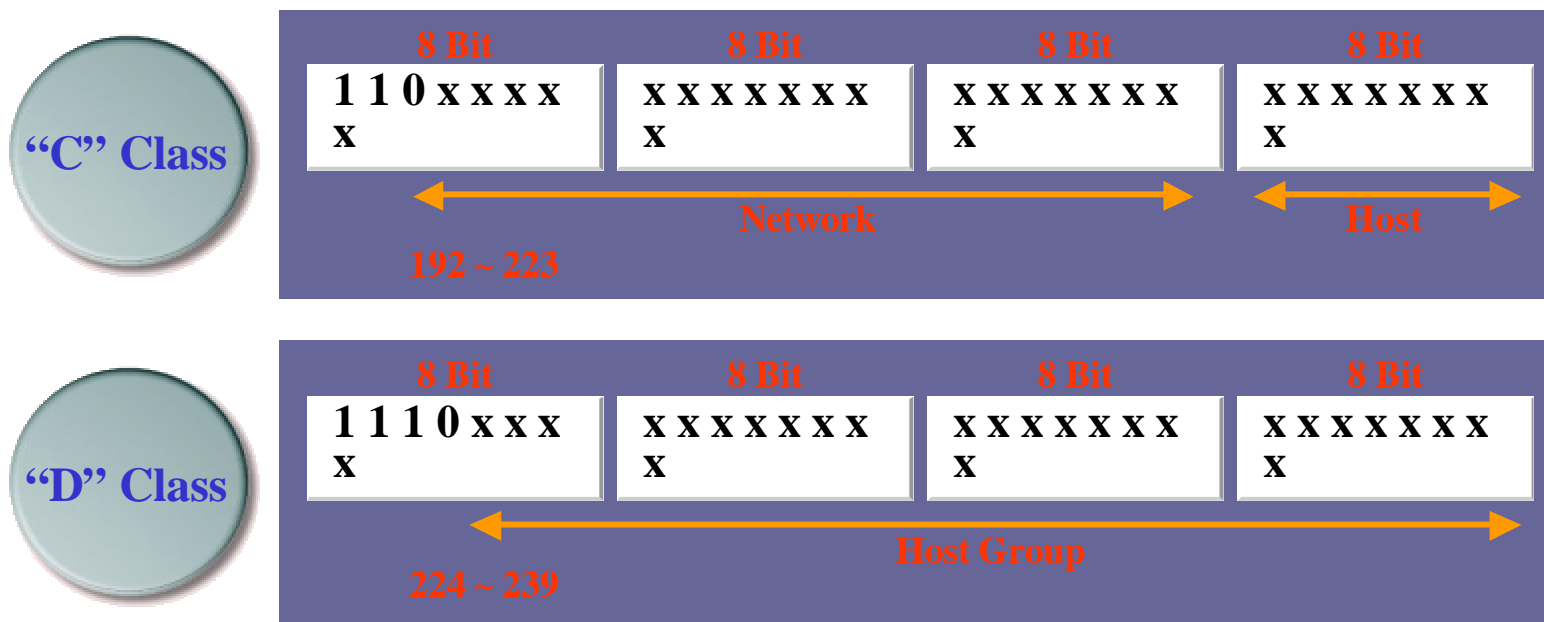
Internet Protocol _ IP Address

☞ “C” Class

- Bit가 “1 1 0”
- Network : 2,097,152, Host : 254

☞ “D” Class

- Bit가 “1 1 1 0”
- Multicast



Internet Protocol _ Subnet Mask

✍ Subnet Mask

✍ IP

✍ Network Host

✍ Major Class

	2		CIDR
A Class	11111111. 00000000. 00000000. 00000000	255. 0. 0. 0	/8
B Class	11111111. 11111111. 00000000. 00000000	255. 255. 0. 0	/16
C Class	11111111. 11111111. 11111111. 00000000	255. 255. 255. 0	/24

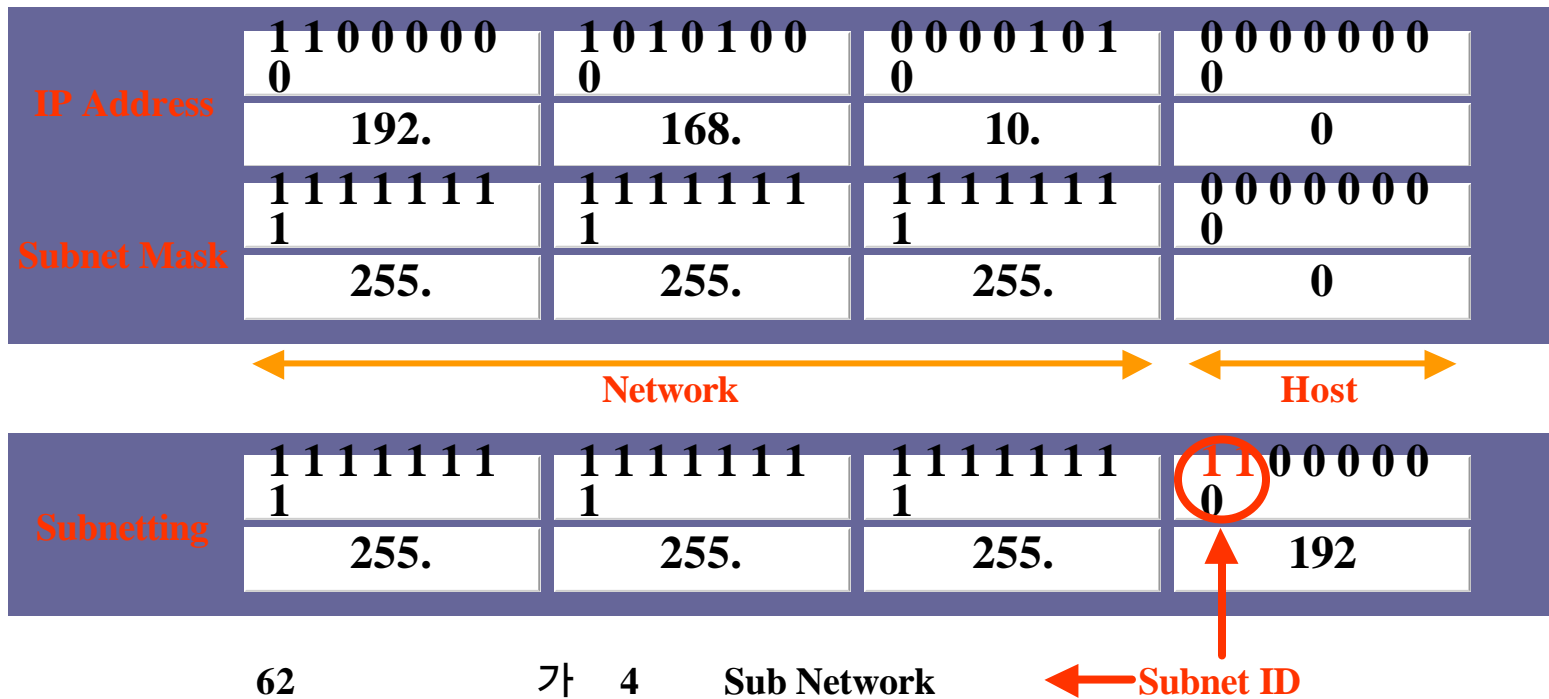
◆ CIDR(Classless Internet Domain Routing) : Subnet Mask

Internet Protocol _ Subnet Mask

✍ Subnetting

- ✍ Host ID Subnet ID
- ✍ Subnet ID Host ID 0 1
- ✍ Subnet ID Net ID 2 Bit

◆) “ C ” Class Subnetting



Internet Protocol _ Subnet Mask

✍ Subnetting Network & Host

✍ “ C ” Class Subnetting

- Network : 2^n
- Host : $2^n - 2$

Subnet Bit(n)	Subnet Mask	Network	/Subnet
1	255. 255. 255. 128	2	126
2	255. 255. 255. 192	4	62
3	255. 255. 255. 224	8	30
4	255. 255. 255. 240	16	14
5	255. 255. 255. 248	32	6
6	255. 255. 255. 252	64	2

Internet Protocol _ Subnet Mask

Broadcast and Multicast

Unicast

- 가

Broadcast

- 가


Multicast

- 가

(Group)

Network broadcast

IP

 Host ID Bit가 " 1 " Broadcast

 Host ID Bit가 " 0 "

 0s "this" , 1s "all"

Internet Protocol _ ARP(Address Resolution Protocol)

(RFC 826)



IP Address

MAC Address



Broadcast



ARP



ARP



A가

D

가

ARP request

broadcast



가

broadcast



D

가

reply

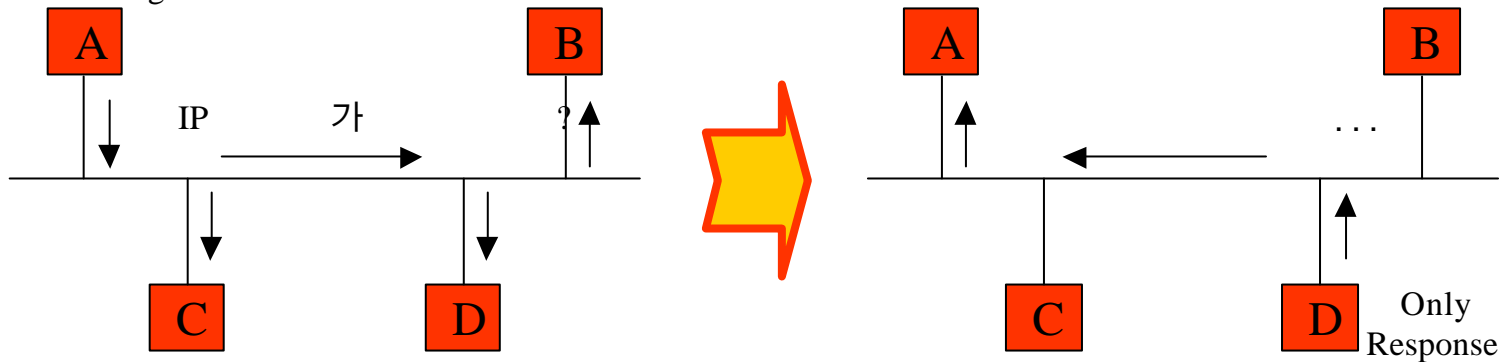


A

D

가

Broadcasting to All



Internet Protocol _ RARP(Reverse Address Resolution Protocol)

(RFC 826)



MAC Address IP Address

Broadcast

RARP

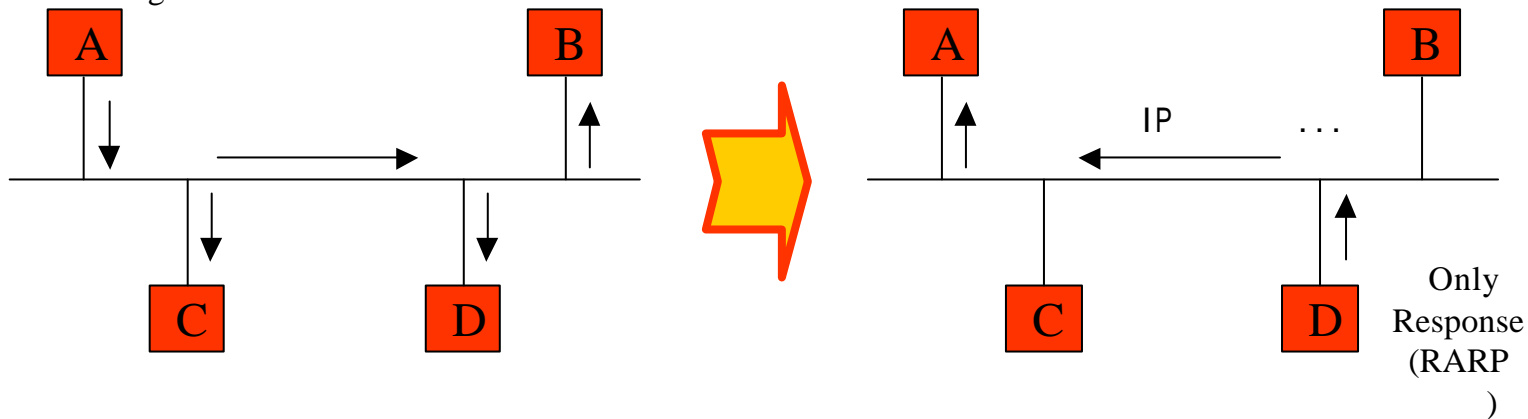
RARP

A가 MAC 가 RARP request broadcast

D(RARP)가 broadcast

D(RARP) A IP 가 reply

Broadcasting to All



Internet Protocol _ Header

Internet Layer(IP Layer)

✍ IP datagram

가

✍ IP datagram

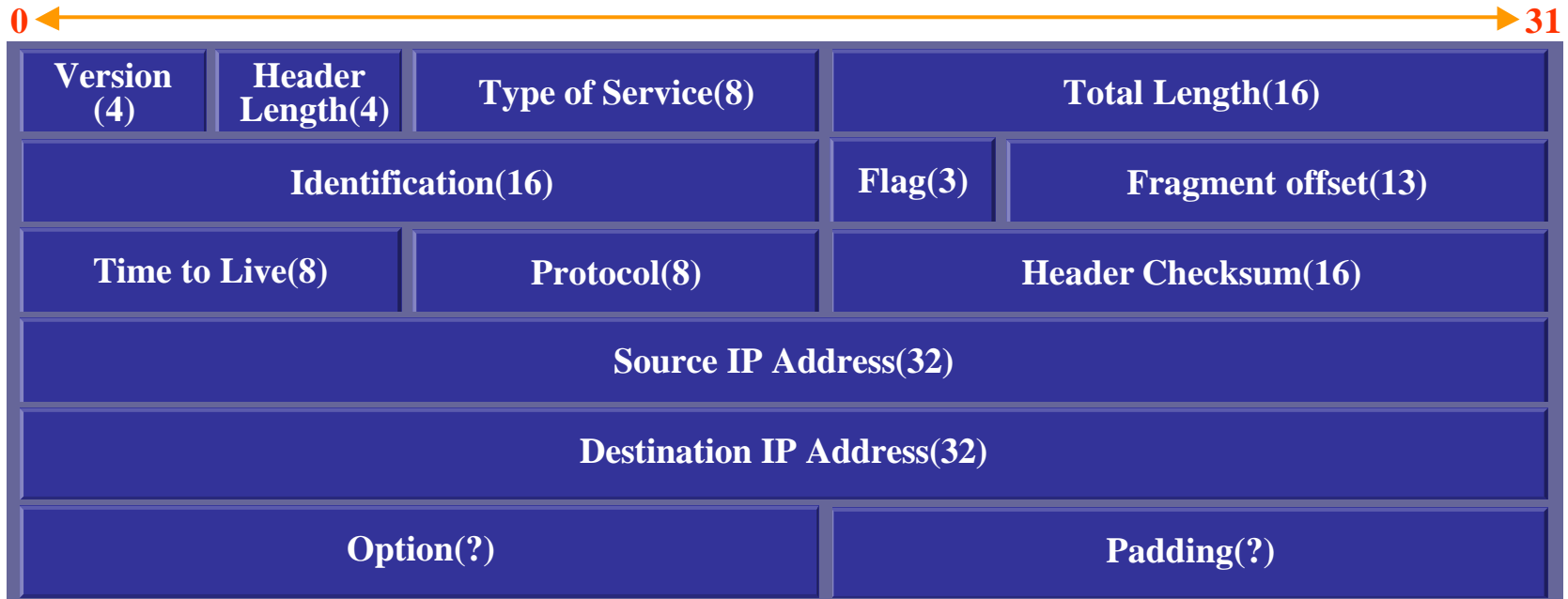
✍

(Association)

()

✍ IP

IP Header



Internet Protocol _ Header

 **Version(4 Bit)**

 **IP (IPv4)**

 **Header Length(4 Bit)**

 **IP 32 Bit**

 **20 Byte(32 Bit x 5)**

 **Type of Service(8 Bit)**





(QoS)

 **8 0 ~ 2**


 **3 ~ 6 ToS**

 **7 0**

 **Total Length(16 Bit)**

 **IP**

 **IP**

 **16 65,535 가 8192**

Internet Protocol _ Header

✍ Identification(16 Bit)

- ✍ Datagram
- ✍ Datagram
- ✍ Datagram Packet 가

✍ Flag(3 Bit)

- ✍ "more fragment"
- ✍ fragment fragment
- ✍ 3 Bit
 - Bit " 0 " : " 0 " Setting
 - Bit " 1 " : " 0 " , " 1 "
 - Bit " 2 " : " 0 " , " 1 "

✍ Fragment offset(13 Bit)

- ✍ Datagram fragment가

Internet Protocol _ Header

Fragmentation and Reassembly

Unit) 가 - MTU(Maximum Transfer

Ethernet MTU 1,500 bytes

Fragmentation

가 IP datagram , IP IP datagram Fragment

Fragment Reassemble 가

, IP Fragmentation

Time to Live(8 Bit)

TTL Datagram

Datagram (0 ~ 255),

" (0)" datagram , 가

Internet Protocol _ Header

✍ Protocol(8 Bit)

✍ IP

✍ ICMP(1), TCP(6), UDP(17)

✍ Header Checksum

✍ IP checksum

✍ TTL, Fragment

✍ ICMP, IGMP, TCP, UDP 가 checksum

✍ IP Address(32 Bit)

✍ IP Datagram Source IP

✍ IP Datagram Destination IP

✍ Option(?)

✍ 가 Optional Information

✍ IP datagram (가)

- Security, Record Route, Timestamp

- Strict Source Routing

✍ Padding(?)

✍ Option Field 가(IP Header 32 Bit)

Internet Protocol _ Routing



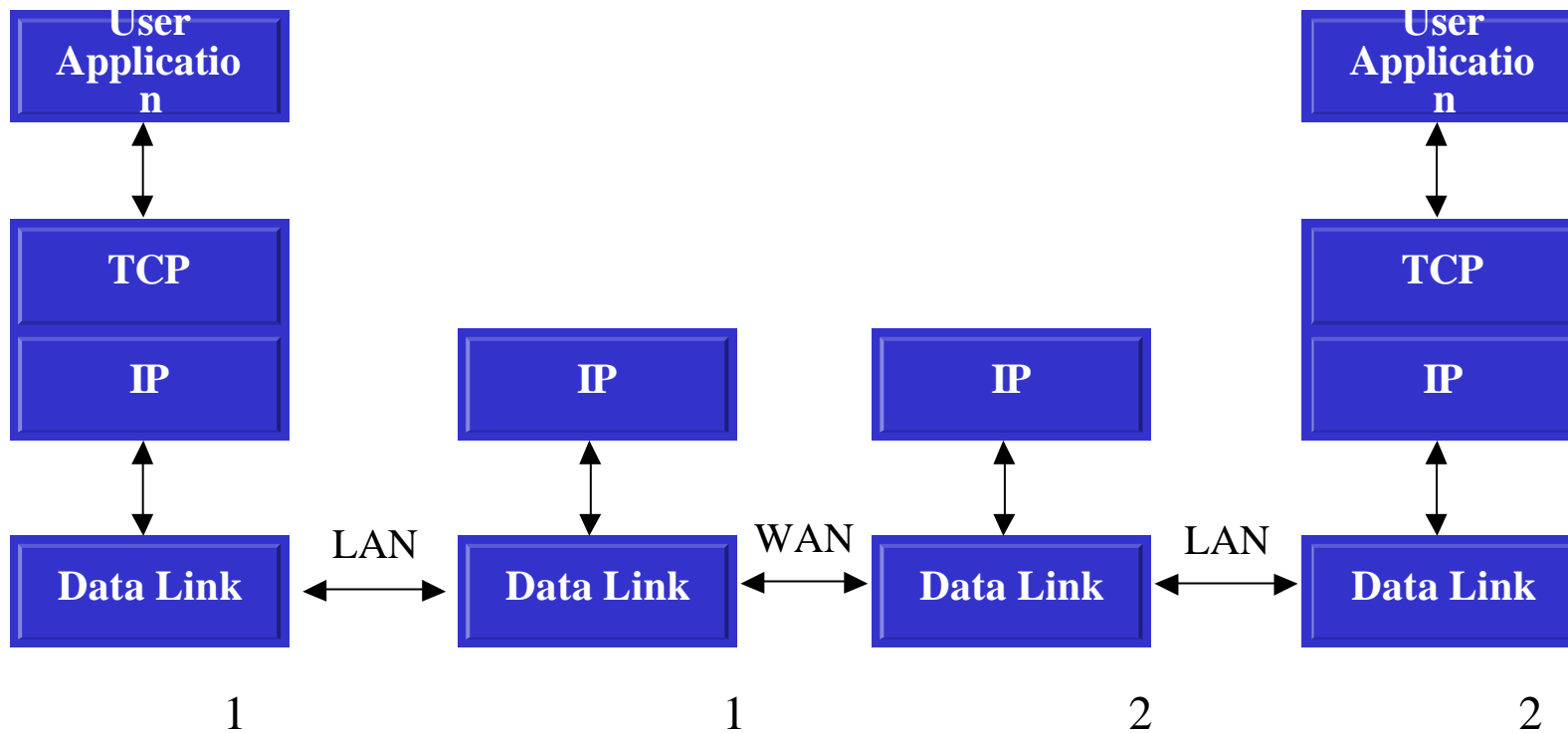
Network

IP



IP

IP



Internet Protocol _ Routing

IP Datagram



- 가 ,
- 가 ,가 가



- 가 가 ,
- 가 ,

IP



-

 RIP, OSPF, IGRP, EIGRP

-

 EGP, BGP

Default

Internet Protocol _ Routing



가 , 가 ()



가 Routing Metric

Routing Metric

Interior Routing Protocol

- , (same AS)

Exterior Routing Protocol

- Backbone , (different AS)

Internet Protocol _ Routing

Interior Routing Protocol



- RIP(Routing Information Protocol)
- OSPF(Open Shortest Path First)



- IGRP(Interior Gateway Routing Protocol)
- EIGRP(Enhanced IGRP)

Exterior Routing Protocol



Inter-domain routing protocol



EGP(Exterior Gateway Protocol)



BGP(Border Gateway Protocol)







Transport Layer – TCP & UDP



IP



6 가

-  **Connection-Oriented or Connectionless**
-  **Sequencing**
-  **Error Control**
-  **Flow Control**
-  **Byte stream or Message**
-  **Full-Duplex or Half-Duplex**

Transport Layer – TCP & UDP

Connection-Oriented

 TCP





 Virtual Circuit(가)

 가

 Connection-Oriented

-

-

-

connectionless

 UDP

 (Datagram)



(datagram)



Transport Layer – TCP & UDP

Sequencing



TCP

- sequencing

UDP

- sequencing

Error control



가

- checksum(가) & positive acknowledgment

-

-

Transport Layer – TCP & UDP

Port Number

 UDP TCP 가



 TCP UDP 16 Port Number

Well-Known Ports

- Client가 Server
- HTTP : 80, FTP: 21, TFTP: 69, SMTP : 25, DNS : 53

TCP

 Connections Between Processes

 Sequencing of Data

 End-to-End Reliability

 End-to-End Flow Control

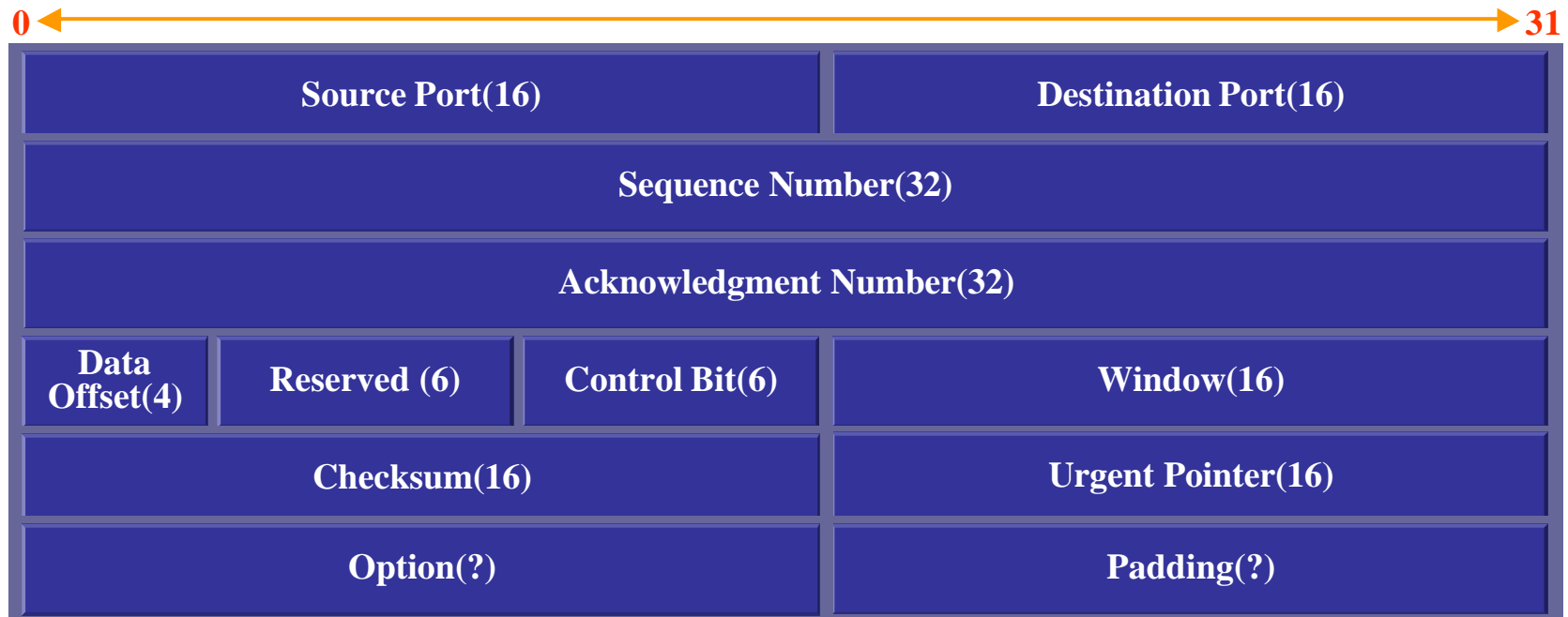
UDP

 Port Numbers

 Optional Checksum

Transport Layer – TCP

TCP Segment



✍ Source Port(16 Bit) :

✍ Destination Port(16 Bit) :

Transport Layer – TCP

✎ Sequence Number(32 Bit)

- 가 octet

✎ Acknowledgment Number(32 Bit)

- 가

✎ Data Offset(4 Bit)-HELN

- 32 TCP .

✎ Reserved(6 Bit)

-

✎ Control Bit(6 Bit)

- TCP

Bit ()	Bit Set “ 1 ”
URG	Urgent pointer field
ACK	Acknowledgment
PSH	
RST	
SYN	Sequence Number
FIN	

Transport Layer – TCP

✍ **Window**

-

✍ **Checksum**

- TCP

✍ **Urgent Pointer**

-

✍ **Options**

- TCP 8

✍ **Padding**

- 가 32 TCP "0" padding

Transport Layer – TCP

✍ Transport

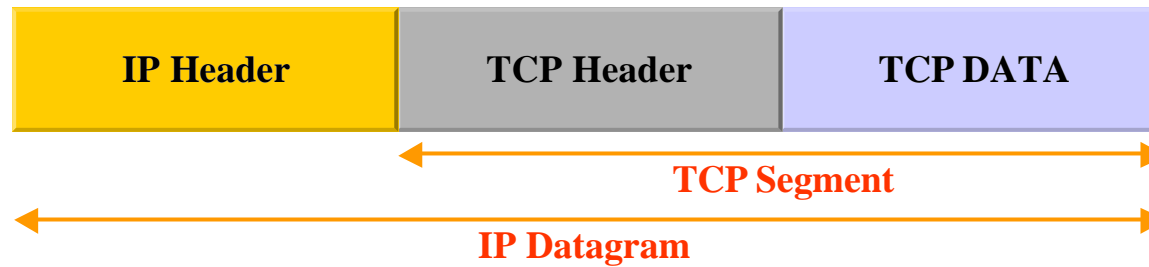
✍ Stream Service

✍ , 가
✍ , 가 (IP)

✍ TCP End-to-End Segment

✍ , Maximum Segment Size(MSS)

✍ IP datagram TCP



Transport Layer – TCP

✍ TCP Flow Control - Sliding Windows

✍ TCP

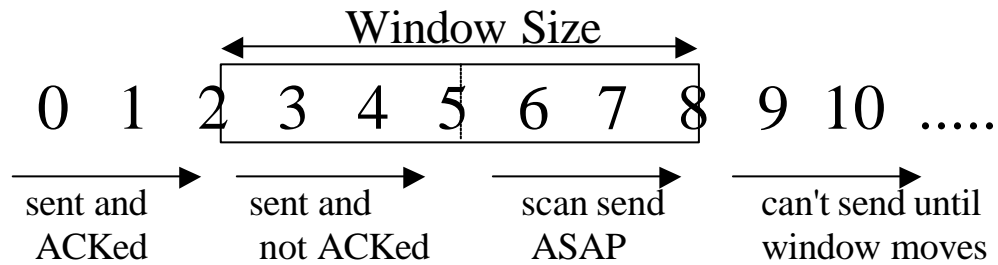
✍ Sliding Window

✍ TCP

-

-

✍ Sliding Window



✍ Window Size

✍ Acknowledgment

✍ 가

,

가

“ 0 ”

,

Transport Layer – TCP

✍ Connection

✍ TCP

- TCP 3-way handshake

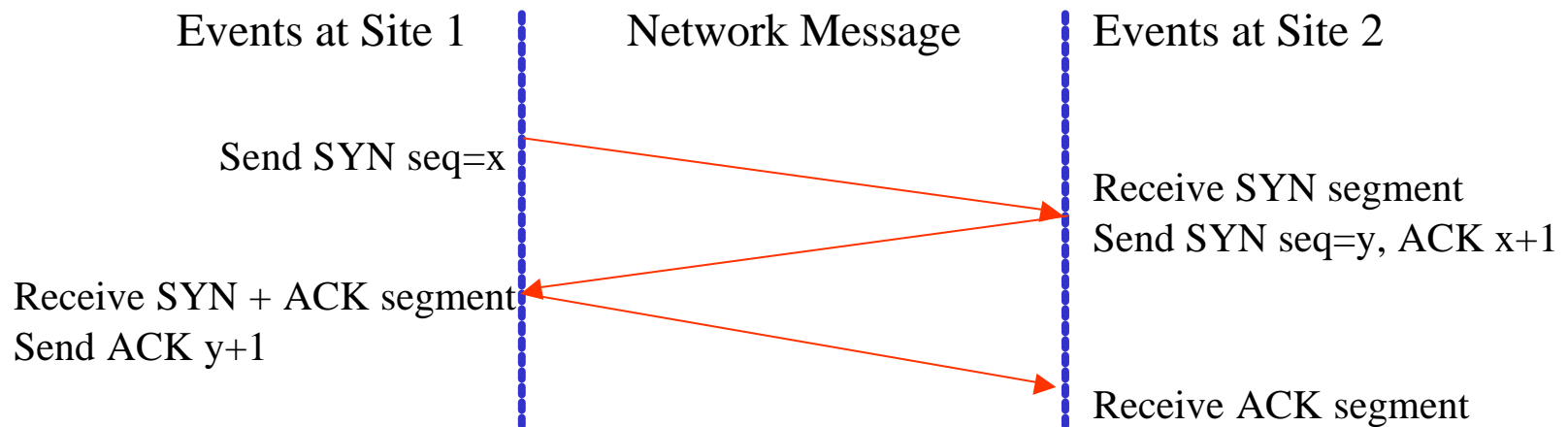
✍ TCP가

✍ Lost, Delayed, Duplicated, Delivered out of Order가

- Site 1 SYN Control bits

- Site 2 ACK SYN Control bits

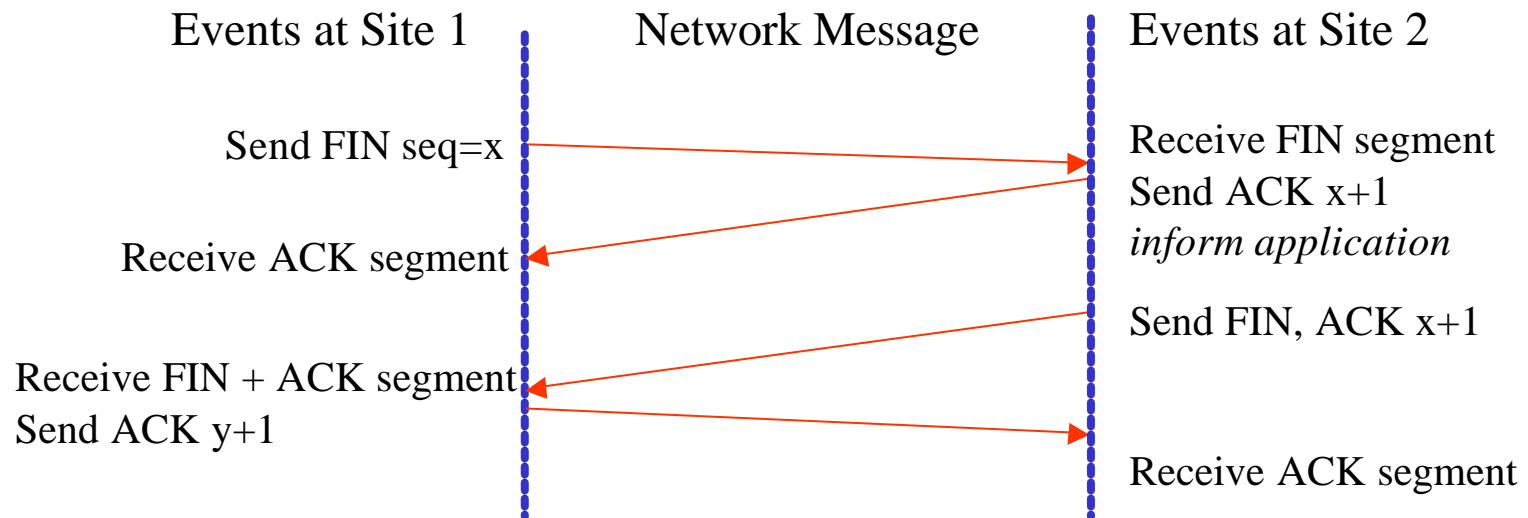
- Site 1 SYN ACK



Transport Layer – TCP

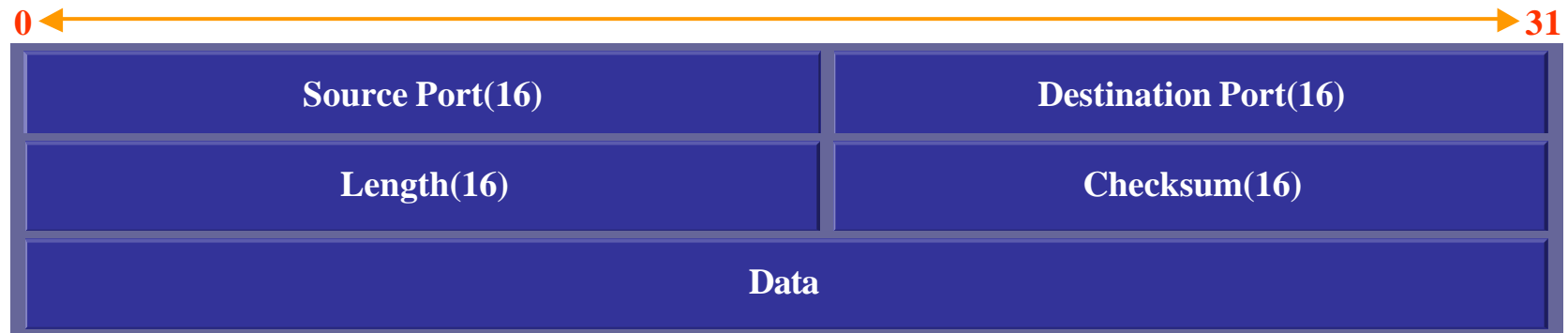
✍ TCP

- TCP 3-way handshake
- FIN , FIN ACK
- TCP
- TCP 2 FIN
- ACK



Transport Layer – UDP

✎ UDP datagram



✎ **Source Port(16 Bit) :**

✎ **Destination Port(16 Bit) :**

✎ **UDP Length(16 Bit) : UDP header + Data**

✎ **UDP Checksum: UDP header + Data Checksum**

Transport Layer – UDP

- ✍ Transport
- ✍ Simple, Datagram-Oriented
- ✍ IP datagram UDP datagram

