



Computer Transport Layer

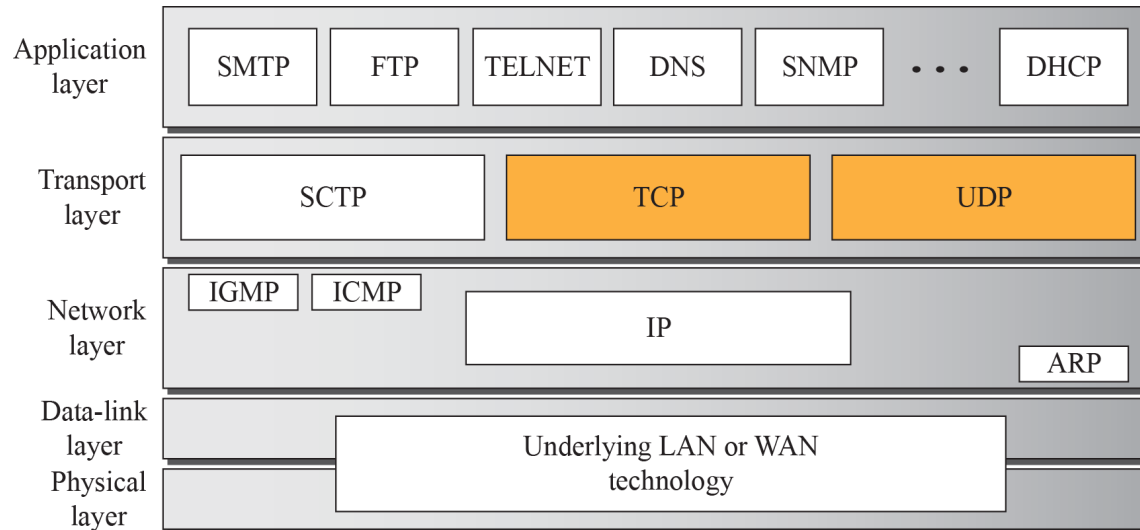
Networks:

BITS Pilani
Hyderabad Campus

Chittaranjan Hota
PhD (CSE)

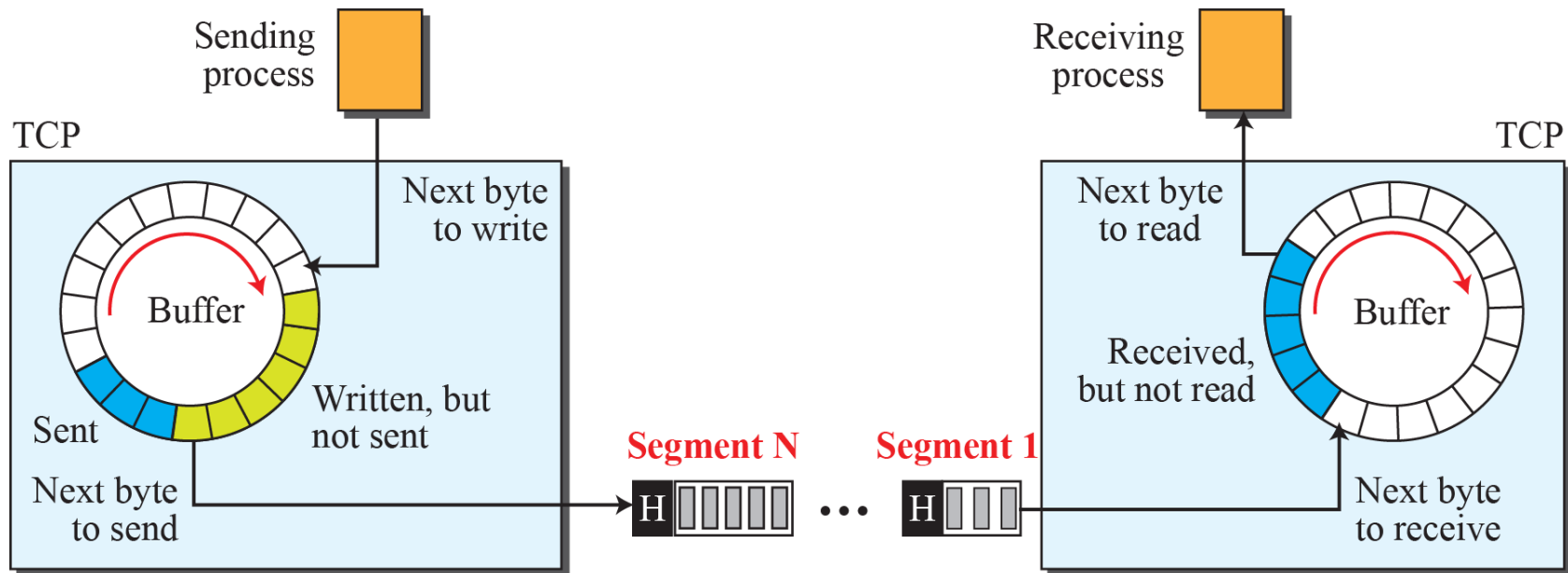
Acknowledgement: Slides and Images adapted from Kurose, and Forouzan (TMH)

Internet Transport Layer



Port	Protocol	UDP	TCP	Description
7	Echo	✓		Echoes back a received datagram
9	Discard	✓		Discards any datagram that is received
11	Users	✓	✓	Active users
13	Daytime	✓	✓	Returns the date and the time
17	Quote	✓	✓	Returns a quote of the day
19	Chargen	✓	✓	Returns a string of characters
20, 21	FTP		✓	File Transfer Protocol
23	TELNET		✓	Terminal Network
25	SMTP		✓	Simple Mail Transfer Protocol
53	DNS	✓	✓	Domain Name Service
67	DHCP	✓	✓	Dynamic Host Configuration Protocol
69	TFTP	✓		Trivial File Transfer Protocol
80	HTTP		✓	Hypertext Transfer Protocol
111	RPC	✓	✓	Remote Procedure Call
123	NTP	✓	✓	Network Time Protocol
161, 162	SNMP		✓	Simple Network Management Protocol

TCP Segments



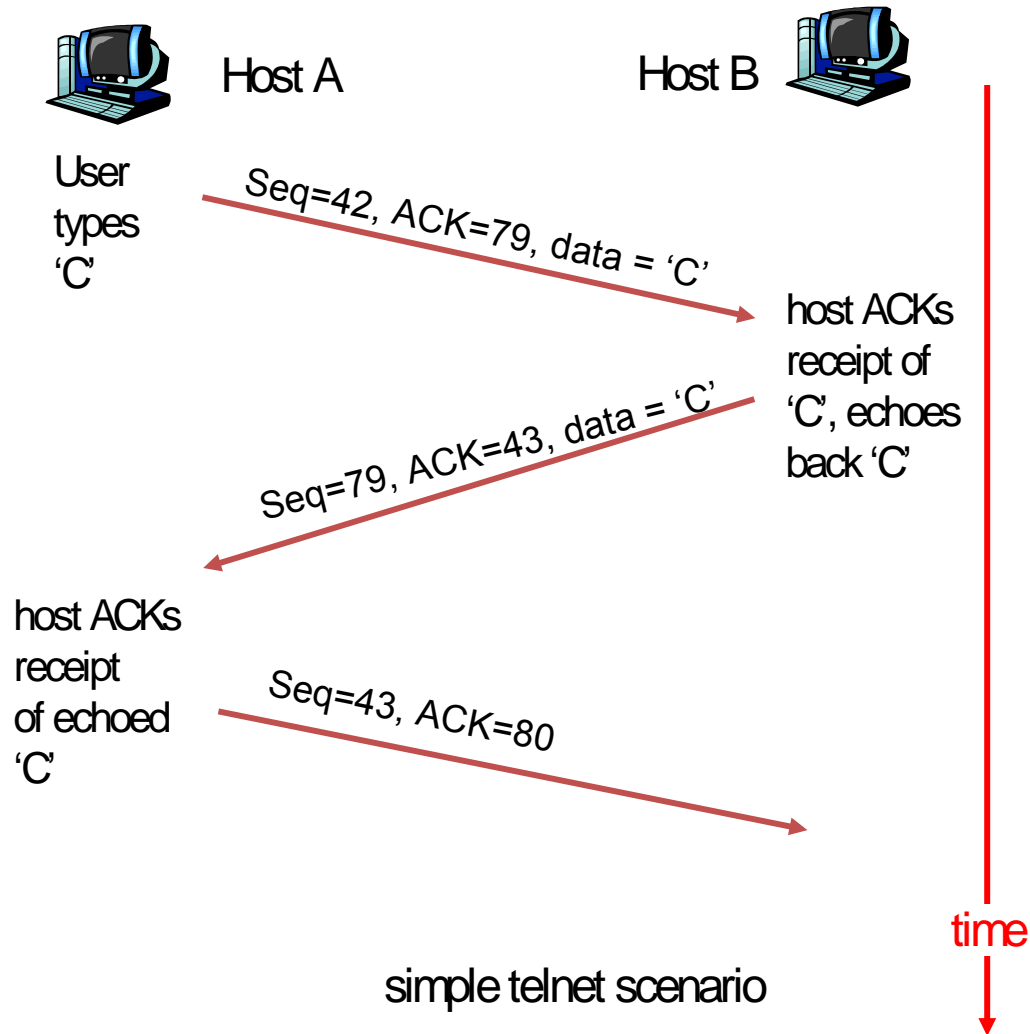
Sequence Numbers



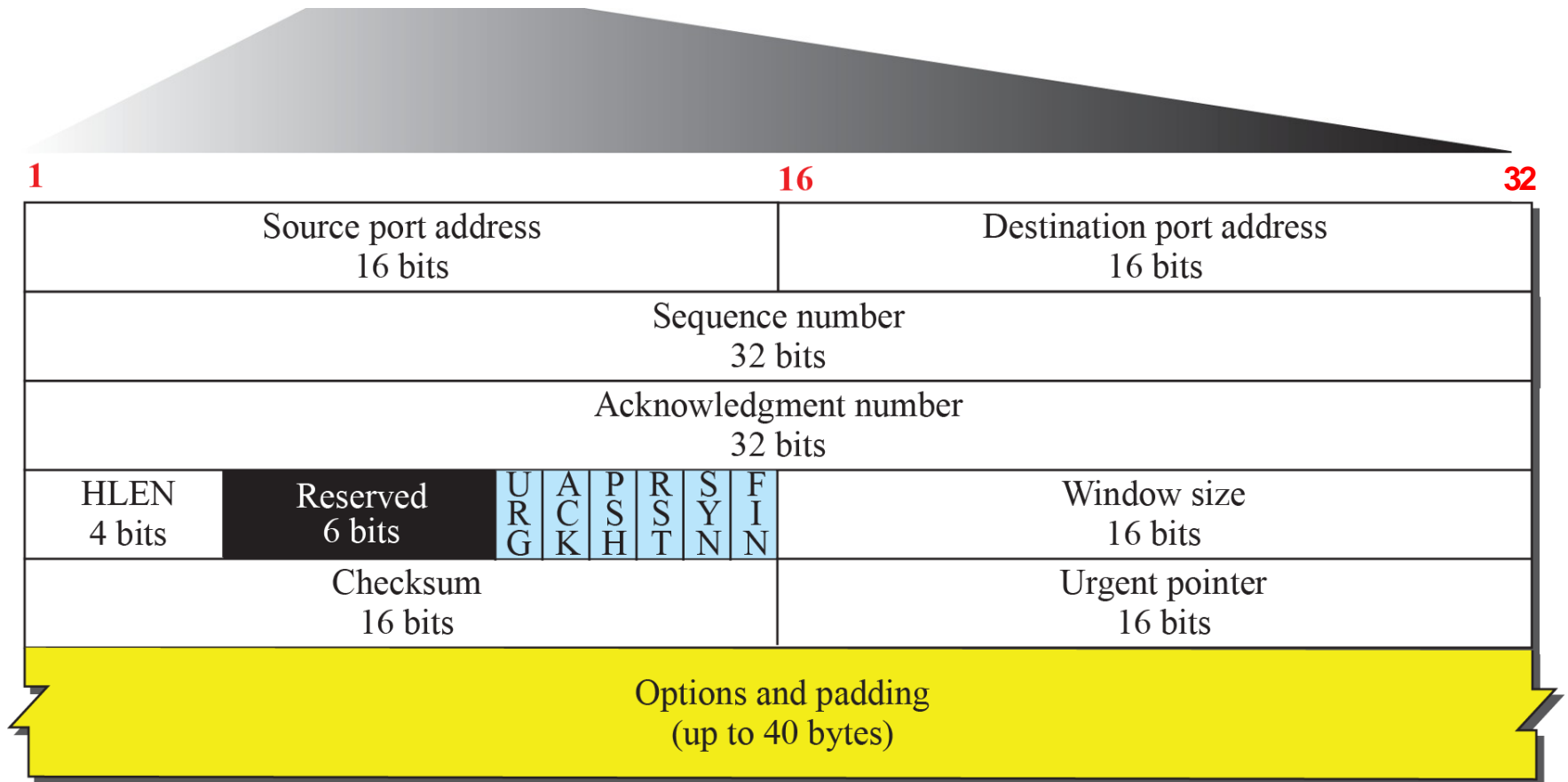
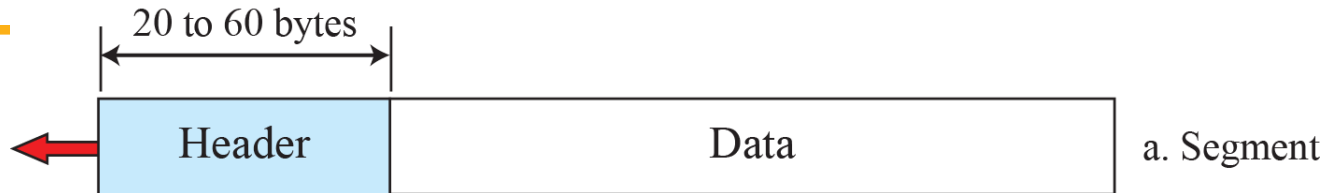
Suppose a TCP connection is transferring a file of 4,000 bytes. The first byte is numbered 10,001.

What are the sequence numbers for each segment if data are sent in **four** segments, each segment has a carrying capacity of 1,000 bytes?

TCP Sequence Number & ACK Numbers

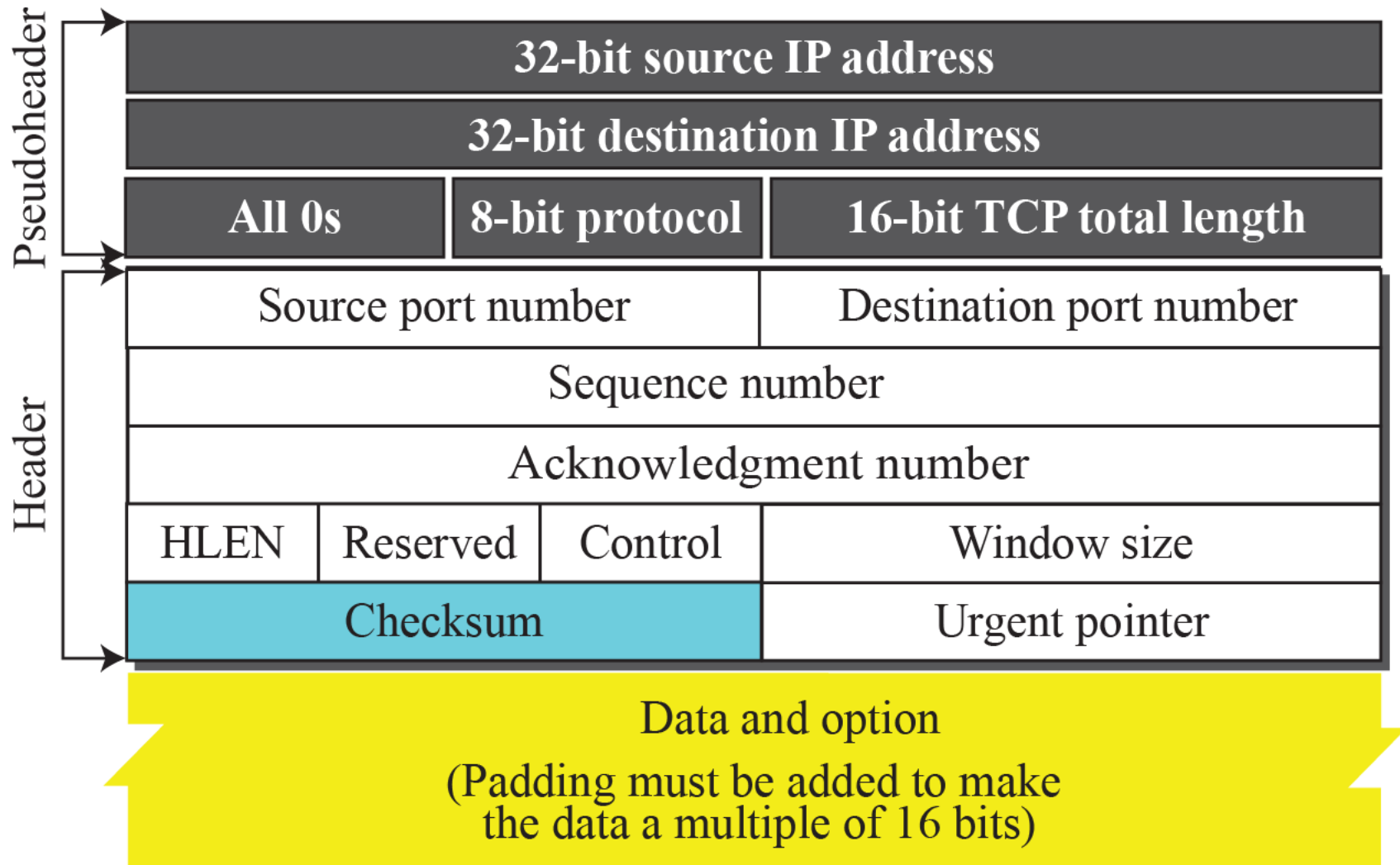


TCP Segment Format

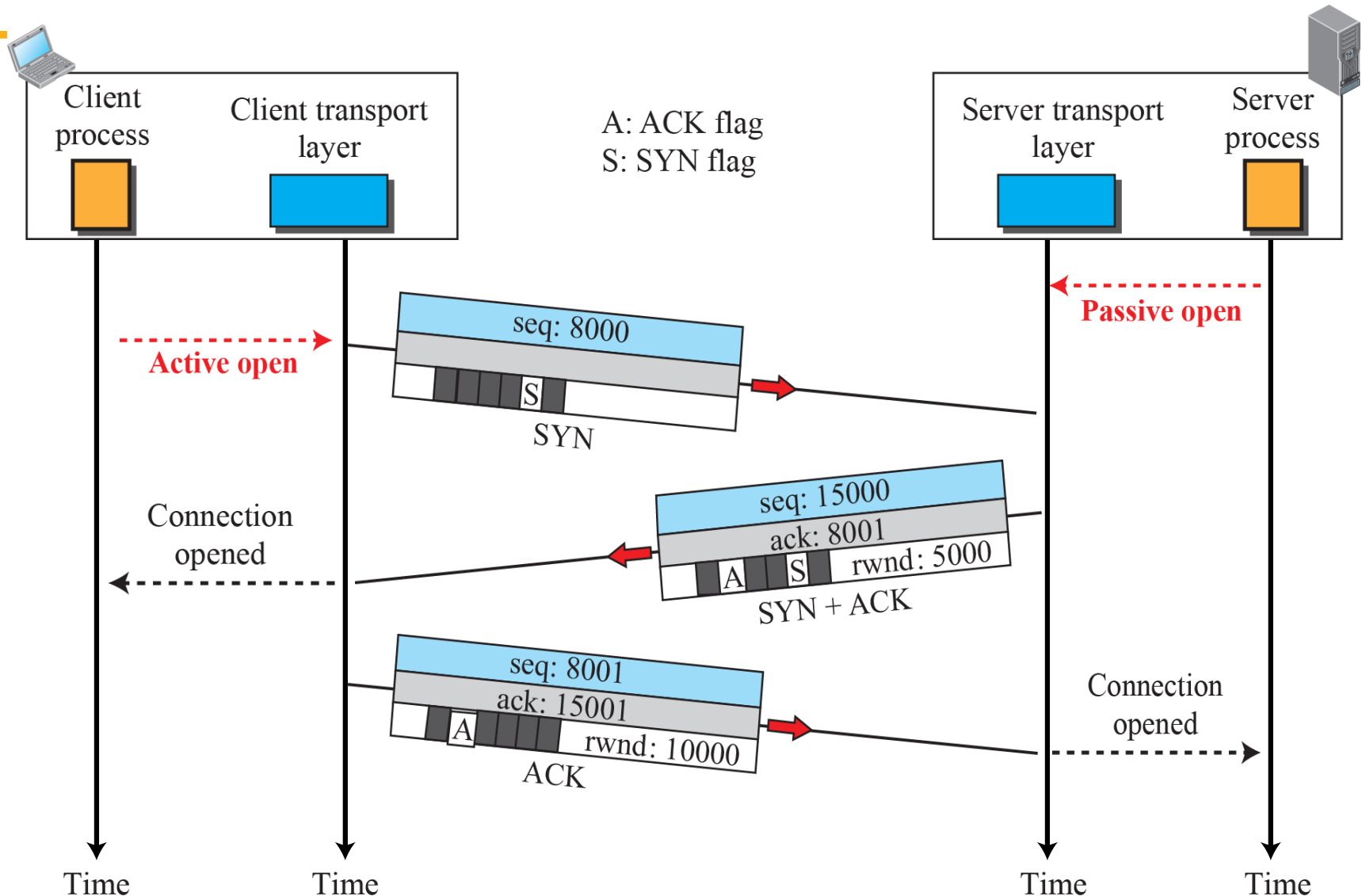


b. Header

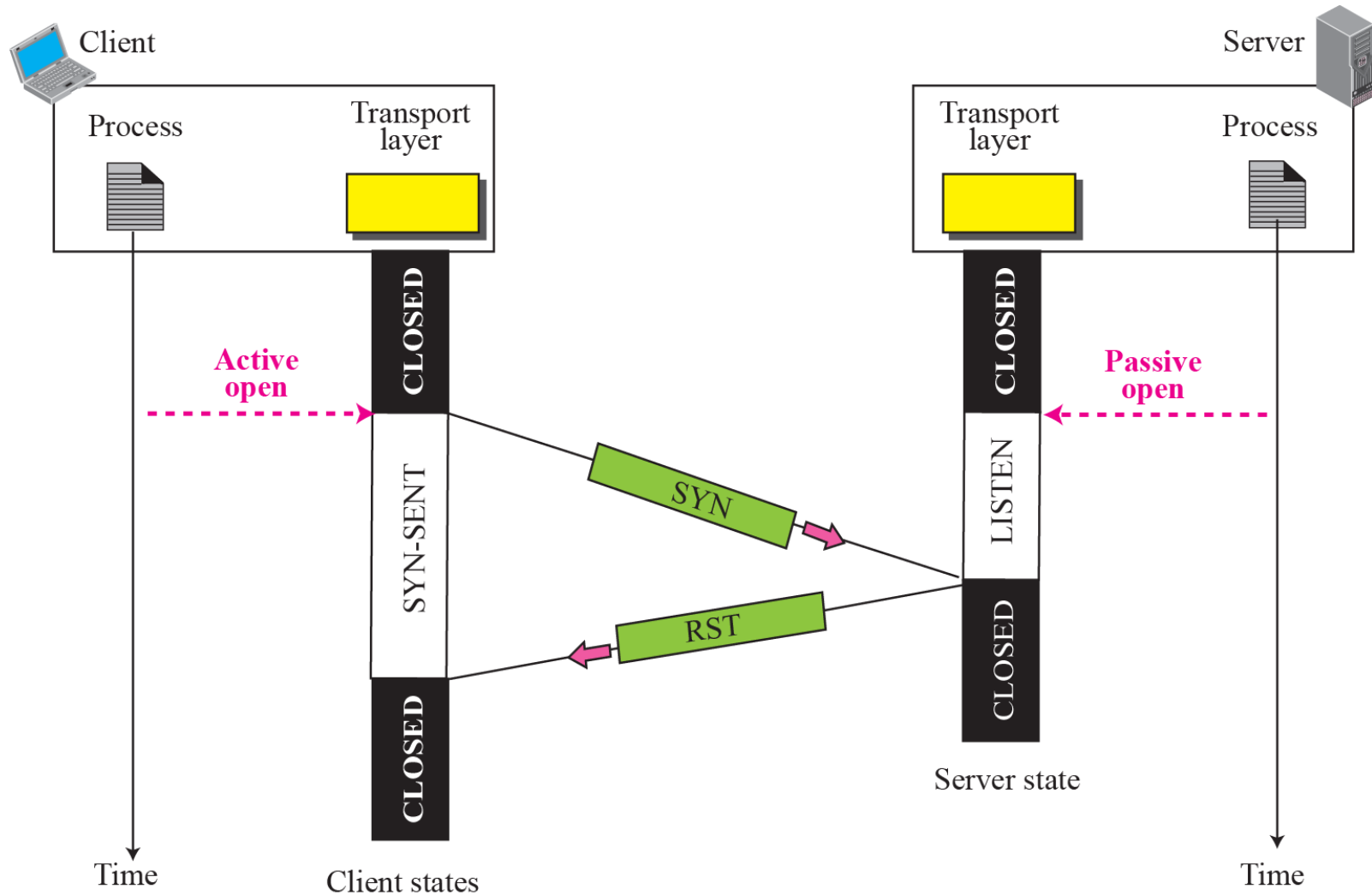
Pseudo header for Checksum



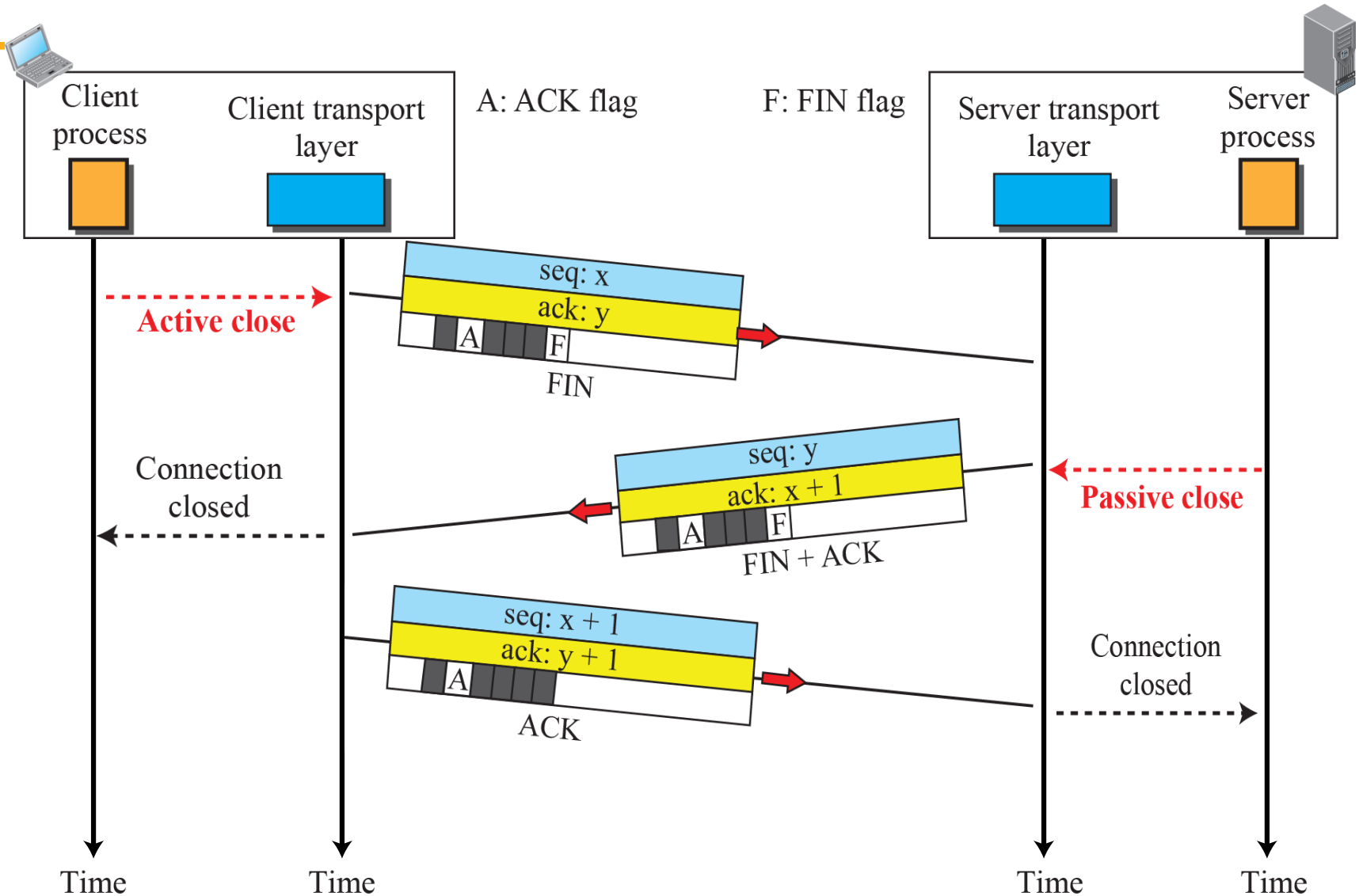
Connection establishment



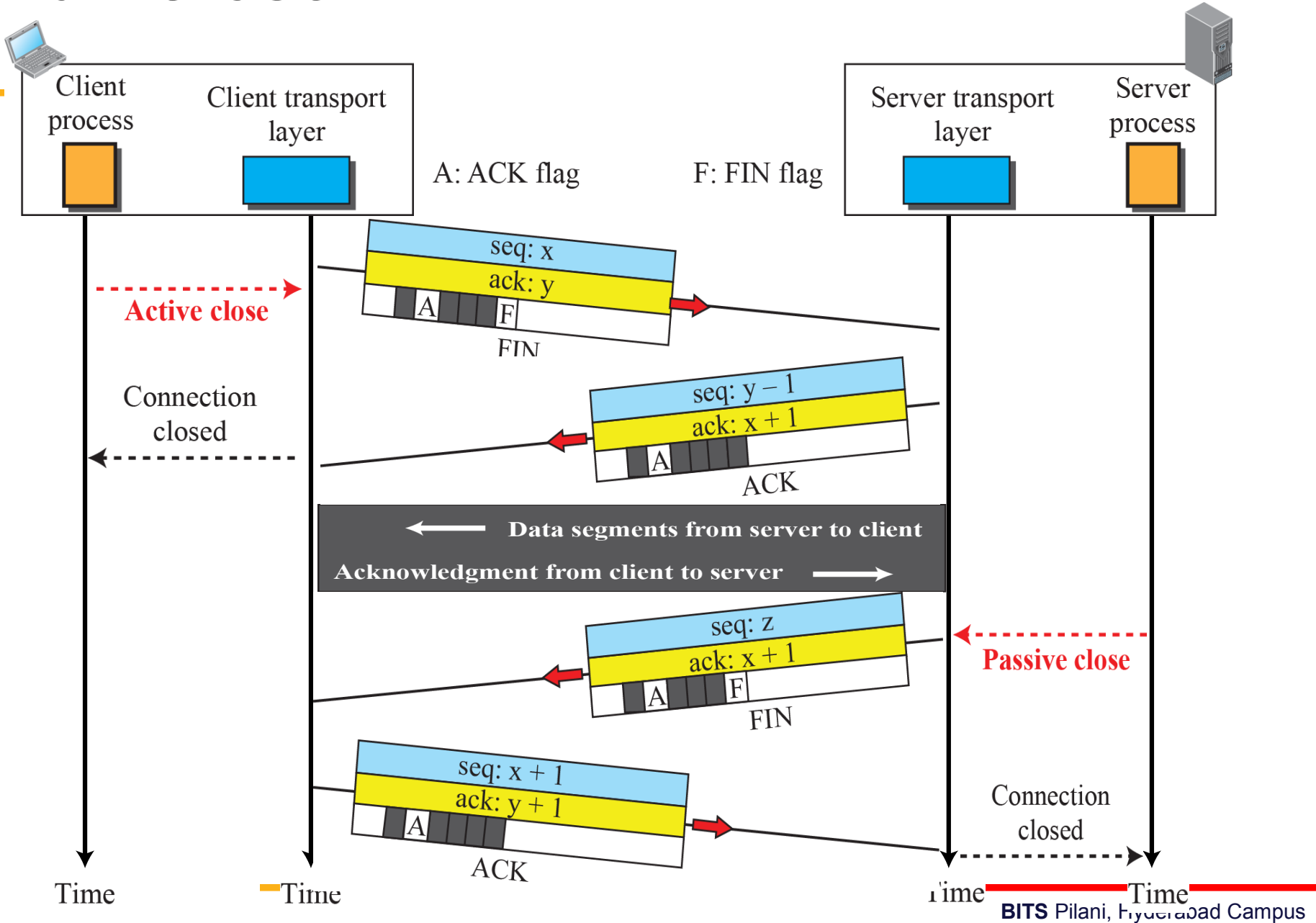
Denying a connection



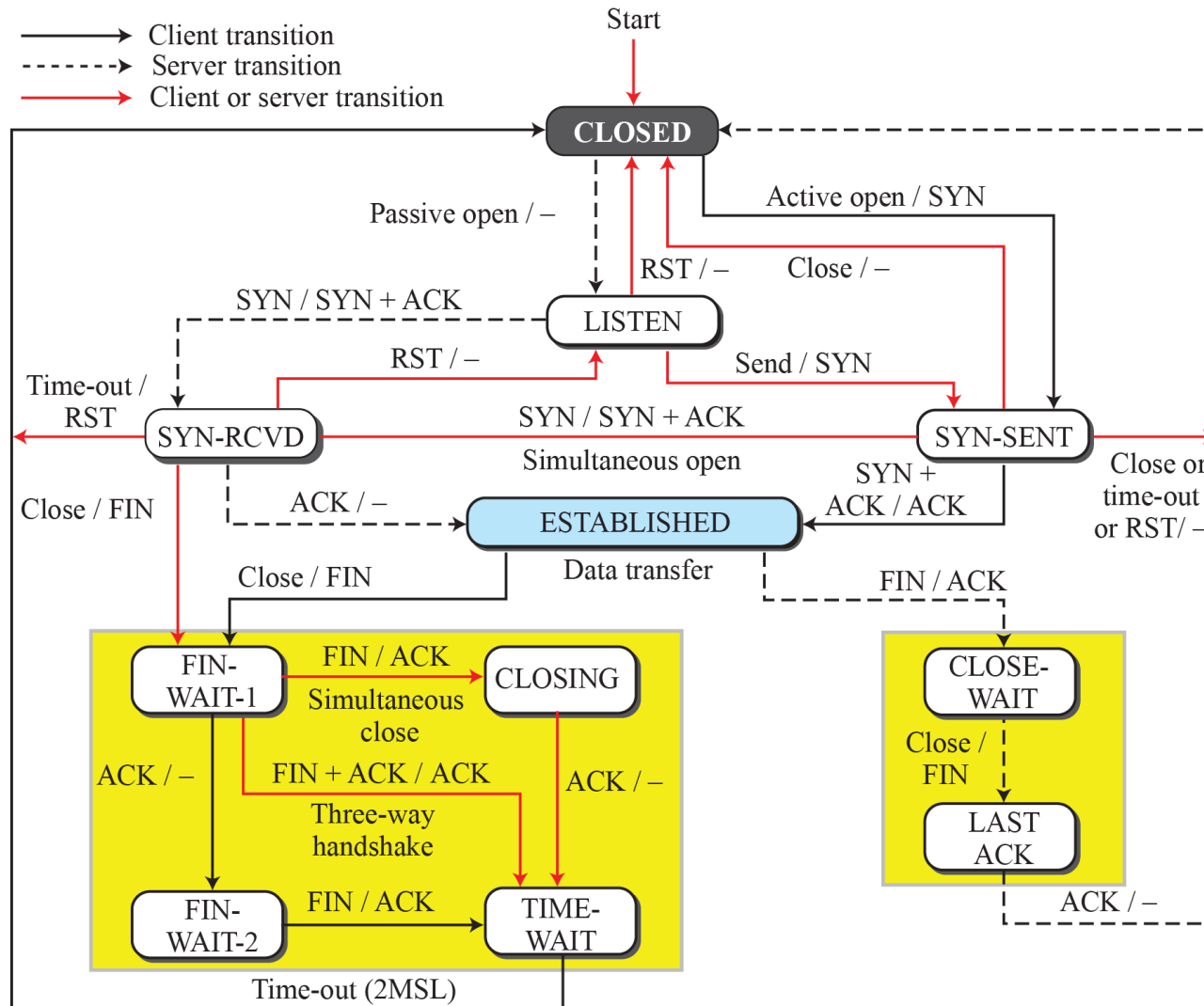
Connection termination



Half Close



TCP State Transitions



Triggering Transmissions

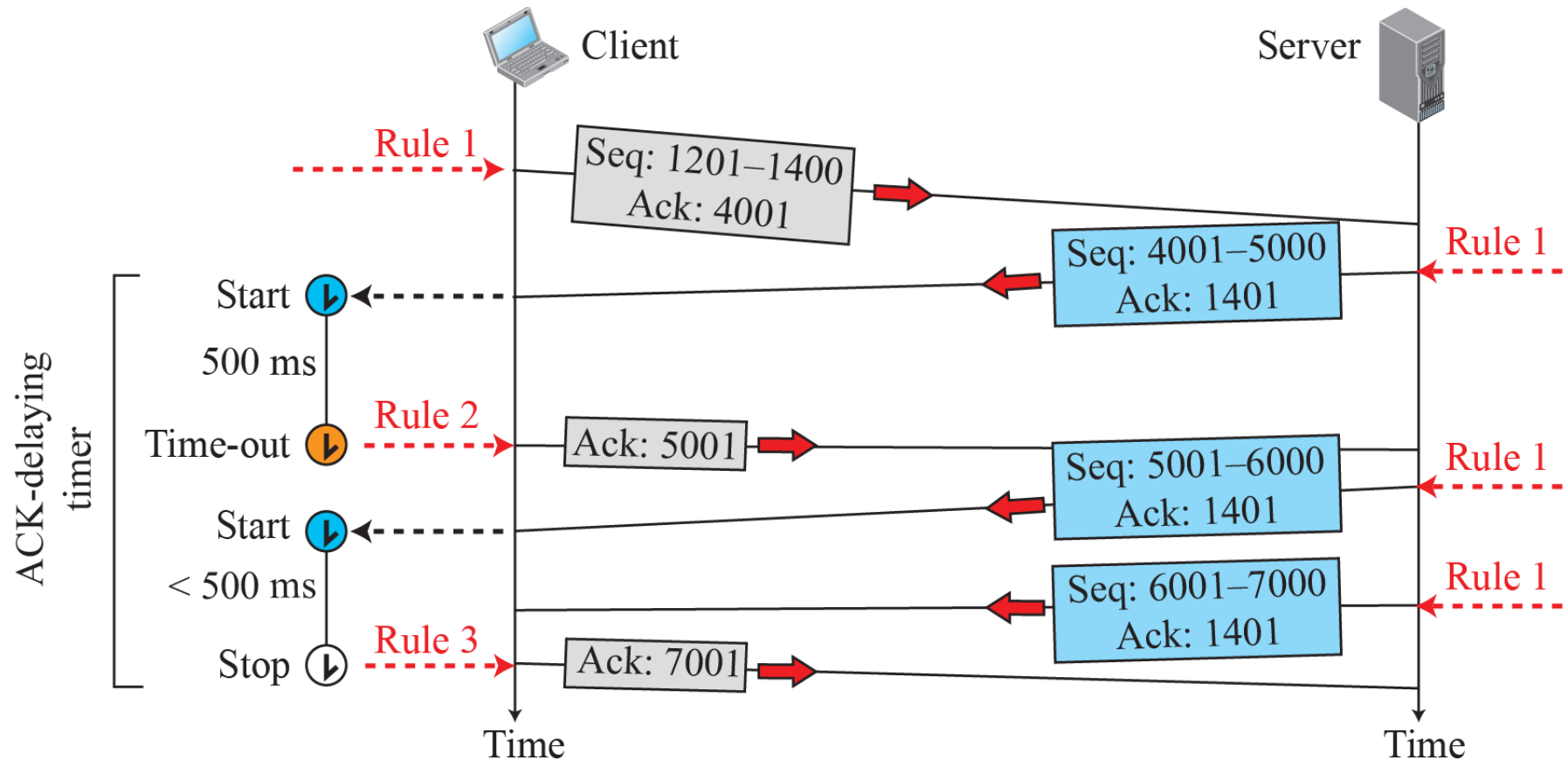


TCP has three mechanism to trigger the transmission of a segment

- 1) TCP maintains a variable MSS and sends a segment as soon as it has collected MSS bytes from the sending process
 - MSS is usually set to the size of the largest segment TCP can send without causing local IP to fragment.
 - MSS: MTU of directly connected network – (TCP header + IP header)
- 2) Sending process has explicitly asked TCP to send it
 - TCP supports push operation
- 3) When a timer fires
 - Resulting segment contains as many bytes as are currently buffered for transmission

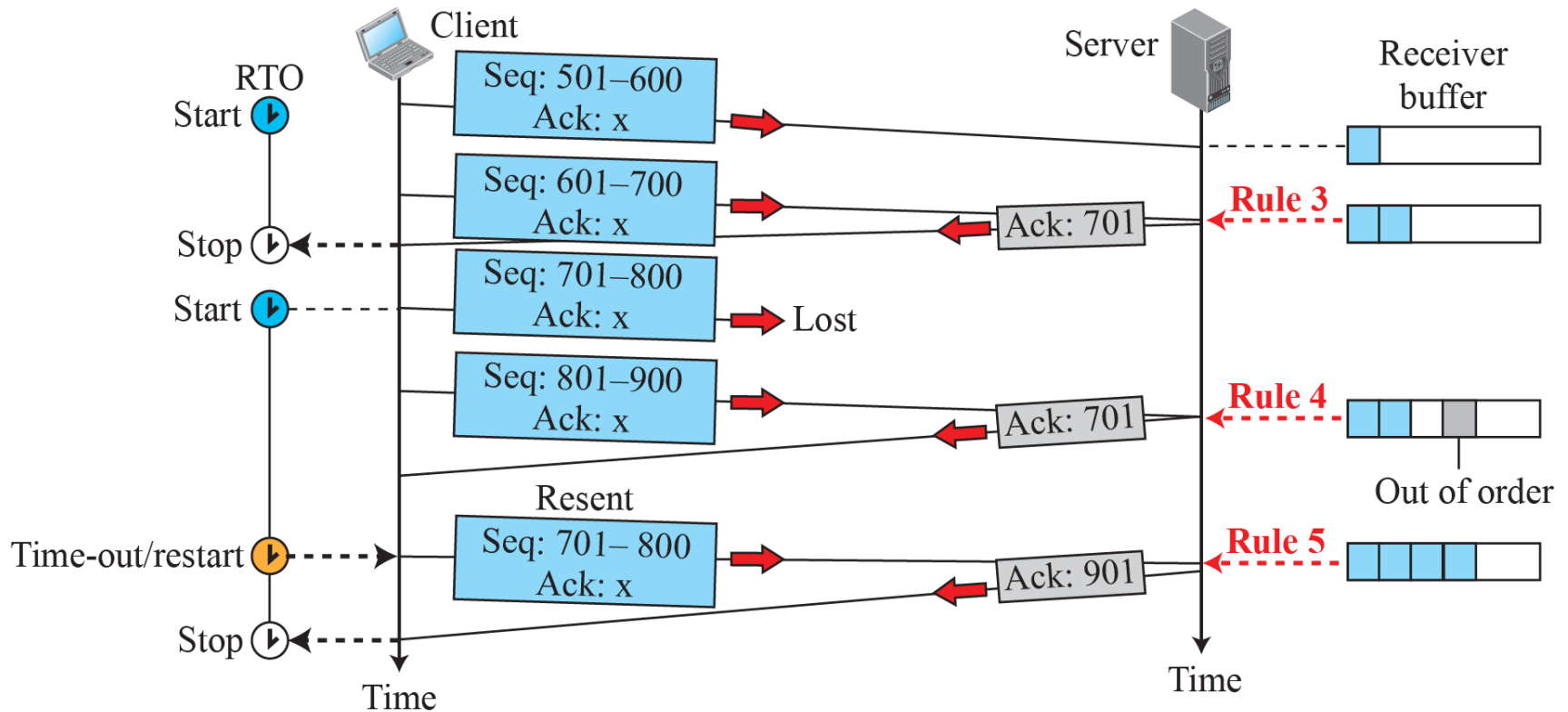
TCP: Go-Back-N or Selective Repeat?

Recap



Normal Operation

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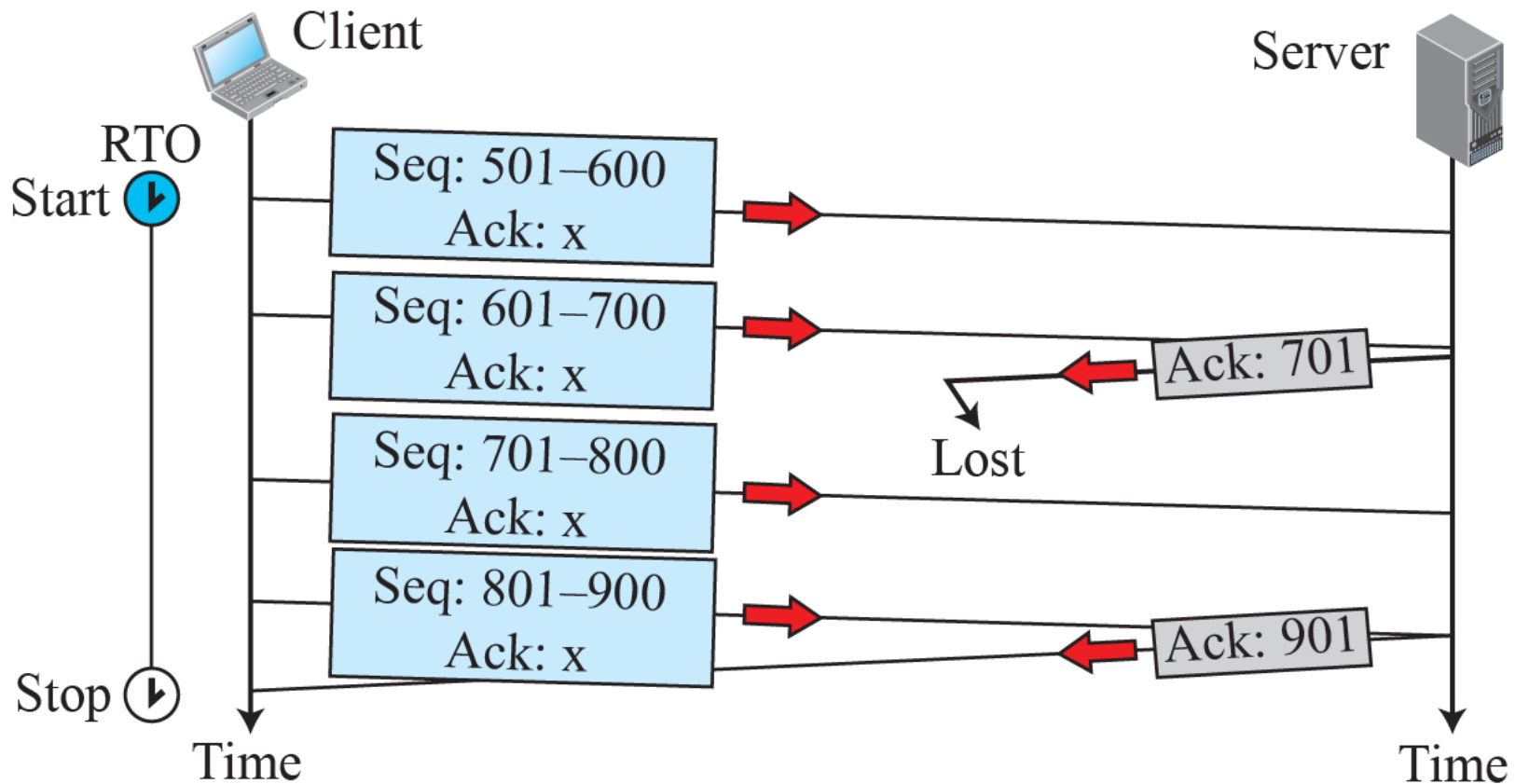


Lost Segment

innovate achieve lead

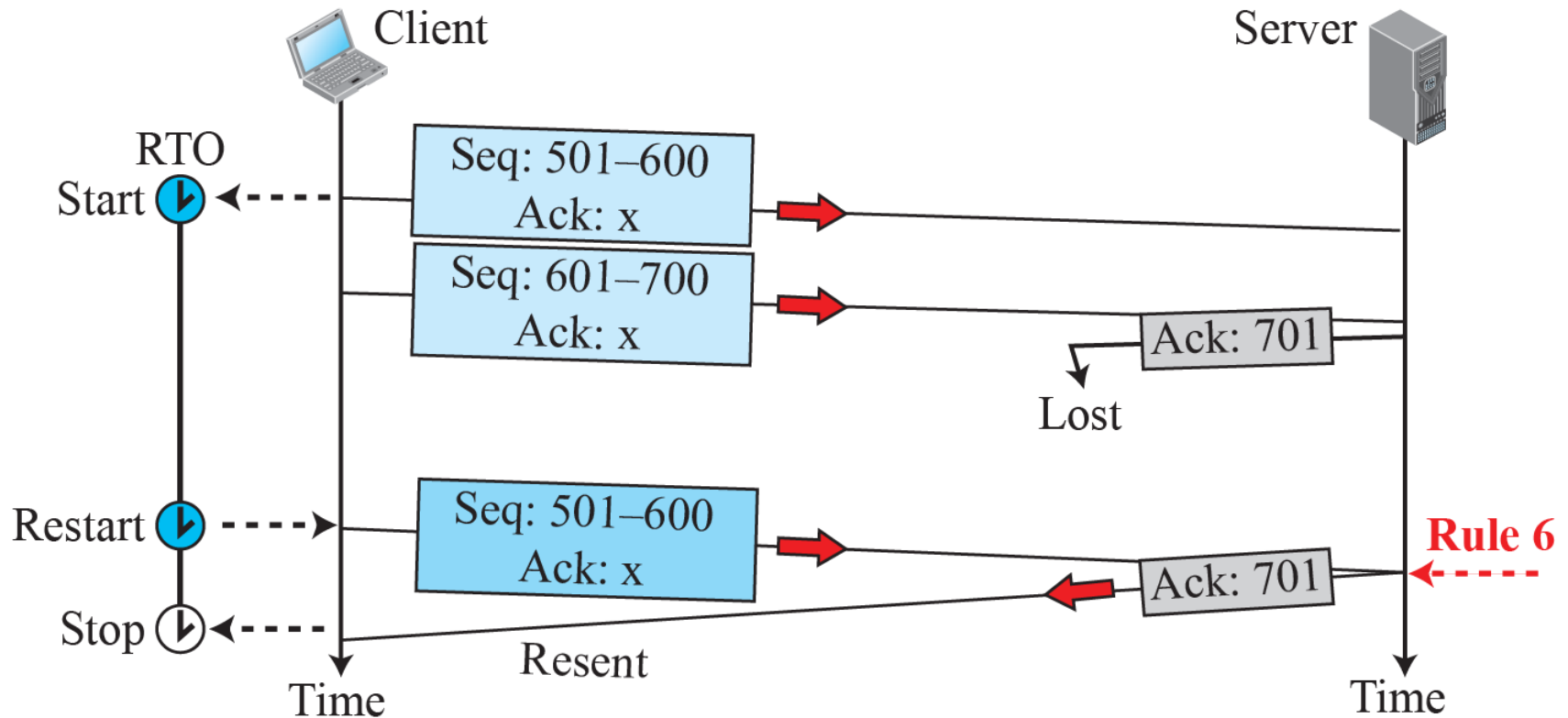


Continued...



Lost Acknowledgement

Continued...



Lost Acknowledgement corrected by resending a segment