

CSC411: Advanced Networks

TCP Overview

Note: This class lecture will be recorded!

If you do not consent to this recording, please do not ask questions via your video, audio or public chat; send your question to the instructor using the private chat.

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TCP Overview

- ▶ Connection-oriented
- ▶ Full-duplex
- ▶ Point-to-point

TCP Segment Structure

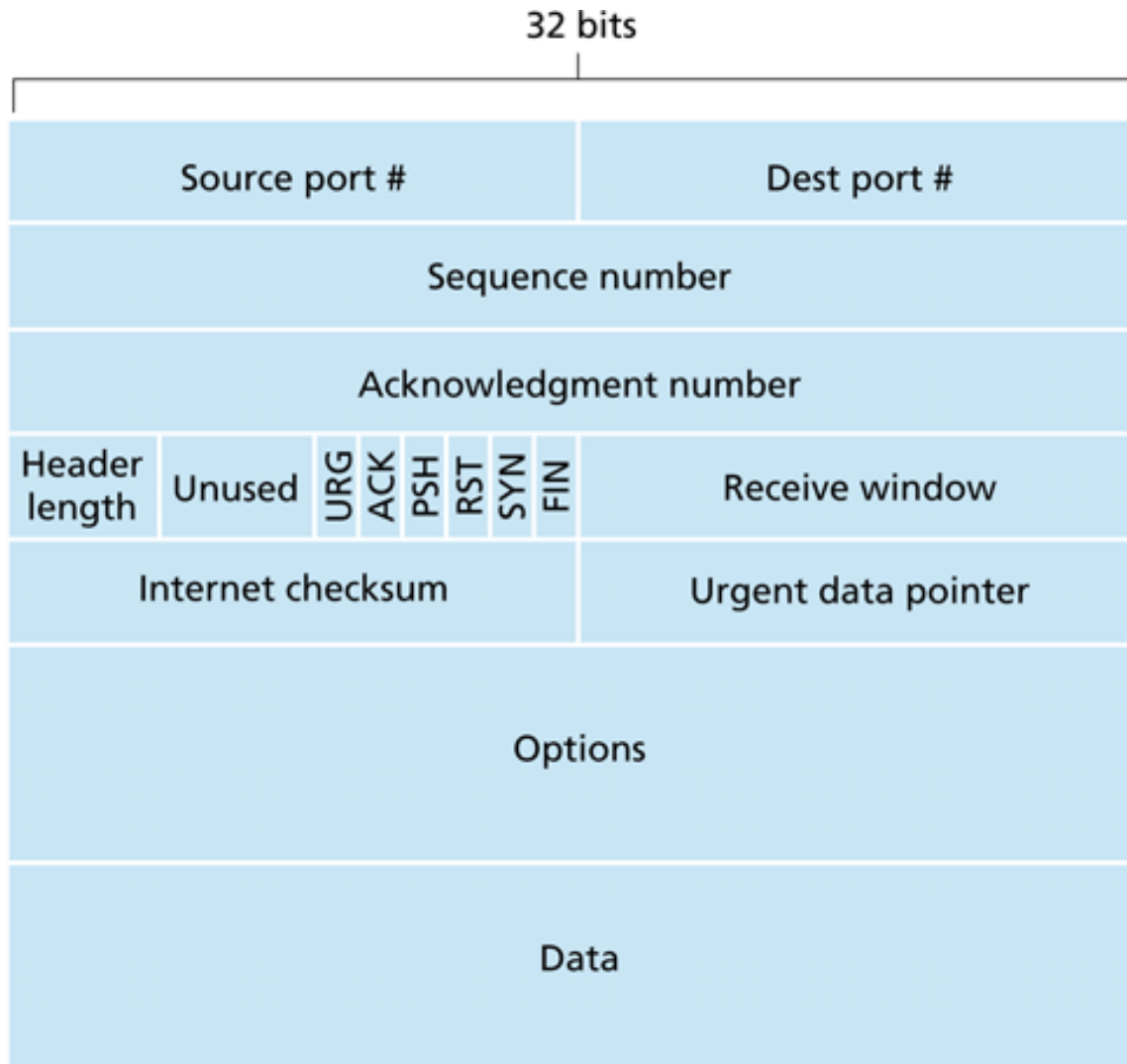


Figure 3.29 ♦ TCP segment structure

TCP Segment Structure, cont.

TCP FIELD	DESCRIPTION
Source Port Number	Identifies the sending application
Destination Port Number	Identifies the receiving application
Sequence Number	Identifies the byte in the stream of data
Acknowledgement Number	Identifies the next sequence number that the sender expects the to receive.
Length	4-bit Header Length
URG	Urgent Pointer
ACK	Acknowledgment Number is valid
PSH	Receiver should pass this data to the application as soon as possible
RST	Reset the connection
SYN	Synchronize sequence numbers to initiate a connection
FIN	The sender is finished sending data
Window Size	The number of outstanding segments allowed at any one time without being acknowledged
Checksum	Covers the header and data
Urgent Pointer	Positive offset that must be added to the sequence number to yield the number of the last byte of data
Options	usually Maximum Segment Size (MSS)

TCP Connection

- ▶ Three-way handshake
- ▶ Send buffer

- ▶ Maximum Segment Size (MSS)
 - Application-layer data only

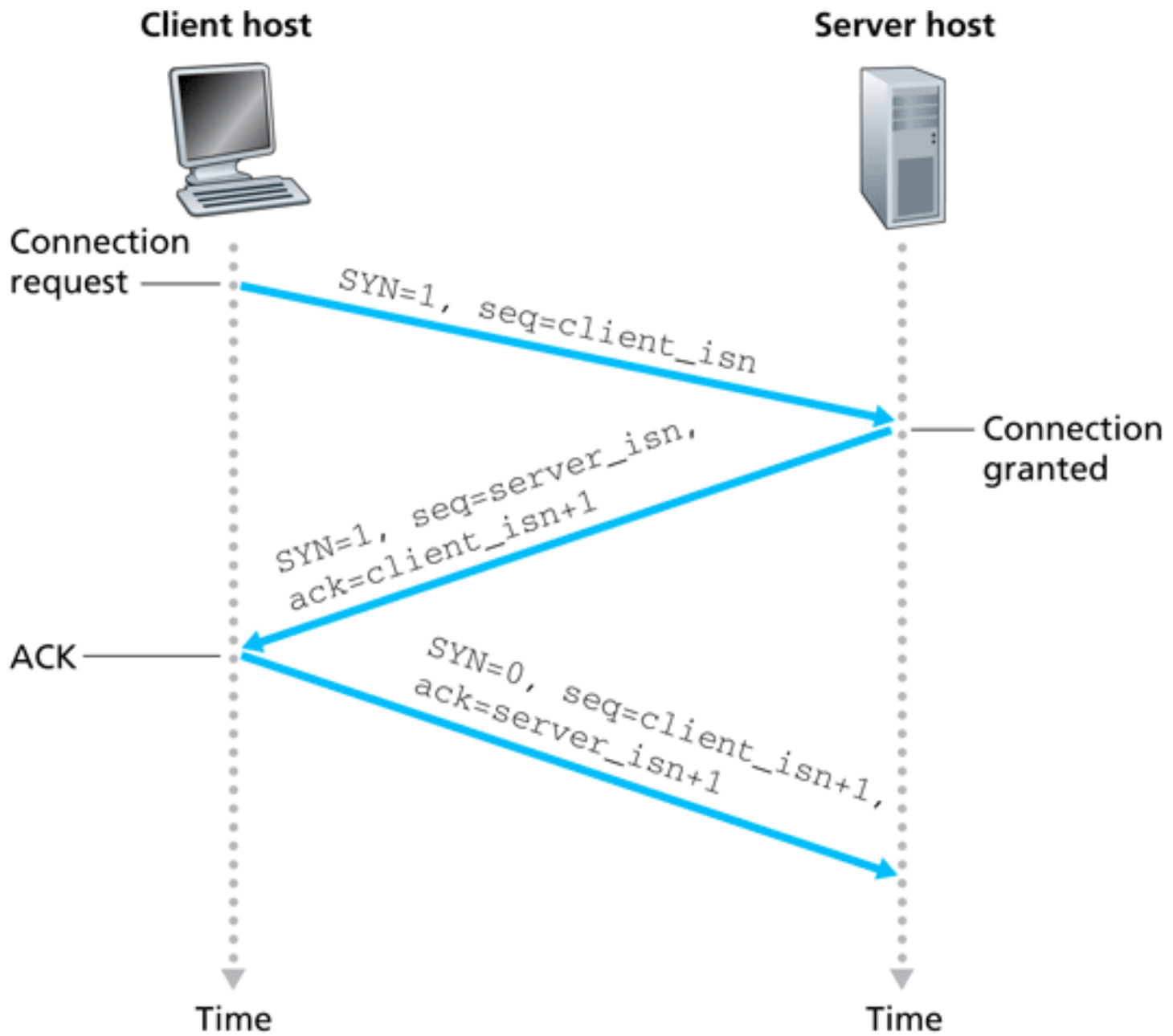


Figure 3.39 ♦ TCP three-way handshake: segment exchange

Connection Established

▶ Sender

- Data passed from application to TCP via socket to send buffer
- TCP grabs data from send buffer (MSS)
- TCP adds header
- Segments passed to network layer

▶ Receiver

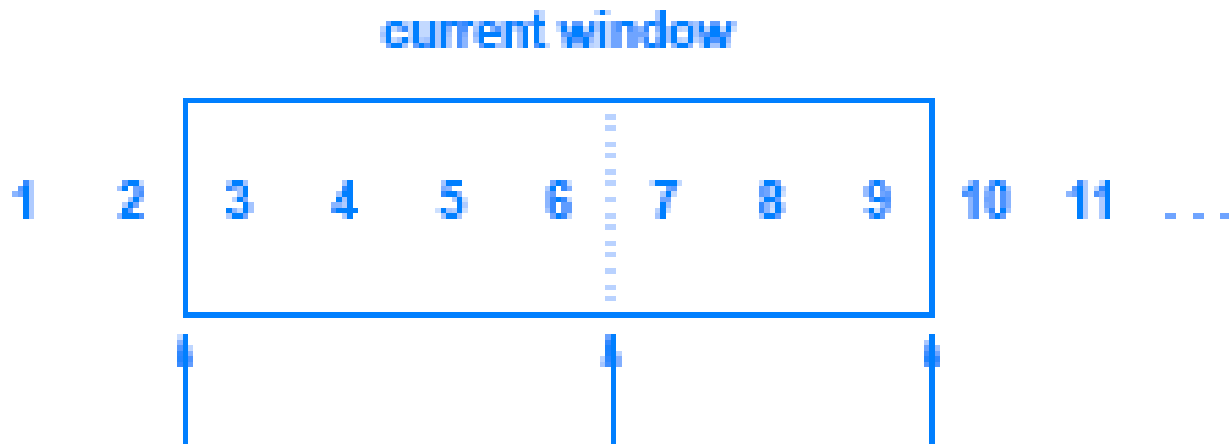
- Process header
- Place data in receive buffer
- Application reads data

Reliable Data-Transfer Service

- ▶ Application-layer data sent to TCP
- ▶ Timer
 - Start
 - Timeout
 - Retransmit
- ▶ Receive an acknowledgement
 - Duplicate ACK
 - Drop packet; re-ACK
 - New ACK
 - Process segment
 - Send ACK

TCP Sliding Window

- What is pipelining?
 - ▶ Octet vs. Byte



Sliding Window Demo

- ▶ http://www2.rad.com/networks/2004/sliding_window/

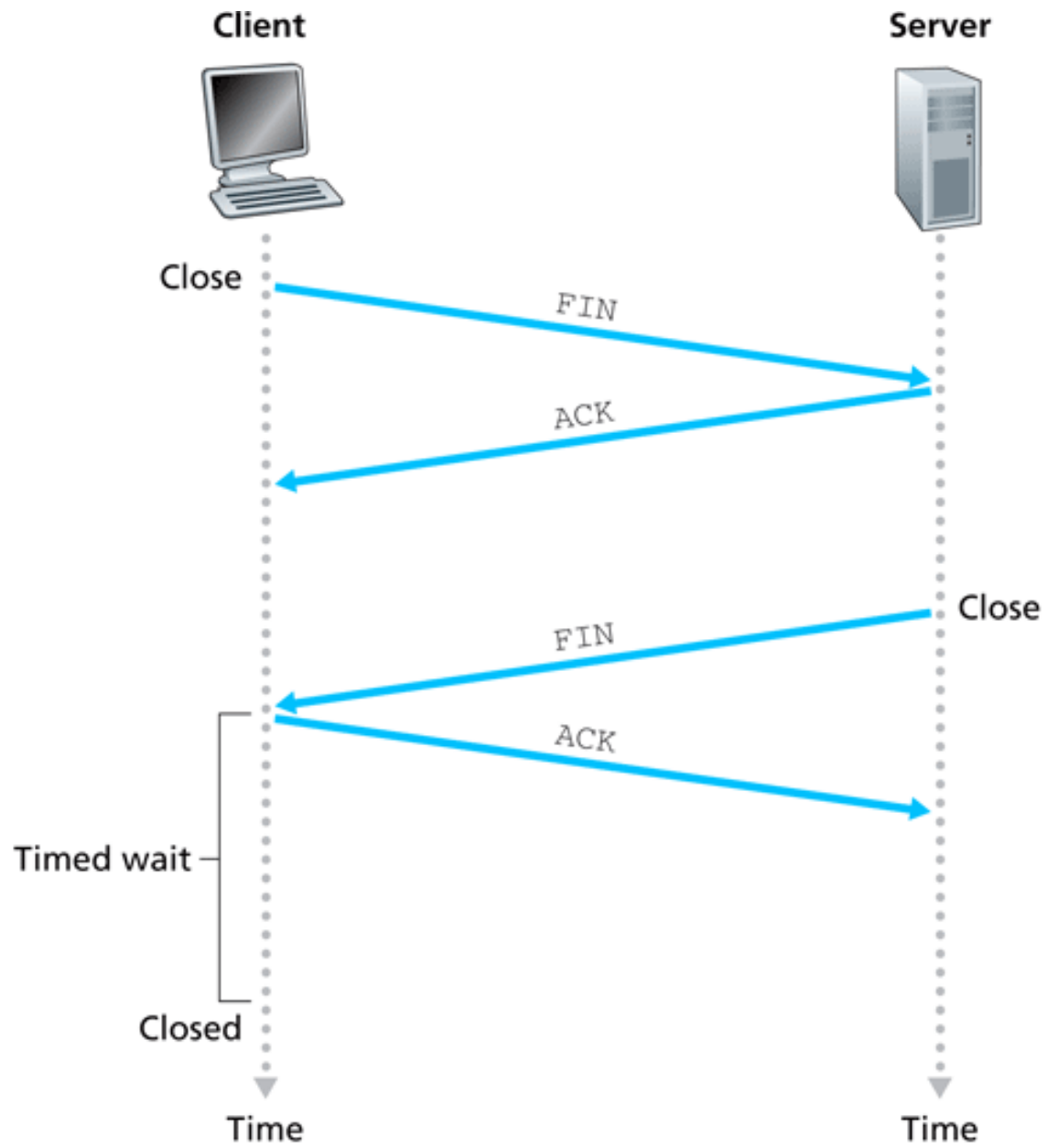


Figure 3.40 ♦ Closing a TCP connection

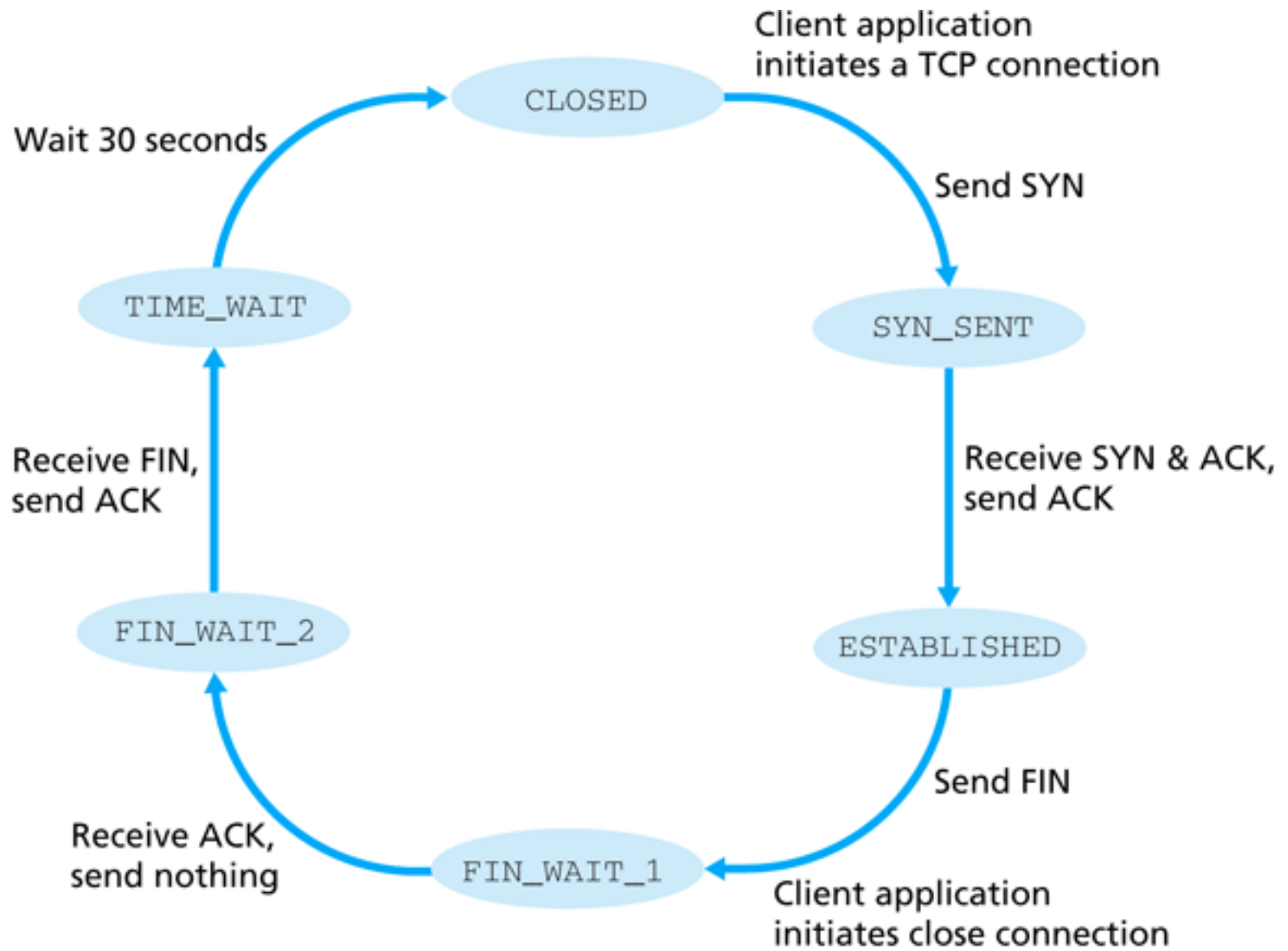


Figure 3.41 ♦ A typical sequence of TCP states visited by a client TCP

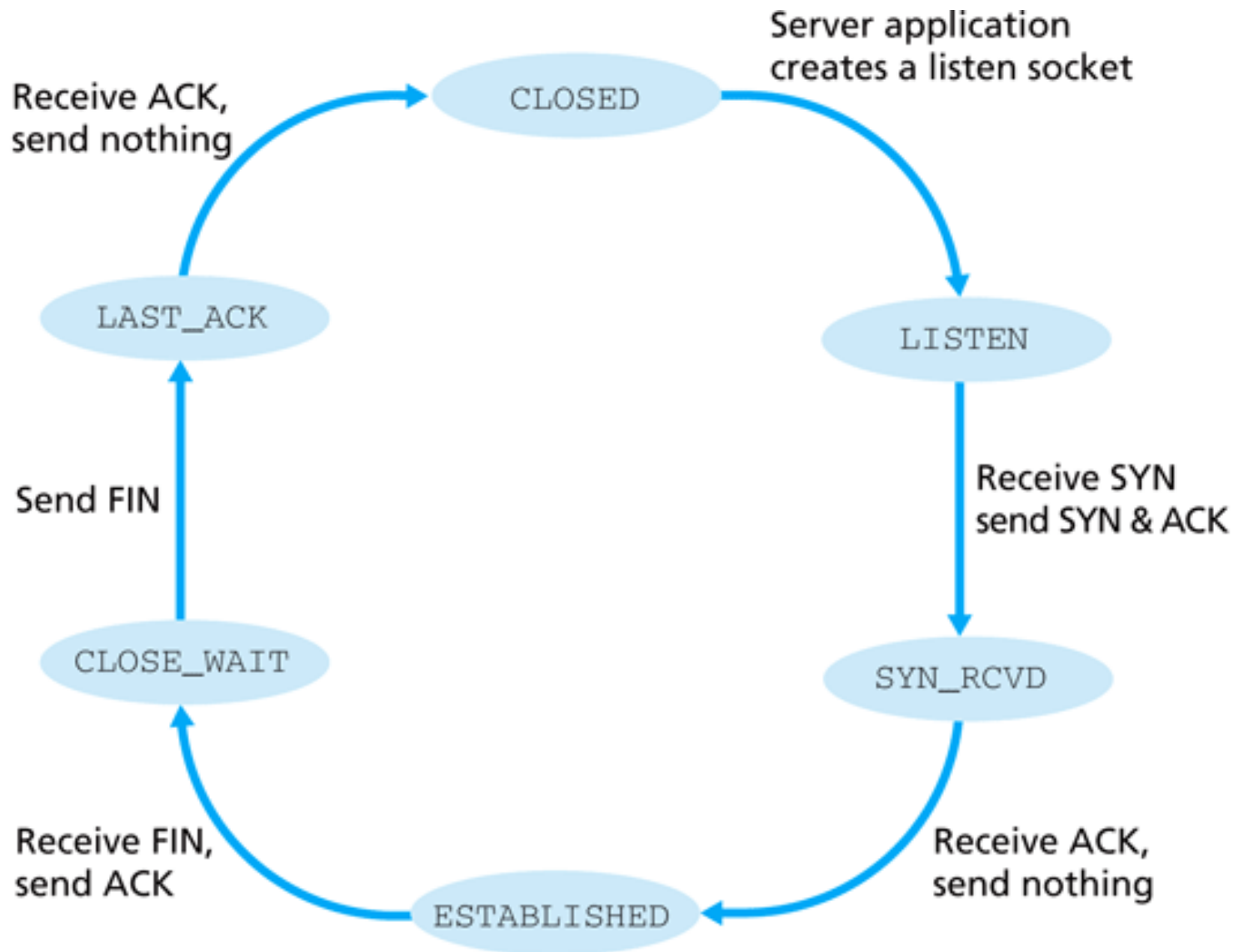


Figure 3.42 ♦ A typical sequence of TCP states visited by a server-side TCP

