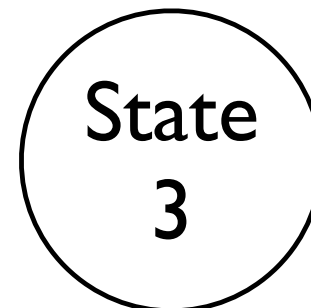# Finite State Machines
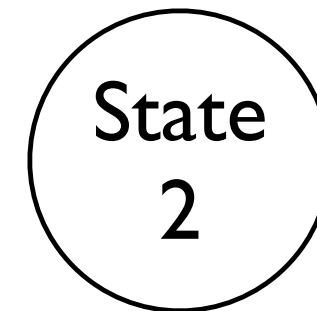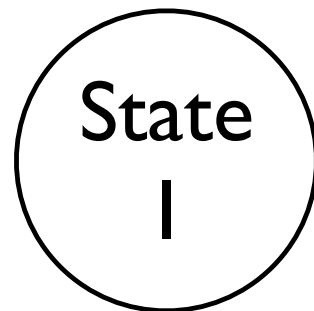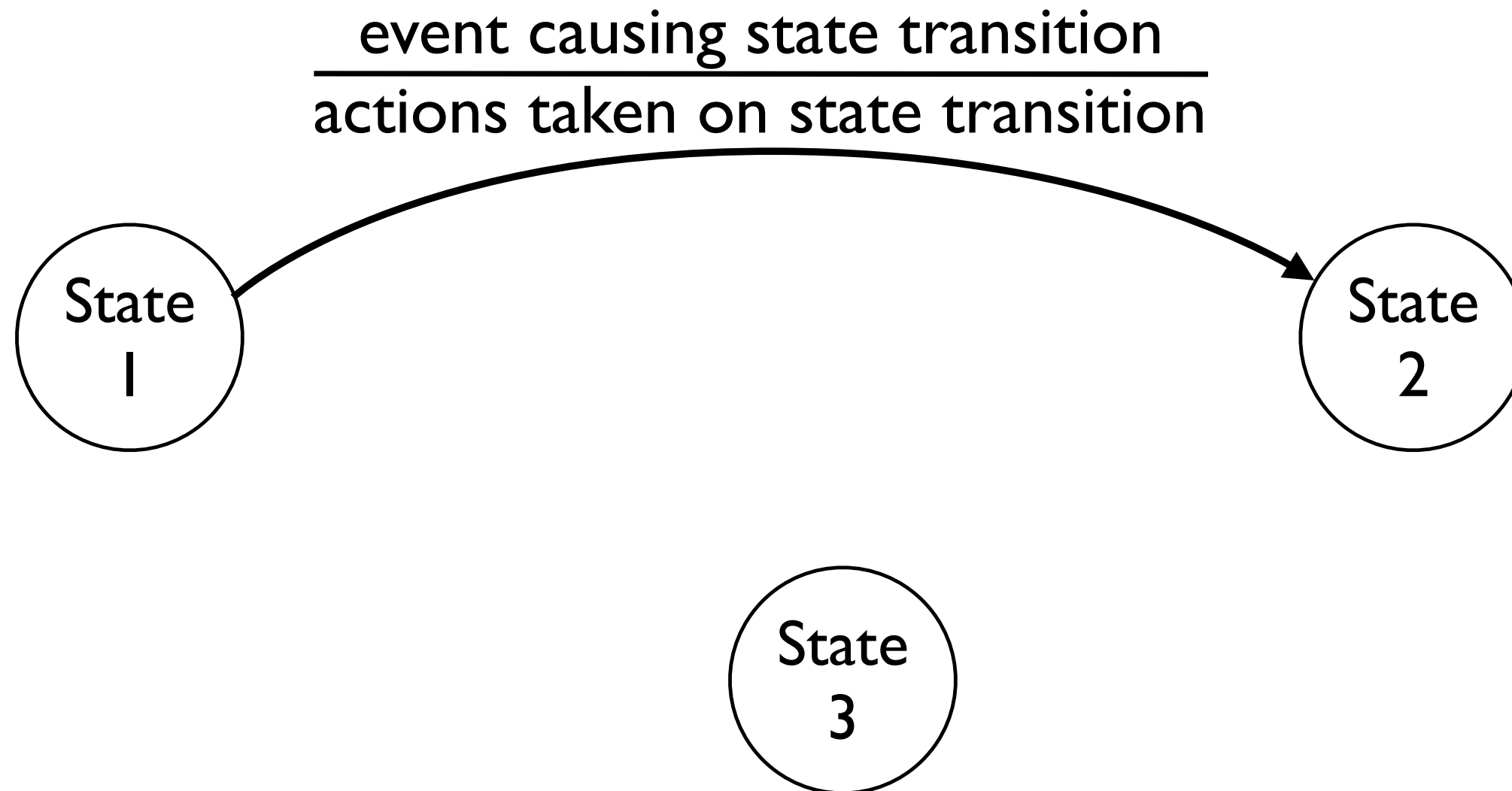
Protocol Specification

Finite State Machines

Finite State Machines

event causing state transition
_____
actions taken on state transition

(State 1) → (State 2)

(State 3)

Finite State Machines

event causing state transition
_____
actions taken on state transition

State 1

State 2

event
_____
action
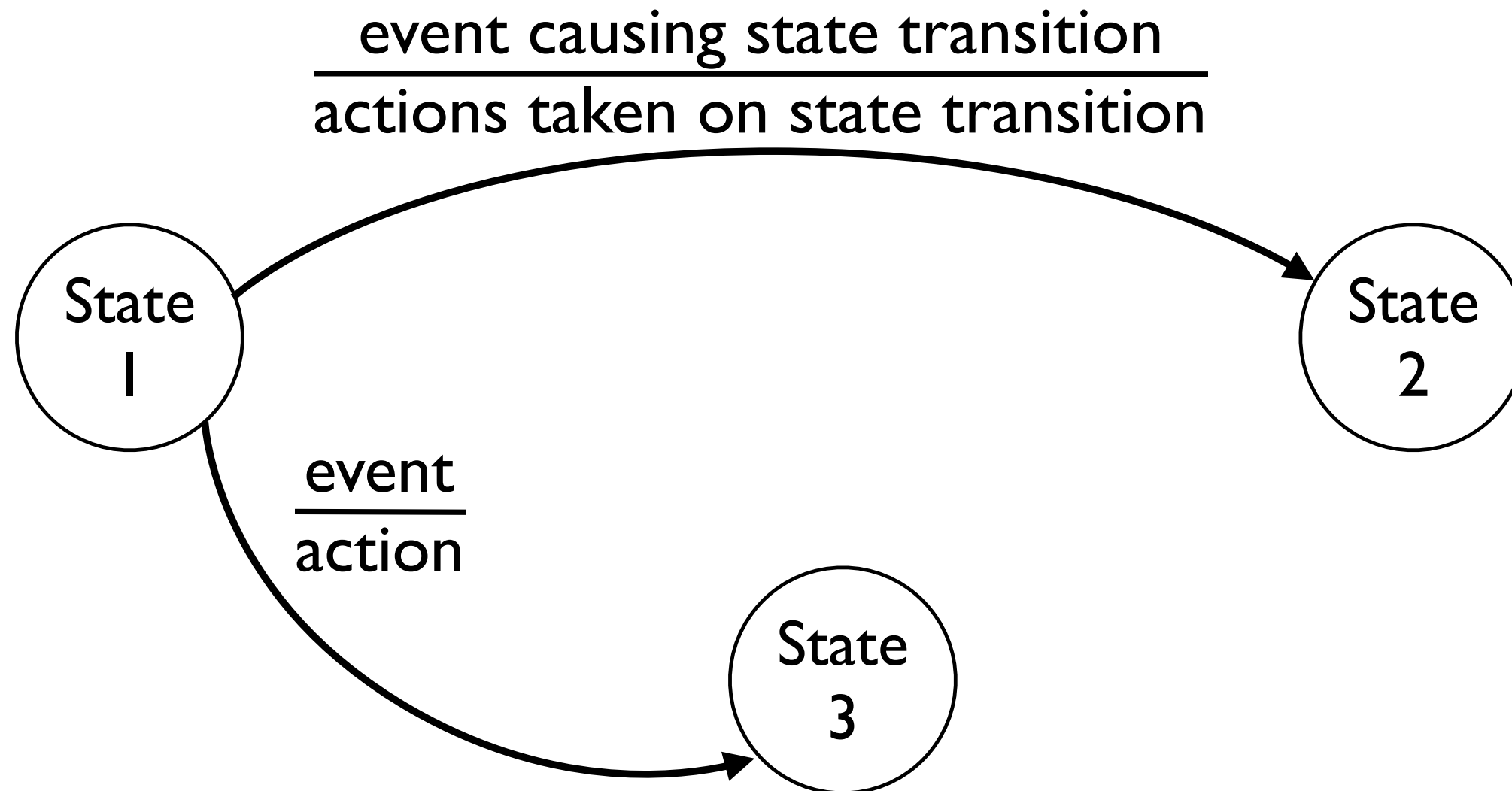
State 3

FSM Example: HTTP Request

FSM Example: TCP Connection

http://upload.wikimedia.org/wikipedia/commons/thumb/a/a2/Tcp_state_diagram_fixed.svg/
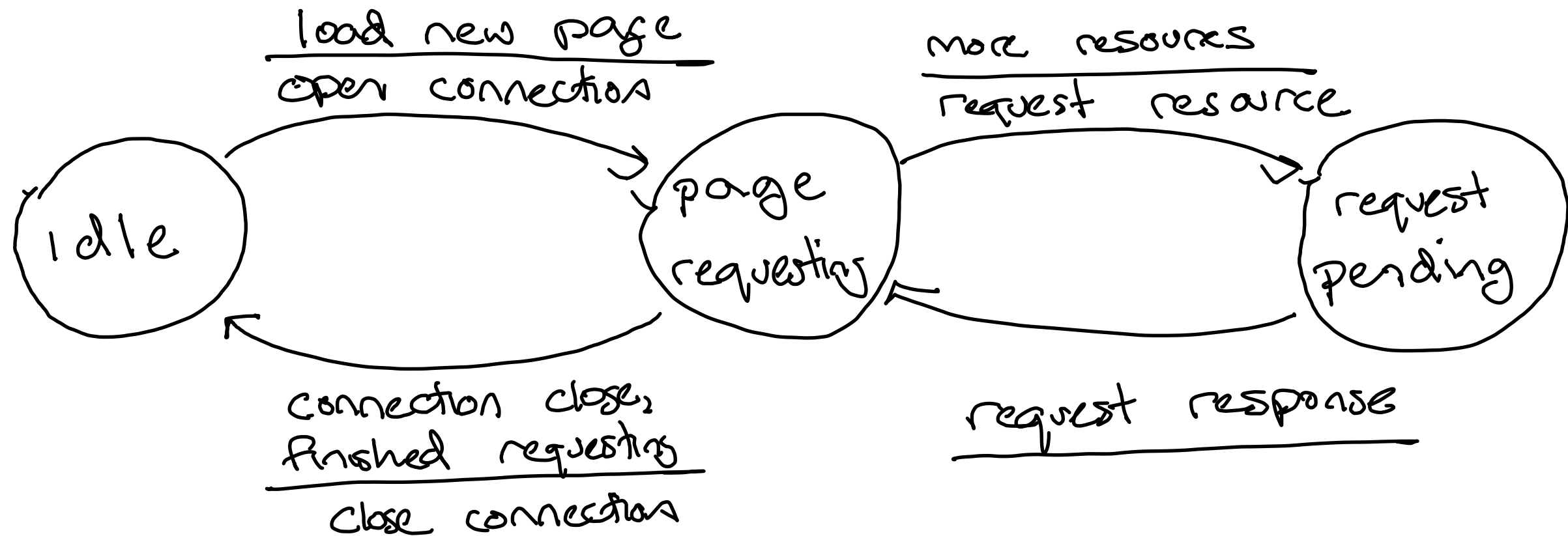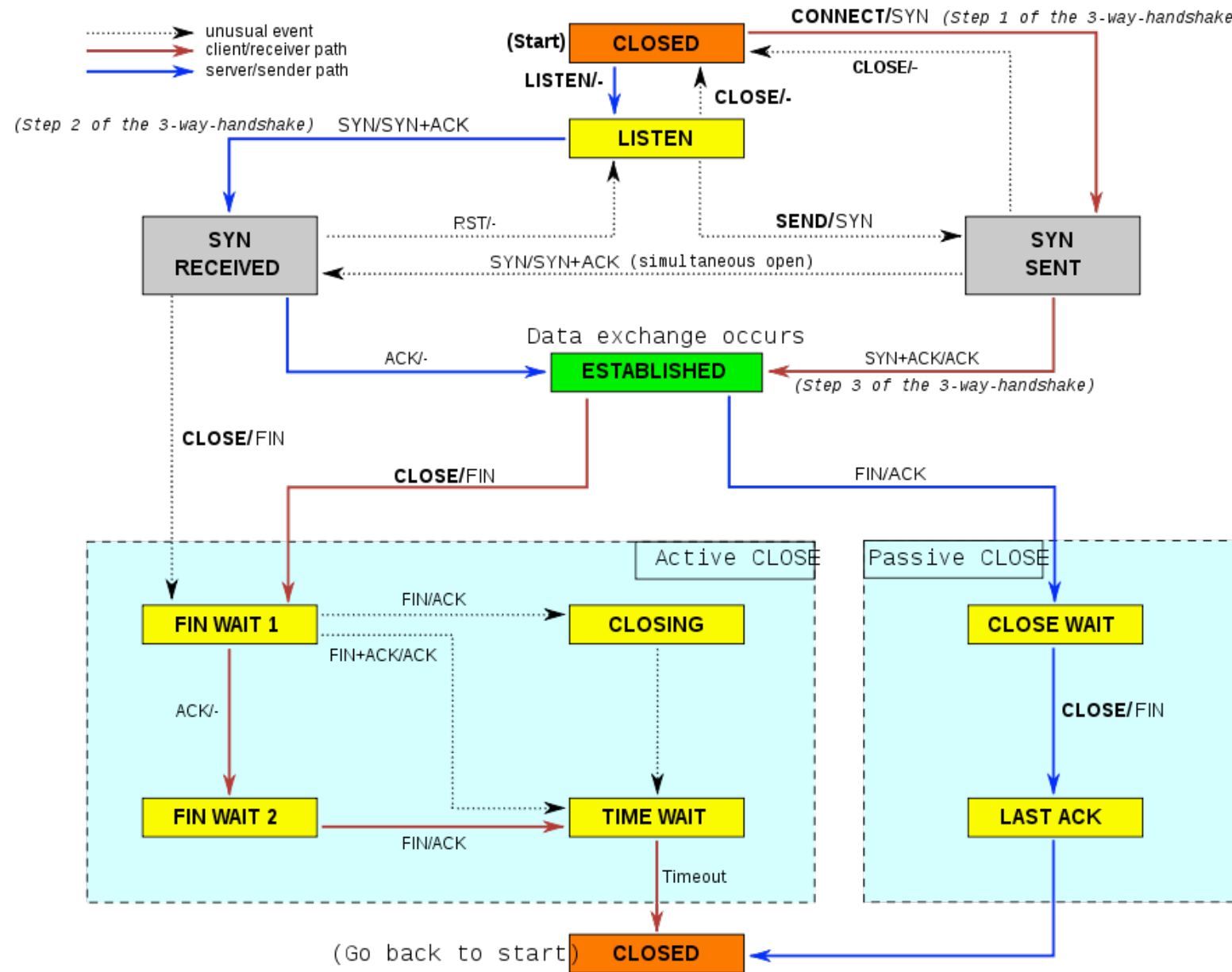
FSM Example: TCP Connection

Quiz

Assume there is no other documentation of the TCP finite state machine, so there's no supporting textual description which defines other state transitions.

Suppose we start in the closed state, then call listen, then receive a SYN, then call close. What state will we be in: CLOSED, SYN SENT, SYN RECEIVED, ESTABLISHED, FIN WAIT 1, or undefined?

Suppose we start in the closed state, then call connect, then call close. What state will we be in: CLOSED, SYN SENT, SYN RECEIVED, ESTABLISHED, FIN WAIT 1, or undefined?
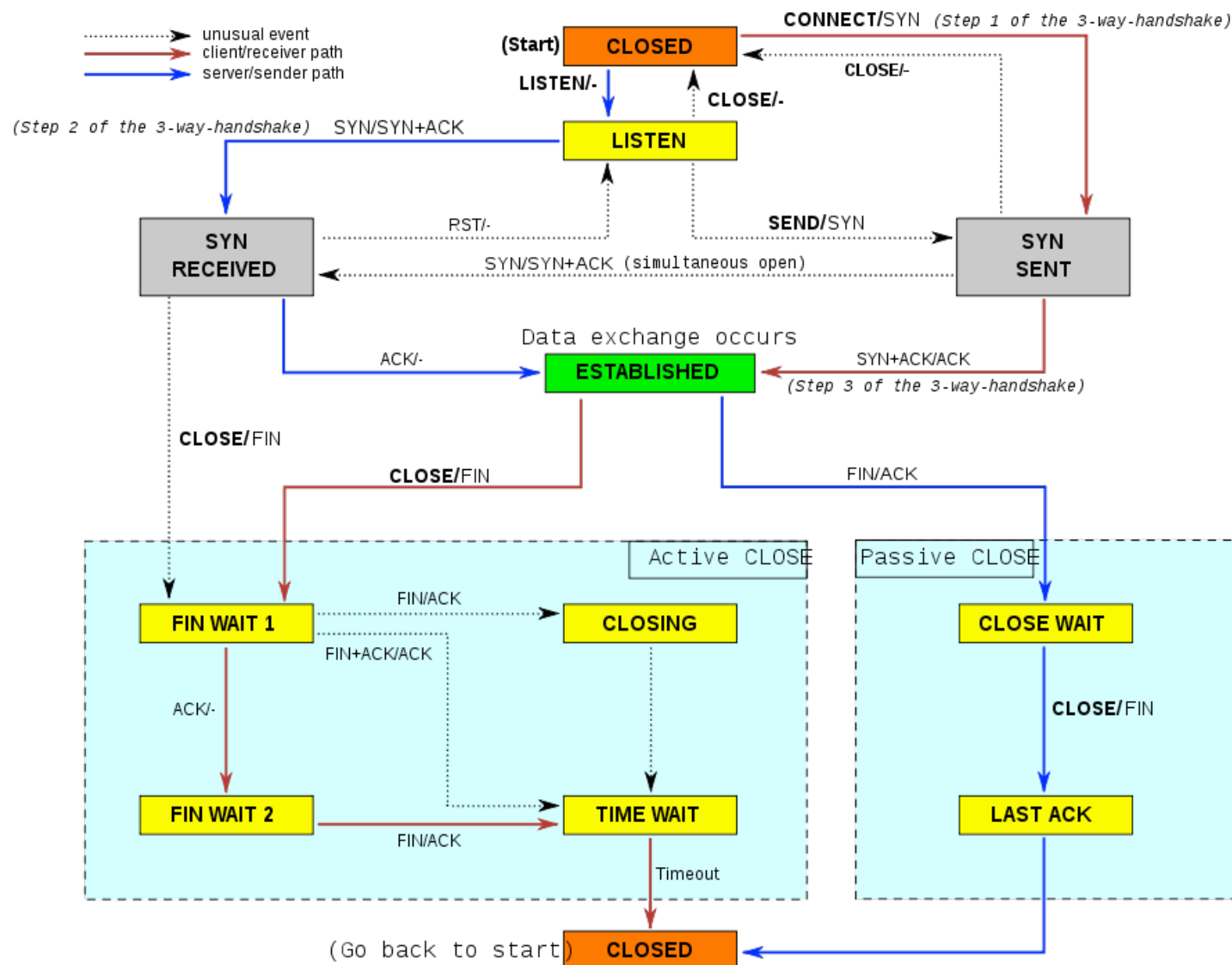
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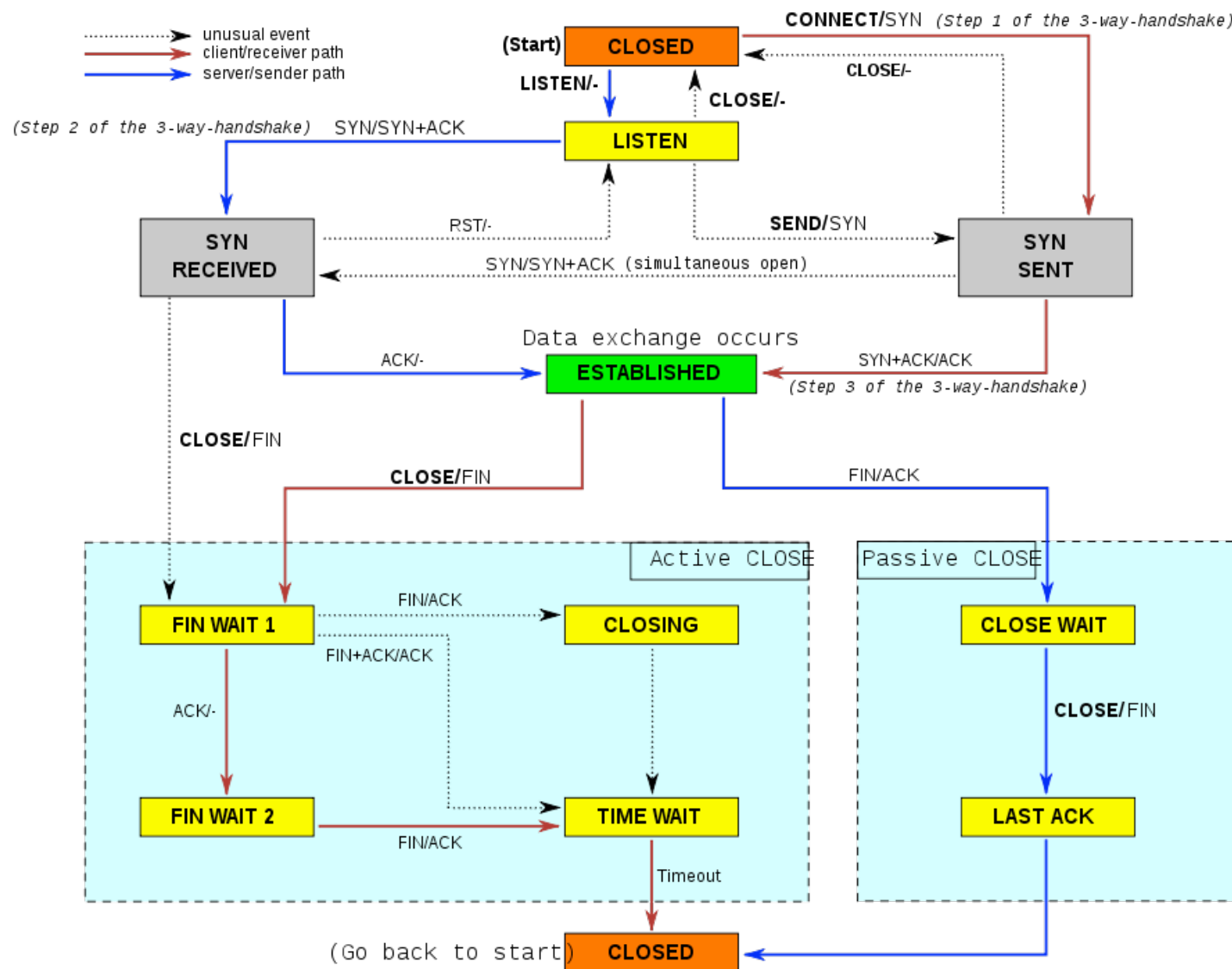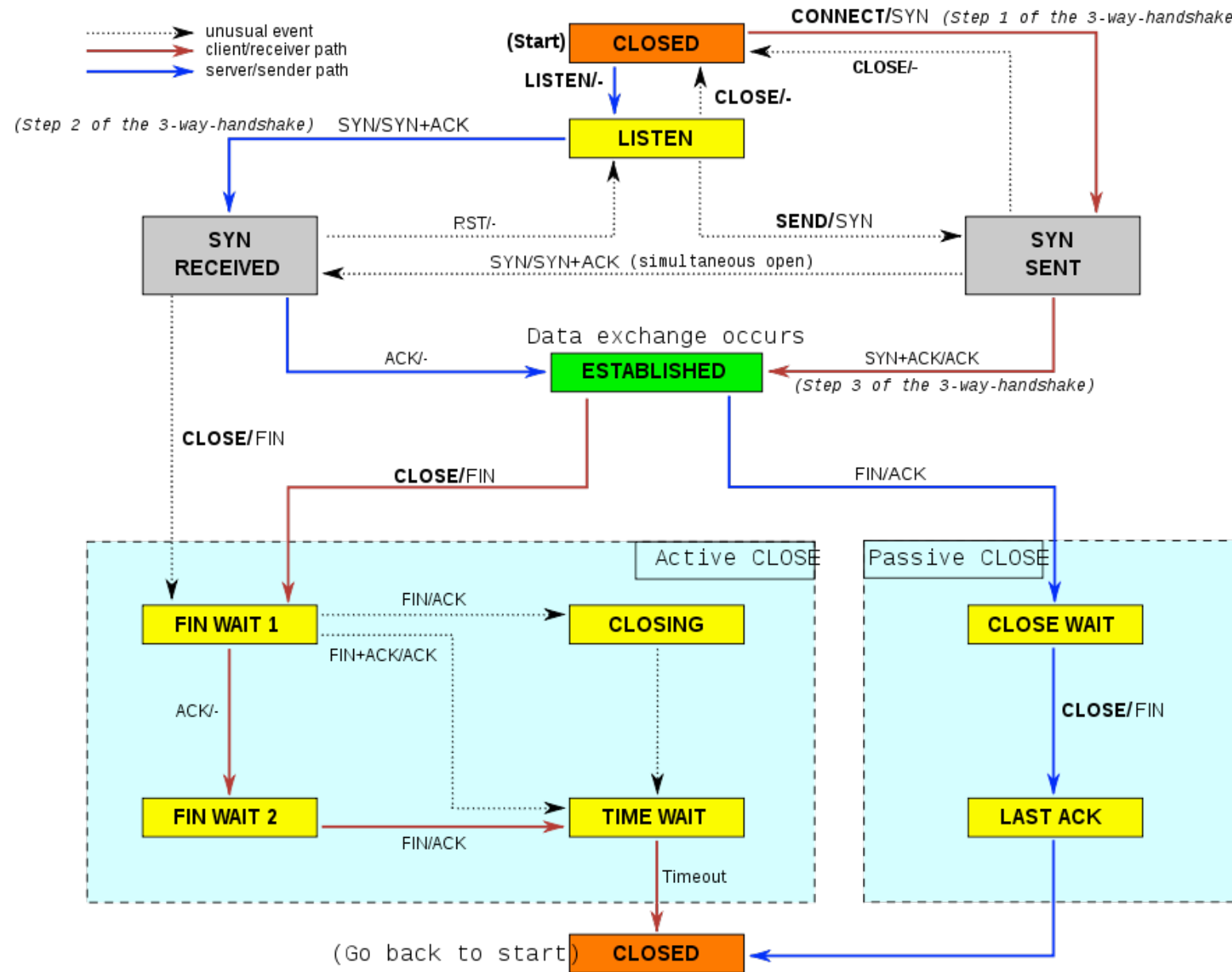
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Suppose we start in the closed state, then call connect, then call close. What state will we be in: CLOSED, SYN SENT, SYN RECEIVED, ESTABLISHED, FIN WAIT 1, or undefined?

unusual event
client/receiver path
server/sender path

CONNECT/SYN *(Step 1 of the 3-way-handshake)*

(Start) CLOSED

CLOSE/-

LISTEN/-

CLOSE/-

(Step 2 of the 3-way-handshake) SYN/SYN+ACK

LISTEN

SYN RECEIVED

RST/-

SEND/SYN

SYN SENT

SYN/SYN+ACK (simultaneous open)

Data exchange occurs

ACK/-

ESTABLISHED

SYN+ACK/ACK
(Step 3 of the 3-way-handshake)

CLOSE/FIN

CLOSE/FIN

FIN/ACK

Active CLOSE

Passive CLOSE

FIN WAIT 1

FIN/ACK

CLOSING

CLOSE WAIT

FIN+ACK/ACK

ACK/-

CLOSE/FIN

FIN WAIT 2

TIME WAIT

LAST ACK

FIN/ACK

Timeout

(Go back to start) CLOSED

FSM Example: TCP Connection

http://upload.wikimedia.org/wikipedia/commons/thumb/a/a2/Tcp_state_diagram_fixed.svg/

FSM Example: TCP Connection