IIT KHARAGPUR

NPTEL ONLINE
CERTIFICATION COURSES

COMPUTER NETWORKS AND INTERNET PROTOCOLS

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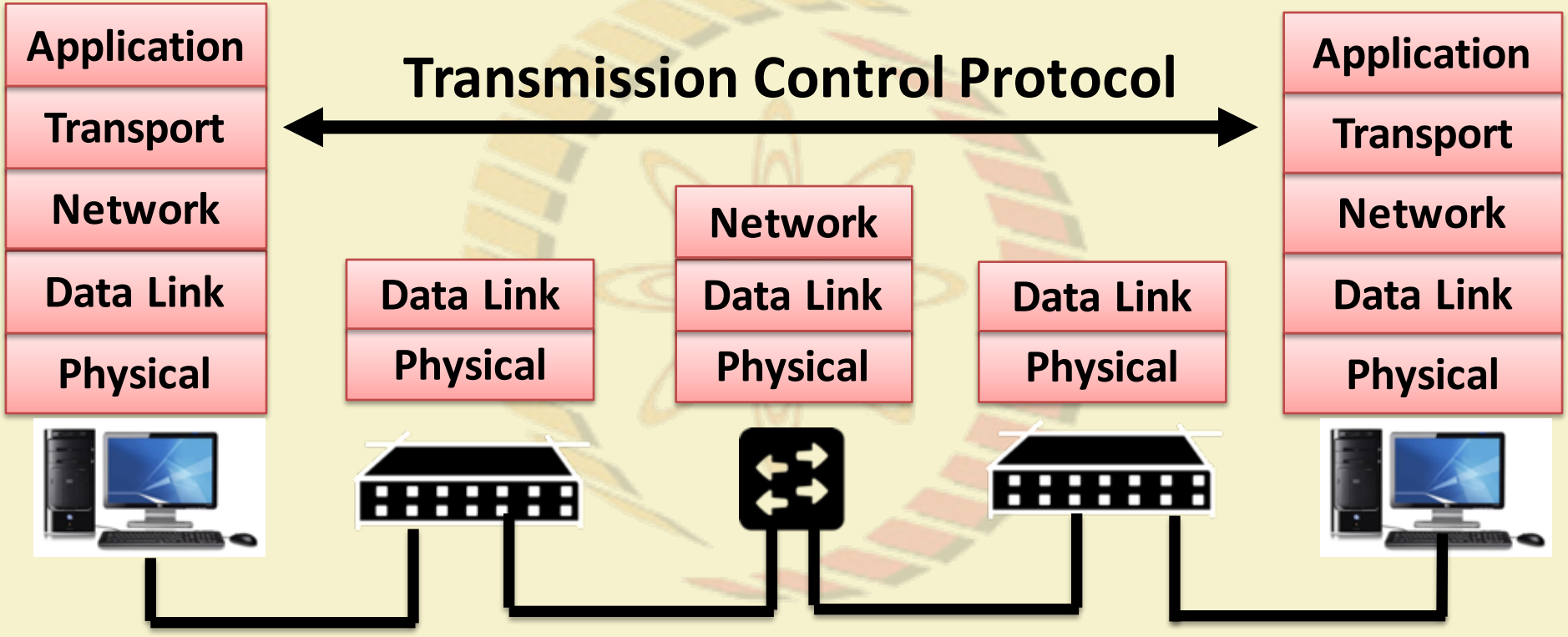
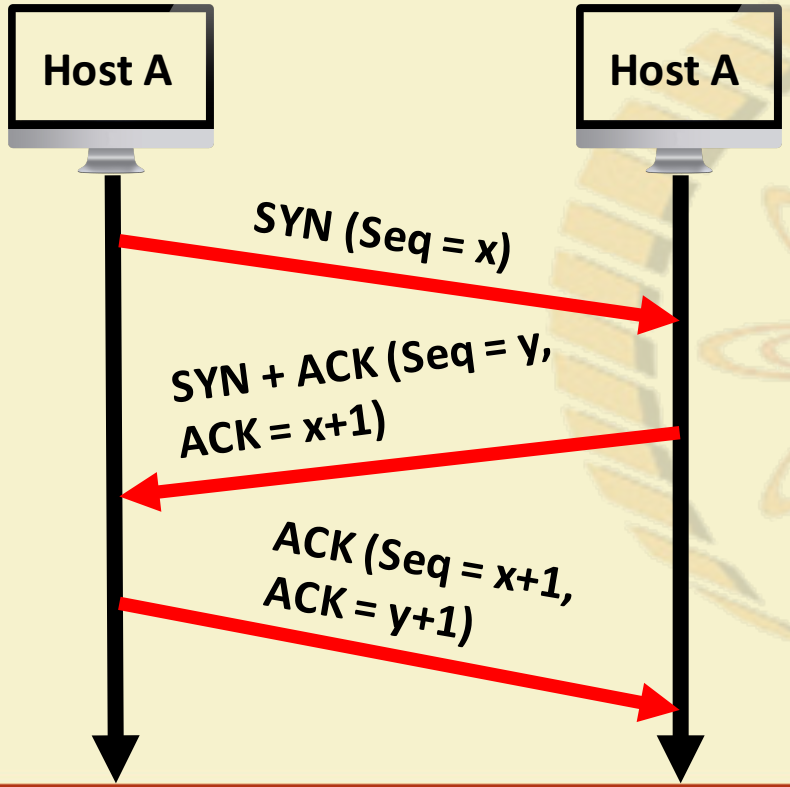
Transmission Control Protocol II (Connections)

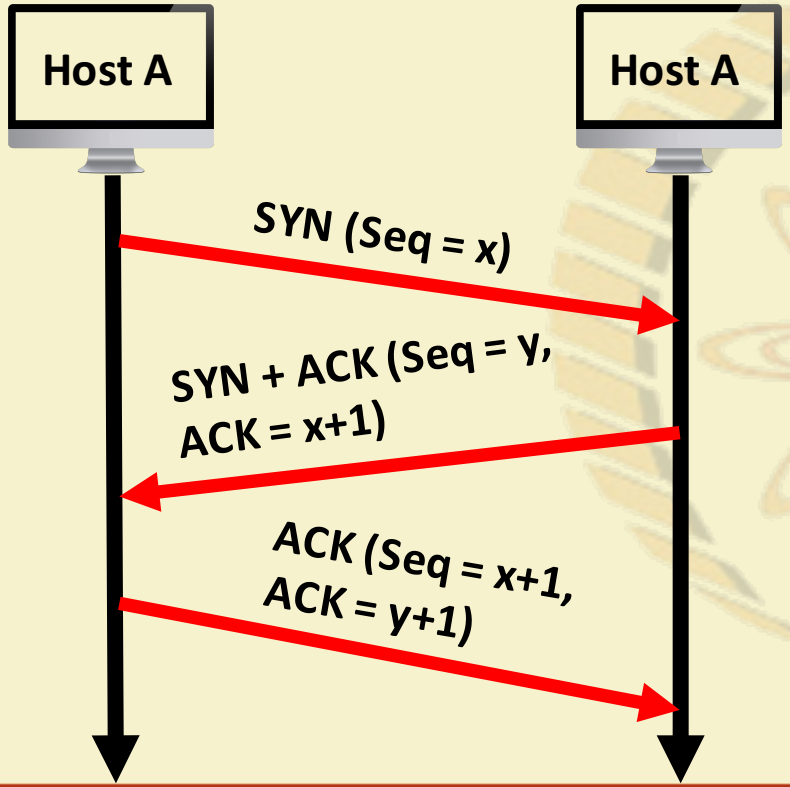


TCP Connection Establishment



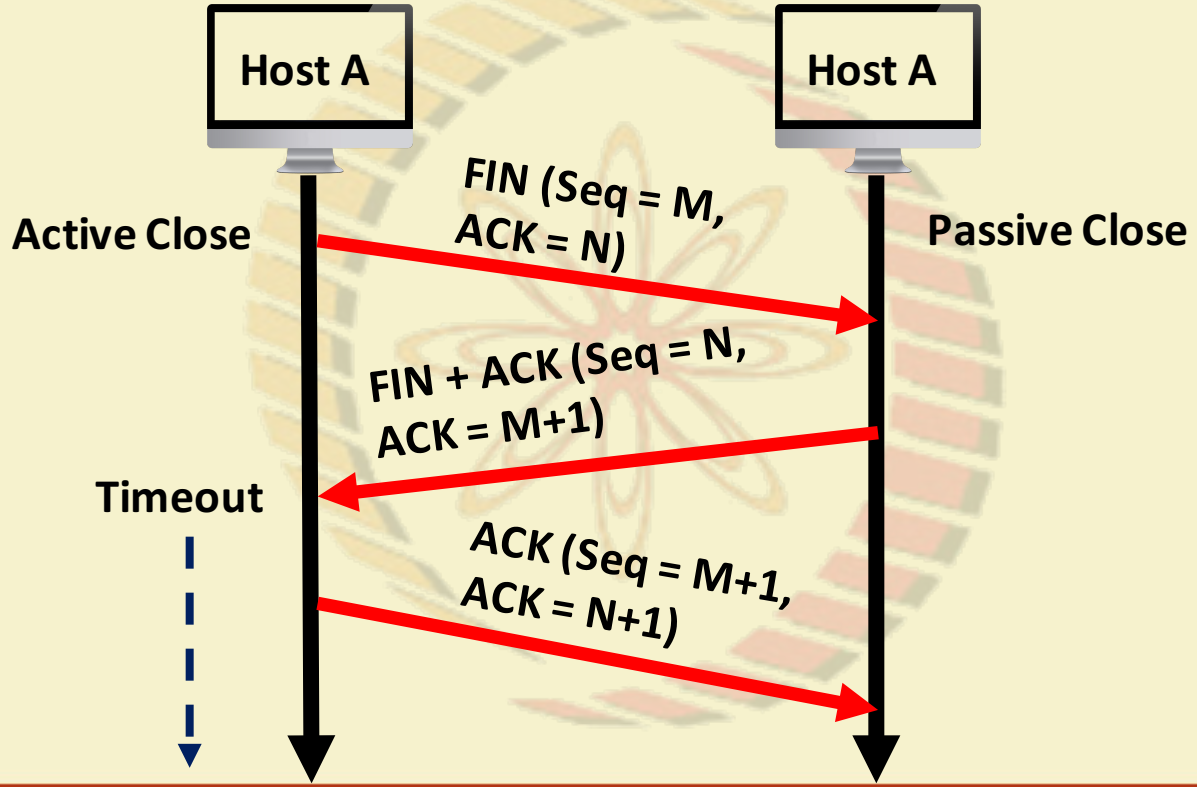
- **How to choose the initial sequence number?**
  - Avoid delayed duplicates, do now generate the initial sequence number for every connection from 0
  - Original implementation of TCP used a clock based approach, the clock ticked every 4 microseconds, the value of the clock cycles from 0 to 2^{32}-1. The value of the clock gives the initial sequence number

TCP Connection Establishment

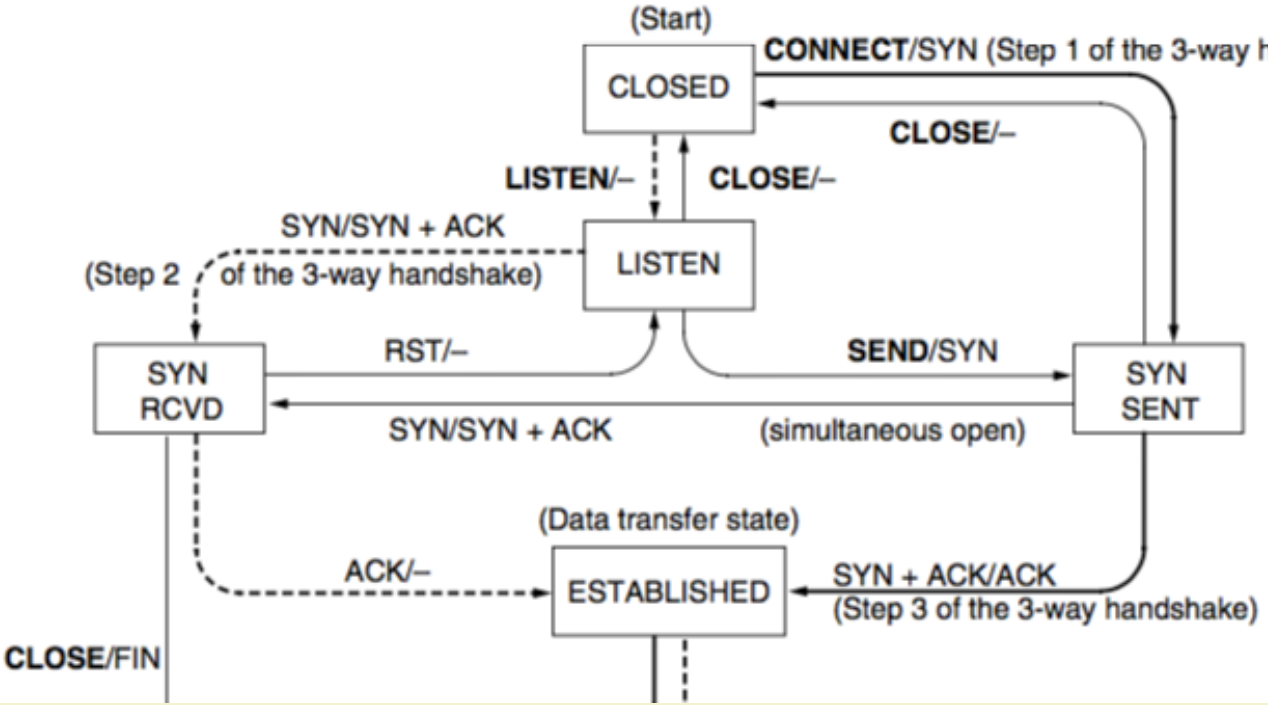


- **TCP SYN flood attack**
  - Solution: Use cryptographic function to generate sequence numbers

TCP Connection Release



TCP State Transition Diagram – Connection Modeling



State	Description
CLOSED	No connection is active or pending
LISTEN	The server is waiting for an incoming call
SYN RCVD	A connection request has arrived; wait for ACK
SYN SENT	The application has started to open a connection
ESTABLISHED	The normal data transfer state
FIN WAIT 1	The application has said it is finished
FIN WAIT 2	The other side has agreed to release
TIME WAIT	Wait for all packets to die off
CLOSING	Both sides have tried to close simultaneously
CLOSE WAIT	The other side has initiated a release
LAST ACK	Wait for all packets to die off

Event/Action
Dashed: Server
Solid: Client

Source: Computer Networks (5th Edition) by Tanenbaum, Wetherell

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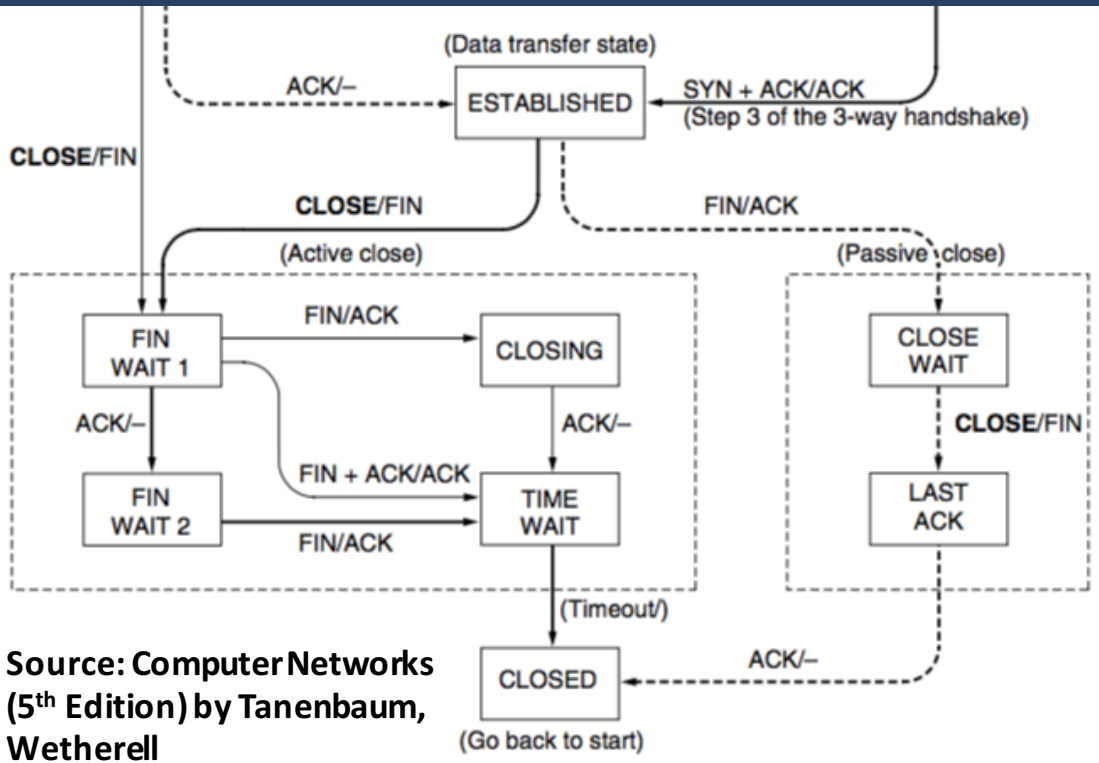

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thank you!