

Transmission Control Protocol (TCP)

Introduction

The Transmission Control Protocol (TCP) state chart encapsulates the intricate dance between communicating devices during establishing, maintaining, and terminating a TCP connection. This state chart visually represents the various states a TCP connection can traverse, illustrating the protocol's connection-oriented nature and ability to ensure reliable data transfer.

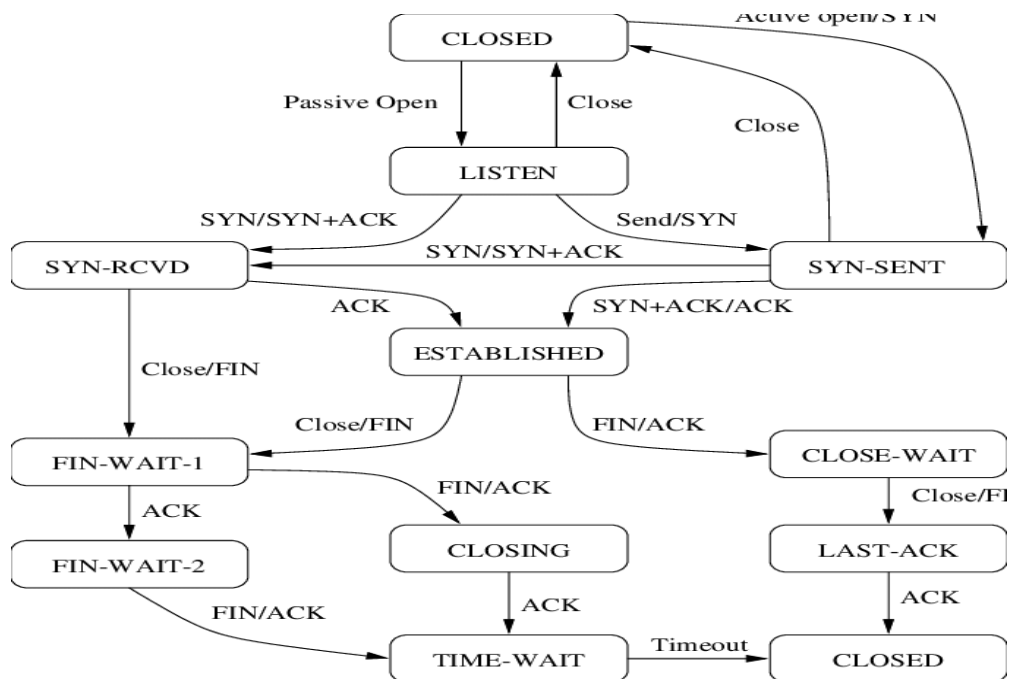


Figure 1 – TCP IP State Chart

- **Closed State:**
 - The journey begins in the Closed state, where no connection exists. This is the default state when a device is not actively communicating. From here, a device can transition to the next state by initiating a connection attempt.
- **Listen State:**
 - When a device wishes to accept incoming connections, it enters the Listen state. In this state, it is ready and waiting for a connection request from a remote device. The Listen state represents a passive role, where the device can establish a connection when requested.
- **Syn Sent State:**
 - The initiation of an active connection starts with the Syn Sent state. In this state, a device sends a synchronization (SYN) packet to the remote device, expressing its intent to establish a connection. The device awaits an acknowledgment (ACK) from the remote side to confirm the readiness for communication.

- **Syn Received State:**
 - The remote device enters the Syn Received state upon receiving the SYN packet. It acknowledges the received SYN packet and responds with its own SYN packet, creating a bidirectional communication path. The devices are now on the brink of forming a fully established connection.
- **Established State:**
 - The Established state marks the zenith of the connection. Both devices have exchanged SYN packets, and the connection is now established. Data transfer occurs seamlessly in this state, and the devices can transmit information in both directions. This state embodies the core functionality of TCP, providing a reliable and ordered data stream.
- **Fin Wait 1 State:**
 - When a device terminates the connection, it enters the Fin Wait 1 state. This is the initial stage of the connection termination process. The device sends a FIN packet to the remote device, indicating its intention to end the connection. However, it continues to wait for any remaining data or acknowledgment from the remote side.
- **Fin Wait 2 State:**
 - In the Fin Wait 2 state, the device has sent a FIN packet and received an acknowledgment from the remote device. It is now waiting for the remote side to send its FIN packet, indicating its agreement to terminate the connection. The devices are in the final stages of closing the connection.
- **Time Wait State:**
 - After sending and receiving FIN packets, the device enters the Time Wait state. This state is crucial for handling delayed packets and ensuring a clean termination. The device remains in this state for a specific duration, allowing delayed packets to arrive and preventing confusion in subsequent connections.
- **Close Wait State:**
 - The device enters the Close Wait state if the remote side initiates the connection termination process. In this state, the device acknowledges the received FIN packet and awaits the application to signal that it has processed all the data. Once the application gives the green light, the device can move to the last state.
- **Last Ack State:**
 - The Last Ack state is the final stage of the connection termination process. The device sends a final acknowledgment for the received FIN packet, acknowledging the termination of the connection. After this acknowledgment, the device transitions back to the Closed state, completing the cycle.

Understanding the TCP state chart is essential for comprehending TCP connections' robust and orderly nature.