SCTP, Connection management

- Stream Control Transmission Protocol (SCTP) is a connection-oriented network protocol for transmitting multiple streams of data simultaneously between two endpoints that have established a connection in a computer network.
- Sometimes known as *next-generation* Transmission Control Protocol or TCPng, SCTP makes it easy to support a telephone connection over the internet.
- SCTP is an Internet Protocol (IP) transport layer protocol. It ensures reliable and in-sequence data transmission so that data units sent over the network arrive completely, and in the right sequence, to the application or user at the endpoint.
- For some transmissions, such as a file or record, this sequence preservation is essential.
- SCTP is a standard protocol (Request for Comments 2960) developed by the Transport Area Working Group (TSVWG) of the Internet Engineering Task Force (IETF).
- The group's intention was to develop a system similar to the telephone Signaling System 7 (SS7) switching network to carry call control signals using IP networks.
- What are other benefits of SCTP?
- As a full-duplex connection, SCTP enables data to be sent and received simultaneously. Data is delivered in chunks and in an ordered fashion within an independent stream, while isolating data from different streams.
- So, it eliminates head-of-line blocking, which often happens with TCP. This is a phenomenon that occurs when a line of packets is held up by the first packet, thus limiting the network's performance. SCTP also enables half-closed connections.

Like TCP and unlike UDP, SCTP provides mechanisms for the following:

- **Flow control.** Adjusts data transmission, in particular its quantity.
- **Congestion control.** SCTP checks the network prior to transmission to prevent congesting the links.
- **Fault tolerance.** Uses IP addresses from different internet service providers so, even if one ISP fails, another could be used for connections.

Attribute	TCP	UDP	SCTP
Reliability	Reliable	Unreliable	Reliable
Connection Management	Connection-oriented	Connectionless	Connection-oriented
Transmission	Byte-oriented	Message-oriented	Message-oriented
Flow Control	Yes	No	Yes

Attribute	TCP	UDP	SCTP
Congestion Control	Yes	No	Yes
Fault Tolerance	No	No	Yes
Data Delivery	Strictly Ordered	Unordered	Partially ordered
Security	Yes	Yes	Improved
Table 1. Differences between TCP, UDP, and SCTP			

- **SCTP** is message-oriented, unlike **TCP**, which is byte-oriented. Because of the byte-oriented nature of **TCP**, the application has to add its own record marking to maintain

- additional security features that **TCP** and **UDP** do not. In **SCTP**, resource allocation during association setup is delayed until the client's identity can be verified using message boundaries.

- **SCTP** provides some degree of fault tolerance by using the Multihoming feature. A host is considered multihomed when it has more than one network interface attached, either on the same or different networks.

- An **SCTP** association can be established between two multihomed hosts. In this case, all IP addresses of both endpoints are exchanged at association startup; this allows each endpoint to use any of these addresses over the life of the connection if one of the interfaces is down for any reason, as long as the peer is reachable through the alternate interfaces.

- **SCTP** provides a cookie exchange mechanism, thus reducing the possibility of Denial of Service attacks.

- SCTP association startup and shutdown
  SCTP association startup and shutdown guidelines are described here.

- SCTP socket APIs
  The features of SCTP socket APIs include consistency, accessibility, and compatibility.