DRONACHARYA College of Engineering

Computer Science & Engineering

Data Communication and Computer Networks

(MTCSE-101-A)

RFC4168
The Stream Control Transmission Protocol (SCTP) as a Transport for the Session Initiation Protocol (SIP)

Outline

- Introduction to RFC4168
- Introduction to SCTP
- Potential Benefits
- Transport Parameter
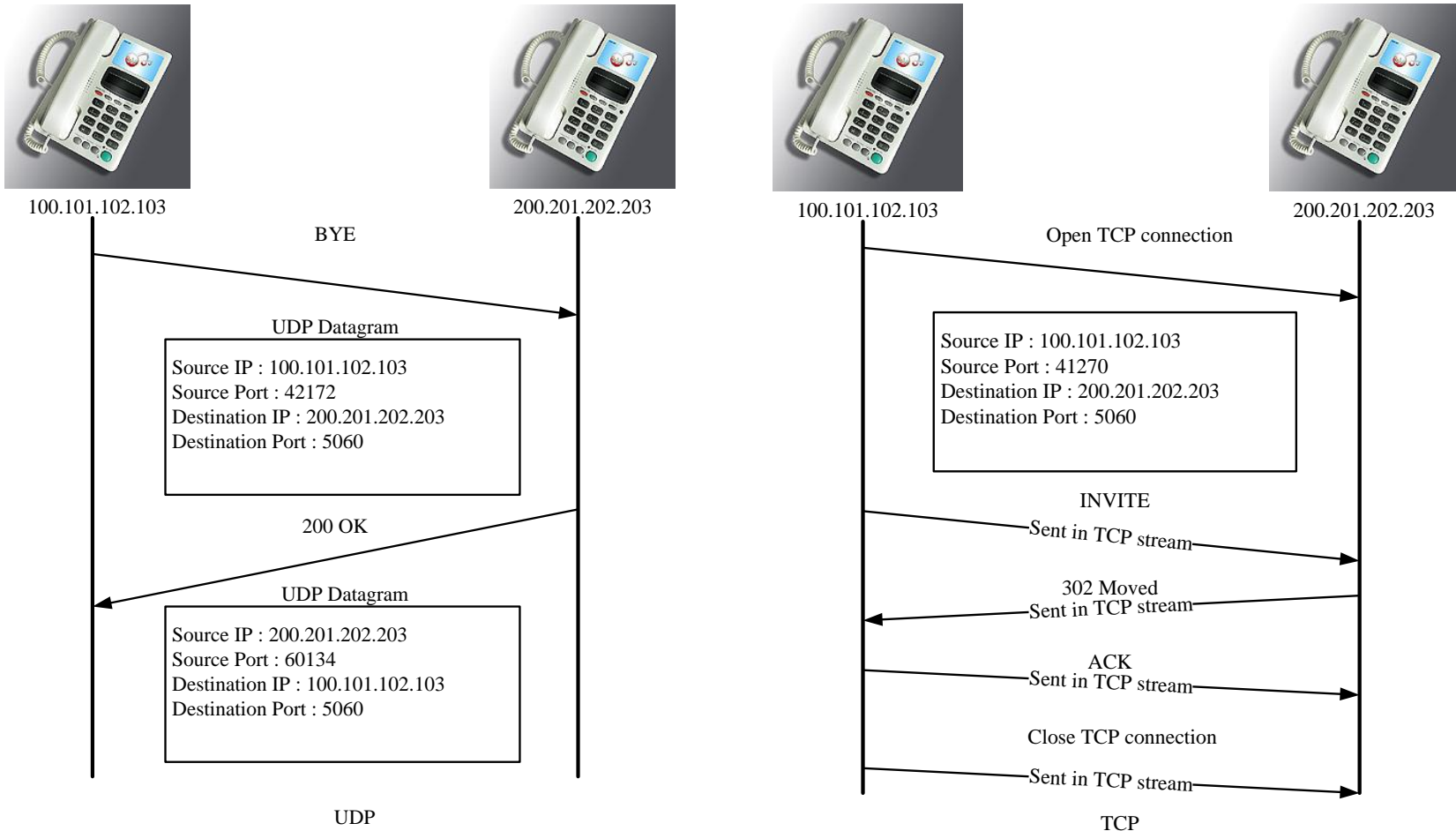- SCTP Usage
- Security Consideration
- Summary

RFC4168

- SCTP is a new protocol that provides several features that may prove beneficial for transport between SIP entities that exchange a large amount of messages
- RFC4168 Specifies a mechanism for usage of SCTP as the transport mechanism for SIP entities.

Overview of features of TCP and UDP

- TCP
  - Connection-oriented
  - Error-free
  - Retransmission
  - In-sequence
  - Flow control
  - Congestion control

- UDP
  - Connection-less
  - Best-effort
  - no flow control and congestion control

Transmission of SIP message using TCP and UDP

100.101.102.103   200.201.202.203

BYE

UDP Datagram

Source IP : 100.101.102.103
Source Port : 42172
Destination IP : 200.201.202.203
Destination Port : 5060

200 OK

UDP Datagram

Source IP : 200.201.202.203
Source Port : 60134
Destination IP : 100.101.102.103
Destination Port : 5060

UDP

100.101.102.103   200.201.202.203

Open TCP connection

Source IP : 100.101.102.103
Source Port : 41270
Destination IP : 200.201.202.203
Destination Port : 5060

INVITE
Sent in TCP stream

302 Moved
Sent in TCP stream

ACK
Sent in TCP stream

Close TCP connection
Sent in TCP stream

TCP

Introduction to SCTP

- SCTP is a new IETF standard transport protocol(RFC2960)
  – Stream Control Transmission Protocol
- It has been designed by the IETF SIGTRAN working group
  – For transport of signaling data over IP-based networks

Features of SCTP

- Connection-oriented
- Ordered/Unordered transmission
- Transport Layer fragmentation
- Message oriented
  - Preserve message boundaries
- Multi-homing support
  - Endpoint with multiple IP addresses
- Multi-streaming support
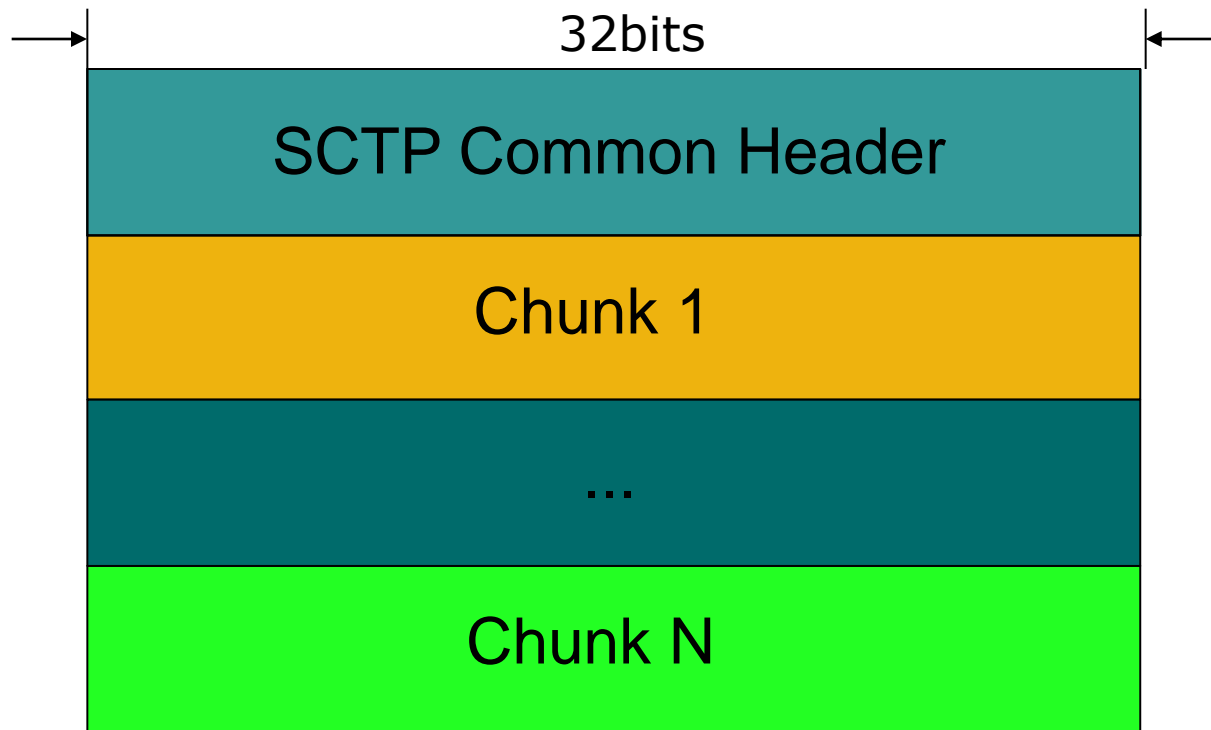- Security feature
  - Against DoS(SYN-flood)
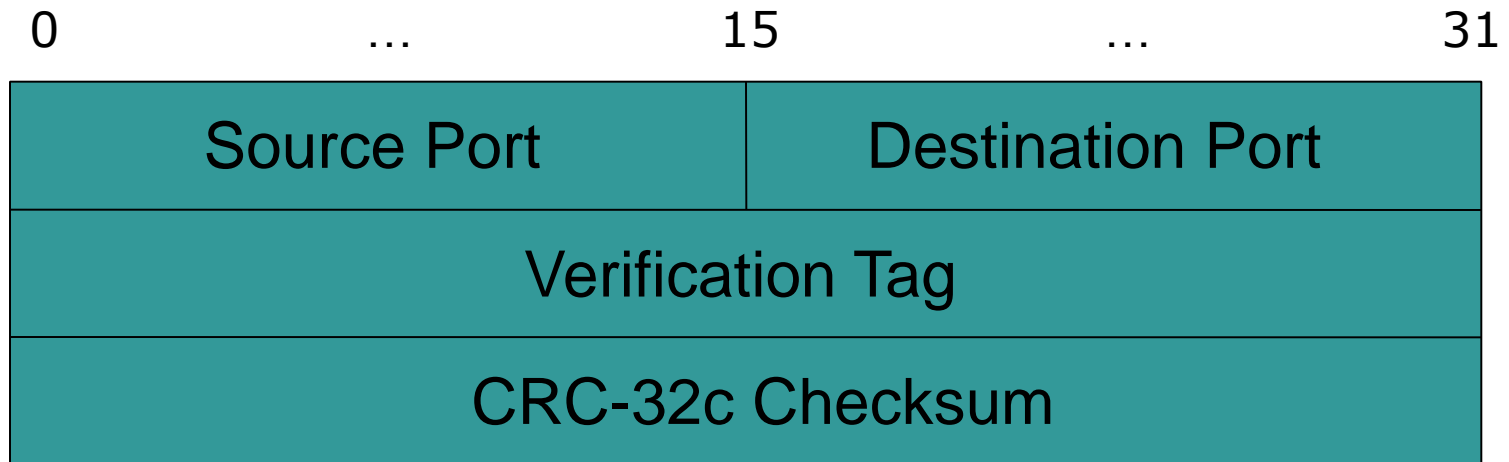
Protocol Stack
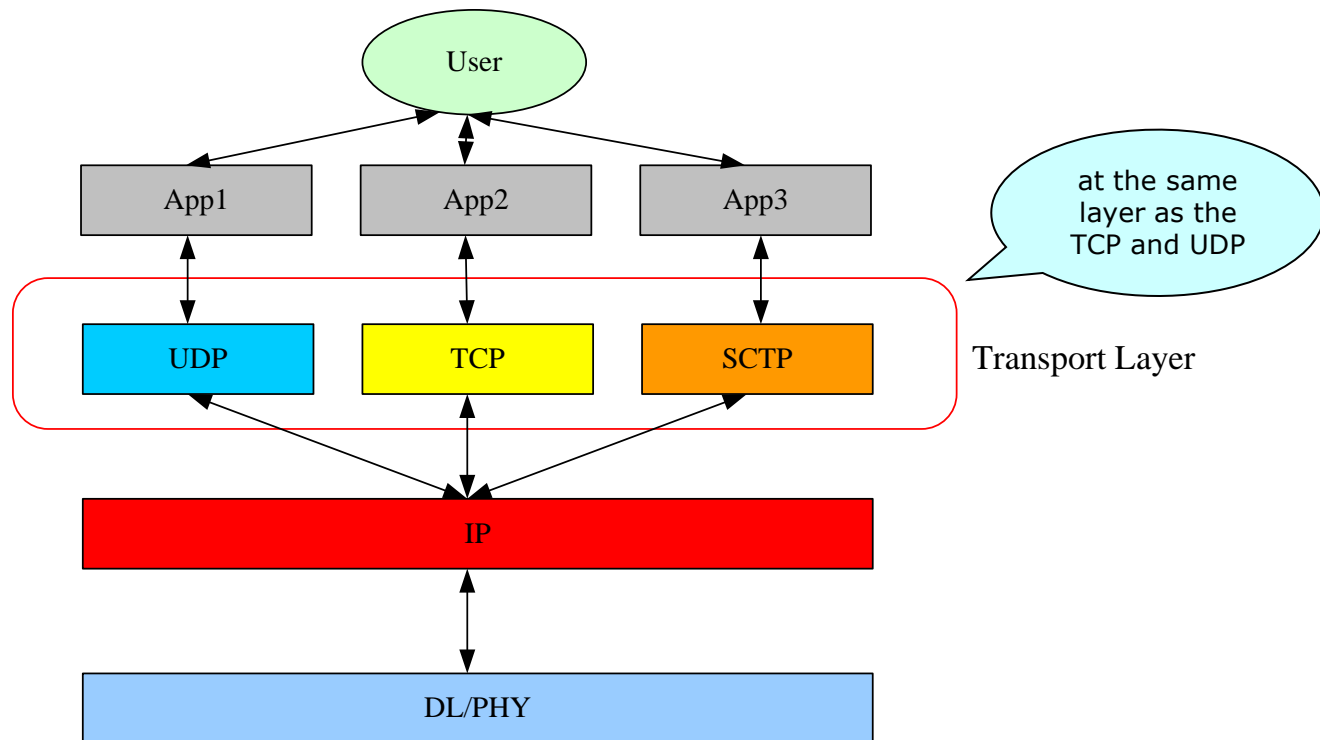
Terminology

- Endpoint
  - Logical sender/receiver
- Association
  - SCTP connection between two endpoints
- Stream
  - Unidirectional logical channel
- Chunk
  - Unit of information within an SCTP packet, consisting of a chunk header and specific content
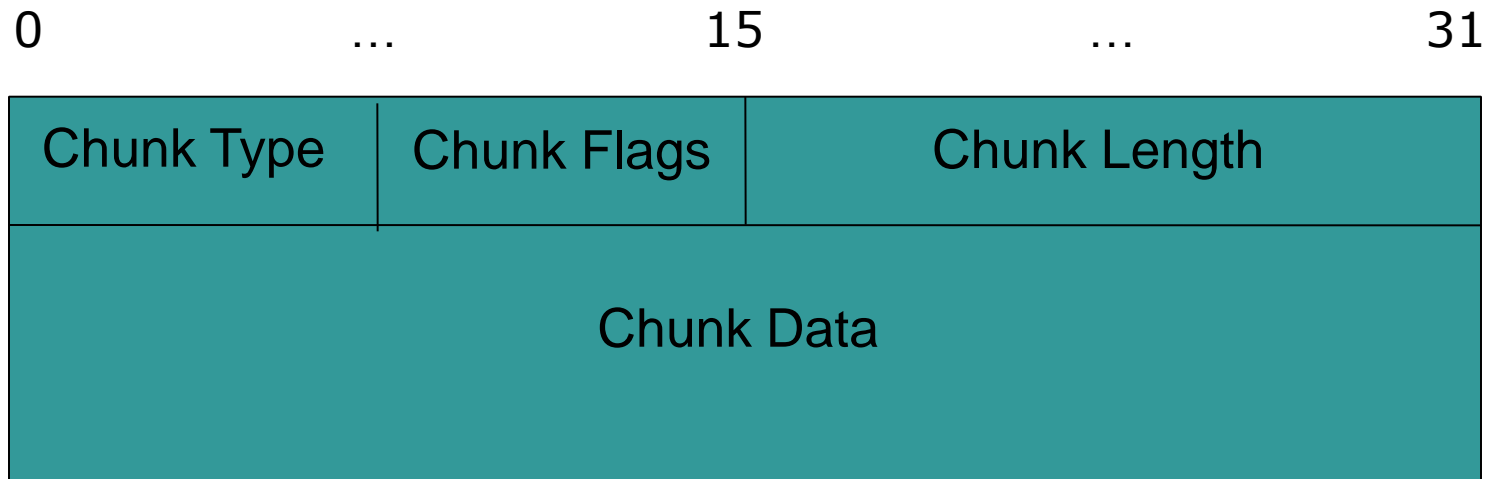
SCTP Packet

Chunk bundling

SCTP Common Header

0 ...	15 ... 31
Source Port	Destination Port
Verification Tag	
CRC-32c Checksum	

SCTP Chunk

0 ...	15 ...	31

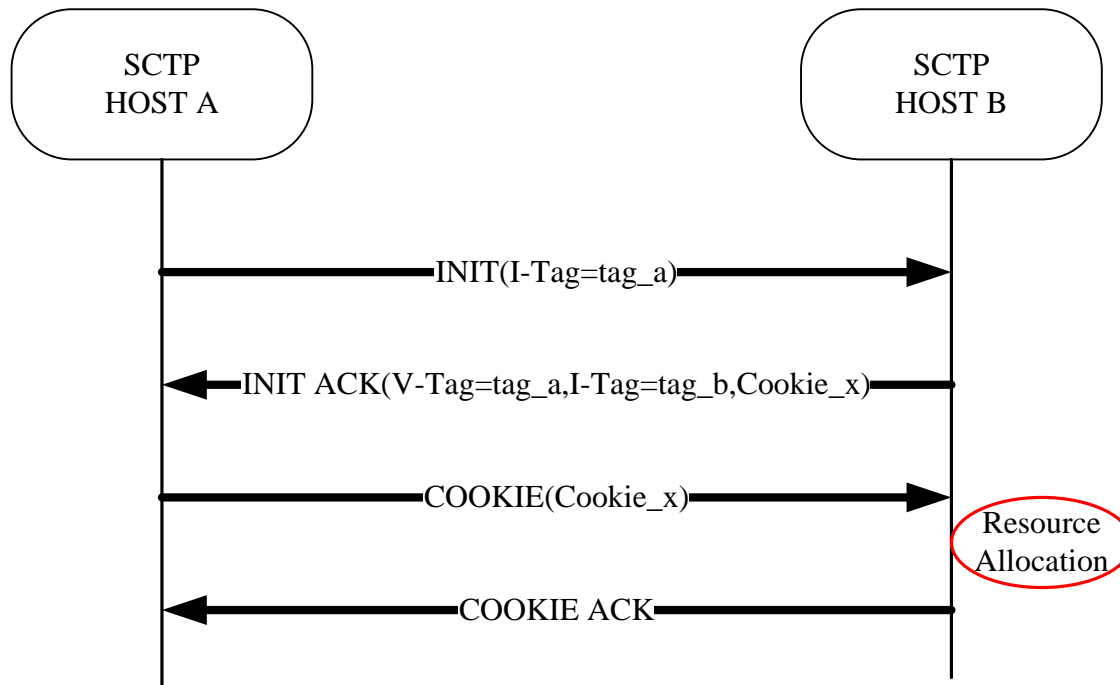| Chunk Type	Chunk Flags	Chunk Length
Chunk Data		

Important chunk types

- Association setup
  - INIT:1
  - INIT ACK:2
  - COOKIE ECHO:10
  - COOKIE ACK:11
- Association Teardown
  - ABORT:6
  - SHUTDOWN:7
  - SHUTDOWN ACK:8

Important chunk types(cont)

- Data transmission
  - DATA:0
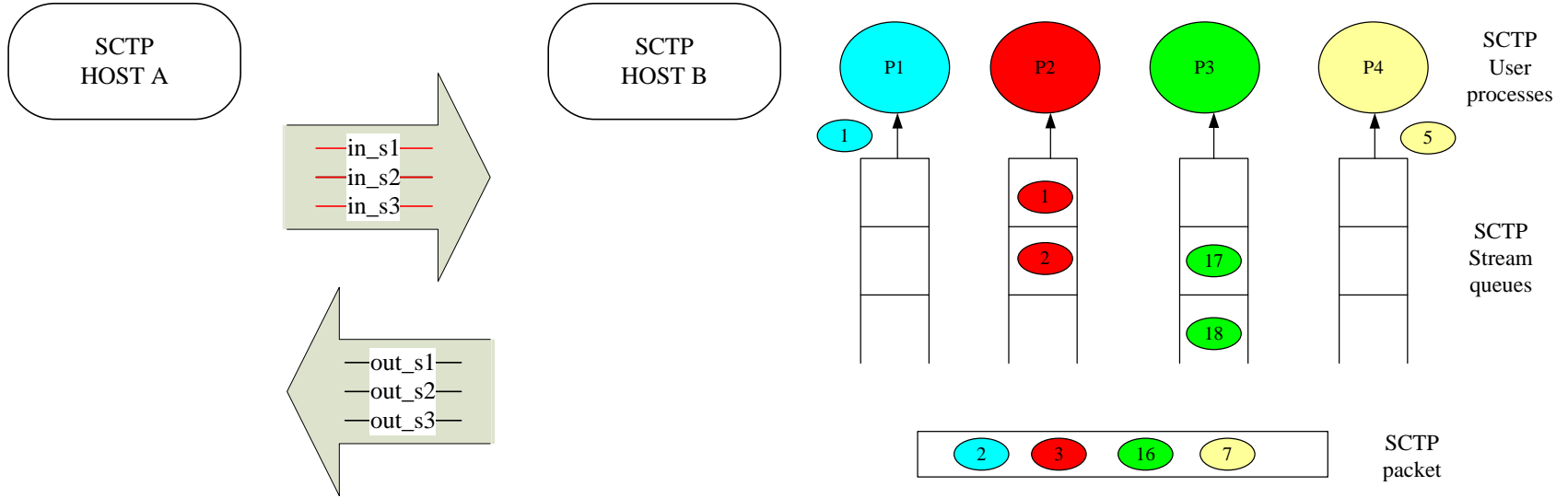 - SACK:3
- Path management
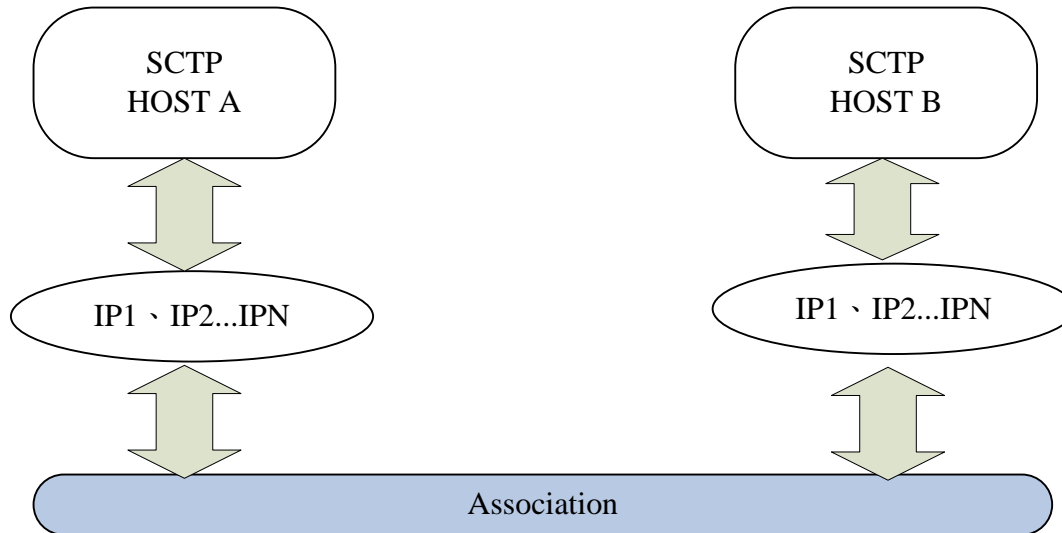 - HEARTBEAT:4
  - HEATBEAT ACK:5

Association Establishment

Four way handshake

Multi-streaming

SCTP
HOST A

SCTP
HOST B

—in_s1—
—in_s2—
—in_s3—

—out_s1—
—out_s2—
—out_s3—

P1 P2 P3 P4

1   1   17 5
    2   18

2 3 16 7

SCTP
User
processes

SCTP
Stream
queues

SCTP
packet

Multi-homing

Potential Benefits

- Advantages over UDP
  - Fast Retransmit
    - Use SACK
  - Congestion control
  - Transport-Layer Fragmentation

Potential Benefits (cont)

- Advantages over TCP
  - Prevent Head of the Line(HOL) problem
  - Easier Parsing
  - Multi-homing

Transport Parameter

- Via header fields carry a transport protocol identifier
  - Via: SIP/2.0/SCTP ws1234.example.com:5060
  - Via: SIP/2.0/TLS-SCTP ws1234.example.com:5060

SCTP Usage

- Rules for sending a request over SCTP are identical to TCP
  - Choose a particular stream
  - Payload Protocol Identifier Must set to zero
- Locating a SIP Server
  - Use DNS query
    - SRV record
- TLS running over SCTP MUST NOT use the SCTP unordered delivery service

Security Considerations

- Denial-of-Service attacks
  - Transport and Network layer
    - TLS
    - IPSec
    - TLS over SCTP

Summary

- SCTP is an alternative to TCP and UDP
- Making use of SCTP to convey SIP messages can increase the efficiency between gateway and proxy and reduce the transmission delay

Reference

- RFC
  - RFC2960 Stream Control Transmission Protocol
  - RFC3261 Session Initiation Protocol
  - RFC3257 Stream Control Transmission Protocol Applicability Statement
- Network resource
  - http://tdrwww.exp-math.uni-essen.de/inhalt/forschung/19ccc2002/html/slide_2.html
  - www.**sctp**.org
  - http://www.sctp.de/sctp.html
  - http://lksctp.sourceforge.net/