The Theme of the Project

Syed M. Huq

Evaluation of Congestion Control in the Stream Control Transmission Protocol (SCTP)

Objectives of the Project

- Theoretical Investigation of Salient Features of SCTP
- Comparison of SCTP and TCP
- Theoretical Investigation of SCTP Congestion Control Mechanism.
- Suitability of Implementation of SCTP in Ad-hoc Networking
- Practical Evaluation of SCTP Congestion Control mechanism in Real World Scenario

Salient Features of SCTP

- Validation and Acknowledgement Mechanisms
- Path Selection and Monitoring
- Flow and Congestion control
- Multi-Homing
- Multi-Streaming

Comparison of SCTP and TCP

- Similarities
  - A Checksum and Transmission Sequence Number
  - Connection-oriented protocol
- Differences
  - SCTP - a 32 bit Checksum, TCP - a 16 bit Checksum
  - SCTP - more than one streams within an Association
  - SCTP -a Stream is a sequence of messages (Chunks), not bytes
  - SCTP - no half open connections
  - SCTP - multi-homed endpoints for redundancy

Theoretical Investigation of SCTP Congestion Control Mechanism

- SCTP Slow-Start and Congestion Avoidance
  - The Slow-Start and Congestion avoidance algorithms - control the amount of data being sent in the network.
  - The following parameters are used to regulate the transmission of SCTP
    - The Receiver Window (rwnd)
      - Measured in bytes
      - Set by the receiver based on its available buffer space
      - Constant for the entire association
    - The Congestion Window (cwnd)
      - Measured in bytes
      - Set by sender based on the network condition
      - Changes with the change of the destination address

Theoretical Investigation of SCTP Congestion Control Mechanism

    - The Slow-Start Threshold (ssthresh)
      - Measured in bytes
      - Used by sender to distinguish slow-start and congestion avoidance phases
      - Changes with the change of the destination address
    - The partial_bytes_sent
      - Variable parameter
      - Used during congestion avoidance phase to facilitate congestion window adjustemnt

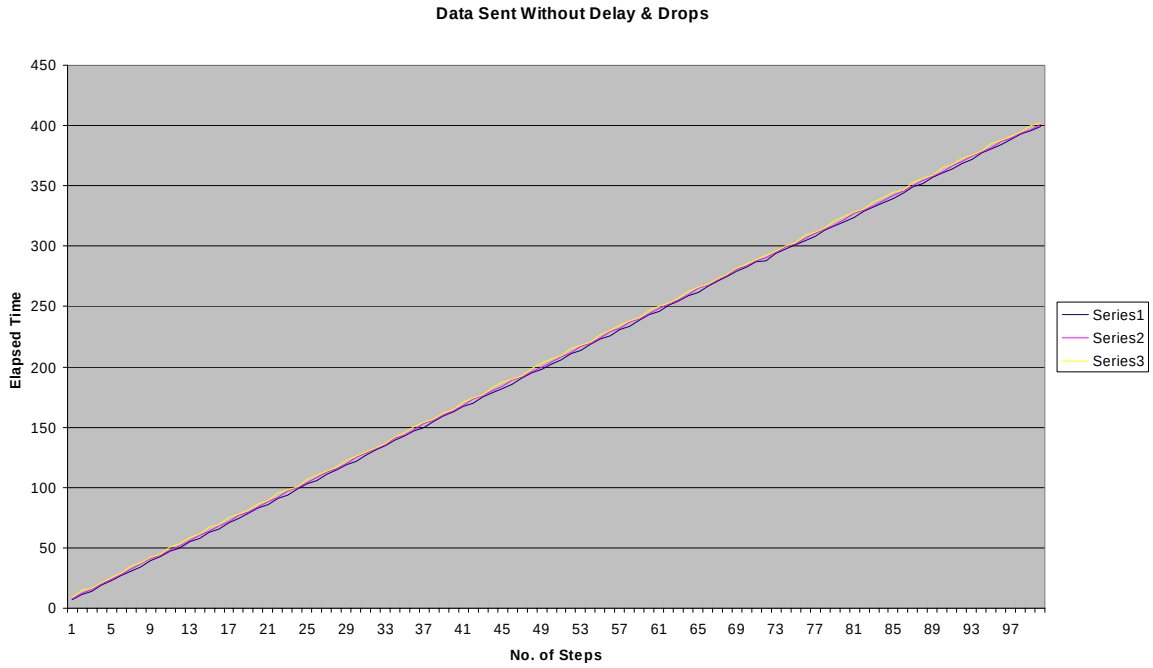
Theoretical Investigation of SCTP Congestion Control Mechanism

- SCTP Retransmission on Gap Reports
  - When no data loss – delayed acknowledgment
  - When there is data loss – selective acknowledgement for every data packet – until no more data loss
  - When 4 consecutive selective acknowledgement indicates the data loss - sender end point starts fast retransmission

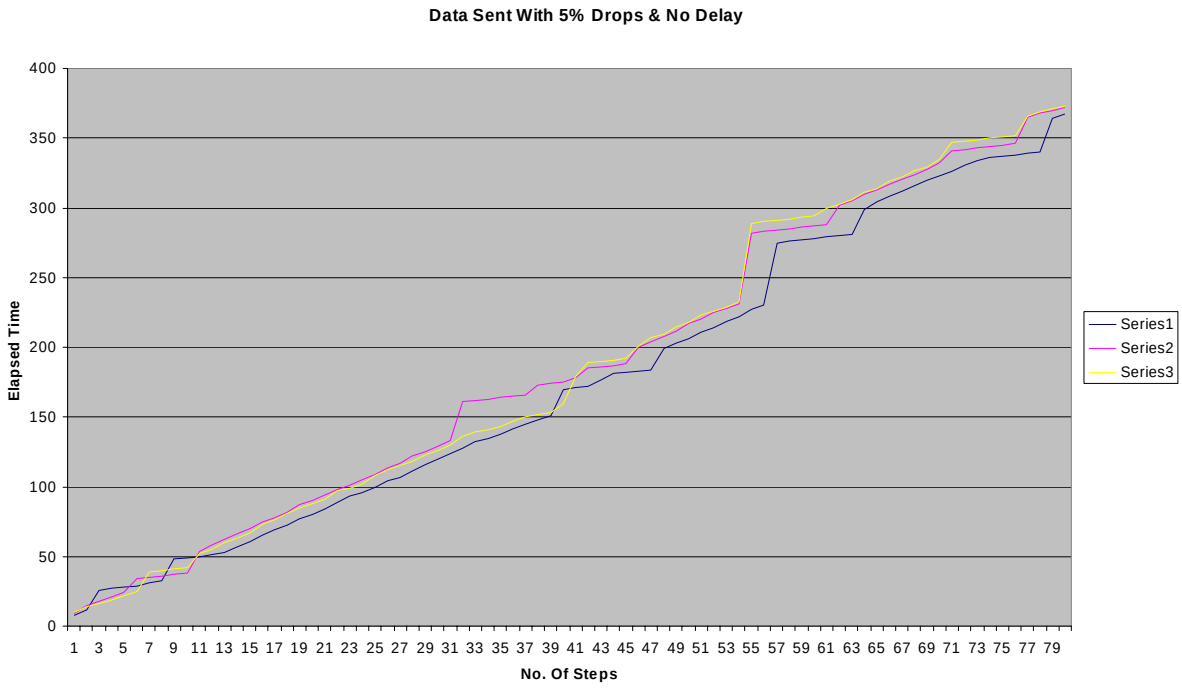
Practical Evaluation of SCTP

- The tools used in the Experiments
  - sctplib-1.0.0-pre19
  - Nistnet
- The Experiment
  - 3 streams are made
  - In each stream 100 data chunks are sent
  - Each data chunk is of size 450 bytes
  - In the receiver end various delays and data drops are introduced

Graph of the Practical Evaluation



Graph of the Practical Evaluation



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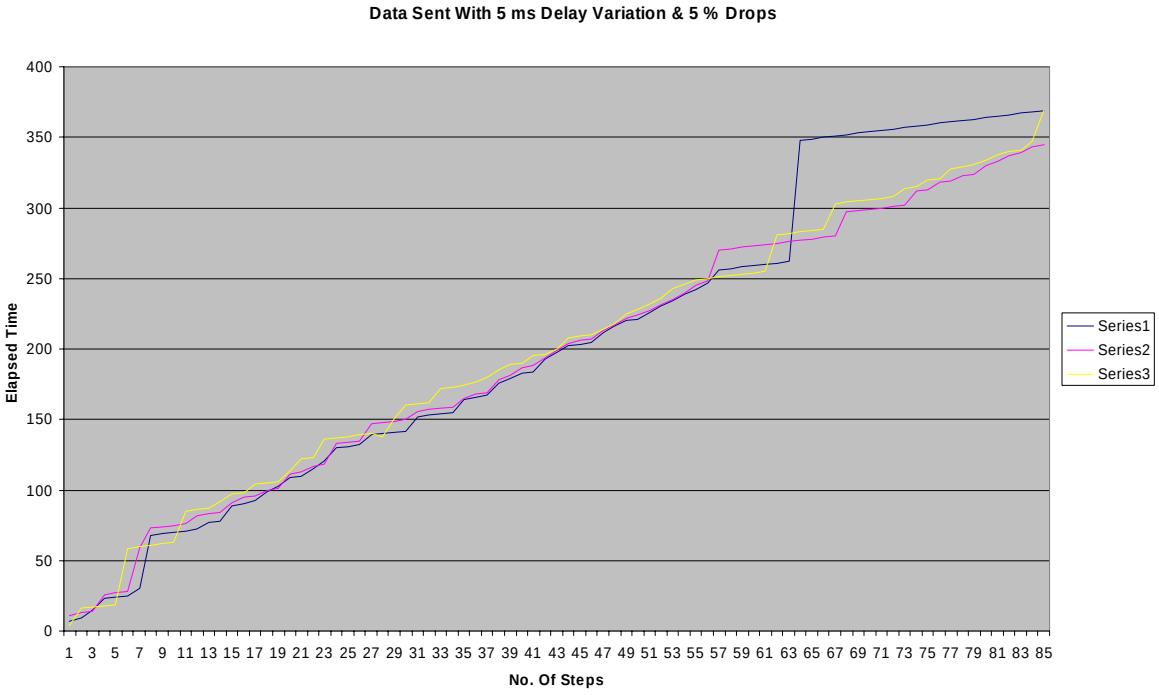

Conclusions of the Practical Evaluation

- Conclusion
  - Slow start at the beginning
  - When no delay and data drops – No fall of data chunks sent – Almost a straight Line
  - When delays and / or data drops introduced – periodic increase and decrease of data sent
  - Increase of delays and / or data drops -> Increase in periodicity of variation of data sent
  - SCTP is suitable for Ad-hoc networking
    - Showing slight variation in rate of data sent for long time & for high delays + data drops