SCTP Send buffer Advertising

CS4099 Project
Final Evaluation

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Outline

Introduction

- Stream Control Transmission Protocol (SCTP):
  - Supports multiple logical channels called streams
  - Multi-homing
- Send buffer Advertising:
  - specialized chunks will carry the amount of backlogged data present in the sender's buffer.

Problem Statement

- To propose a scheme to
  - advertise send buffer occupancy information in SCTP
  - implement it in the Linux kernel and
  - study the performance implications of the same.

Previous Design

- New chunk type with Chunk Type value between 128 to 190.
- Highest order 2 bits determine action to be taken if Chunk Type is unknown.
- This ensures that unmodified hosts won't send a Unrecognized Chunk Type Error chunk upon reception.

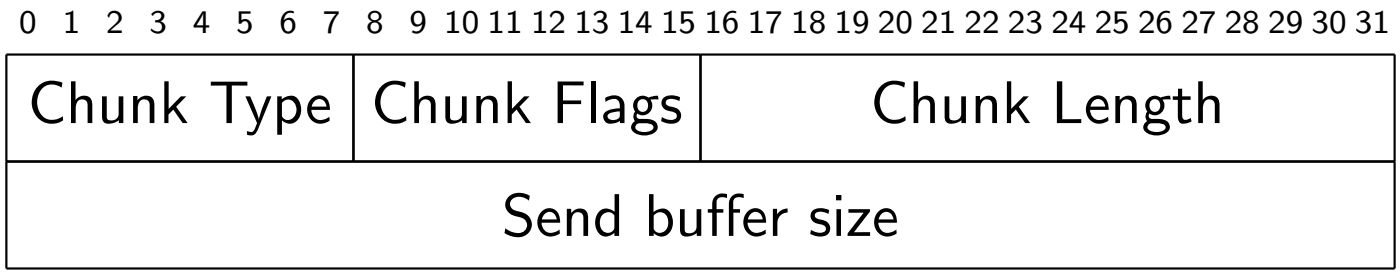

Figure: Proposed Chunk for send buffer advertisement

Current Design

- Every SCTP packet having a DATA chunk contains the send buffer occupancy percentage chunk as the first chunk.
- Traffic controller classification required each packet to have the send buffer occupancy information.

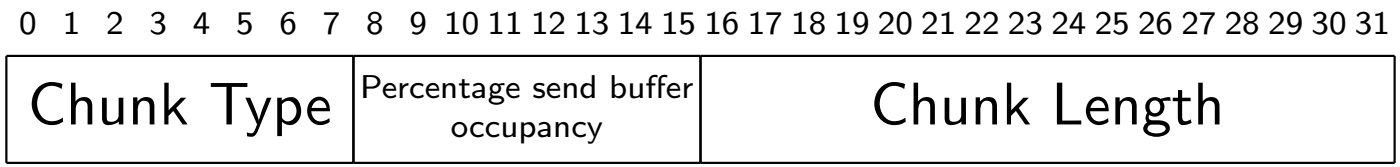

Figure: Proposed Chunk for send buffer advertisement

Test bed Design

A dumbbell shaped network topology was created with two routers in the center, and multiple hosts connected to one end of each router via a switch. This ensures that we have a bottleneck link in all flows between end hosts on either side.

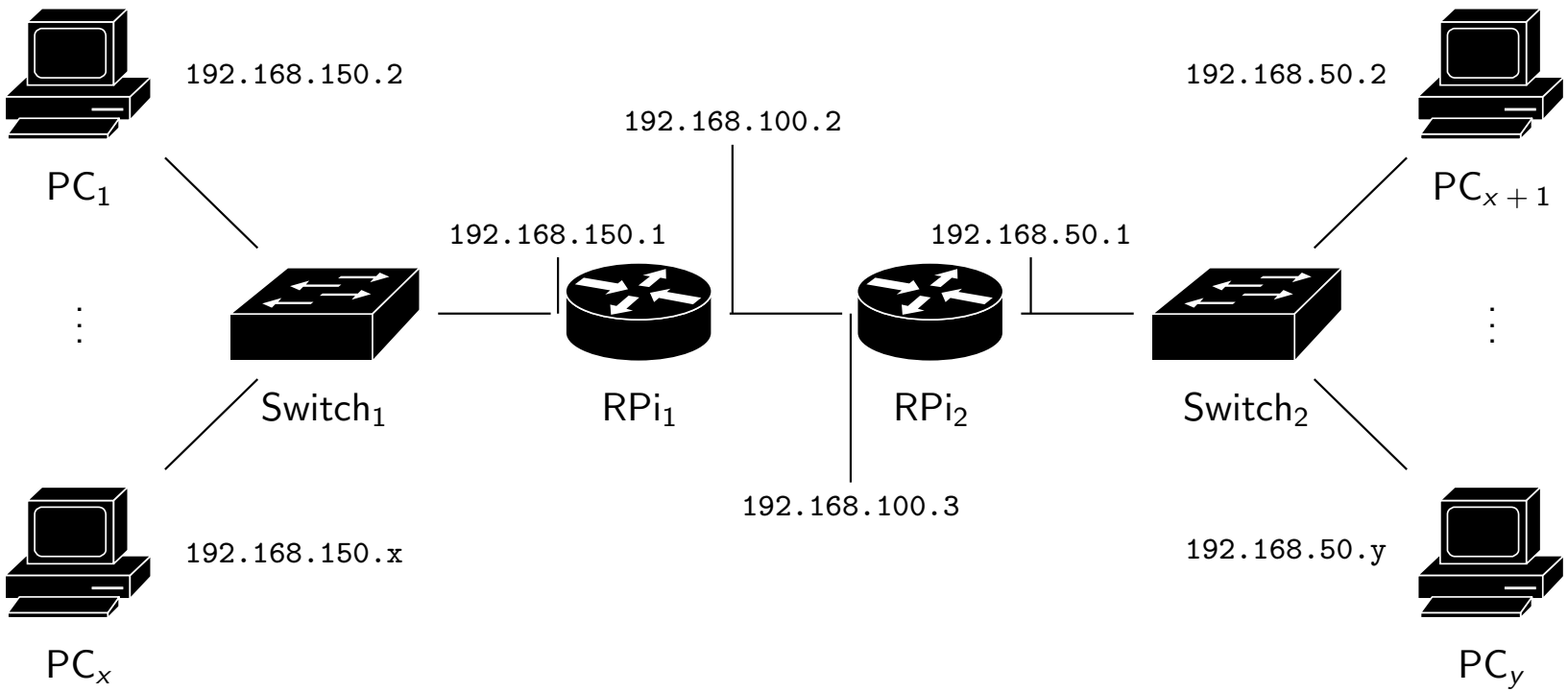

Figure: Test bed implementation

Work Done

- Modified kernel module `sctp_probe` to measure send buffer.
- Explored Linux kernel SCTP implementation.
- Identified parameter to be advertised.
- A patch implementing the SCTP send buffer advertisement was created for Linux kernel `v4.6-rc4`.
- The send buffer advertisement chunk type value was set to 150.
- A kernel timer was added corresponding to each SCTP association (within the `struct sctp_association`).
- A state table was created for this chunk, specifying the states in which the send buffer advertisement chunk should be generated and sent.

Tests conducted

- Queueing discipline - Classless & Classful.
- Classless - TBF, SFQ, etc.
- Classful - HTB, CBQ, etc.

AIM - create a classification hierarchy which works better than the existing qdiscs.

Results I

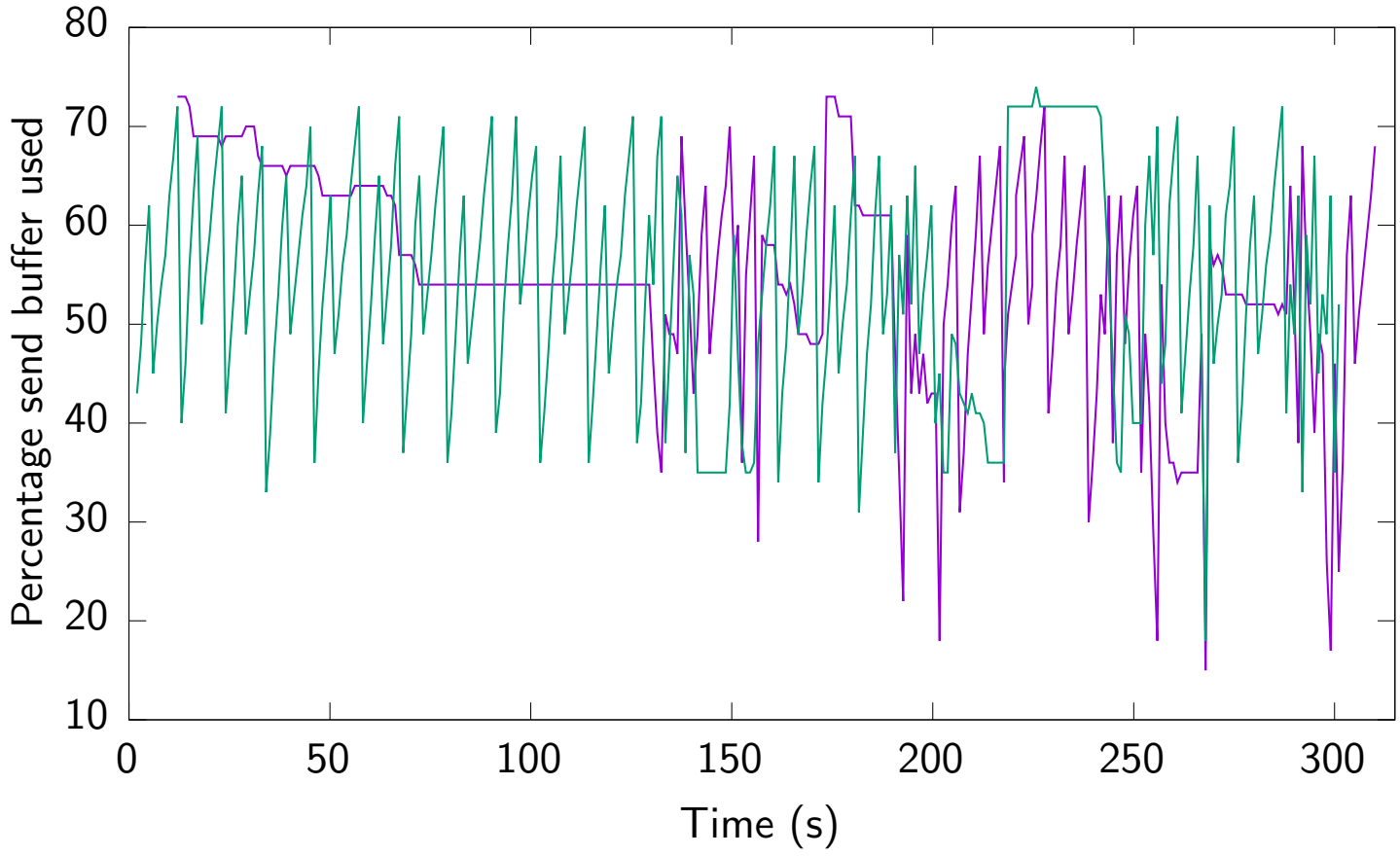

Figure: Percentage send buffer variation with 2 flows each having duration of 300 seconds using the Token Bucket Filter qdisc with rate limited to 1mbit/sec

Results II

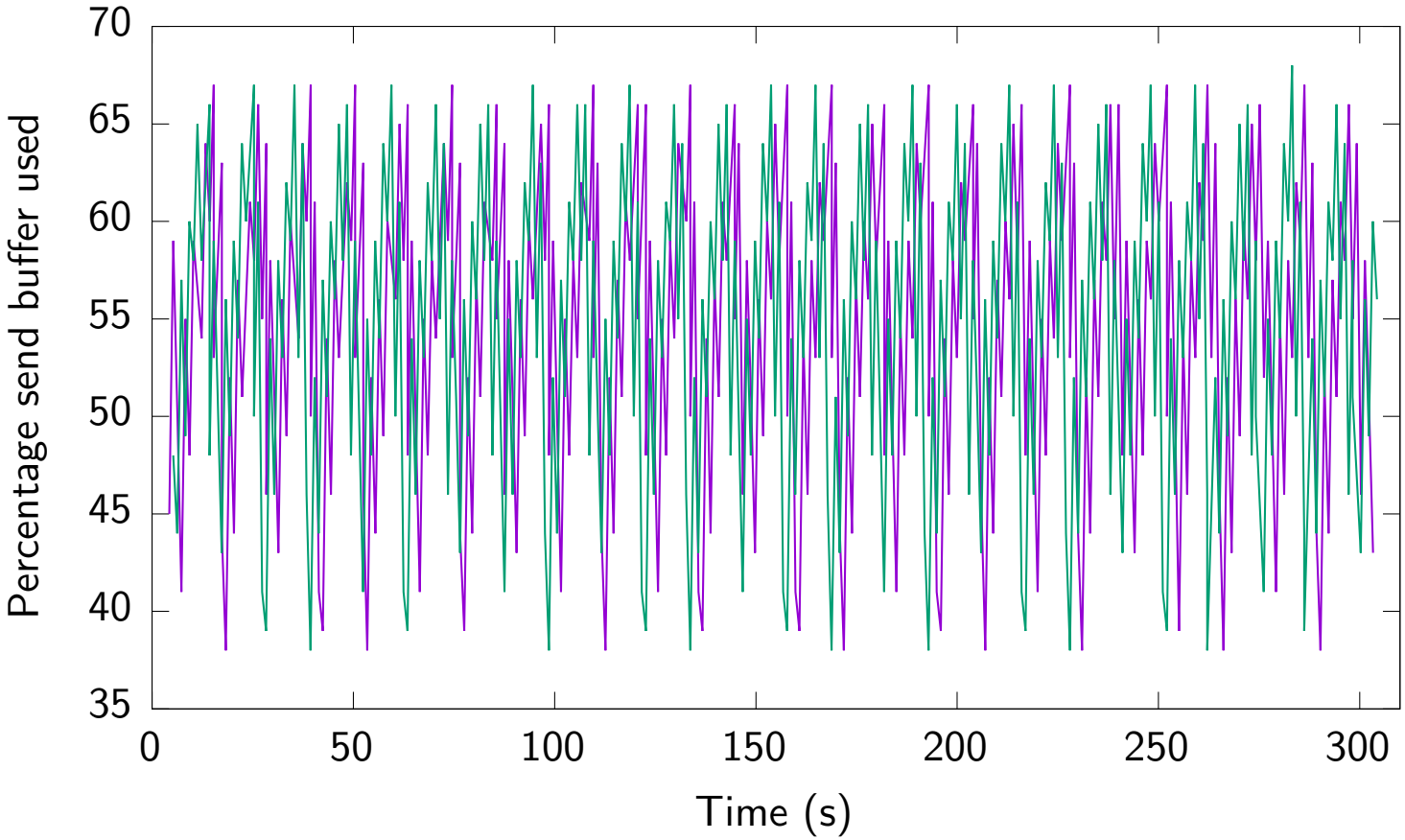

Figure: Percentage send buffer variation with 2 flows each having duration of 300 seconds using Stochastic Fair Queuing qdisc with rate limited to 1mbit/sec

Work to be completed

- There are several scheduling algorithms which prioritizes packets based on some criteria. One of these priority based scheduling algorithms can be modified to consider the send buffer information and to improve QoS for high volume flows.

References I

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