TCP Congestion Control Report

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1 TCP Vegas

TCP Vegas is a congestion control algorithm that uses round-trip time (RTT) measurements to detect and avoid congestion early. This approach is designed to optimize throughput and minimize packet loss by monitoring the network state and adjusting the sending rate accordingly.

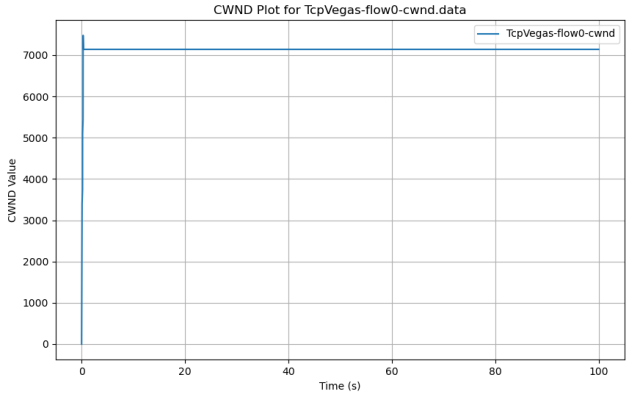

Figure 1: Congestion Window (CWND) for TCP Vegas

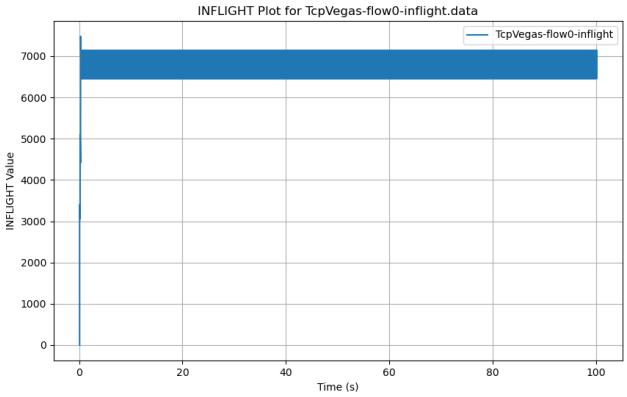

Figure 2: Inflight Packtes for TCP Vegas(Flow 0)

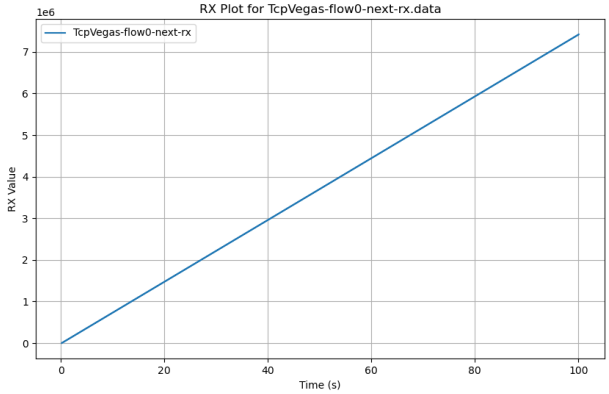

Figure 3: Next RX for TCP Vegas(Flow 0)

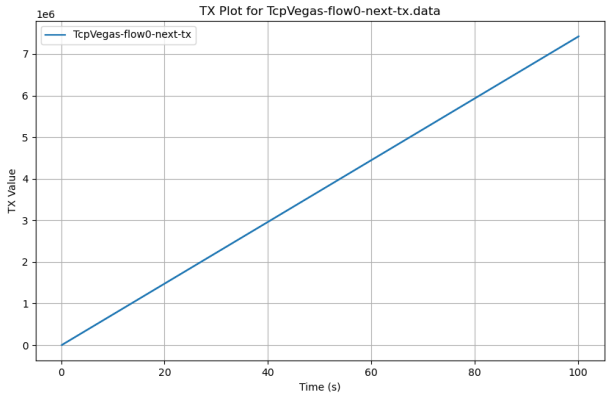

Figure 4: Next TX for TCP Vegas(Flow 0)

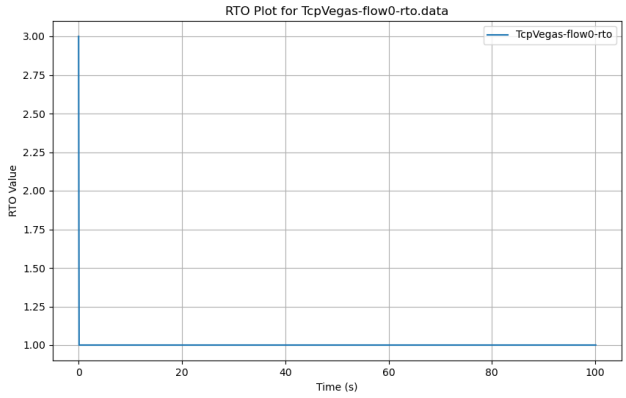

Figure 5: Retransmission Timeout (RTO) for TCP Vegas(Flow 0)

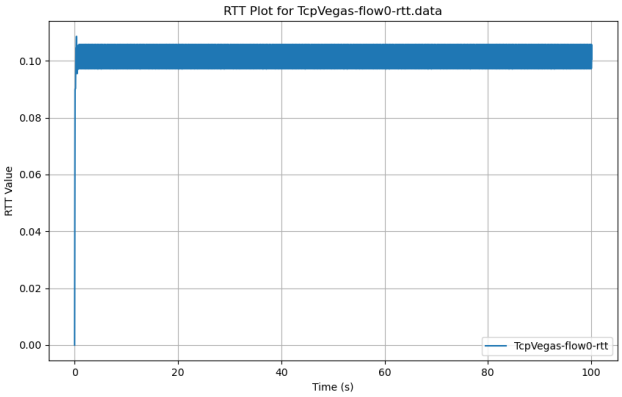

Figure 6: Round Trip Time (RTT) for TCP Vegas(Flow 0)

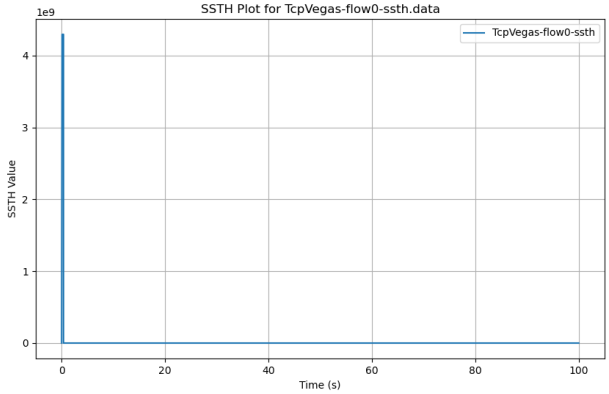

Figure 7: Slow Start Threshold (SSTH) for TCP Vegas(Flow 0)

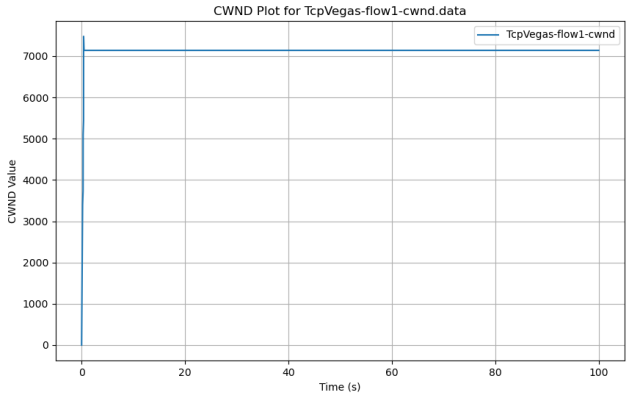

Figure 8: Congestion Window (CWND) for TCP Vegas (Flow 1)

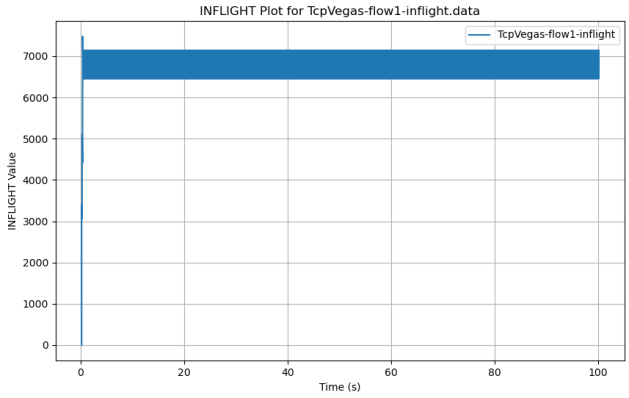

Figure 9: Inflight Packets for TCP Vegas (Flow 1)

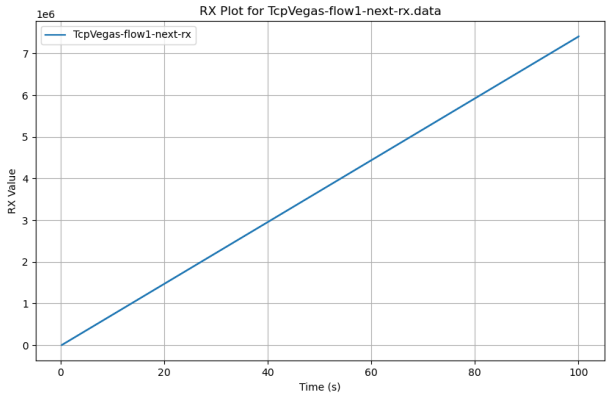

Figure 10: Next RX for TCP Vegas (Flow 1)

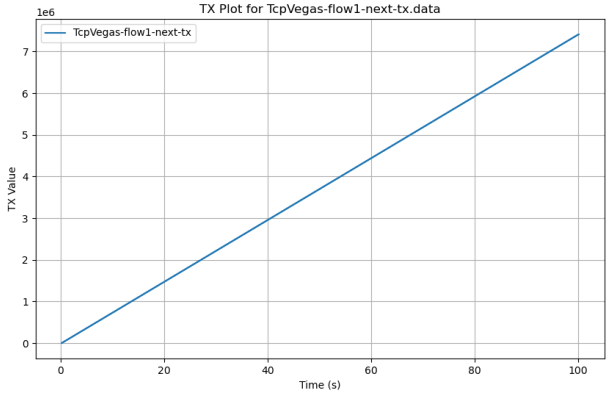

Figure 11: Next TX for TCP Vegas (Flow 1)

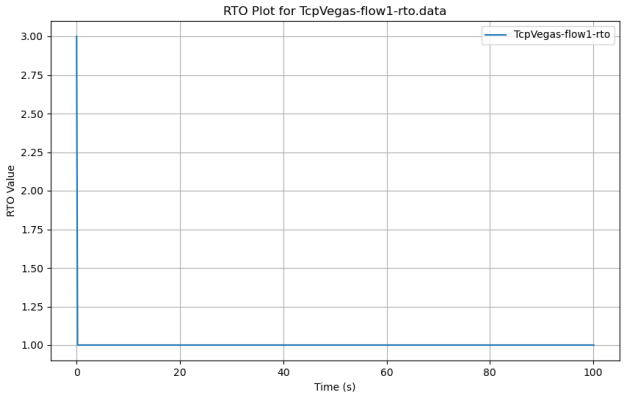

Figure 12: Retransmission Timeout (RTO) for TCP Vegas (Flow 1)

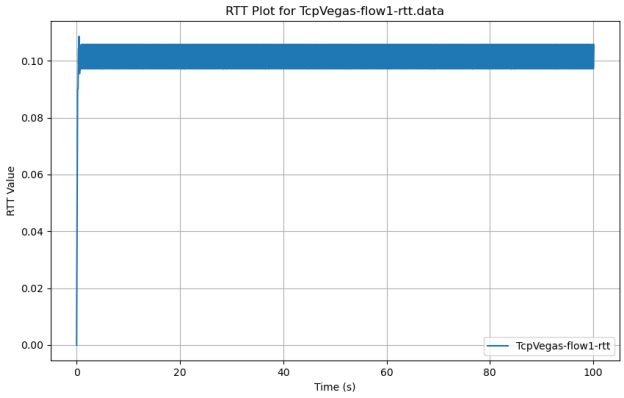

Figure 13: Round Trip Time (RTT) for TCP Vegas (Flow 1)

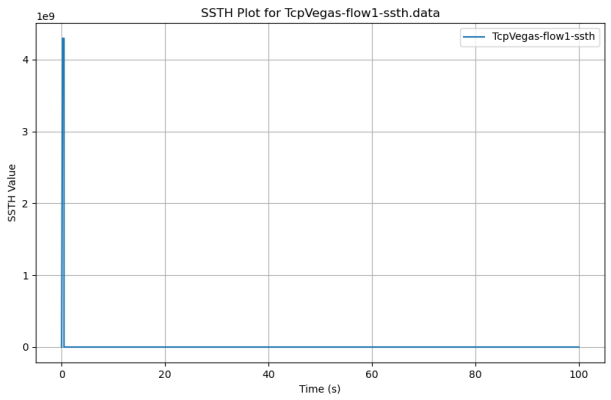

Figure 14: Slow Start Threshold (SSTH) for TCP Vegas (Flow 1)

2 TCP Vegas Tweaked

TCP Vegas Tweaked builds on the principles of TCP Vegas by fine-tuning parameters to further improve congestion detection and adaptability. This modified version aims to achieve higher throughput and better network utilization.

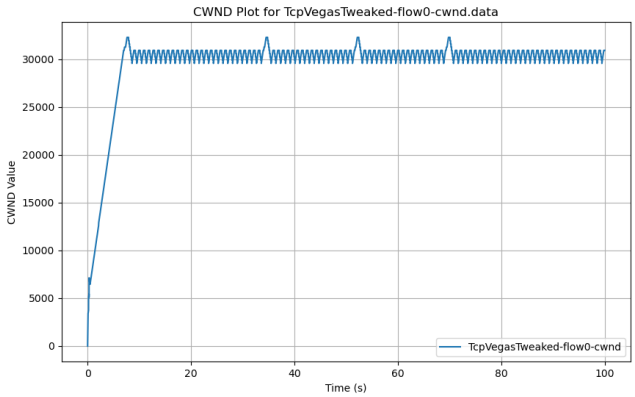

Figure 15: Congestion Window (CWND) for TCP Vegas Tweaked (Flow 0)

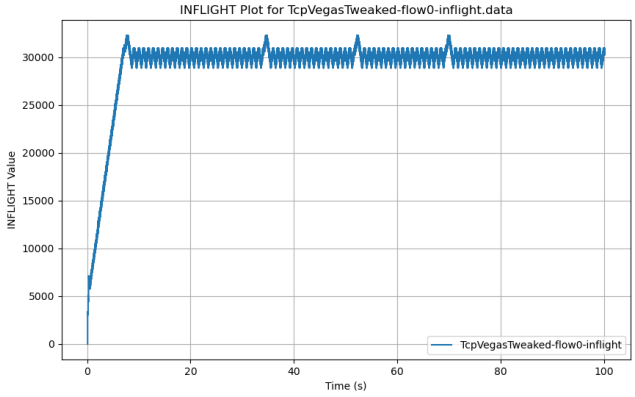

Figure 16: Inflight Packets for TCP Vegas Tweaked (Flow 0)

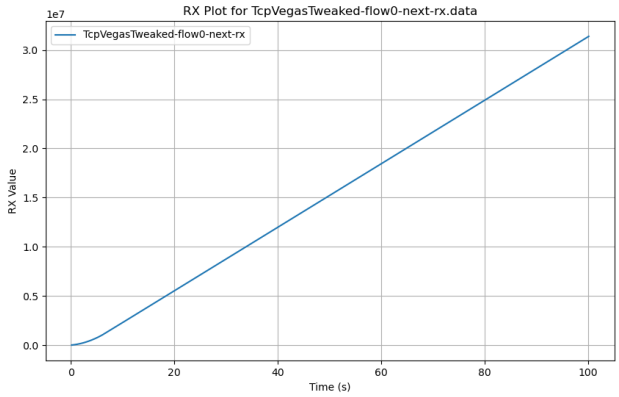

Figure 17: Next RX for TCP Vegas Tweaked (Flow 0)

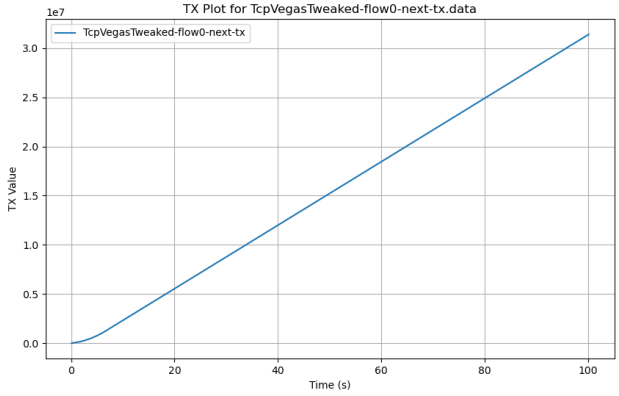

Figure 18: Next TX for TCP Vegas Tweaked (Flow 0)

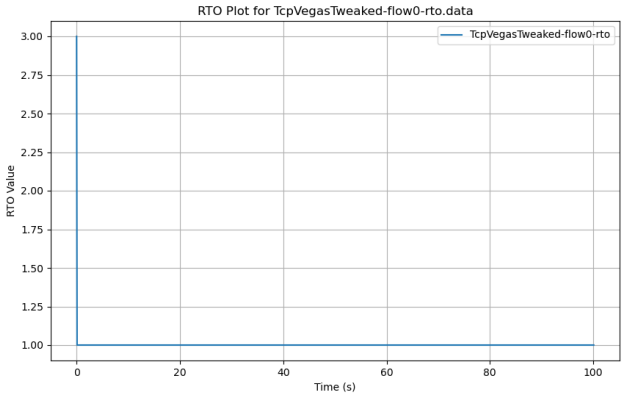

Figure 19: Retransmission Timeout (RTO) for TCP Vegas Tweaked (Flow 0)

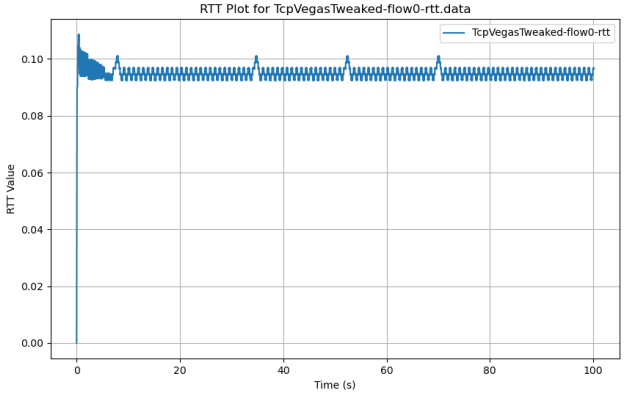

Figure 20: Round Trip Time (RTT) for TCP Vegas Tweaked (Flow 0)

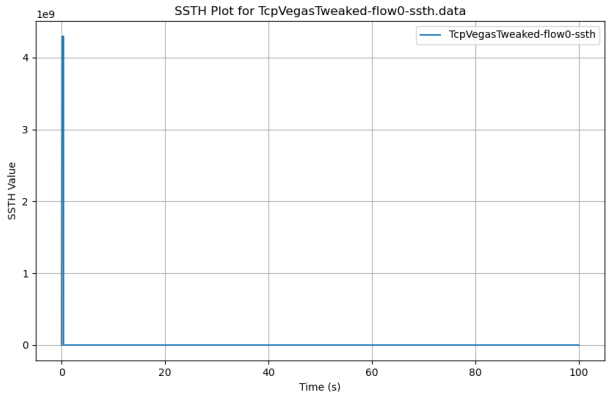

Figure 21: Slow Start Threshold (SSTH) for TCP Vegas Tweaked (Flow 0)

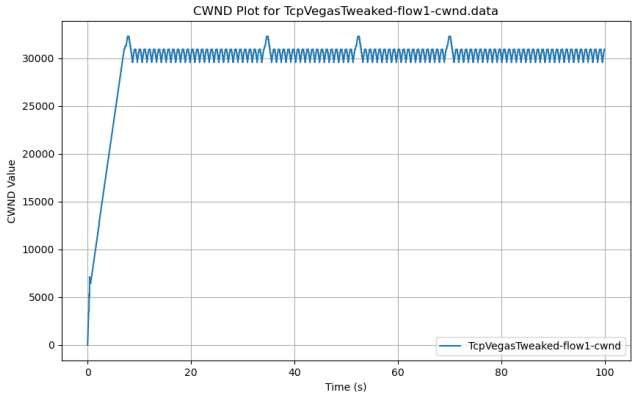

Figure 22: Congestion Window (CWND) for TCP Vegas Tweaked (Flow 1)

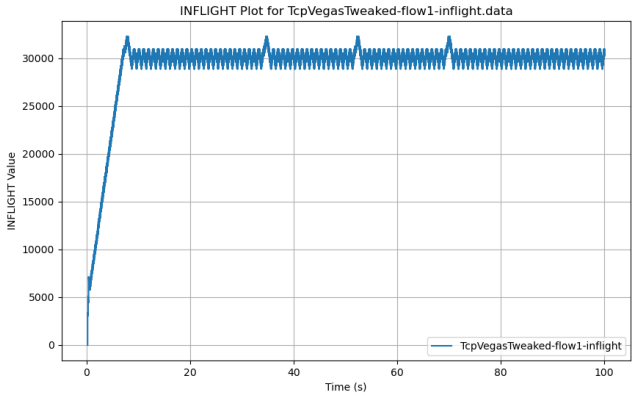

Figure 23: Inflight Packets for TCP Vegas Tweaked (Flow 1)

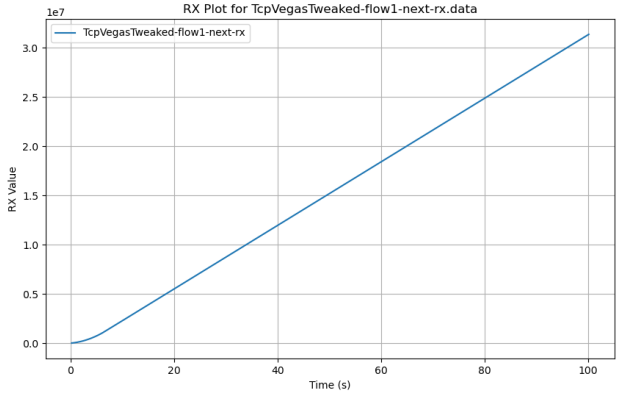

Figure 24: Next RX for TCP Vegas Tweaked (Flow 1)

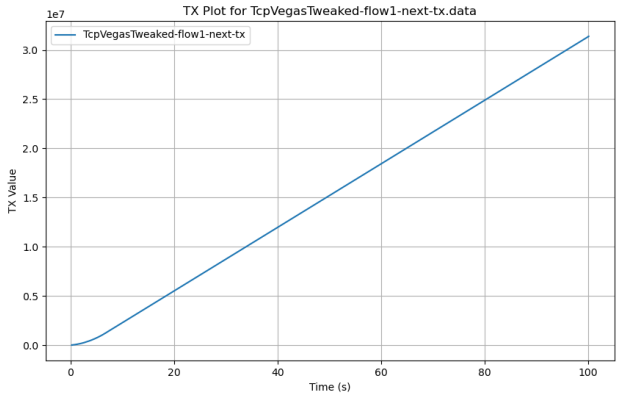

Figure 25: Next TX for TCP Vegas Tweaked (Flow 1)

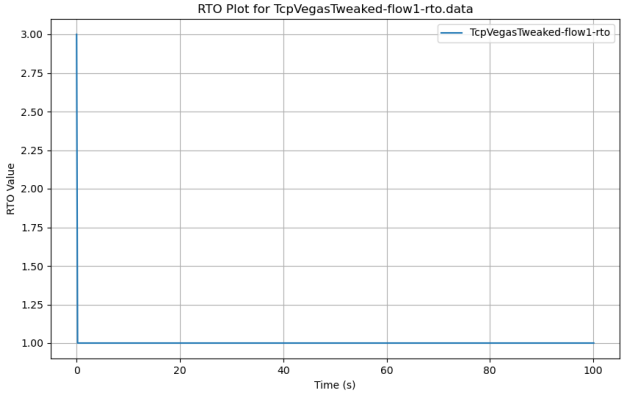

Figure 26: Retransmission Timeout (RTO) for TCP Vegas Tweaked (Flow 1)

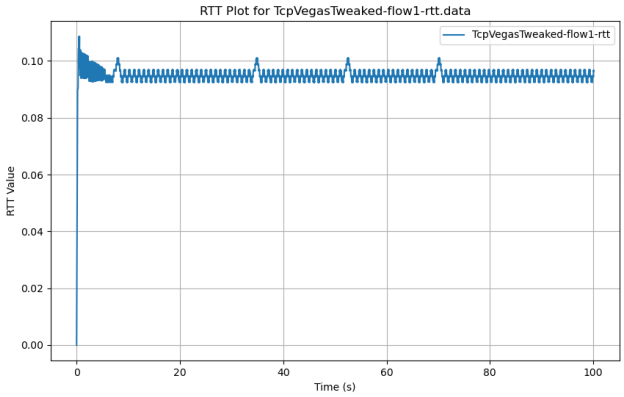

Figure 27: Round Trip Time (RTT) for TCP Vegas Tweaked (Flow 1)

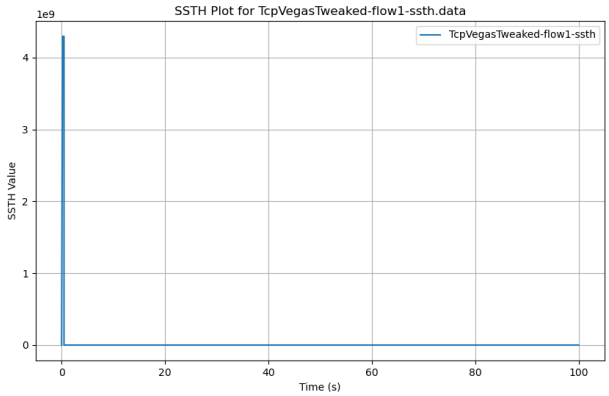

Figure 28: Slow Start Threshold (SSTH) for TCP Vegas Tweaked (Flow 1)

3 TCP BBR

TCP BBR (Bottleneck Bandwidth and Round-trip propagation time) is a modern congestion control algorithm designed to maximize throughput by estimating the bottleneck bandwidth and round-trip time. Unlike traditional loss-based approaches, BBR avoids overloading the network and ensures minimal delay.

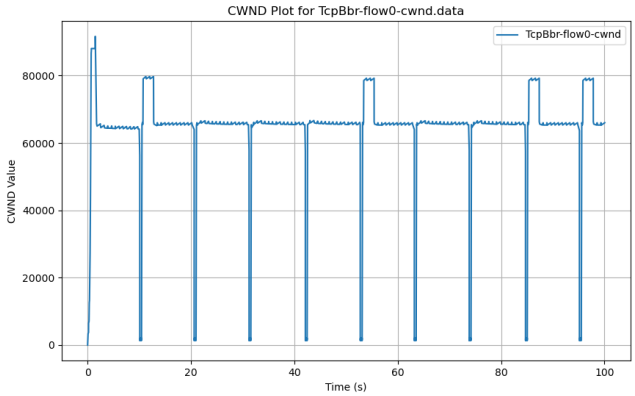

Figure 29: Congestion Window (CWND) for TCP BBR (Flow 0)

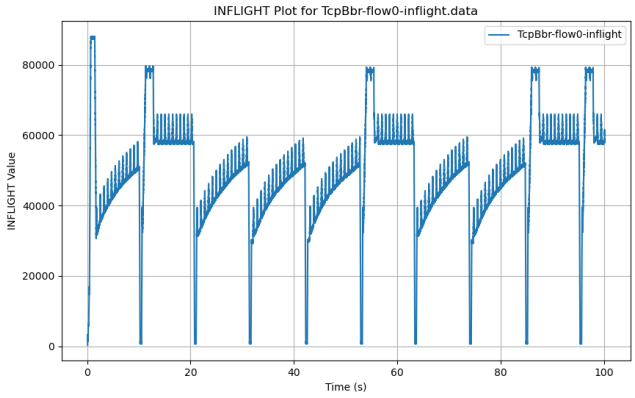

Figure 30: Inflight Packets for TCP BBR (Flow 0)

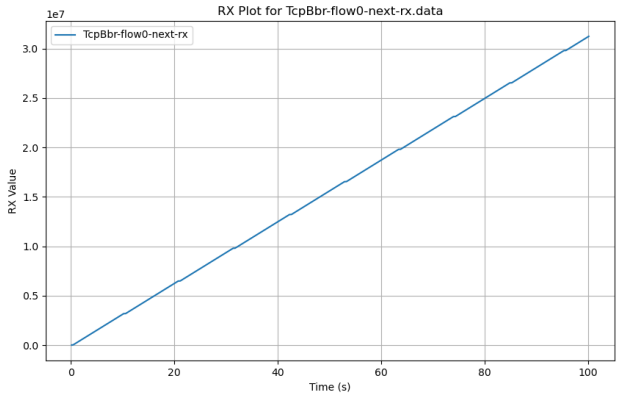

Figure 31: Next RX for TCP BBR (Flow 0)

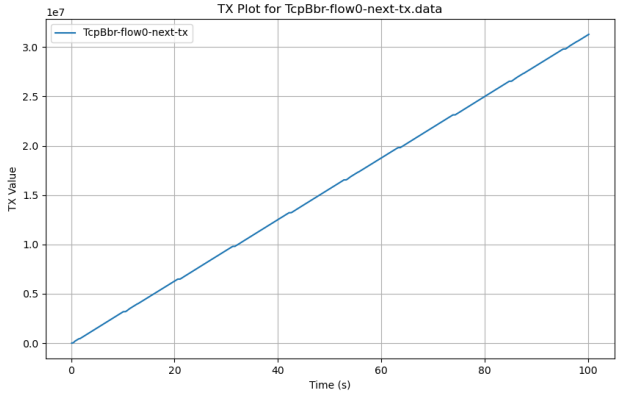

Figure 32: Next TX for TCP BBR (Flow 0)

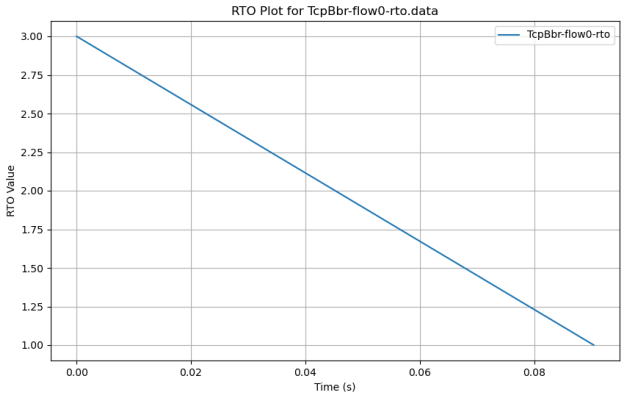

Figure 33: Retransmission Timeout (RTO) for TCP BBR (Flow 0)

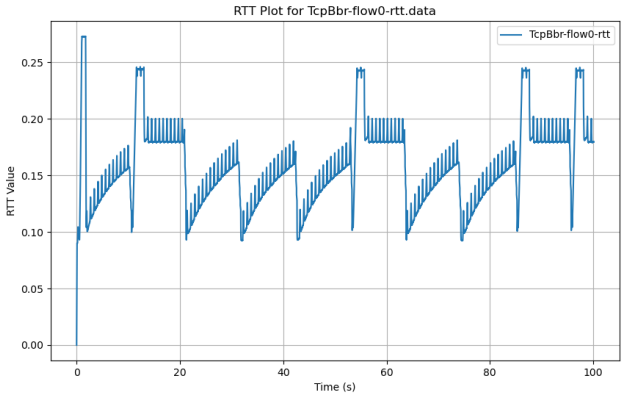

Figure 34: Round Trip Time (RTT) for TCP BBR (Flow 0)

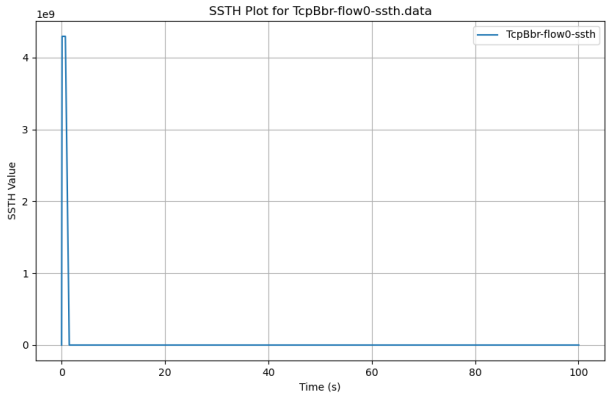

Figure 35: Slow Start Threshold (SSTH) for TCP BBR (Flow 0)

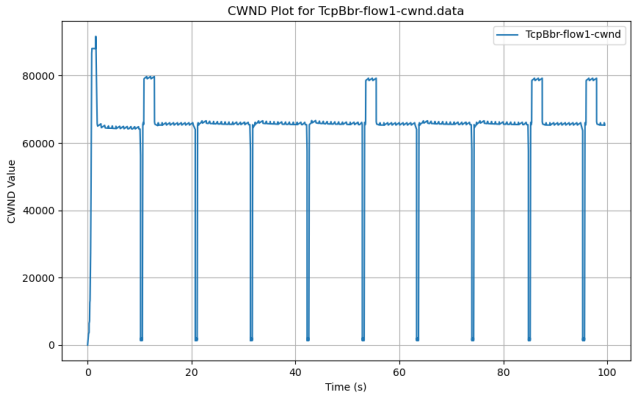

Figure 36: Congestion Window (CWND) for TCP BBR (Flow 1)

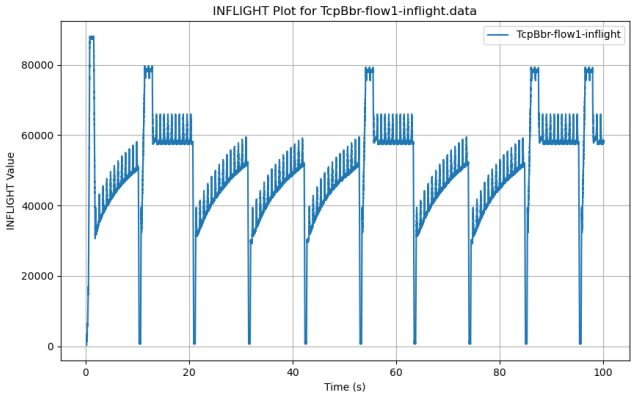

Figure 37: Inflight Packets for TCP BBR (Flow 1)

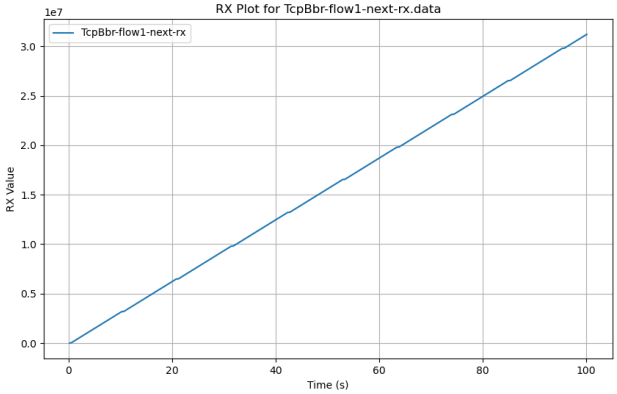

Figure 38: Next RX for TCP BBR (Flow 1)

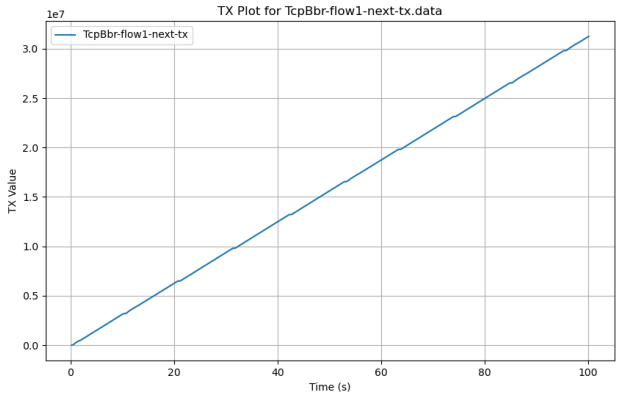

Figure 39: Next TX for TCP BBR (Flow 1)

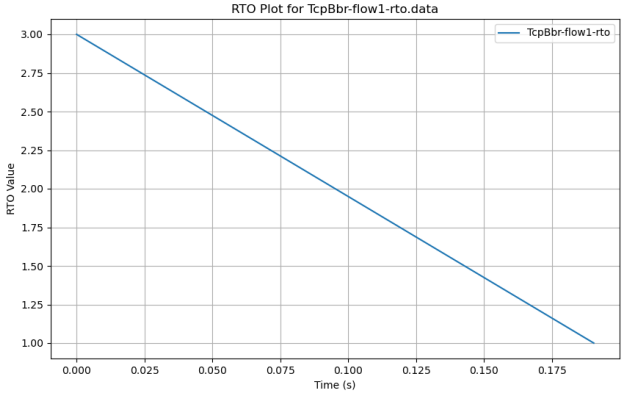

Figure 40: Retransmission Timeout (RTO) for TCP BBR (Flow 1)

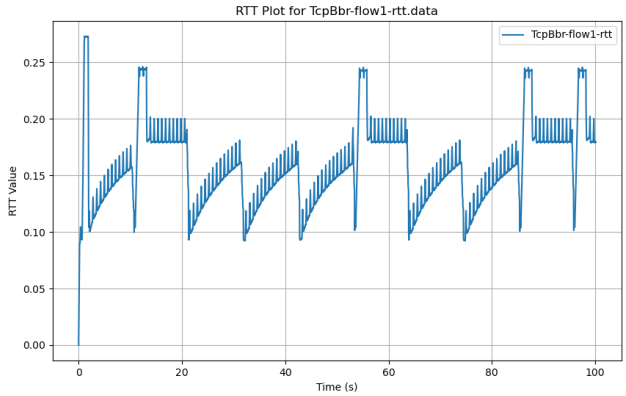

Figure 41: Round Trip Time (RTT) for TCP BBR (Flow 1)

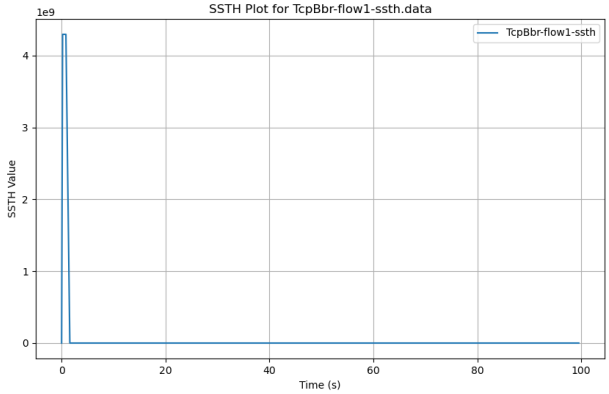

Figure 42: Slow Start Threshold (SSTH) for TCP BBR (Flow 1)

4 Comparison of TCP Vegas, TCP Vegas Tweaked, and TCP BBR

This section compares the performance of the three algorithms based on key metrics such as congestion window, round-trip time, and retransmission timeout.

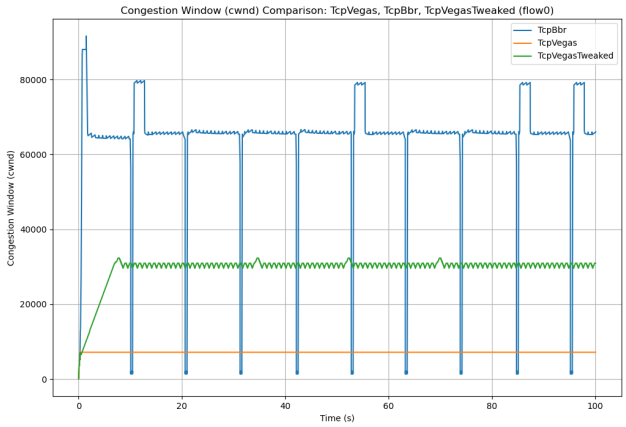

Figure 43: Comparison of Congestion Window (CWND)(Flow-0)

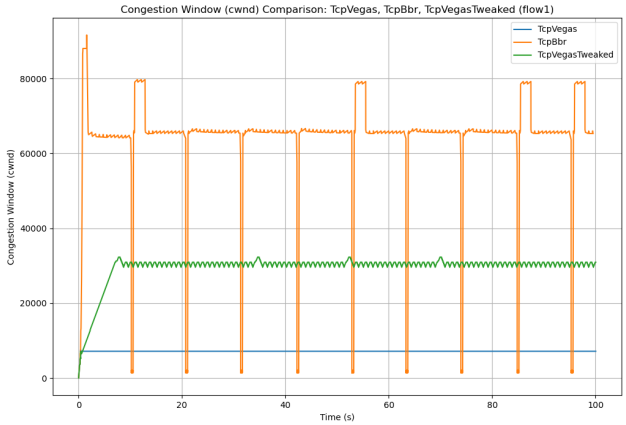

Figure 44: Comparison of Congestion Window (CWND)(Flow-1)

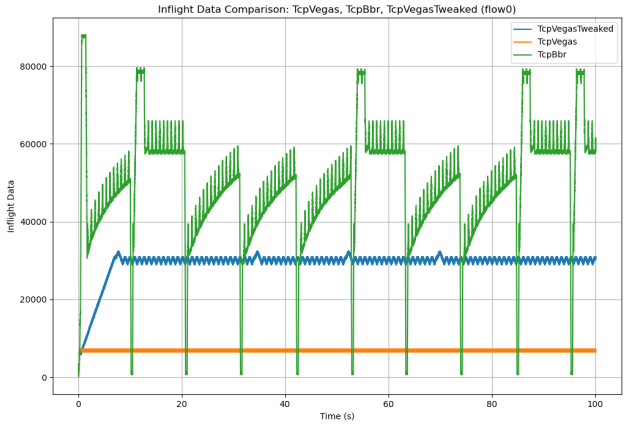

Figure 45: Comparison of Inflight Packets(Flow-0)

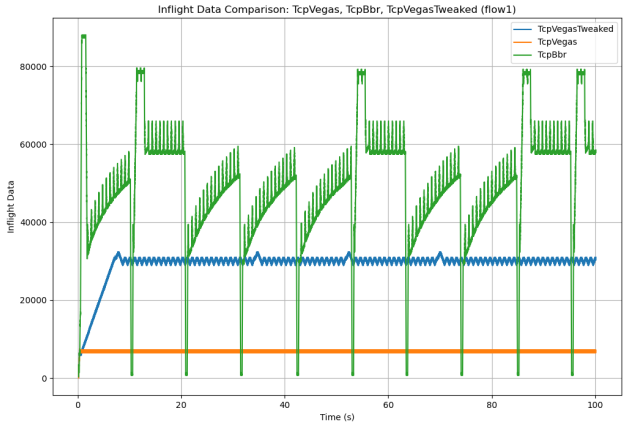

Figure 46: Comparison of Inflight Packets(Flow-1)

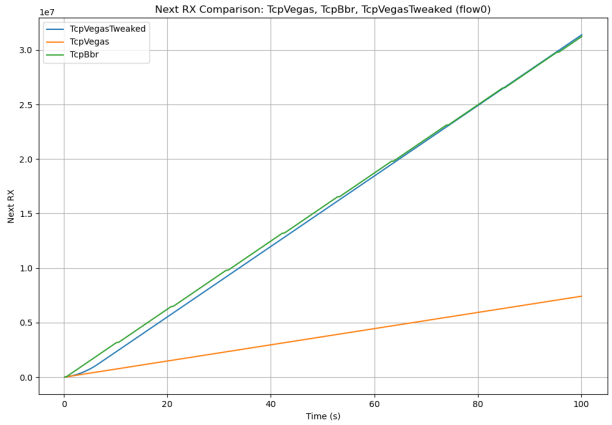

Figure 47: Comparison of Next RX(Flow-0)

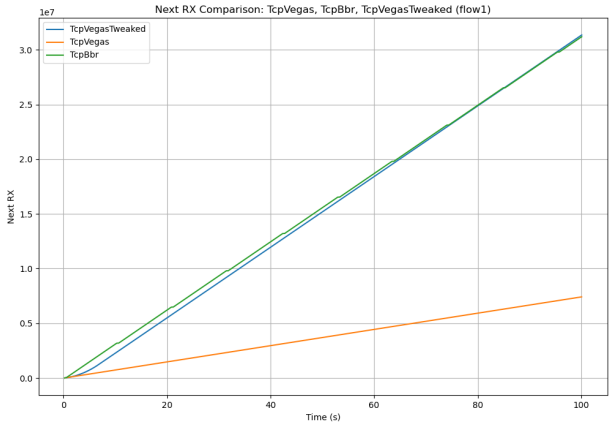

Figure 48: Comparison of Next RX(Flow-1)

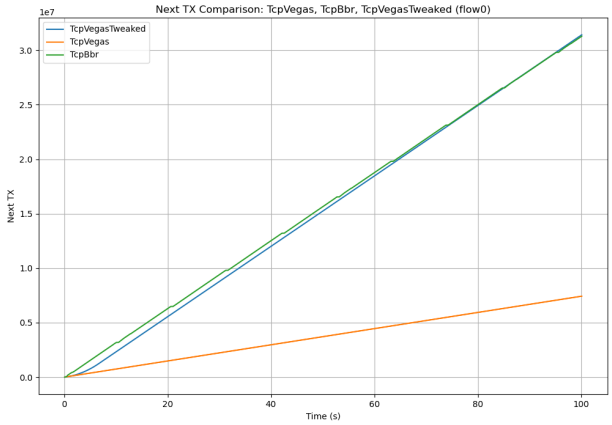

Figure 49: Comparison of Next TX(Flow-0)

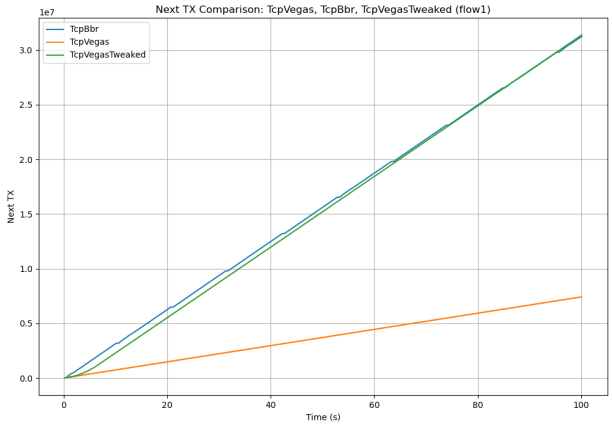

Figure 50: Comparison of Next TX(Flow-1)

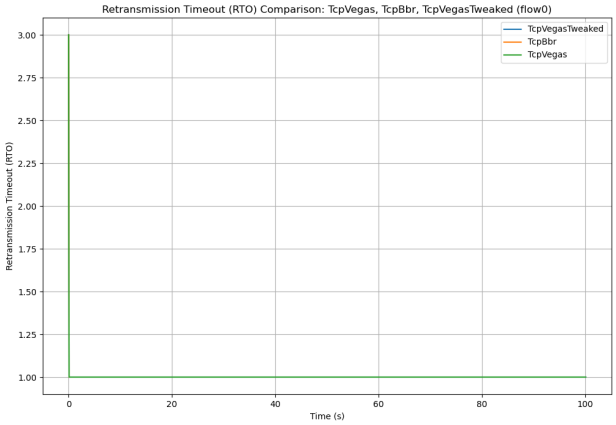

Figure 51: Comparison of Retransmission Timeout (RTO)(Flow-0)

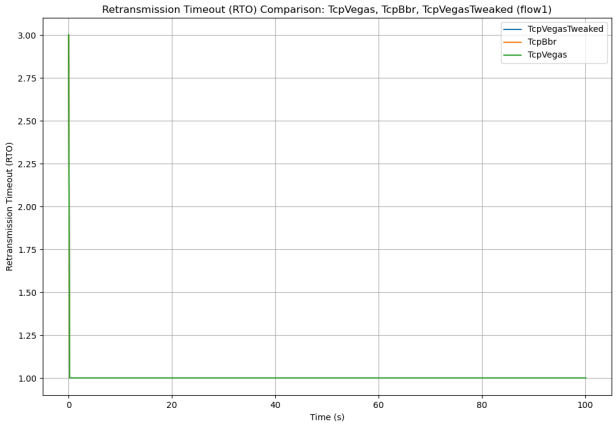

Figure 52: Comparison of Retransmission Timeout (RTO)(Flow-1)

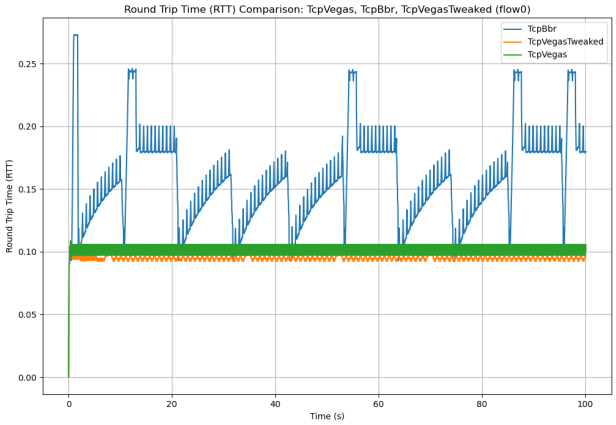

Figure 53: Comparison of Round Trip Time (RTT)(Flow-0)

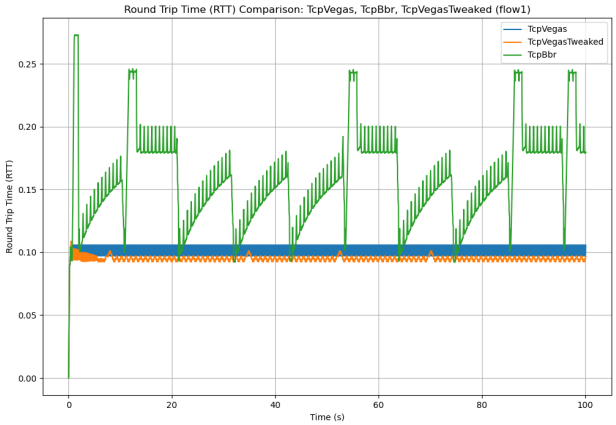

Figure 54: Comparison of Round Trip Time (RTT)(Flow-1)

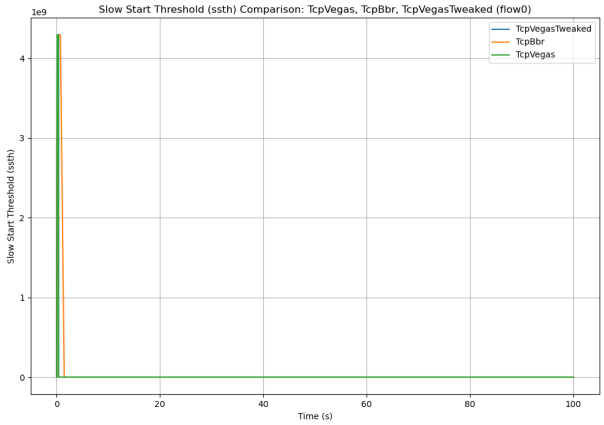

Figure 55: Comparison of Slow Start Threshold (SSTH)(Flow-0)

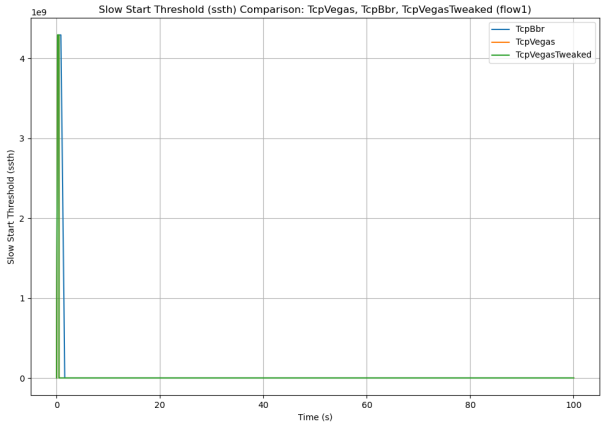

Figure 56: Comparison of Slow Start Threshold (SSTH)(Flow-1)