

AN EXPERIMENTAL EVALUATION OF TCP STARTUP ALGORITHMS

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01 Introduction

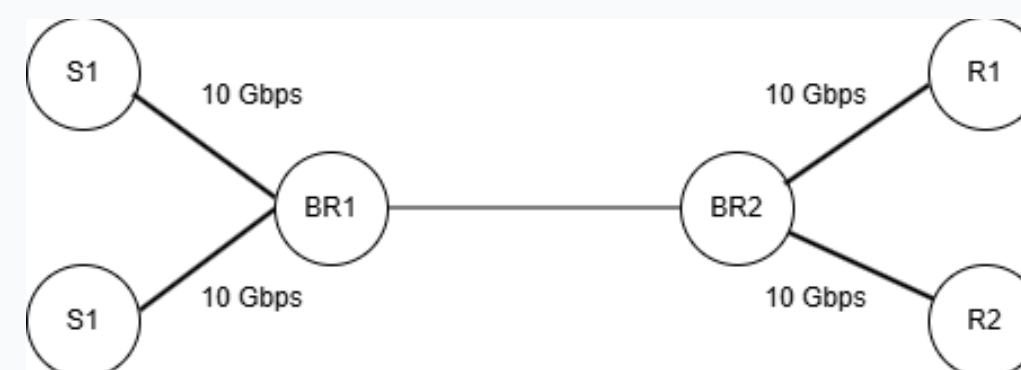
- In the Internet most flows are short [4]
- One important factor that impacts TCP performance is the startup mechanism used
- A thorough evaluation of these algorithms in different conditions is essential to understand its performance

02 Background

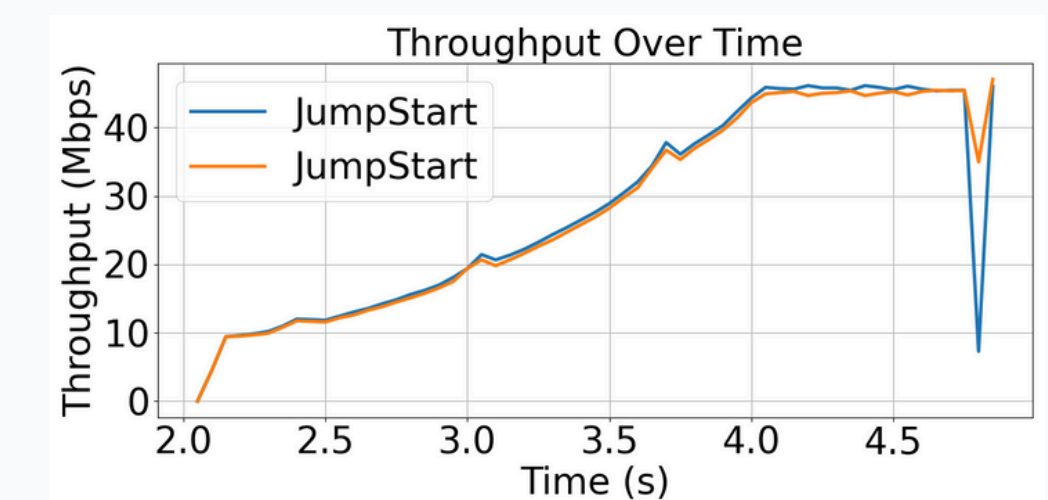
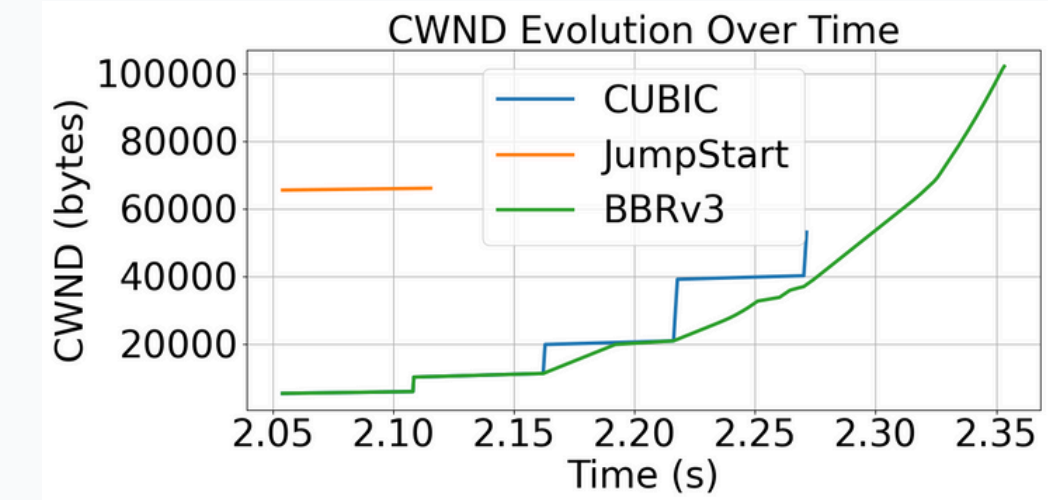
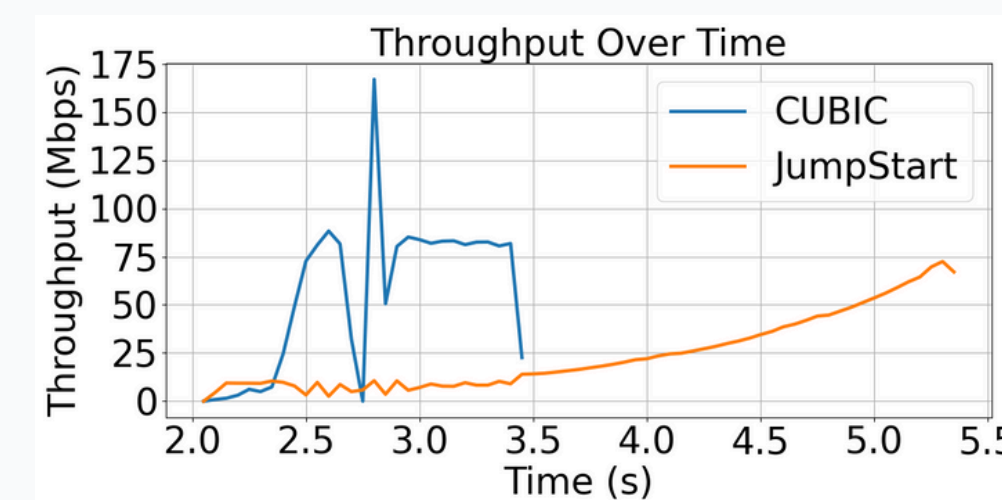
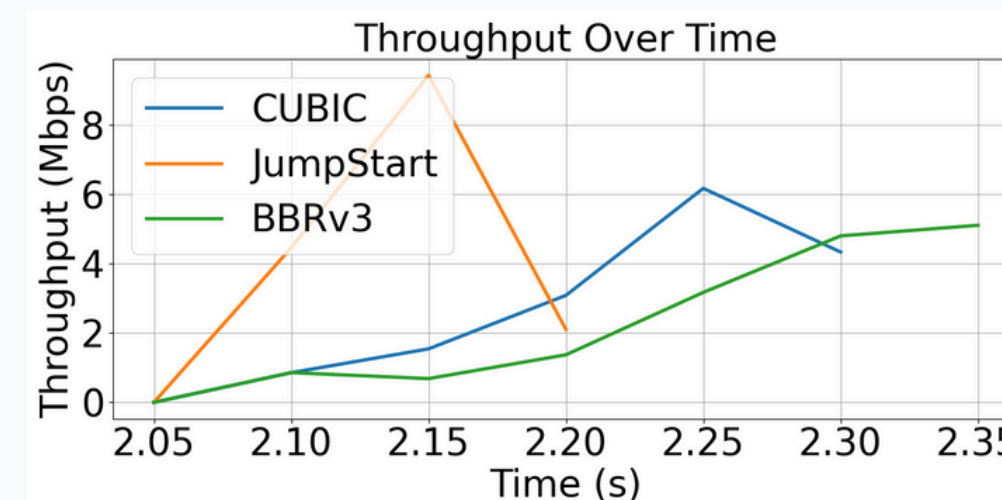
- Several startup mechanisms were proposed to try to optimize TCP performance
- HyStart is used in CUBIC and it tries to find a safe point of exiting slow start before overshooting the cwnd [1]
- BBRv3 startup is similar to traditional Slow Start but it exists startup phase either when the bandwidth estimation plateaus or too much loss is encountered [3]
- JumpStart is a startup algorithm that skips startup altogether and paces as many packets as the receiver's advertised window over the first RTT [2]

03 Methodology

- Using ns3 network simulator for experiments
- Dumbbell topology
- **Experiment 1:** Different bandwidth values (10, 100, 1000 Mbps) and flow sizes (50, 100, 200, 400 KB)
- **Experiment 2:** Different RTT values (10, 50, 200 ms)
- **Experiment 3:** One existing long flow and one short flow with different algorithms
- **Experiment 4:** Two medium flows competing at the same time with different algorithms
- **Experiment 5:** Two medium flows competing at the same time with the same algorithm
- Measure flow completion time, throughput, cwnd size, fairness



04 RESULTS



05 Conclusion

- JumpStart outperforms the others for short flows
- JumpStart performs more poorly for longer flows
- The algorithms are more fair when competing with the same algorithm
- JumpStart has potential to make communication on the Internet faster
- Further research should be conducted into JumpStart and comparing other startup algorithms

References

1. Sangtae Ha and Injong Rhee. "Taming the elephants: New TCP slow start". In: Computer Networks 55.9 (2011). Publisher: Elsevier.
2. Dan Liu et al. "Congestion control without a startup phase". In: Proc. PFLDnet. 2007
3. Neal Cardwell et al. "BBRv3: Algorithm Bug Fixes and Public Internet Deployment". In: July 2023.
4. Feng Qian et al. "TCP revisited: a fresh look at TCP in the wild". In: Proceedings of the 9th ACM SIGCOMM conference on Internet measurement.