

# Aim and the Required Setup

## Week III Presentation

Santwana Verma

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# The Research Question/ The Immediate Aim

- **Ques** Does the mathematical model presented by Rajeev and Thanos represent the actual TCP-BBR performance?
- Their claim is that the BBR underestimates the BDP.
- **Ques** Are there any other mathematical model or an experimental analysis of TCP-BBR?

# The Mathematical Model

The relation between **Throughput loss** and the **RTTs** put forward by Rajeev and Thanos is given below:

$$\begin{aligned}\mathcal{L}_{\text{Throughput}} &= 1 - 2 \times \frac{BDP}{BDP_{\text{ideal}}} \\ &\approx 1 - 2 \times \frac{\mathbb{E}[\mathcal{W}]}{\mathbb{E}\left[\min_{1 \leq i \leq 10} \max_{1 \leq j \leq n'} X_j^i\right]}\end{aligned}\tag{1}$$

Where,

$BDP$ : Estimated Bandwidth-Delay Product

$\mathcal{W}$ : Estimated RTT

$X_j^i$ : RTT for the  $i^{th}$  ACK where each ACK acknowledges  $n'$  packets

## Related Work

- W. K. Leong, Z. Wang, and B. Leong, "Tcp congestion control beyond bandwidth-delay product for mobile cellular networks", in *Proceedings of the 13th International Conference on Emerging Networking Experiments and Technologies*, ser. CoNEXT '17. New York, NY, USA: ACM, 2017, pp. 167-179.
- M. Hock, R. Bless, and M. Zitterbart, "Experiment evaluation of bbr congestion control," in *2017 IEEE 25th International Conference on Network Protocols (ICNP)*, Oct 2017, pp. 1-10.

# Procedure to be Followed

- Mimic the TCP-BBR flow on the CloudLab testbed and record various metrics.
- **Potential Metrics**
  - Throughput Loss
  - Congestion Window (cwnd)
  - RTT
  - Data in Flight.
  - Delivery Rate
  - Number of packets/Acknowledgements

# Going Backwards

- Validate the relationship between the throughput loss and the RTT.
- **If** the relationship is not true, we trace back the errors by going back.
  - Validate the computation of Bandwidth.
  - Validate that both **Bandwidth and RTT** are **underestimated**.

# Experimental Scenario

The entire TCP-BBR algorithm depends on **RTT** and **Bottleneck Bandwidth**.

- Stable and Intermittent RTT
- Changing Bandwidth
- Multiple Flows vs Single Flow
- With Other TCP congestion controls

Suggestions Are Welcomed!

Thank You!