

 stats_b0.csv
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In this dataset, there are some outliers in terms of spin frequency, especially when delay is 0 and loss rate is higher than 4%. Here, spin frequency is defined by the frequency of change of latency spin bit in QUIC(spins/sec). Ignore bandwidth parameter because it is However, high spin frequency samples showed higher throughput in average. Can you explain this phenomenon?



The dataset contains the following columns:

1. `lossRate` : The packet loss rate.
2. `Unnamed: 1` : An empty or irrelevant column (perhaps a placeholder).
3. `delay` : Network delay in milliseconds.
4. `spinFreq` : The frequency of spin bit changes (spins per second).
5. `avgThroughput` : Average throughput in the network.
6. `numLosses` : Number of packet losses.

To understand the phenomenon where high spin frequency samples show higher throughput when delay is 0 and loss rate is greater than 4%, I will analyze the subset of the data with:

- Delay = 0.
- Loss rate > 4%.

Then, I will explore the relationship between spin frequency and throughput in this subset. [\[-\]](#)

In the subset where delay is 0 and the loss rate is greater than 4%, the data shows:

- **Spin frequency:** Ranges from ~2278 spins/sec to ~3316 spins/sec, with an average of ~2900 spins/sec.
- **Average throughput:** Ranges from ~169.7 Mbps to ~173.9 Mbps, with an average of ~171.7 Mbps.

The relatively high spin frequency samples tend to be associated with higher throughput values.

Explanation:

1. **Spin bit frequency and feedback:** The spin bit helps measure end-to-end RTT in low-latency networks. A higher spin frequency (more rapid changes) suggests faster detection of RTT and more responsive feedback to congestion control mechanisms, leading to quicker adjustment in packet transmission rates. This could help optimize throughput even under conditions of higher loss rates.
2. **Loss detection and compensation:** With high spin frequency, QUIC's congestion control can react more dynamically to packet loss, compensating by adjusting window sizes more effectively and avoiding excessive retransmission. This results in maintaining higher throughput.

Thus, in environments with higher loss rates, the combination of no delay and a high spin bit frequency can enable more adaptive and efficient throughput maintenance. [\[-\]](#)