Analysis

Experiment 1.1 --> 1Mbps - 0ms - 0%

Experiment 1.2 --> 1Mbps - 0ms - 3%

Experiment 1.3 --> 1Mbps - 0ms - 8%

Table

Description automatically generated

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How does low bandwidth and varying levels of packet loss effect?

* Initial Delay = Is long but drastically increases as packet loss does
* Average Buffer Frequency = Only starts to happen when the packet loss is exceptionally high, drastically effects the QoE
* Average Buffer Duration = Generally the same for 1mbps unless high packet loss interferes which decreases it massively.
* Subjective MOS = very low overall due to low bw but gets significantly worse due to buffer events when the packet loss his high.

Experiment 2.1 --> 5Mbps - 0ms - 0%

Experiment 2.2 --> 5Mbps - 0ms - 4%

Experiment 2.3 --> 5Mbps - 0ms - 8%

What does Medium bandwidth and varying levels of packet loss do to:

* Initial Delay = Did not particularly fluctuate much despite varying packet loss, the bw was enough.
* Average Buffer Frequency = Exponentially increased as packet loss reached 8% otherwise it was mostly infrequent. Severely effected QoE.
* Average Buffer Duration = Was similar until packet loss was high, then dramatically dropped.
* Subjective MOS = Generally better quality than 1mbps, however 8% packet loss still tanks the QoE due to increased buffering event frequency.

Experiment 3.1 --> 10Mbps - 0ms - 0%

Experiment 3.2 --> 10Mbps - 0ms - 4%

Experiment 3.3 --> 10Mbps - 0ms - 8%

What does High bandwidth and varying levels of packet loss do to:

* Initial Delay = All the ID’s where low compared to other bandwidths, probably dependant on having enough bw.
* Average Buffer Frequency = Was high with high packet loss, despite that ran better than 5mbps. Still tanked QoE.
* Average Buffer Duration = Same pattern as other bandwidths.
* Subjective MOS = Even better overall than 5mbps however high packet loss remains as the driving contributor for bad QoE alongside low bandwidth.

Subjective opinion – explained with patterns observed from objective data. Back up using cherry picked objective data (have full in appendix). Always tie back to user QoE.

Bitrate effects QoE, and is influenced by Bandwidth and packet loss, the worse both are the more QoS of application layer metrics act up and the video has to adapt to a worse bitrate to manage. Leading to a loss in QoE.

Link between:

* Bandwidth and Packet loss cause conditions to worsen and the video to adapt its bitrate consequently influencing QoE
* Bitrate, Buffer frequency on Subjective MOS
* Differences in Buffer length with worse Packet Loss. And consequently, its effects on the video condition and QoE. (Video streaming cannot keep up due to having to retransmit packets a lot)
* Initial Delay and Bandwidth (not really influenced by Packet Loss)

What went wrong =

* 16.4 Ubuntu image was successful but too slow
* Mininet installation file was bugged and needed changing
* Segmentation wasn’t set to the right level
* Apache2 must be closed on the vm before opening topology
* ODL Oxygen – Old version of ODL did not work with new Ubuntu Image, RYU was not fit for purpose.