

Demo: Benchmarking and Visualizing Compression Errors in Volumetric Streaming Systems



Krutik Pandya, Flemming Laursen, Jason Lobo, Gael Melo, Detim Zhao, Sun-Yen Tan and Dr. Robert LiKamWa
Arizona State University, Tempe, Arizona



Benchmarking Tool to Evaluate Quality and Performance of Volumetric Streaming Configurations

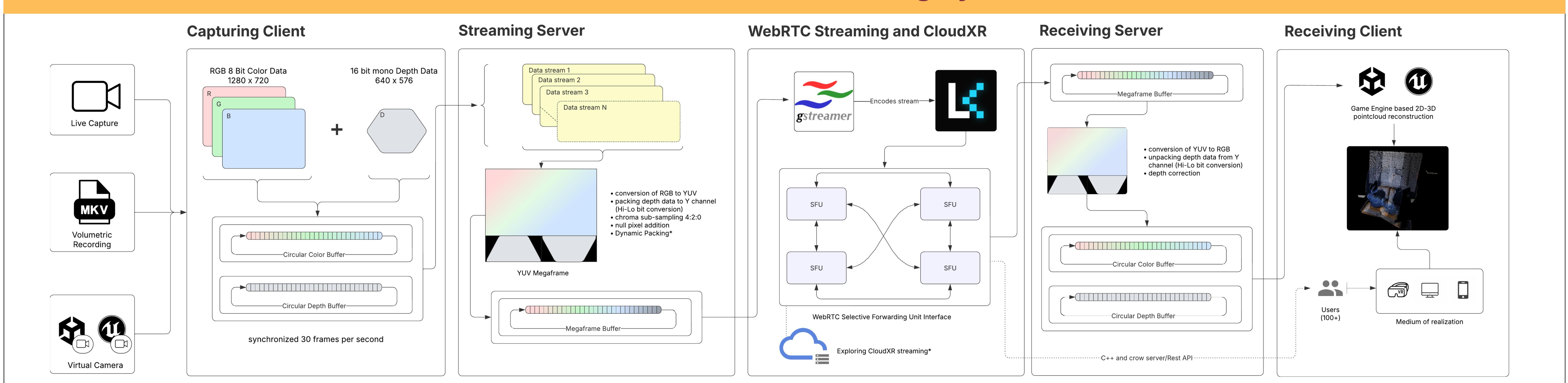
Researchers -- including us -- are investigating adaptive, low-latency live streaming systems for real-time volumetric data.

- Exploring adjustable streaming parameters.
- Analyzing data flow in modular live streaming architectures.
- Synchronizing multiple streams across various data formats.
- Comparing volumetric streaming methods: RGB-D 2D to 3D, Point Cloud, Stereo Depth, etc.

Advantages of a benchmarking tool for streaming data analysis.

- Supports modular volumetric streaming systems for real-time applications.
- Enables side-by-side visualization of multiple live-streamed data sources.
- Supports configuration updates at any stage of the pipeline.
- Generates benchmarking metrics for streaming configurations.
- Helps identify errors from compression, data packing, data handling, and network issues.

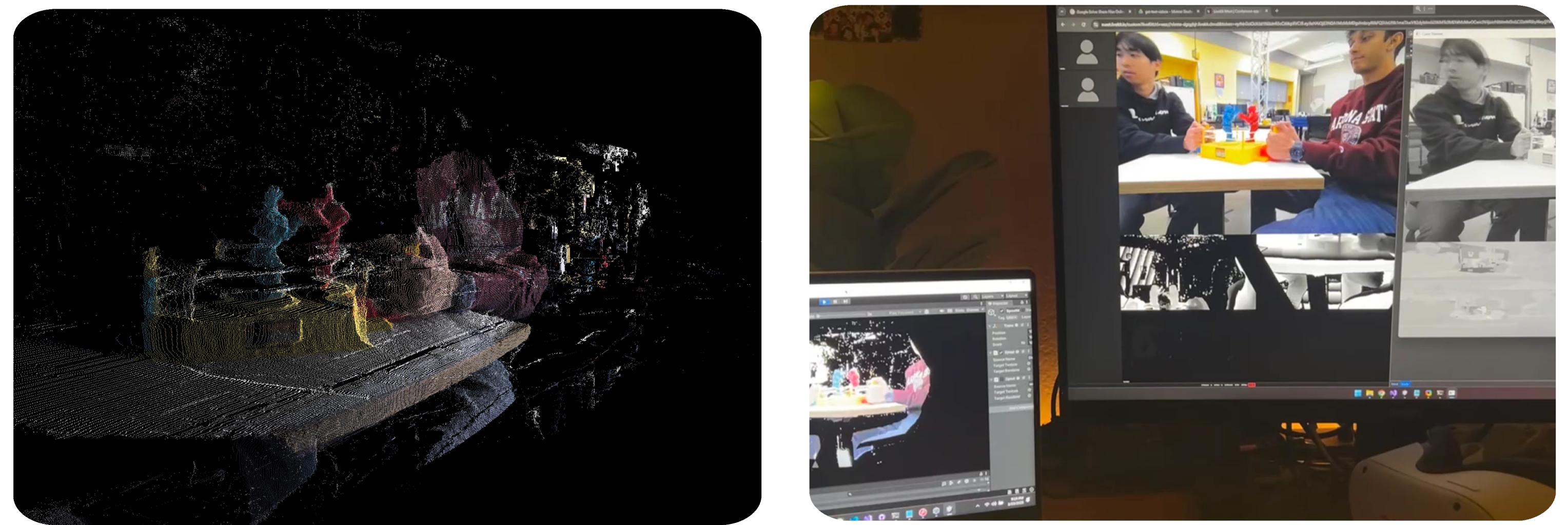
Modular Volumetric Streaming System



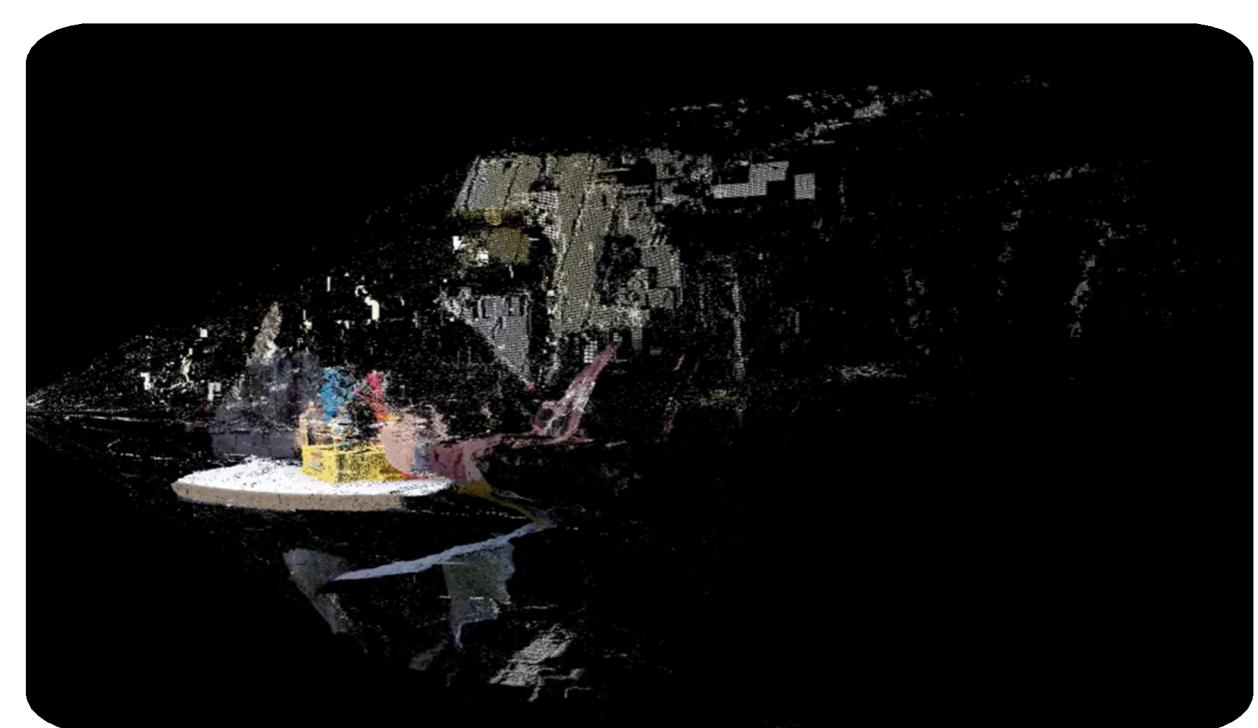
Adjustable Streaming Parameters

- **Resolution:** The total number of pixels or points within a volumetric frame.
- **Bitrate:** The rate at which data is transmitted per second.
- **Quantization:** The process of reducing precision in values to optimize data compression.
- **Video Codecs:** compression algorithms designed to encode and decode video streams efficiently.
- **Keyframe Refresh:** Sets the maximum time between keyframes, balancing compression efficiency and error recovery.

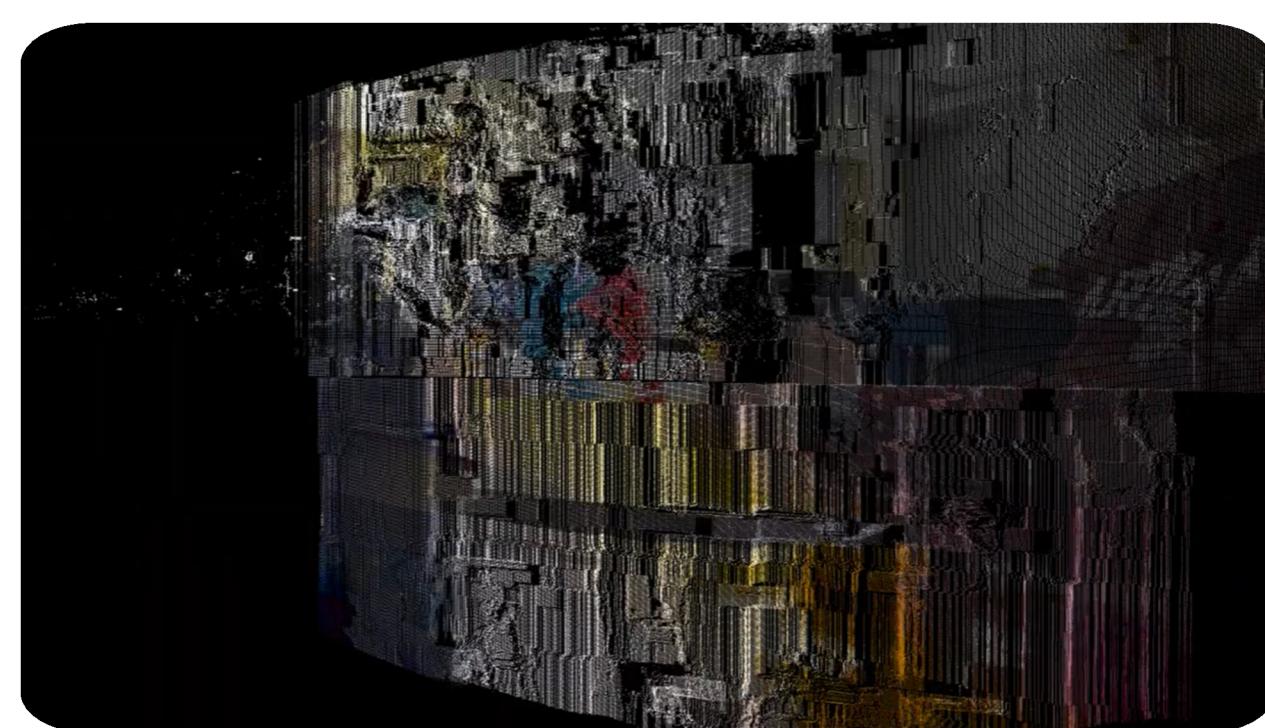
Example Benchmarking Views



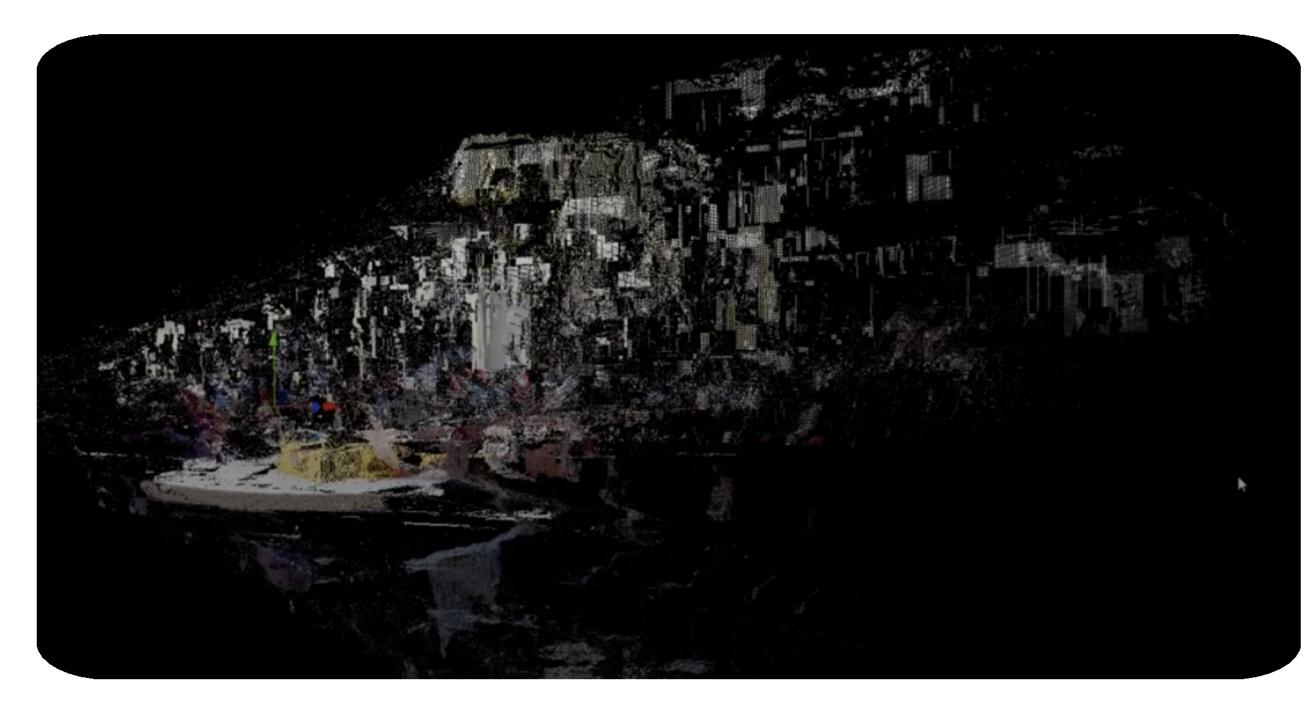
Observable Compression Errors



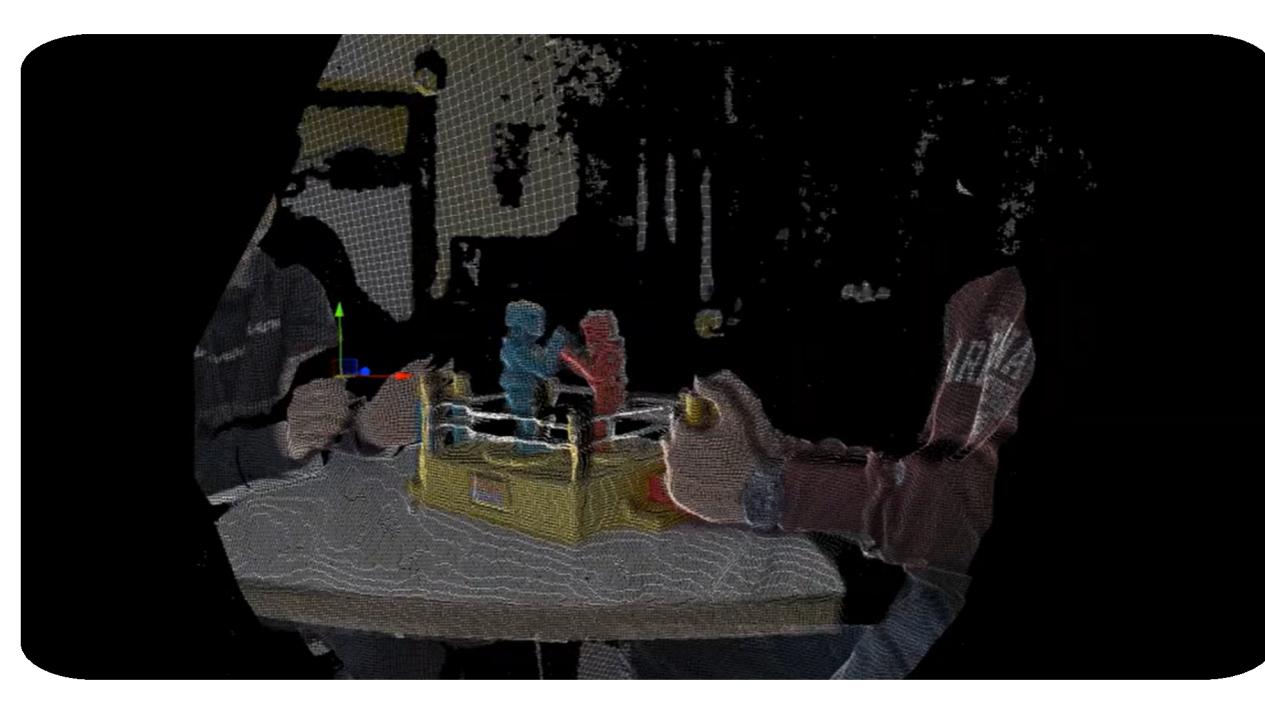
(a) Visible convex depth cone-like artifacts appear when adjusting quantization values.



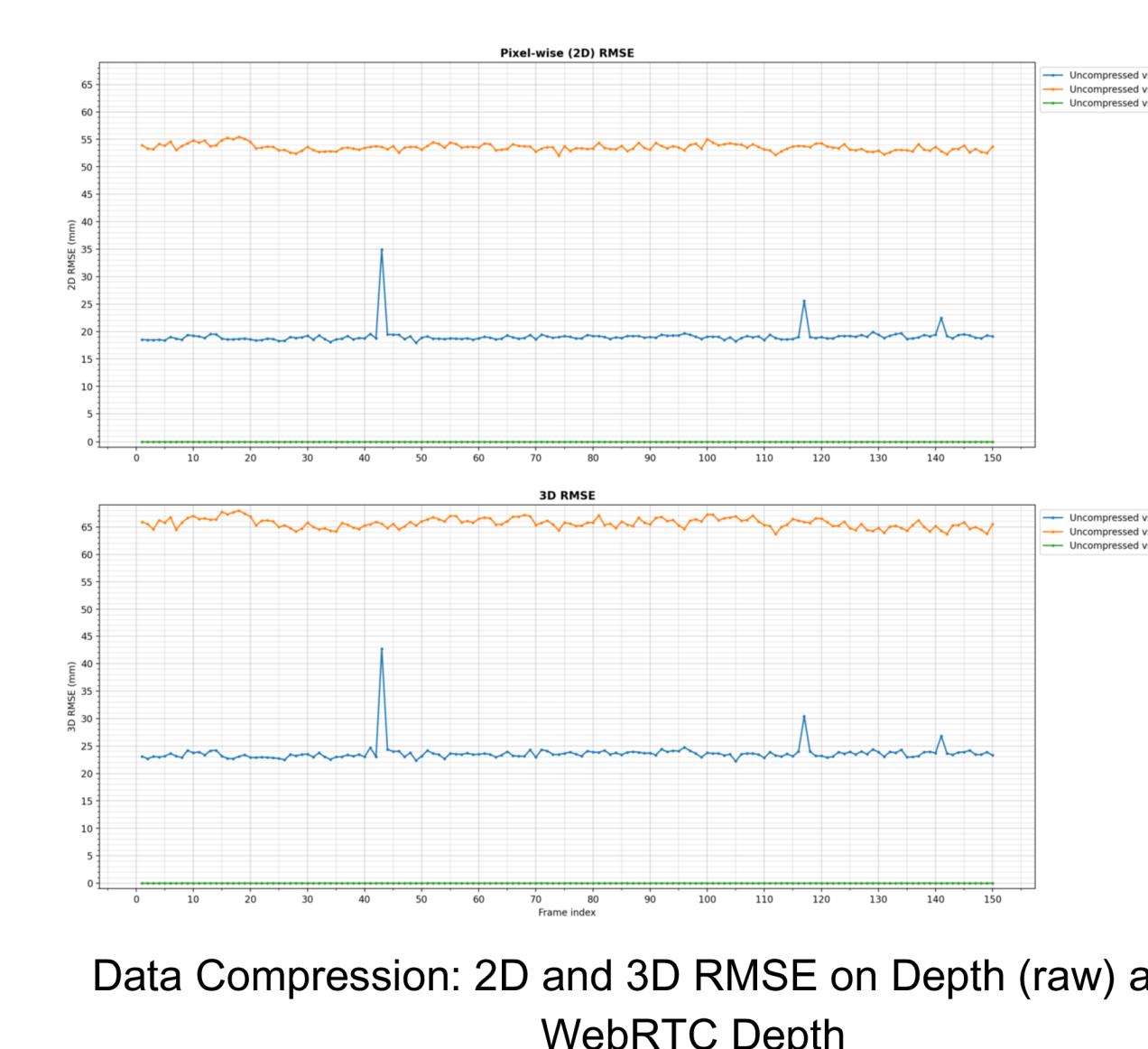
(b) Flickering and growing artifacts appear due to *interframe-compression*.



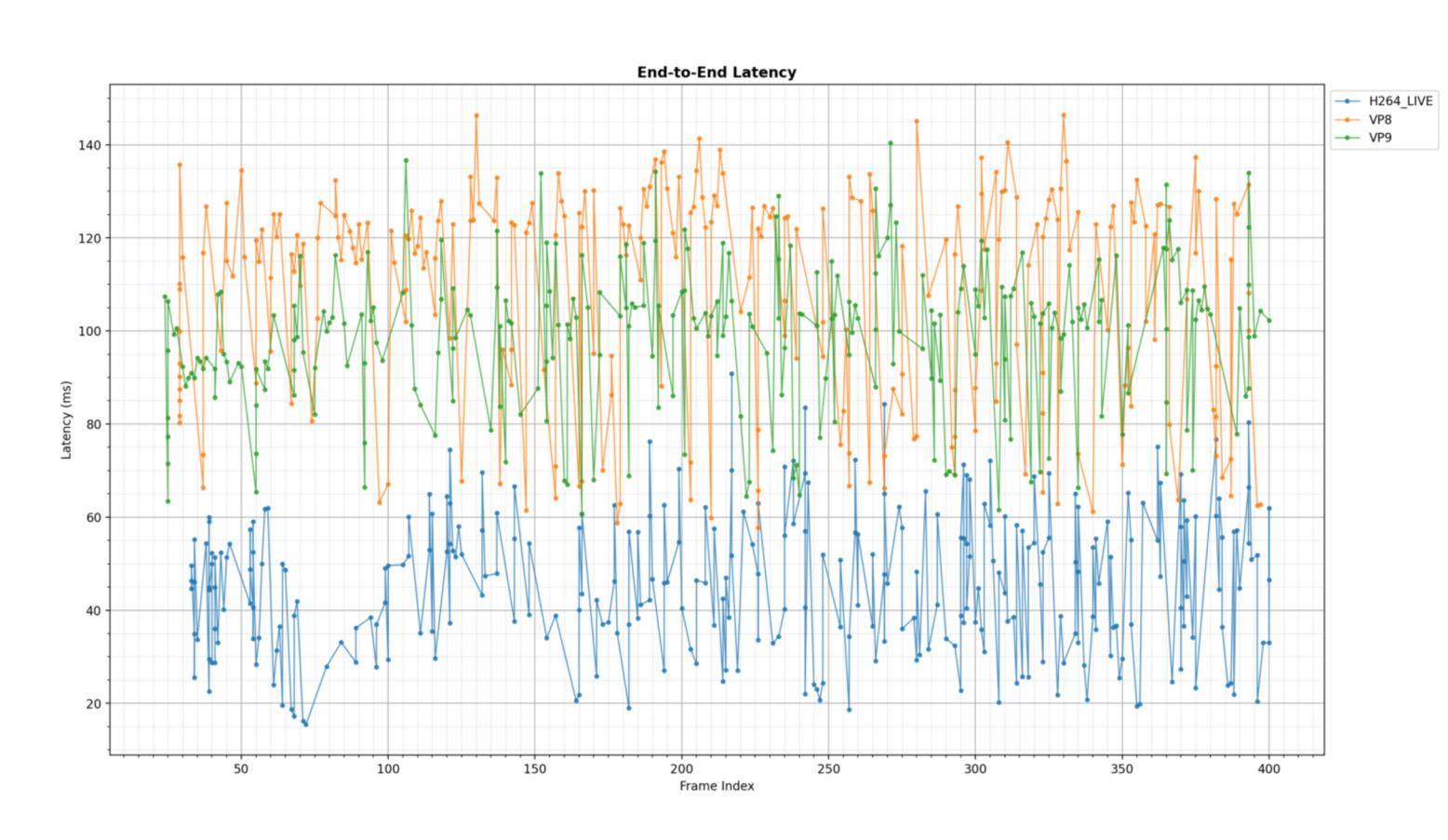
(c) Lowering *bitrate* leads to a higher concentration of points.



(d) Increased latency observed when very slow encoder preset is used.



Observable degradation when adjusting streaming parameters

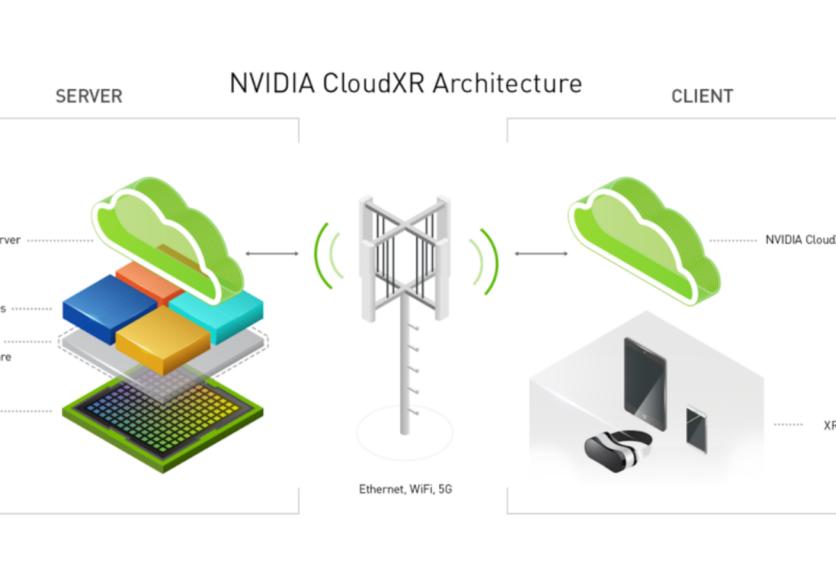
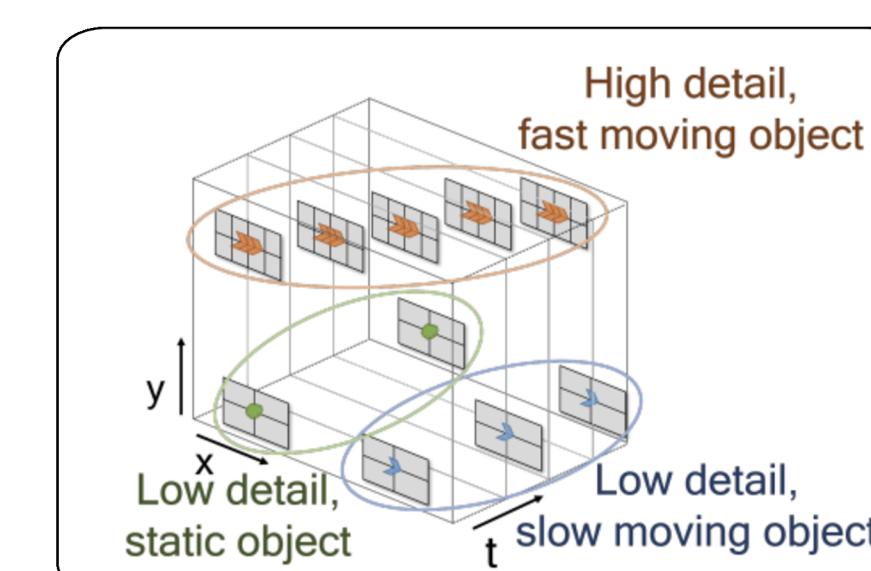


Analysis of Quality and Performance across different devices

Data Compression: 2D and 3D RMSE on Depth (raw) and post WebRTC Depth

Visualize streaming network performance: End-to-end latency

Research Directions to Support



Adaptive Streaming[1,2]

Cloud XR + Multicast[3]

Novel view synthesis

Acknowledgments

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Details available on <https://asu-meteor.github.io/compression-errors-volumetric-streaming>