Network Music Performance Beyond 4G

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NMP needs what only 5G can provide

Ultra-low latency	• NMP requires 30-40 ms one way
Very high bandwidth	• Especially with volumetric video
Processing at the edge	• To relay or process media streams

The TENeMP project @ SPIRIT

Feasibility analysis of NMP over 5G

- Can we do NMP over 5G? Is the latency low and the bitrate high?

Performance gains of edge-computing

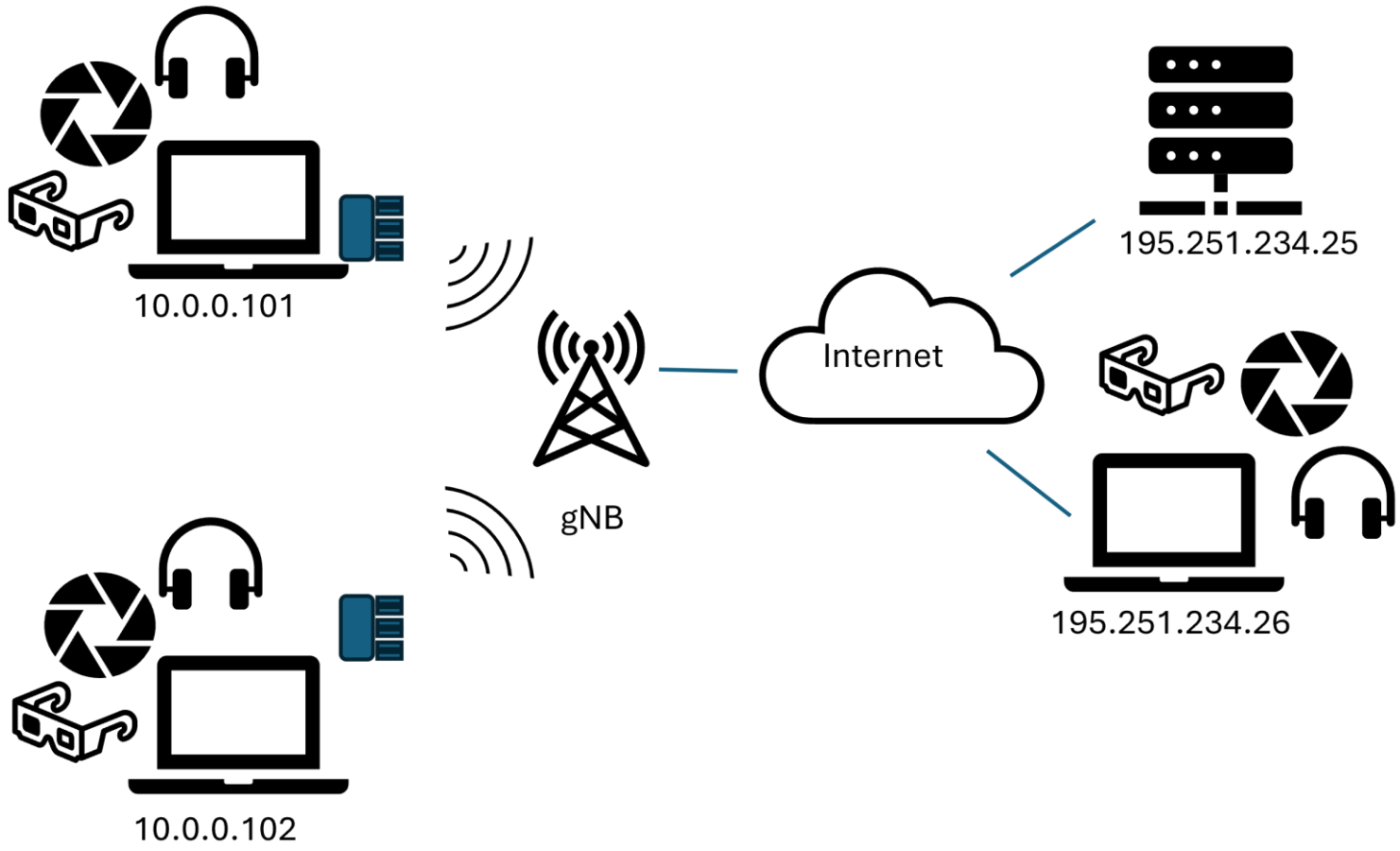
- Can we do multiparty NMP if we put the SFU in the MEC?

Integration of telepresence in NMP

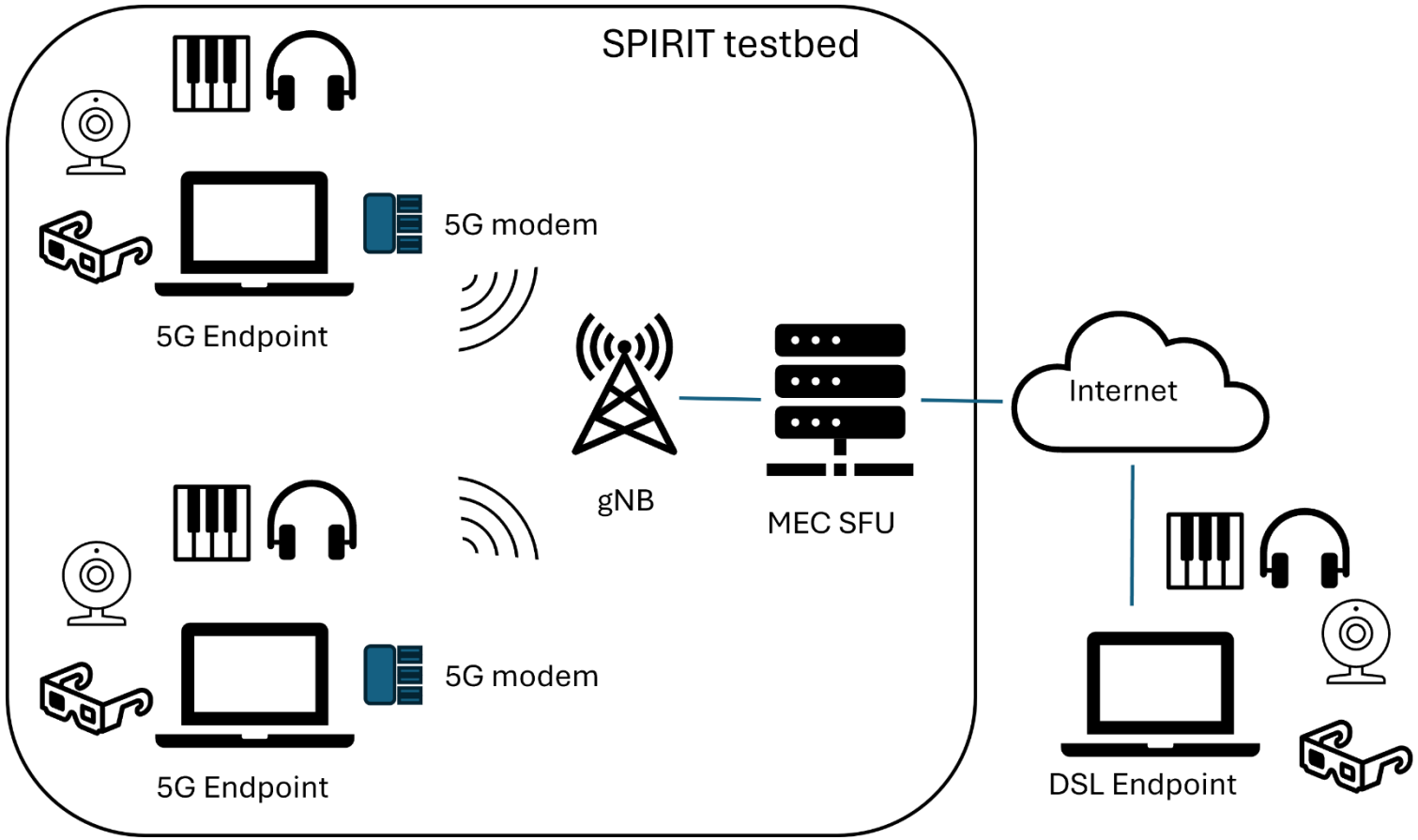
- Can we offer volumetric video along with the audio?

Testbeds

TENeMP topology @ MMlab testbed



TENeMP topology @ SPIRIT testbed



Challenges

Tools

Existing tools are not enough

- No low-latency 2D video
- Audio SFUs very slow
- No low-latency/multiparty volumetric

Development of new tools

- Prototyped with Gstreamer pipelines
- Native C++ app for telepresence
- Simple server for signaling and SFU

Measurement setup

Audio

- Audio pulse method
- Fully automated during project

Video

- LED flash method
- Fully automated during project

Telepresence

- Hard to test AR glasses
- Measurements with 2D projection

Measurements

Tools

Endpoints

- WebAPI based: Simple but slow
- Gstreamer based: Quicker and flexible
- Jacktrip/Sonobus: Audio state of the art

SFUs

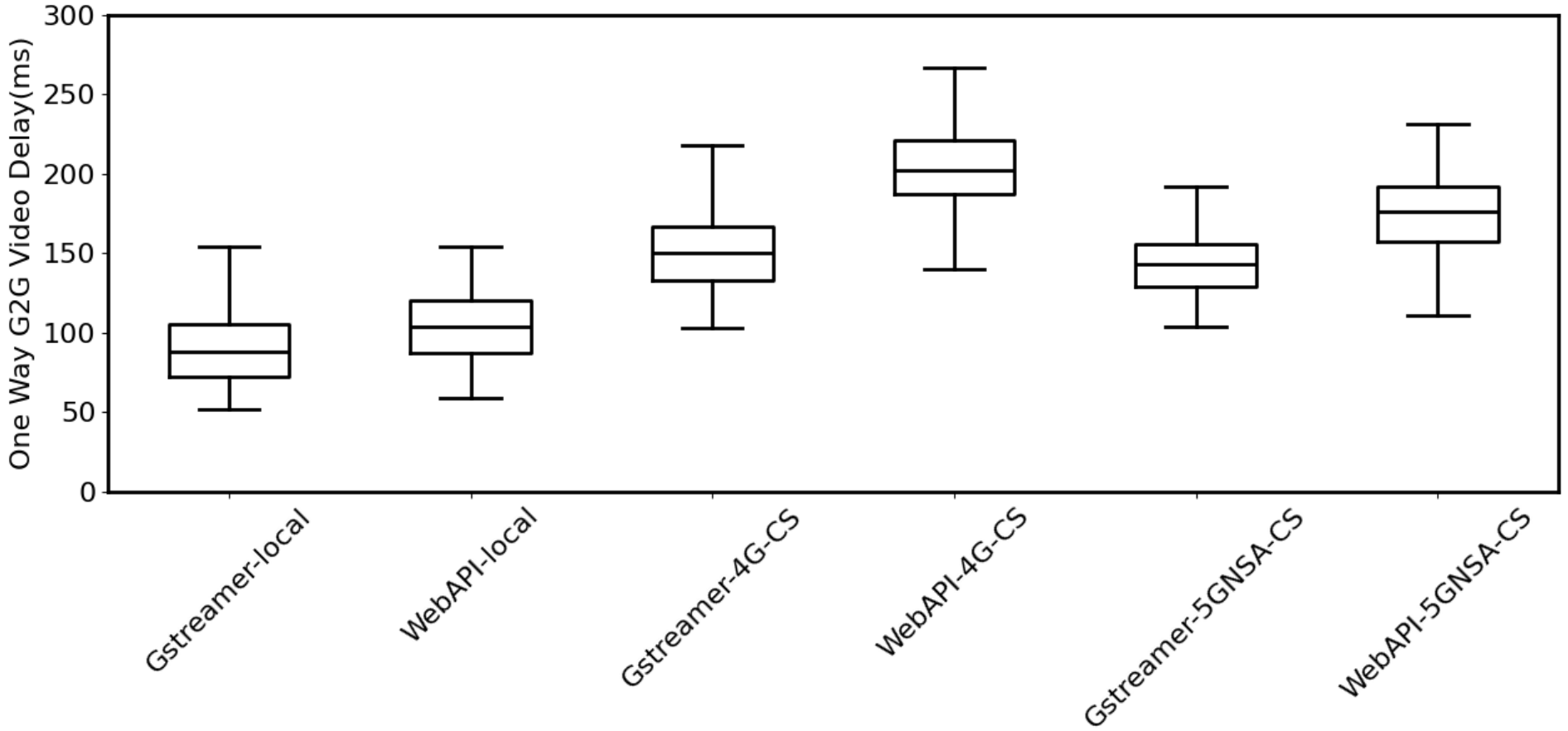
- Janus, Jitsi, MediaSoup: Slow for audio
- Janus seems to be the fastest

Networks

- Local (no network), LAN
- COSMOTE 4G, COSMOTE 5G NSA

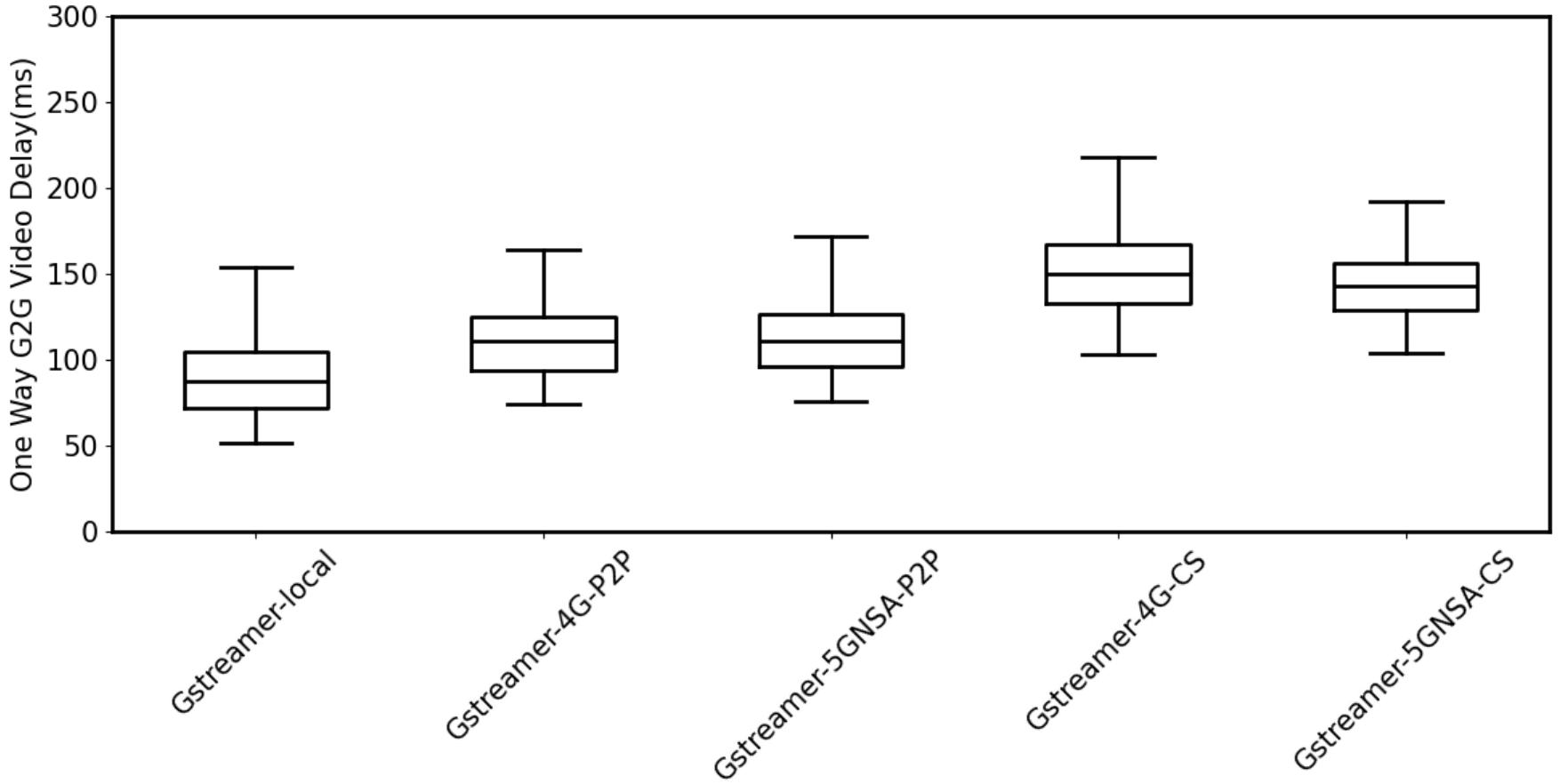
Glass to Glass delay

Gstreamer vs. WebAPI, Janus



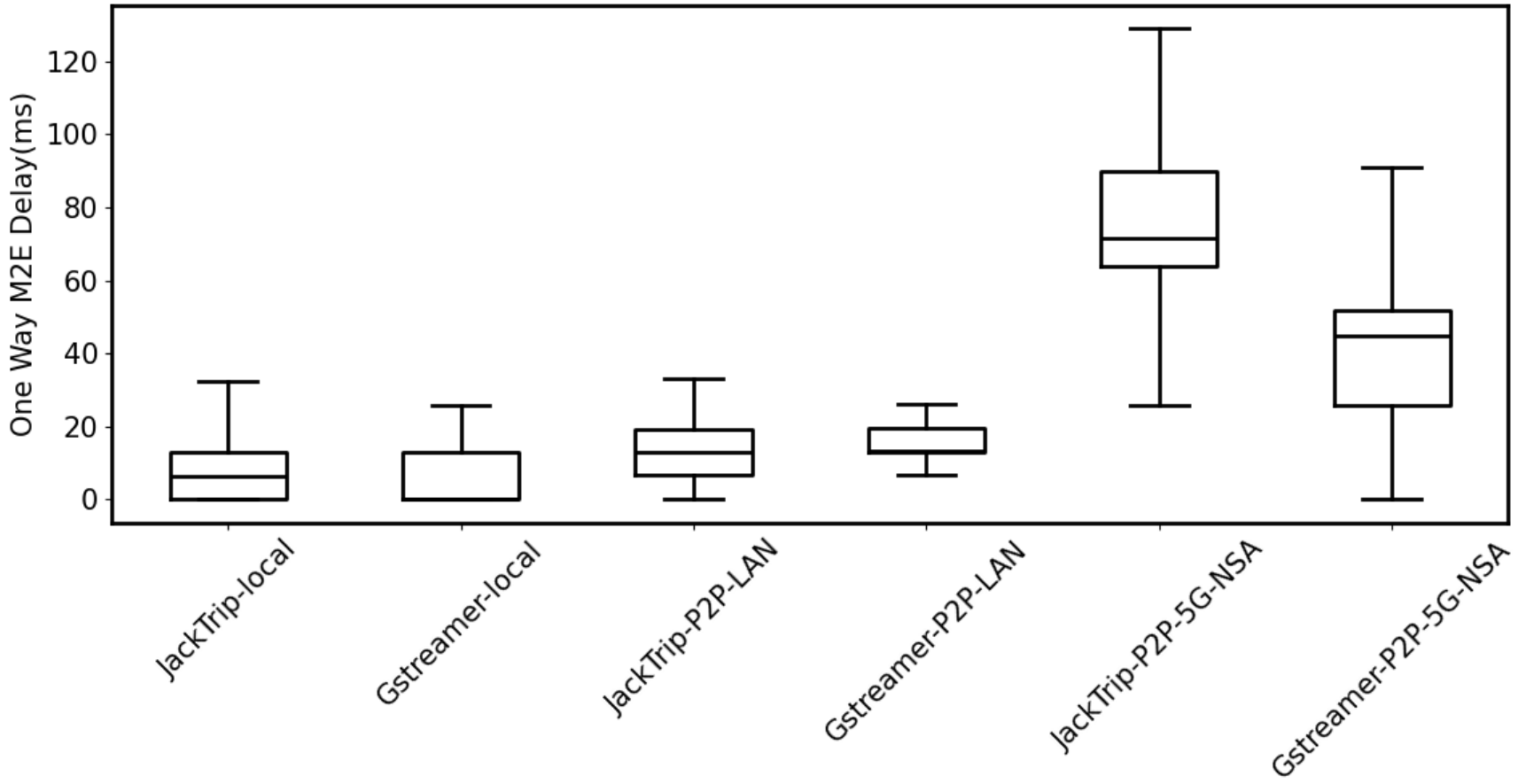
Glass to Glass delay

Gstreamer 4G-5G, P2P-Janus



Mouth to Ear delay

JackTrip/Sonobus vs. Gstreamer



Next steps

Future work

Volumetric video

- Design latency measurement method
- Complete volumetric tool

Additional measurements

- Assess benefits of SFU at 5G edge
- Test volumetric video tool

https://mmlab-aueb.github.io/tenemp-site/

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