Telepresence-Enhanced Network Music Performance (TENeMP)

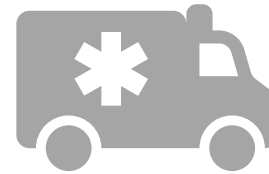# Who we are and what we do

Main MMLab team

Konstantinos Tsioutas (NMP, QoE, AV)

Yannis Thomas (NMP, Networking, SFU)

Iakovos Pittaras (Cloud, GPUs)

Nikos Fotiou (Security, Privacy),

George Xylomenos (PI)

Previous experience

NMP: QoE and objective study with 22 musicians

Musinet: developed an SFU by hacking Asterisk

SFUs: ULL SFU via netmap (2015) and P4 (current)

Experiments

| Performance comparison of different NMP tools.	Performance gains of edge-computing.	Integration of future telepresence techniques in NMP tools.
• Assess feasibility of Network Music Performance (NMP) in 5G networks P2P transmissions / various musician placements	• Can NMP benefit from the placement of an SFU server at the edge?	• Integrate 3D streaming with NMP • Assess the feasibility with and without SFU

NMP use cases (requirements)

| Use-case scenario	Audio Latency (ms)	Video Support & Latency (ms)	Audio Video synchronization/offset
Remote Music performance (synchronous)	<30 mouth-to-ear	Optional / < 30 ms motion-to-photon	audio lead to video: <15ms video lead to audio: <45ms (ITU for TV broadcast)
Remote Music recording (pseudo-synchronous, metronome)	< 120 ms	Optional / <200 ms	
Remote Music Education (asynchronous)	< 120 ms	Important / <200 ms	

TENeMP topology @ Mmlab testbed

10.0.0.101

10.0.0.102

gNB

Internet

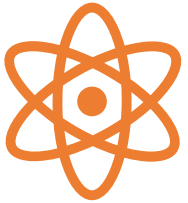195.251.234.25

195.251.234.26
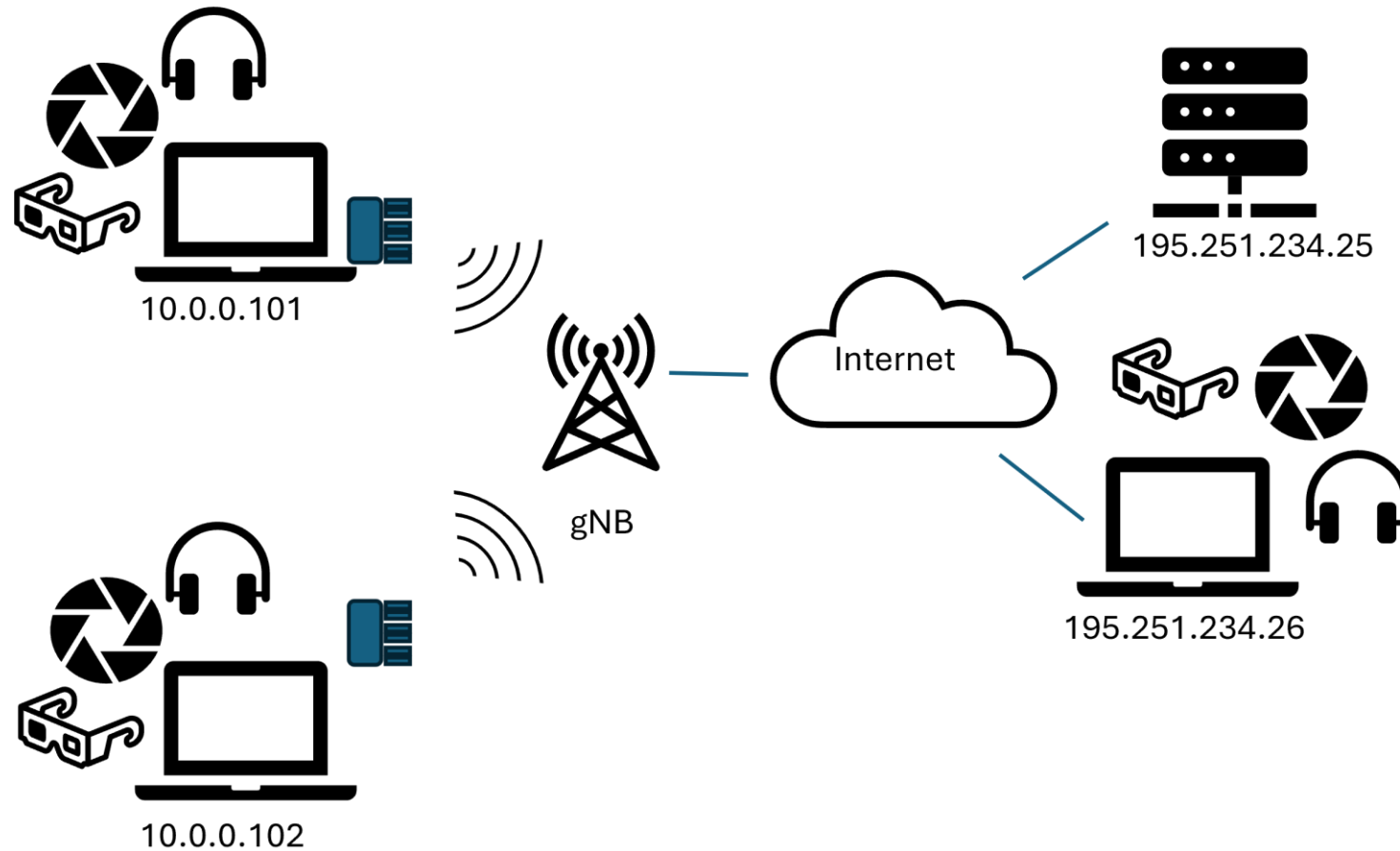
TENeMP topology @ SPIRIT testbed
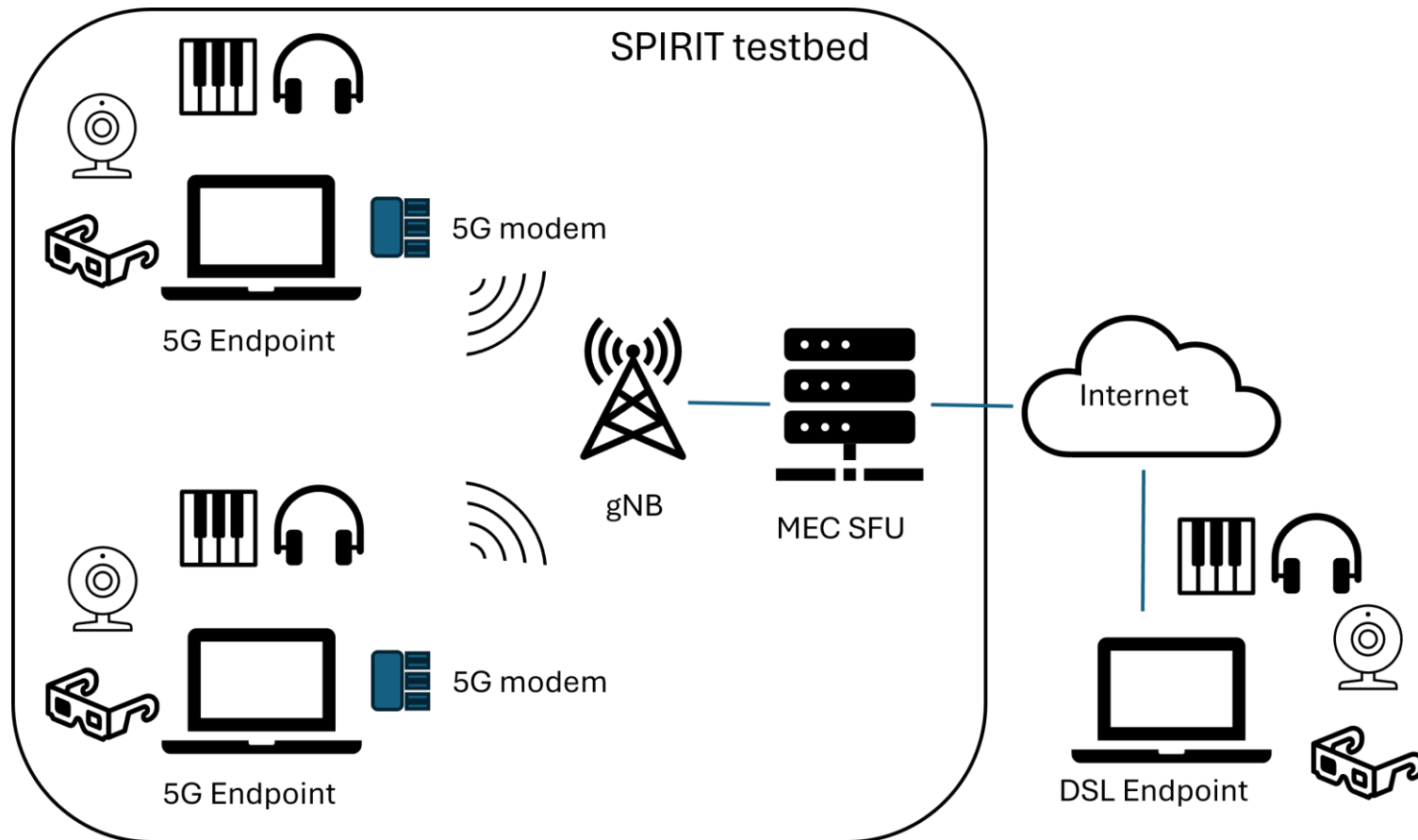
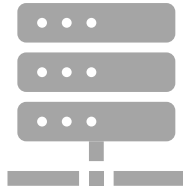# TENeMP endpoint configuration
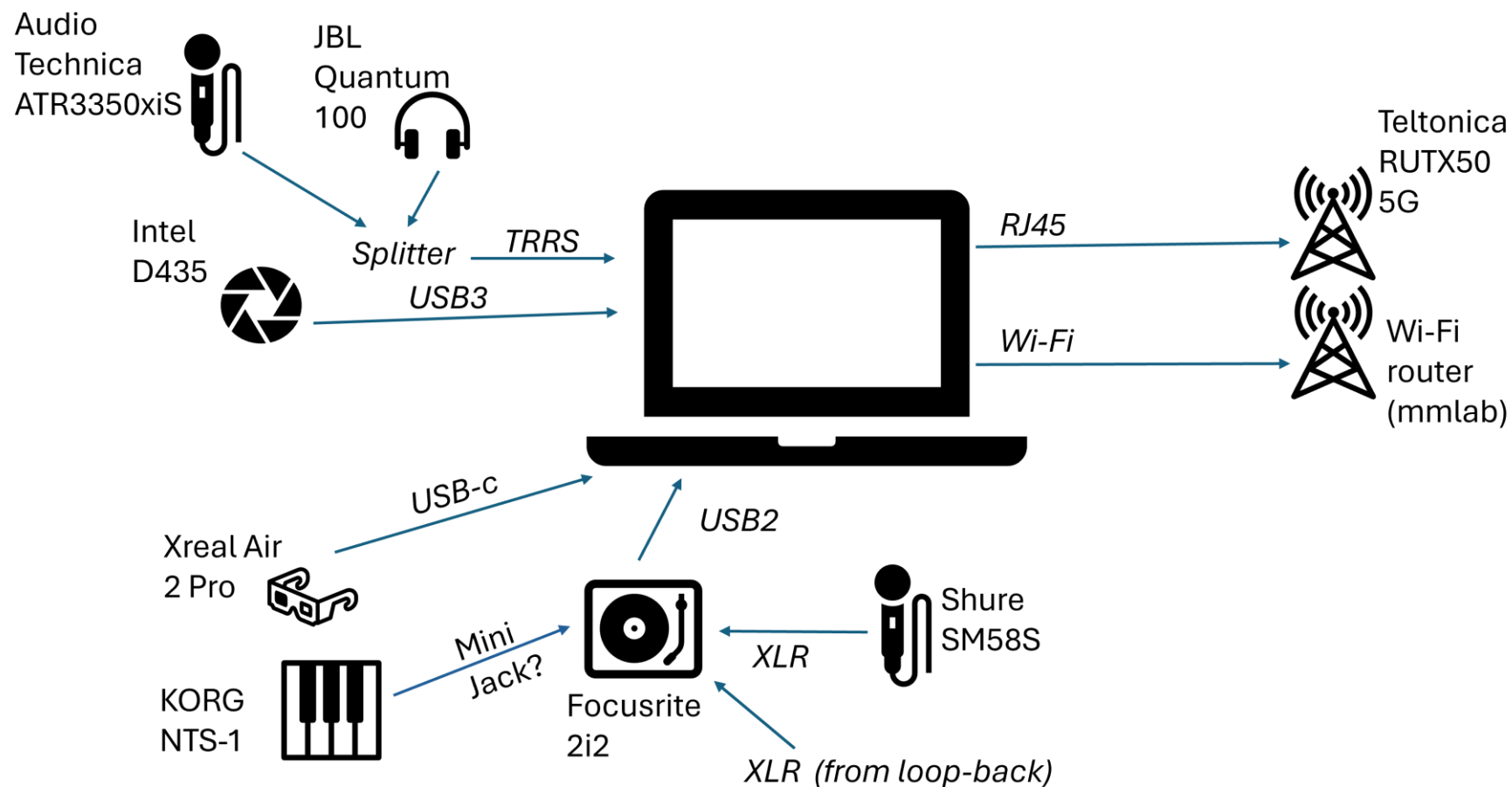
Metrics

Latency:

Measure mouth-to-ear & motion-to-photon delay

Send impulse signals, loopback

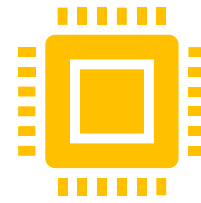Use Audacity (DAW) to measure difference

Bandwidth:

Measure packets (or bytes) received/sent at node network interfaces

Several Linux-based tools create traffic

- nload, bmon, iftop, vnstat, ifstat

Computing cost:

Measure CPU and memory usage of the SFU service

- `kubectl top node` command (available to cluster admin)