

Telepresence- Enhanced Network Music Performance (TENeMP)

George Xylomenos @ MMLab



Funded by
the European Union



SPIRIT

Project Team

MMLab team

- Postdocs: K. Tsioutas, Y. Thomas, A. Kefala, N. Fotiou
- PhDs: I. Pittaras, C.D. Nassar Kyriakidou, A.M. Papathanasiou
- MS: F. Bistas, I. Barous
- Faculty: G. Xylomenos (PI), G. Polyzos

Team experience

- Low-latency audio tools
 - Ultra-low latency SFUs with netmap and P4
- Largest QoE NMP study with real musicians
- Fighting latency in NMP since 2012!

Project Goals

Feasibility analysis of NMP over 5G

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

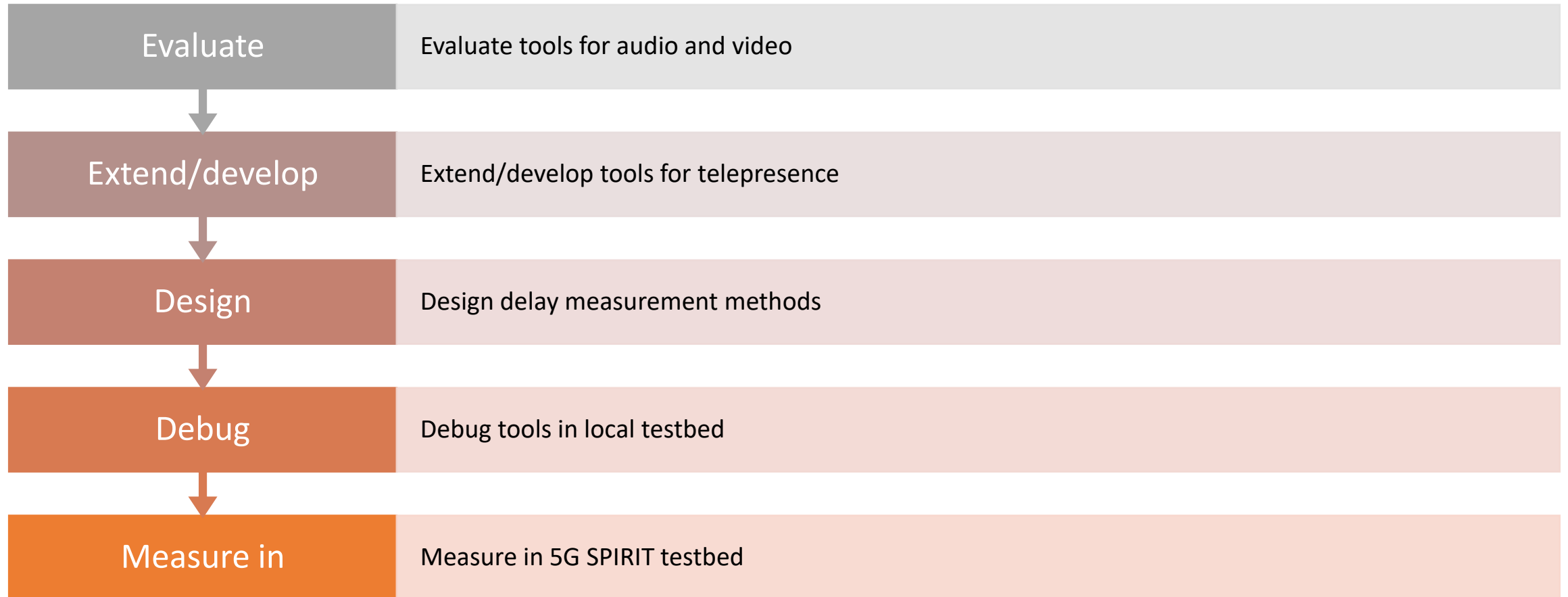
Performance gains of edge-computing

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

Integration of telepresence in NMP

- Can we offer volumetric video on top of the audio?

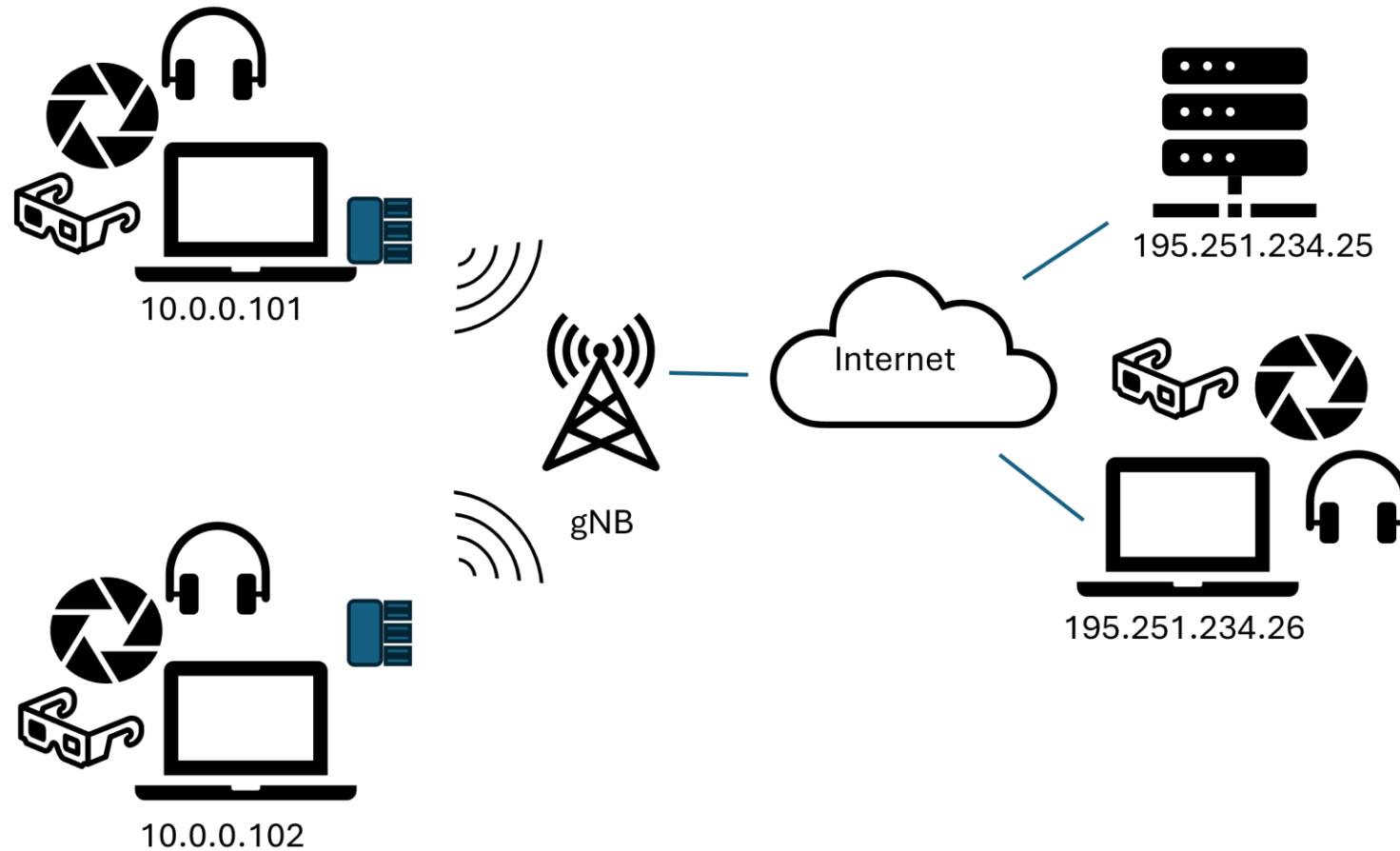
Project Activities



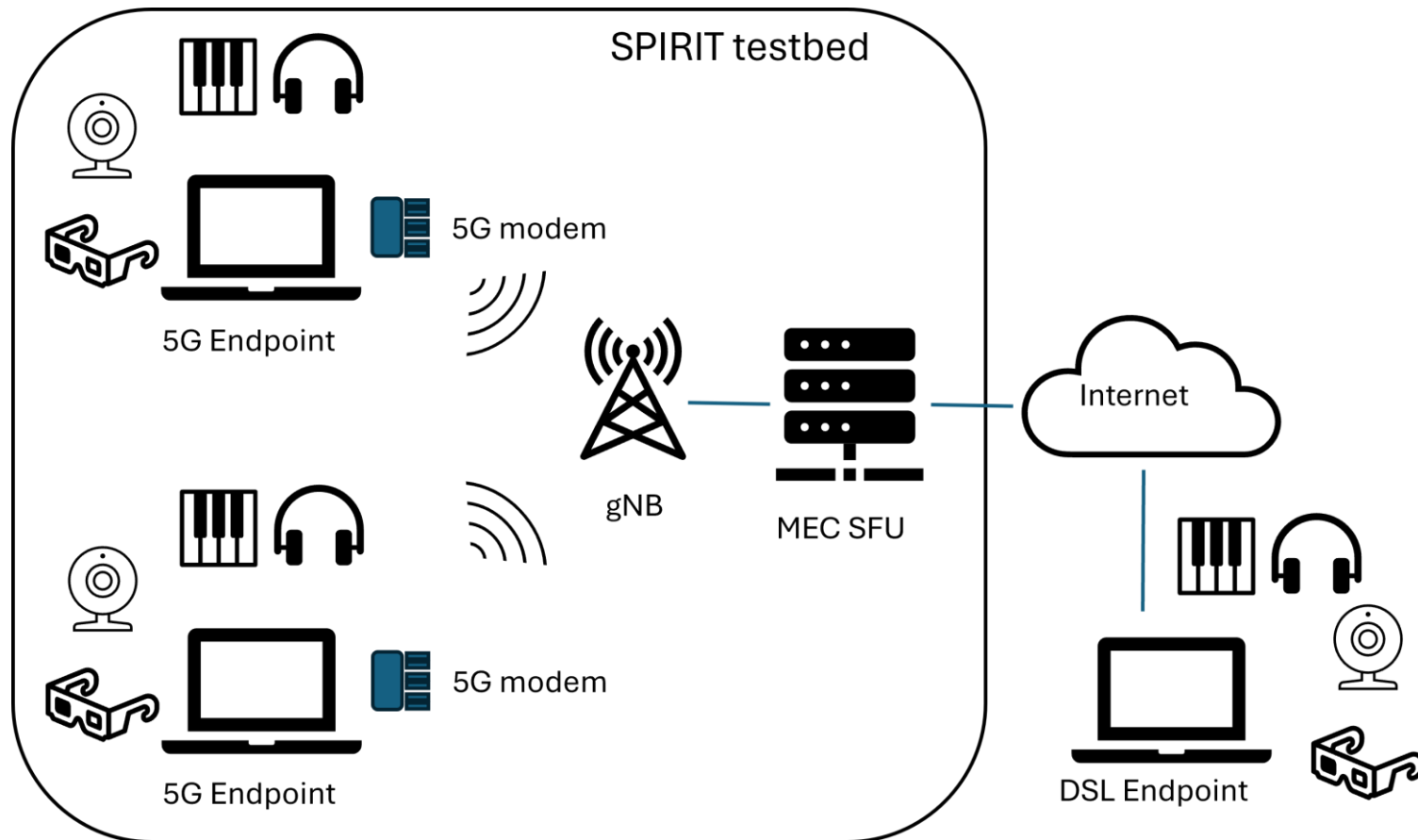
NMP Use Cases

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	

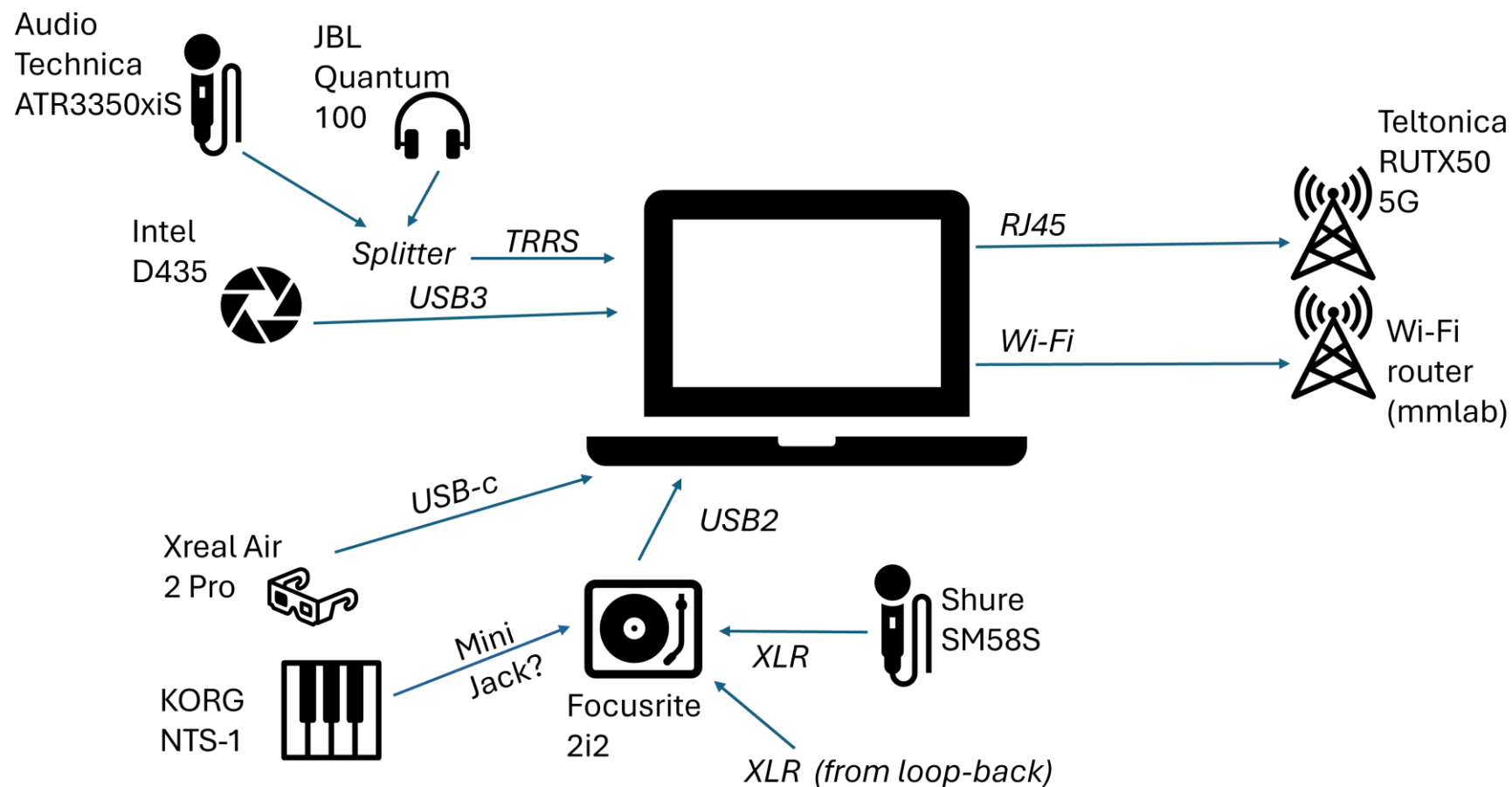
TENeMP topology @ Mmlab testbed



TENeMP topology @ SPIRIT testbed



TENeMP endpoint configuration



Metrics

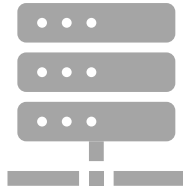


Latency:

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

Send impulse signals, loopback

Use Audacity (DAW) to measure difference

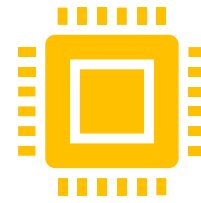


Bandwidth:

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)

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

Funded by the European Union (SPIRIT, 101070672). Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them. The SPIRIT project has received funding from the Swiss State Secretariat for Education, Research and Innovation (SERI).

