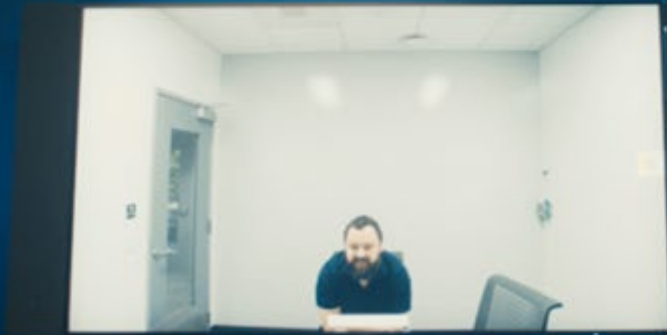# Audio Futures:
Technologies for Games

Scott Selfon
Audio Experiences Manager,
Facebook Reality Labs Research

Agenda

1. Defining audio presence
2. Experiences driving technology
3. What we've learned from the future and can use in the present
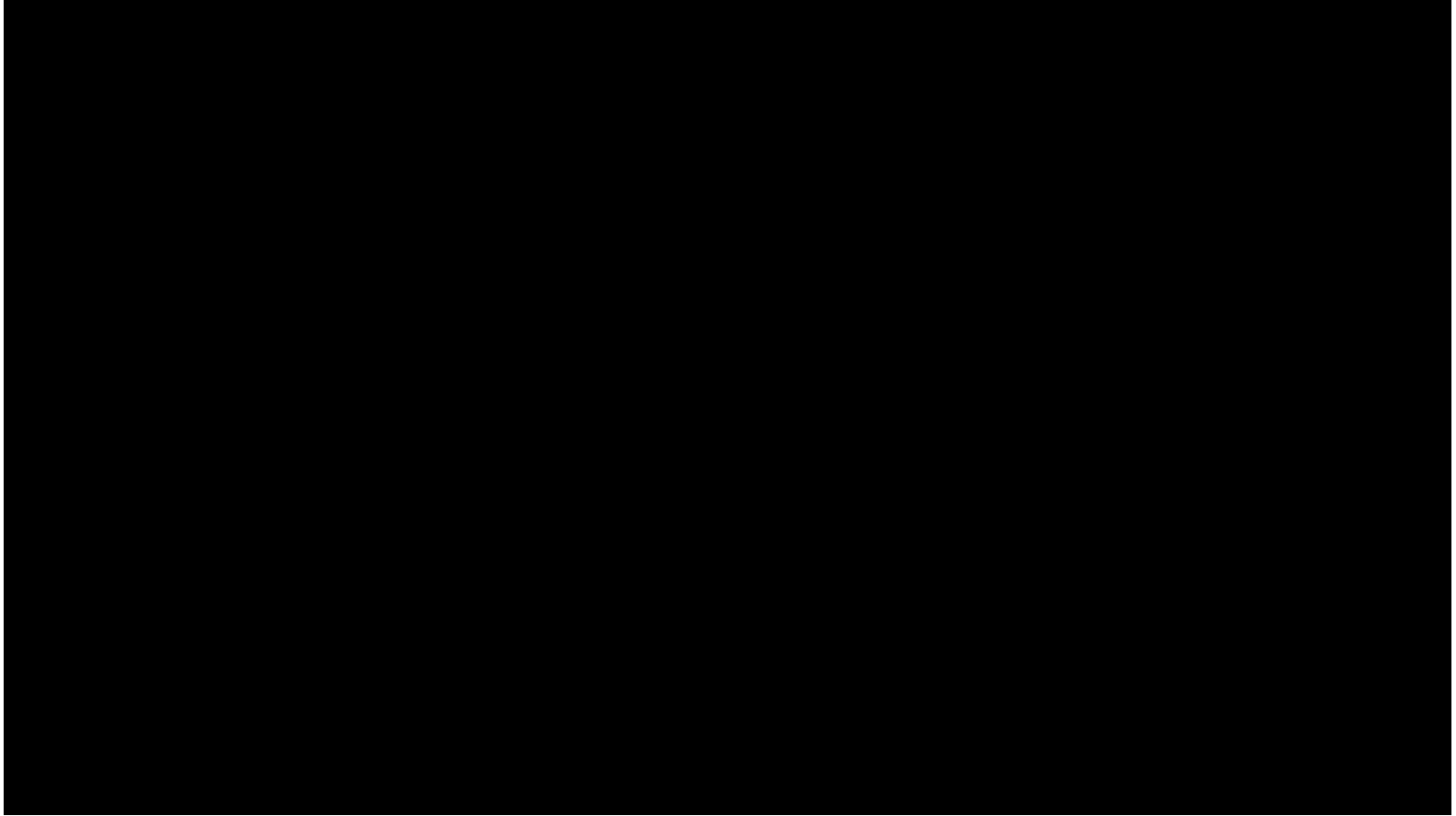4. Emerging best practices

Distance

Experiences of Audio Presence

Audio Presence: "Rewinding Reality"

Audio Presence: "The Cassette Player"

Audio Presence: "The Cassette Player"

Audio Presence: "Virtual Audio Competition"

Bringing the Future to the Present

Capture and Render Fidelity in the Here & Now

State of voice capture & reproduction
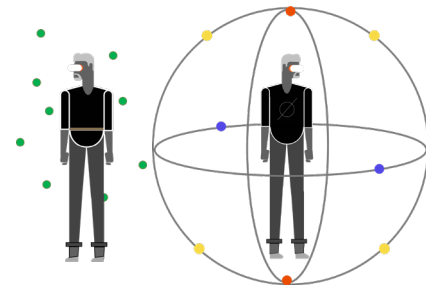
Capturing my (real) environment

Building and sharing a plausible virtual environment

Spatialization in the Here & Now

Taking full advantage of current capabilities

- Literal and creative positioning uses

- Spatialization and clarity

- Mixing between head-fixed, body-fixed, world-fixed, non-diegetic

An Aside: Why Spatialize in VR/MR/AR?

Repercussions of bypassing spatialization for head-locked sounds:

- Can mask spatial cues of other sounds

- Can dominate spatialized sounds (amplitude, spectrum)

- Can collapse the entire sound field to the sides of (or inside of) the head

Instead consider:

- Virtual speakers (at fixed listener distance and from aesthetically appropriate positions)

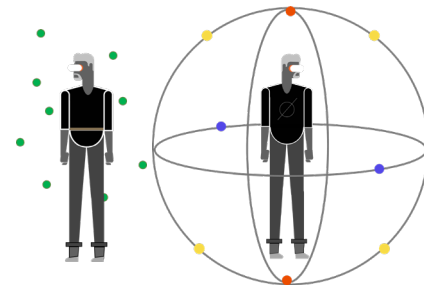- Gently filtering sounds in primary spatial/spectral cue areas

Spatialization in the Here & Now

Taking full advantage of current capabilities

- Literal and creative positioning uses

- Spatialization and clarity

- Mixing between head-fixed, body-fixed, world-fixed, non-diegetic

- Directionality

- Volumetric emitters

Acoustic Propagation in the Here & Now

Reverb:

- The evolution of real-time interactive acoustics

- Early/late reflections based on actual game spaces (geometry, materials)

- Directionally spatialized reverb (RIR->BRIR)

- Direct/Indirect Path levels
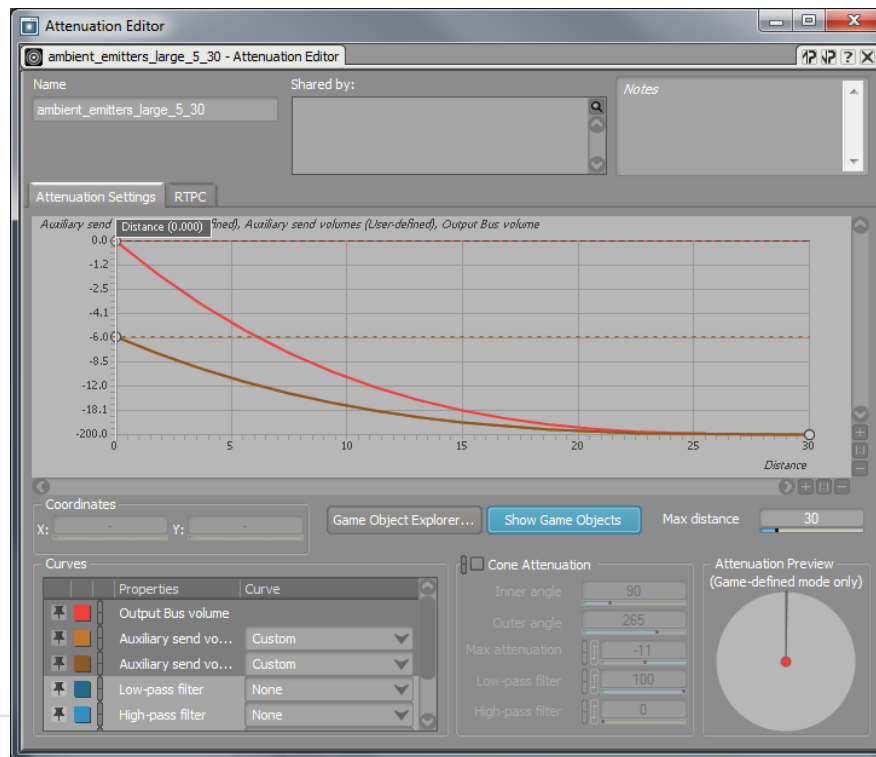
- Distance and Scale
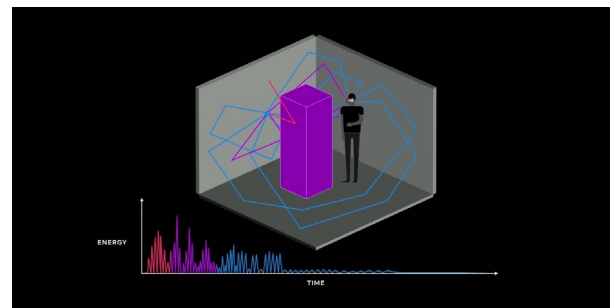
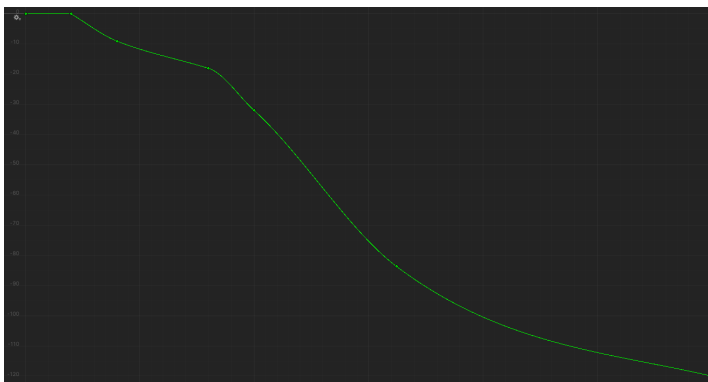# What Does Distance Actually Mean?

Image courtesy of Audiokinetic

Distance in Immersive Experiences

Scale:

- Listen and validate in "world scale"

- What about when world scale can change?

The Best Practices (So Far)

The Best Practices – So Far
From Other Media

Critical listening/mixing in high quality environment

Listen and validate on expected consumer's actual devices

Validate mix in expected actual playback environments

Use all of the best practices you've learned for storytelling

The Best Practices – So Far

Mix relative to well-defined playback levels

(ITU-R BS.1770-4 LUFS as metering benchmark)

Device	Recommended Mix Reference
Oculus Rift / Oculus Quest & Quest 2	-18 LUFS
Portal (media)	-18 LUFS
Portal (playback during calls)	-24 LUFS
Spark AR	-20 LUFS
Spark AR (during mic capture)	-35 LUFS (sometimes -55 LUFS)

- Compare/balance to existing "system" experiences

The Best Practices – So Far

Plan for the real world's potential impact:

Movement through space (not just time)

VR: Loud/shared playback environments

AR: Dynamic, competing/complimentary sound of the entire world

Mixing in space

Space as another tool for clarity/density

Elevation as a tool (not just for literal sound localization)

Thank you

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Learn more:

https://tech.fb.com/inside-facebook-reality-labs-research-the-future-of-audio/

FACEBOOK
REALITY LABS