

**Redefining the limits
of reality**

BARCO

The Forgotten Element of Simulation Training: *Immersive Audio*

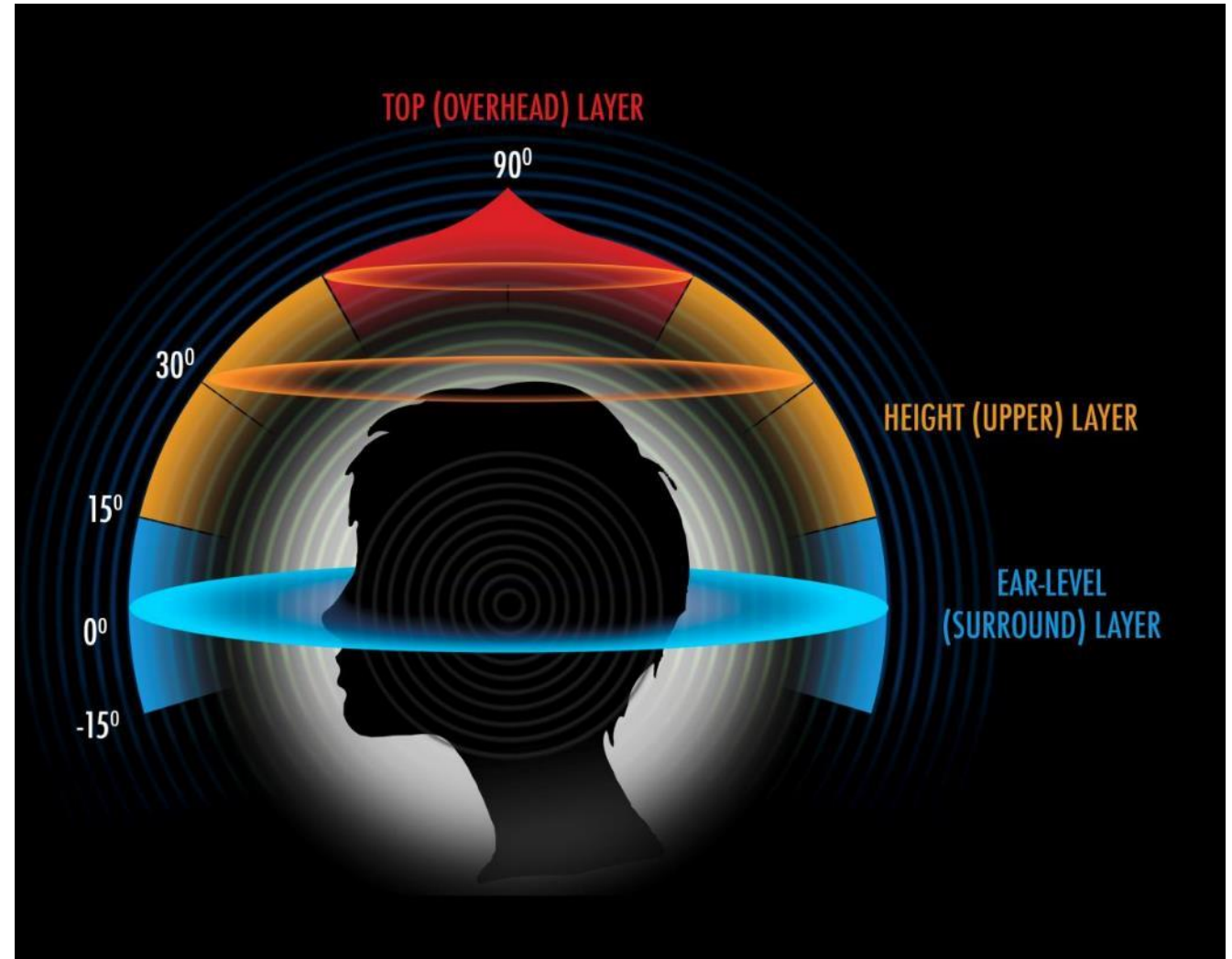
Dave Fluegeman, VP, Simulation

26 March, 2019

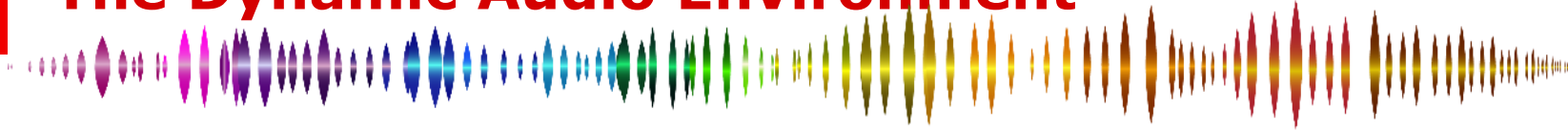


Object-based sound means:

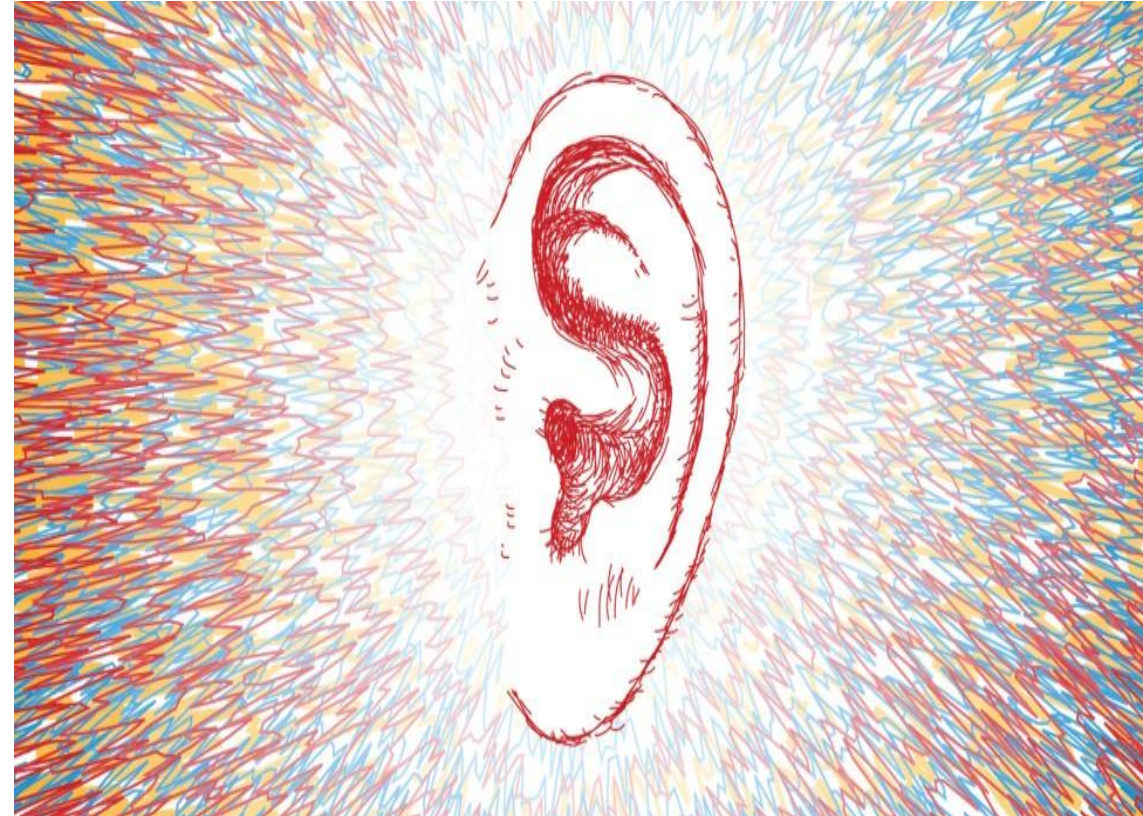
- It positions sound correctly relative to the trainee's position and object's behavior in 3D space (x,y,z).
- No sweet spot.
- Independent of speaker setup.



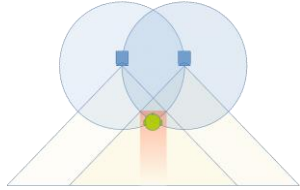
The Dynamic Audio Environment



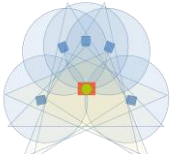
- A true separation from consumer-level audio systems
- A completely separate modelling environment from Visual
 - Modelled audio to reflect specific characteristics
 - Audio modelled to be acoustically perfect
 - Reverberation and doppler
 - Positional and in-motion processing
- Can be fully correlated to the visual environment for suspension of disbelief



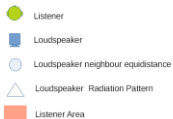
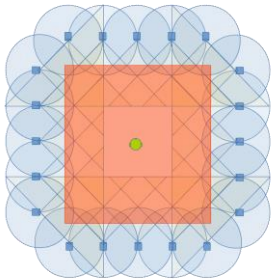
Stereo vs Surround Sound vs Immersive audio



- Stereo sound uses 2 loudspeakers to create an image appearing to come from between 2 loudspeakers.

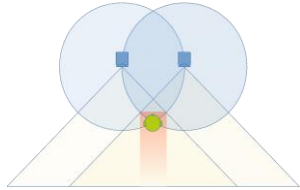


- Surround sound let's the listener hear sounds from a certain direction and sound can also come from behind. Usually as a channel based output solution (5.1/7.1 etc.) .
 - Spatial effect hard-coded in signal delivered to a fixed speaker array



- Immersive audio require accurate reproduction of sound scene and localization to:
 - Immerse the listener in the scene to suspend the feeling of disbelief.
 - Correlate audio with image exactly (HMD and Dome projection applications)
 - Give the listener freedom to move around.

The Challenge with Surround Sound

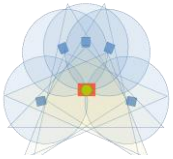


- Traditional surround sound layouts (5.1/7.1) depend on an exact predetermined positioning of the loudspeakers and the listener (defined sweet spot).

- Not always conducive to training tasks or environments

- The individual channels have the spatial information embedded

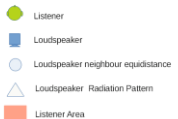
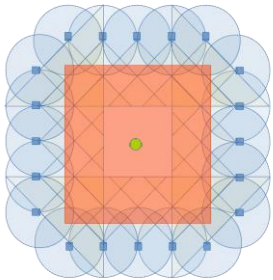
- "Immersive effect" is pre-processed and delivered to a specific channel



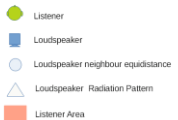
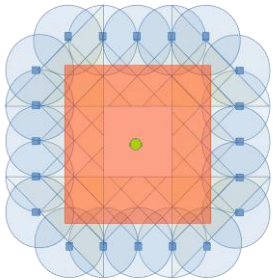
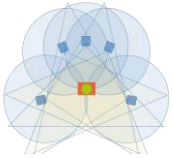
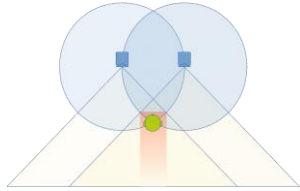
- Changing the positioning of the loudspeakers or moving out of the sweet spot breaks down the perception of immersiveness.

- One part of the "immersive effect" dominates and the audio environment becomes unbalanced

- Localizing a precise audio cue in a complex, real-time training scene becomes difficult.



True Immersive Audio



- Realistic behaviour of sound across the loudspeaker arrangement transfers the trainee to the virtual world and create a sense of “being there”.
- Moving around the training space enhances immersive aspects.
- Object based sound or treating individual sounds in the scene as objects detaches positional information from the sound signal and introduces meta data that can be processed separately. Interfacing directly with the simulation.
- Vital for training in sound related skills like shot detection and night operations, as well as other low visibility environments and certain failure identification scenarios.

Immersive Audio

Training benefits of immersive audio

- Auralize objects beyond the visual threshold. Objects can be realistically cued even if they are out of sight.
 - Can be correlated with real-time visual, or time-synched with video or live exercises.
- Immerse the trainee in the synthetic environment providing a lifelike experience.
- Create disruptive audio environments to induce stress and train decision making under pressure.
- Train for low visibility environments and nocturnal scenarios.





First Responder





Battlefield Care





Command & Control Centers





Multi-crew Environments



Situational Awareness Training Ecosphere

Military Medical



Emergency Medical
(Public)



**Audio-driven
Sensory &
Environmental
Cues**

Law Enforcement

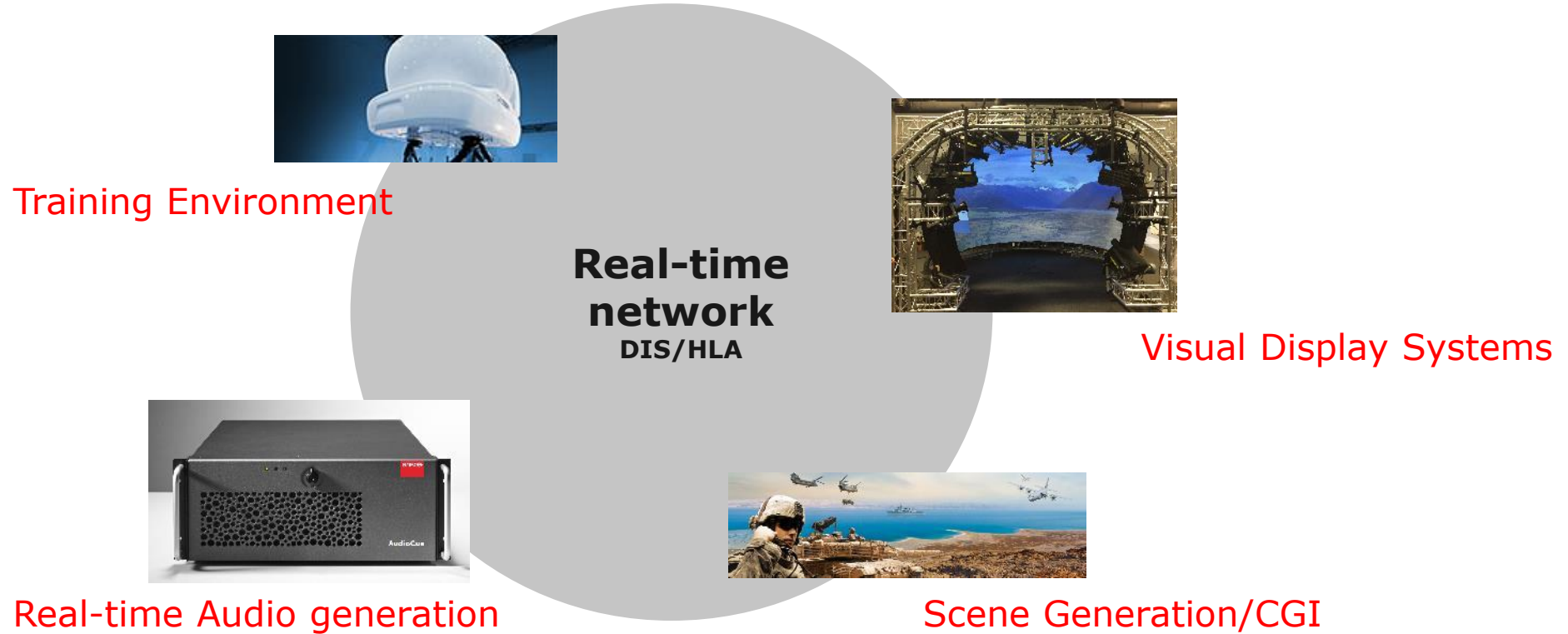


Firefighting
Military & Civilian



Compiled audio cues
played at specific times

AudioCue in the Real-Time Training Ecosphere



BARCO

Barco AudioCue



Don't just train your eyes

AudioCue, deploy immersive audio and raise
the gain of your training



**Redefining the limits
of reality**

Barco Simulation
Engineered to Outperform