The next generation of data collection is multimodal

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Motivation

- **Multimodal Imaging for Brain Research:** Combining MRI, EEG, and other methods enhances understanding of brain structure, function, and disorders [1].
- **Integrating Diverse Data for Deeper Insight:** Multimodal approaches link brain activity with behavior, emotion, and social interaction by incorporating facial expressions, movement, and environmental context [2, 3].
- **Next-generation MoBI Lab Design:** A multimodal brain/body imaging (MoBI) lab captures brain activity and physiological signals (EEG, EMG, ECG, eye-tracking, motion capture, and more) in dynamic, real-world scenarios [4].

Challenges

1 Each modality's hardware and software requirements often rely on multiple computing systems and peripheral devices, creating logistical and operational burdens.

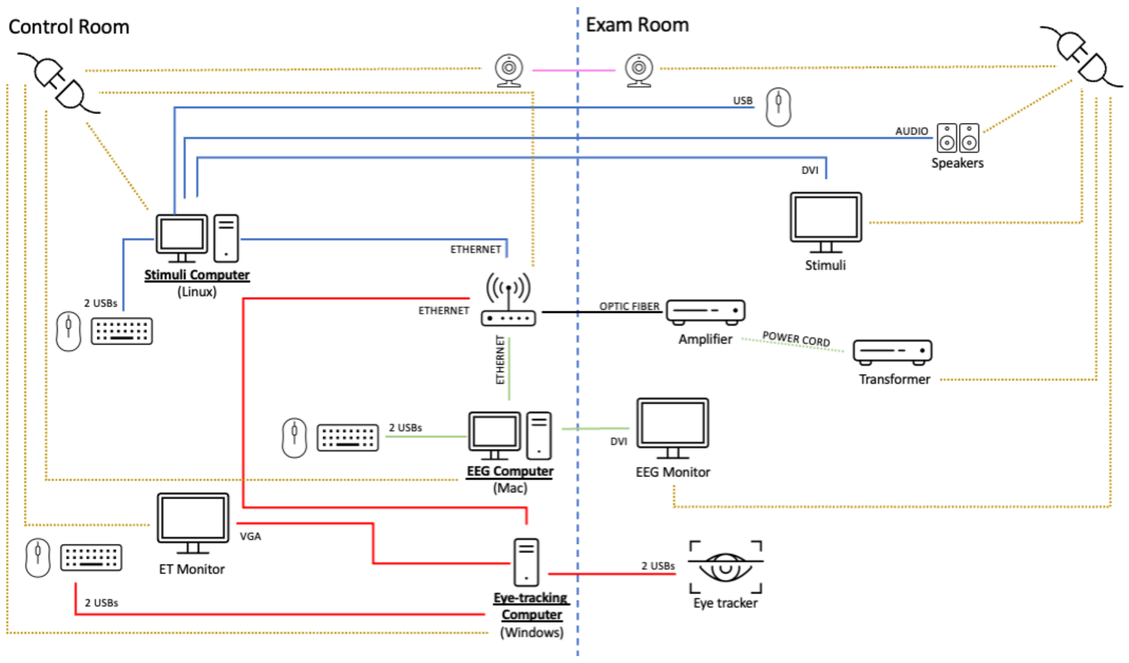

Figure 1: Simplified diagram of a traditional lab collecting EEG, eye-tracking, and behavioral data.

2 The independent acquisition of data streams for each modality results in separate files, complicating the synchronization of timestamps across devices.

CMI's MoBI Lab setup

1

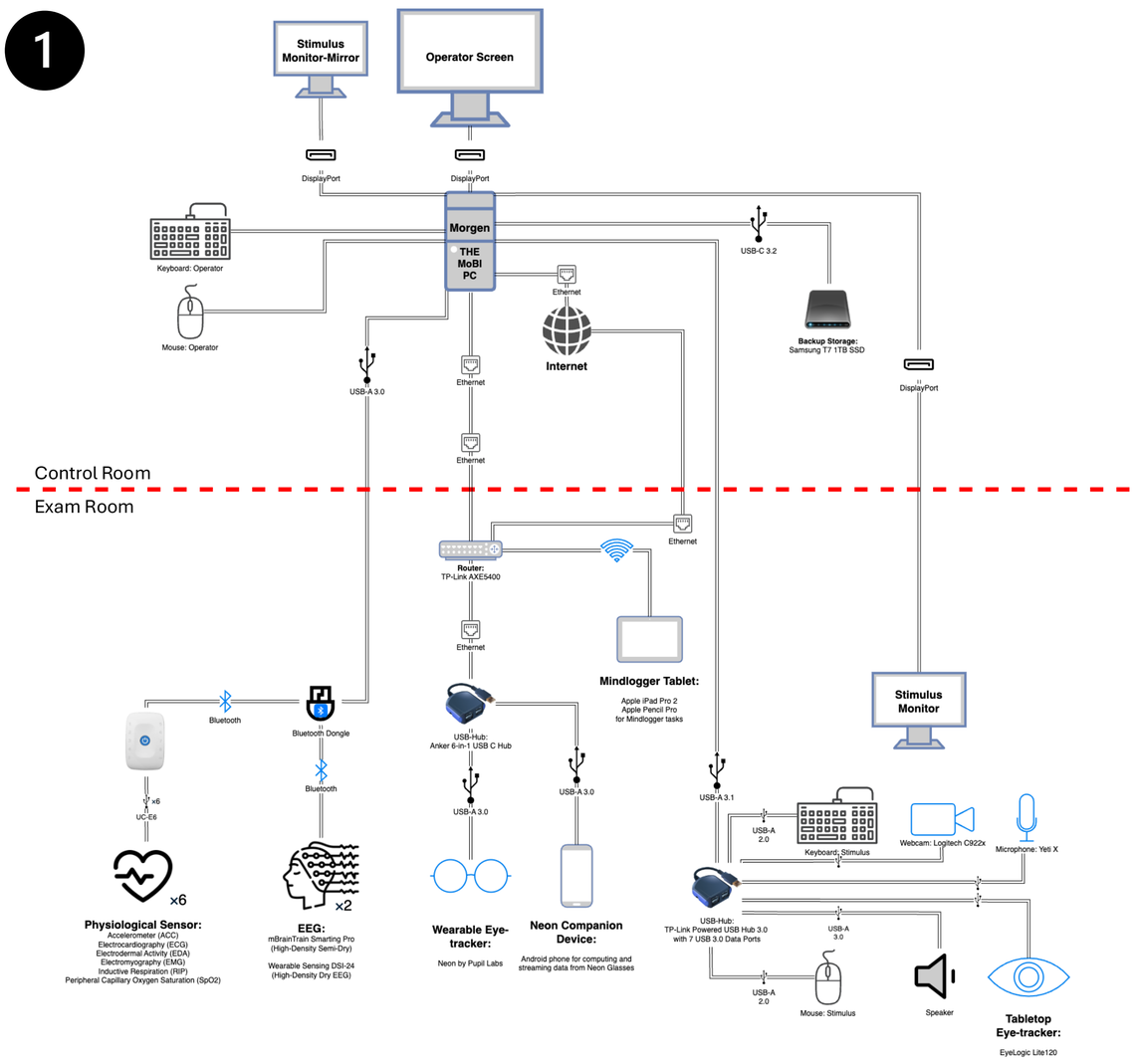

Figure 2: Basic schema of a MoBI lab setup showing the connection between each piece of equipment and the core computer.

2

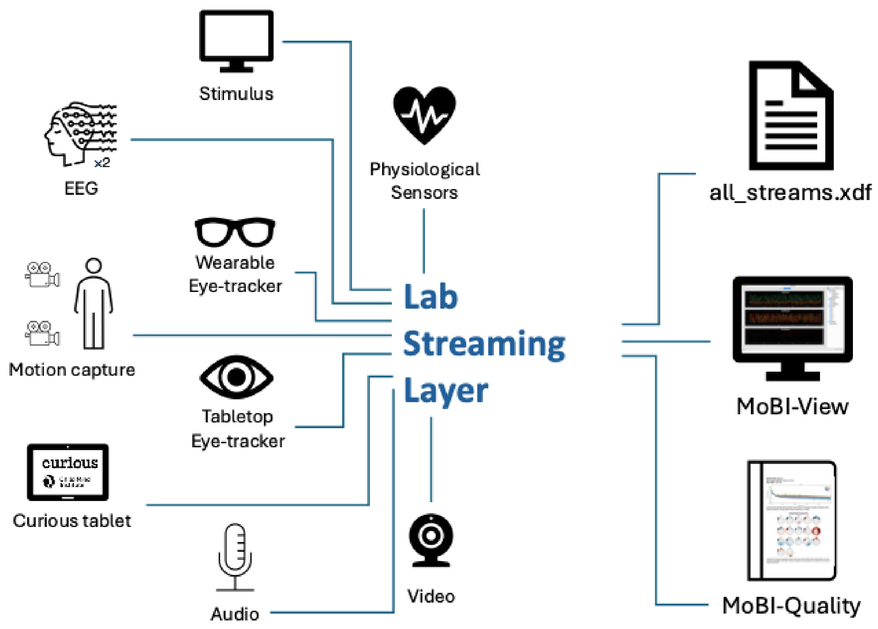

Figure 3: All streams are connected to Lab Streaming Layer (LSL). By using MoBI-View, you can check the data streams in real time. At the end of the session, you can run a quick data quality control with MoBI-Quality and have access to all streams saved in the .xdf file.

Take home message

- One computer for all data modalities.
- Cost reduction up to 50% compared to a traditional lab design.
- Documentation is publicly available (scan QR code below)
- Use of LSL's framework to achieve clock synchronization and time drift correction across devices.
- MoBI-View and MoBI-Quality facilitate real-time and post-session data quality checks.

SCAN ME

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[1] Warbrick, 2022 – Simultaneous EEG-fMRI: What have we learned and what does the future hold?
[2] Calhoun & Sui, 2016 – Multimodal fusion of brain imaging data: a key to finding the missing link(s) in complex mental illness
[3] Madsen & Parra, 2024 – Bidirectional brain-body interactions during natural story listening
[4] Makeig et al., 2009 – Linking brain, mind, and behavior