# Audio in the Portal

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# Topics to be covered (broadly)

- Preface
  - Our experience

- From the tangible to intangible
  - Room acoustics
  - Feedback, feedback, feedback...
  - Microphones
  - Signal Processing (DSP)
  - Signal path

# What's been our experience so far?

Our first semester saw us dealing with:

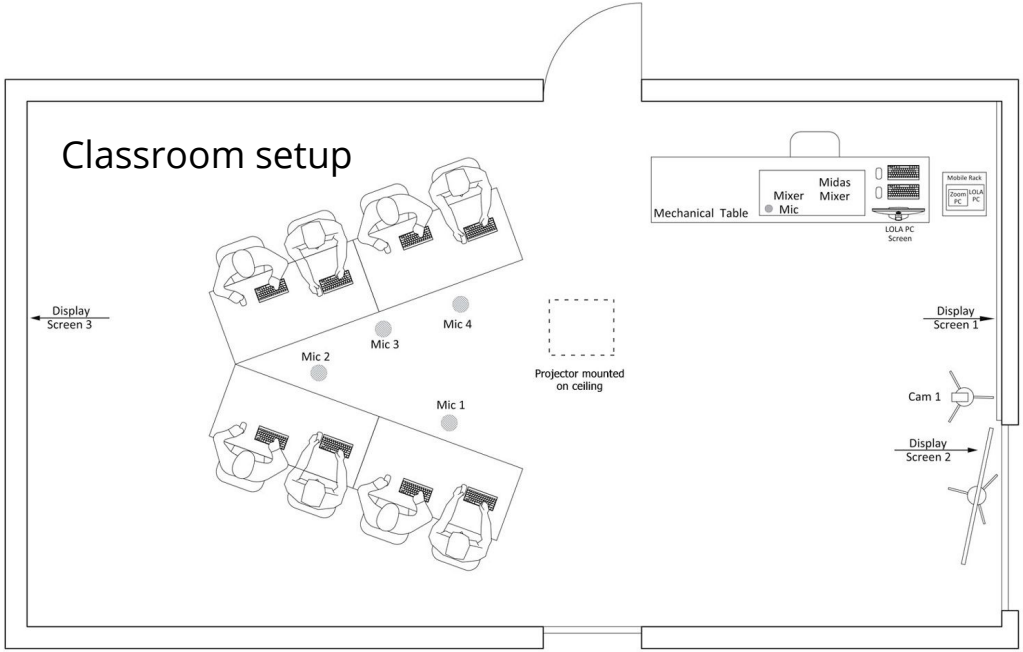
- Lots of feedback
- Strange mixing scenarios on both side (who gains who?)
- Difficulty making each other intelligible
- Setup and initialization troubles (connecting to LOLA)

- Asking the question, "Who knows how to do this?"
  - And quite soon after, "I don't know what's going on!"
  - Across every level of dealing with the Portal (acoustics, mics, DSP, and the signal path) there are wide ranges of experience and expertise
  - *It's better to attempt to learn yourself rather than rely on someone already knows*

All in all, a very educational experience

- And one that could serve as a teaching tool for working in any sound environment

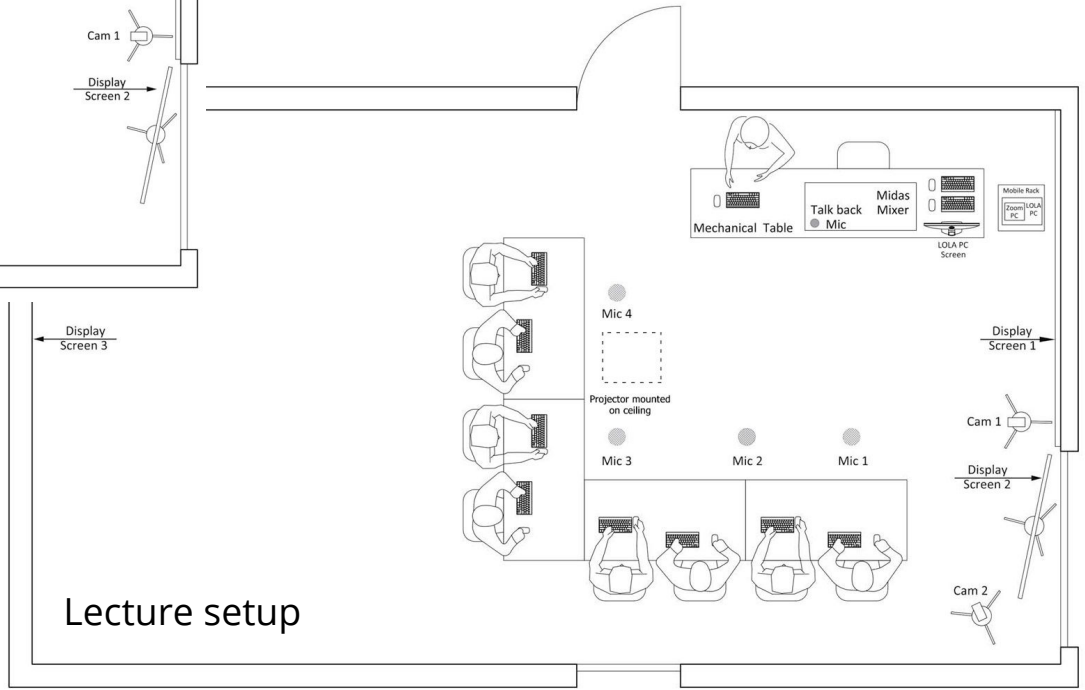
## Classroom setup




See this blog post on different class scenarios (past):

[Scenarios in the Trondheim Portal during the spring semester-2019 | The MCT Blog]

## Lecture setup

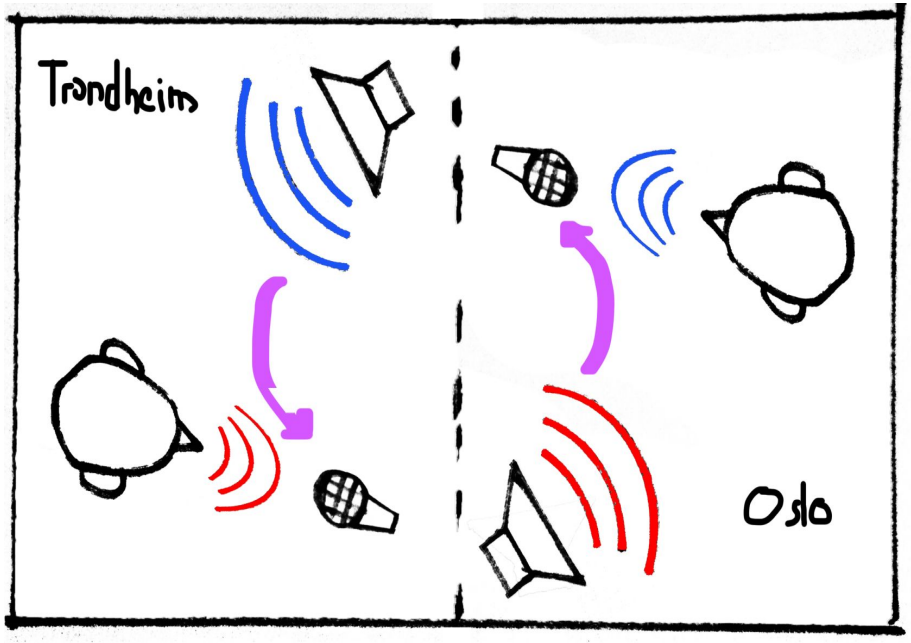


# The Portal - a “Feedback System”

- Sending signal via side A’s microphones
  - Signal comes out side B’s speakers
  - From these speakers, sound travels *back* into side B’s mics

- Side A’s voices reach side A
  - This is bad :(

First rule in the war on feedback:
**SPEAK AND ARTICULATE CLEARLY!**



# Room acoustics

The portal is not a professional studio and sound does tends to bounce around

Some ways to improve upon the acoustics of any space:

- Absorption and dampening of sound using different materials (curtains, acoustic panel)
- Speaker placement (keeping it head-level)
- Microphone placement (calculating the sonic bounce into our microphones)
- How do we make voices from the other portal sound natural when coming through speakers?
    - Different rooms can “shape” sound

The room acoustics play a large role in determining the equipment we use and DSP effects we employ

# Microphones

See: Microphone Testing Results | The MCT Blog

We've tested a number of microphones

Some are **far better** than others - why?

See here for just one example of our issues:

The importance of sound quality | The MCT Blog

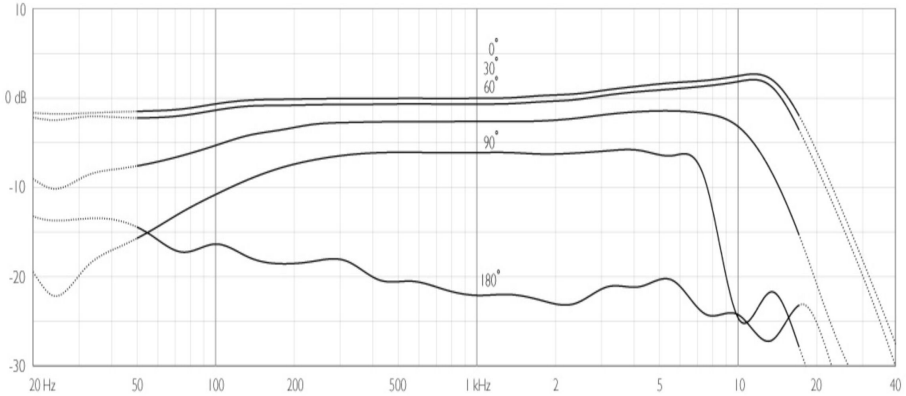
- Use case (communication vs. live music - big difference)
- Directionality
- Invasiveness (visual obstruction)
- Ease of use (how easy is it to rearrange microphones)
- Sensitivity
- Pattern control

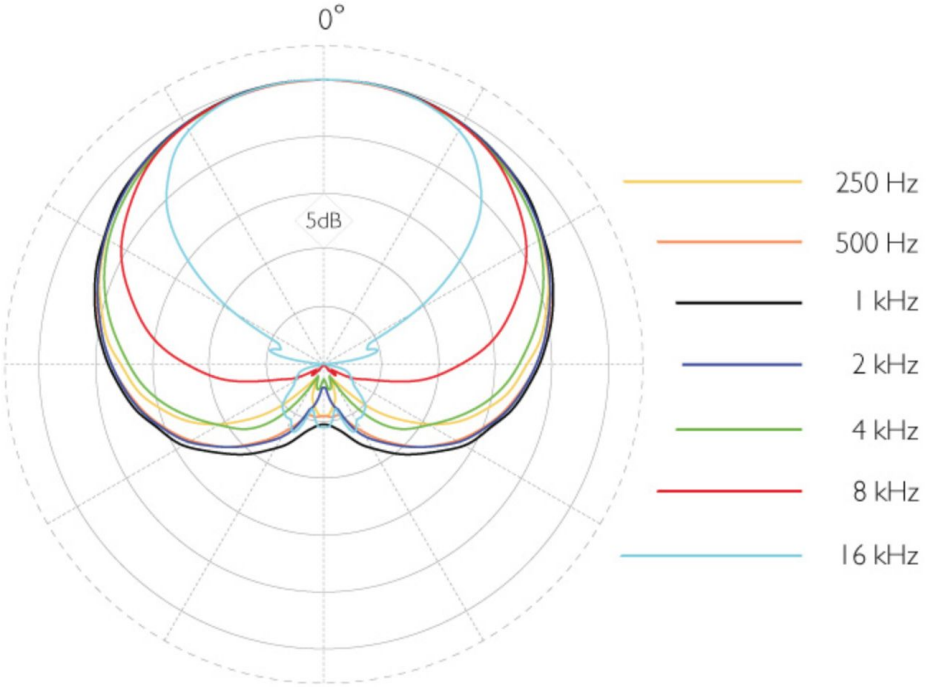
# Microphones

- We began with 4 section microphones
  - 4 boundary microphones (Audio Technica U841R) in Trondheim
  - 4 condensers (AKG C414) in Oslo
- Consolidated to 2 overhead
  - 2 cardioid condensers in near-coincident in (DPA 2011C)
- Presenters have spot microphone (C414 or Shotgun)
  - Worn Lavalier in Trondheim
  - Hypercardioid pointed to middle desk in Oslo
- Panning of mics determined by usage
  - Wide live like pan to determine direction
  - Narrow pan for discussions

# Dpa 2011c

- Good speaker rejection + wide cardioid pattern captures speakers sides
- Honest frequency response preserves legibility



# Signal path

See: [Portal Flowchart | The MCT Blog]

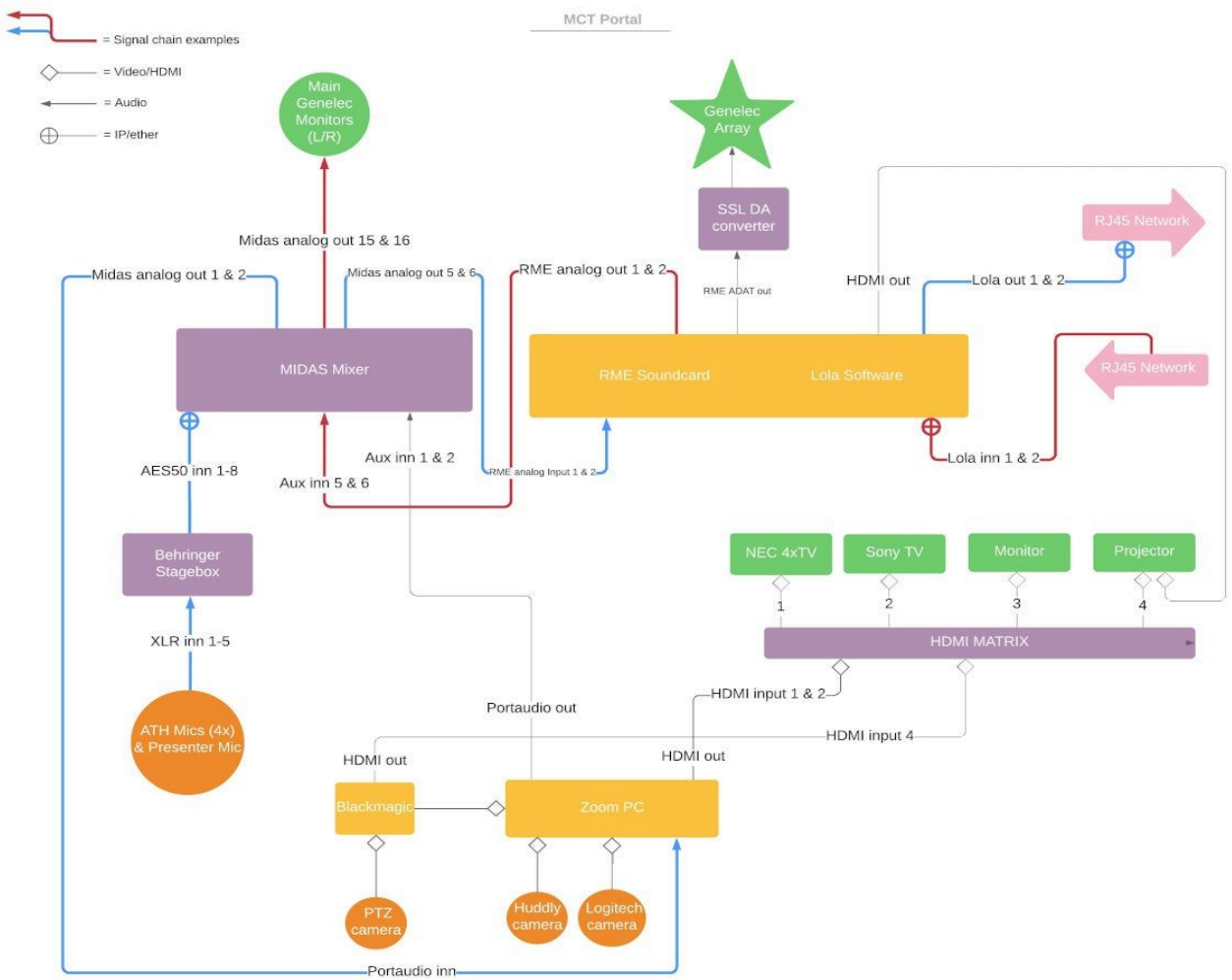
From our diagrams, it's a pretty complicated setup.

- Cameras, stage boxes, video matrixes, audio converters, video converters
- Mircophones
- A dedicated PC for LOLA and for Zoom
- 1Gb/s network connect across the schools

... and it's changed ***a lot*** since then...

Simplification has been our priority!

But some items are necessary in the signal chain (ex. converters, routers)



# Signal path - LOLA / Zoom

We primarily use LOLA - a state of the art, low-latency solution for A/V

For most classroom communication between Oslo and Trondheim we use LOLA as a dedicated solution - no downtime, self-hosted, pre-built hardware

Zoom is used as a fallback, or if an external party is joining or if something fails

- Passing audio through Lola is “simple”
- But what if someone joins on Zoom?
  - Needs particular setup!
  - Only ONE side (side A) routes all LOLA audio (both sides) to/from zoom
  - Side B is “Zoom-muted” (again: routed by Side A)

What if there is a live performance? (Synchronising mixing approach at both ends…)

Multi-channel? Ambisonics? (8-channel ADAT…)

# Signal Processing (DSP)

The Holy Midas M32


- Contains many standard DSP effects that can be applied on any channel or channel groups

- Different Approaches:
  - Gain matching
  - EQ matching (reciprocal process - “less is more” - “more = phase-issues")
  - Gating (reducing ambient noise)
  - Polarity inversion (phase cancellation at correct mic/speaker distances)

- Varying results:
  - Auto mix, see: An introduction to automix | The MCT Blog
  - Auto ducking

- However, things can become convoluted quickly
  - “Who did what?” - A need for distributed knowledge across students
  - Expertise and knowledge are often unbalanced across groups