

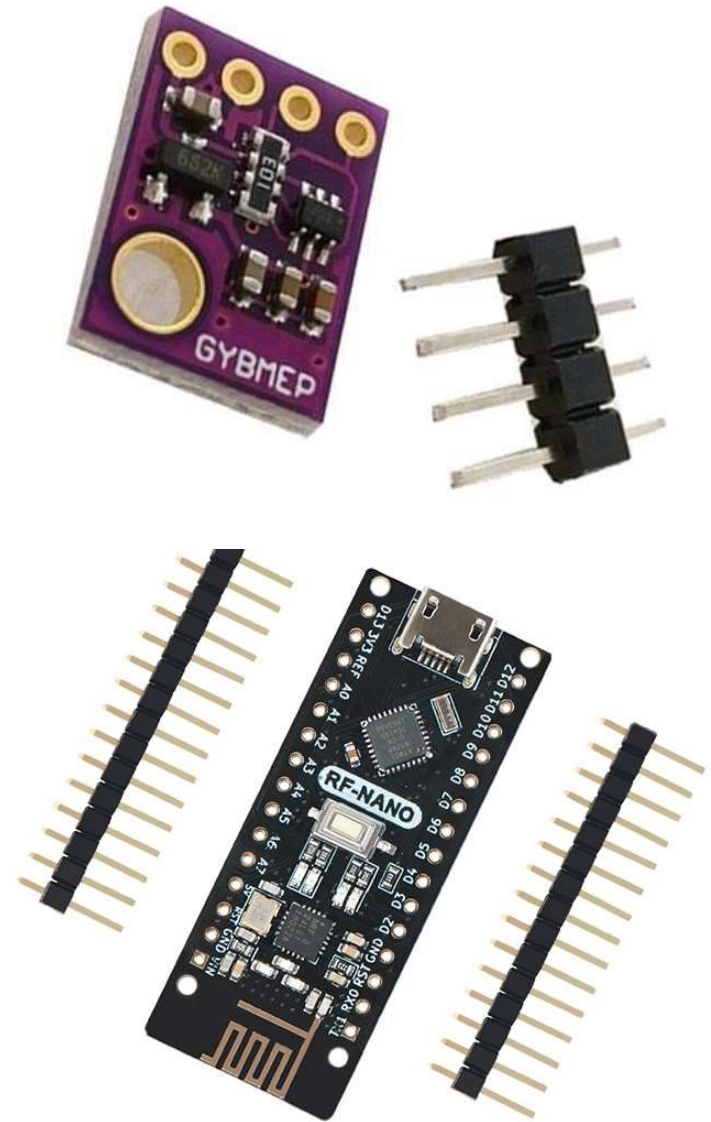
# Valpo SensorNet

Musical Instrument Microclimates

Daniel Piccoli

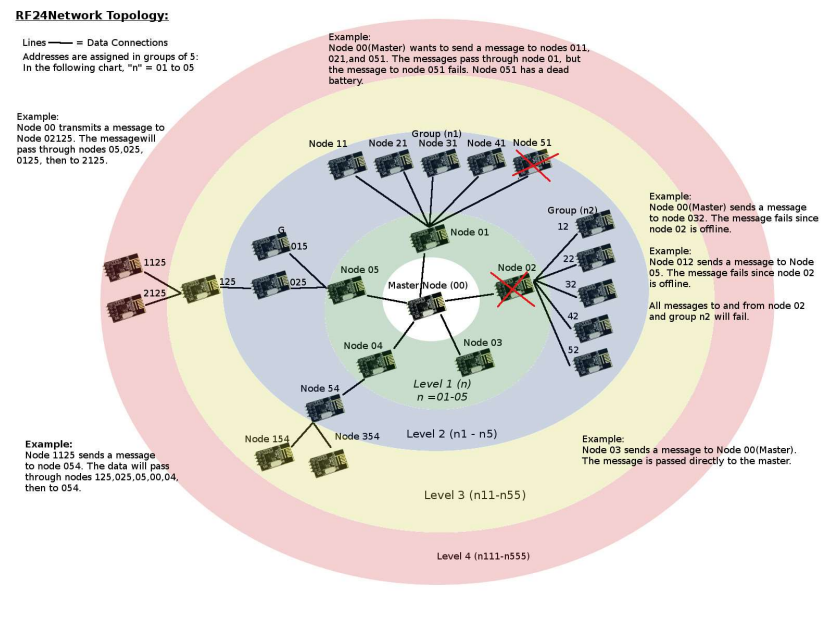
# Why measure climate?

- Environment can have huge effects on musical instruments
- Temperature, humidity mostly to cause
- Valparaiso University Chapel lacks climate control
  - Important to observe the effects of this



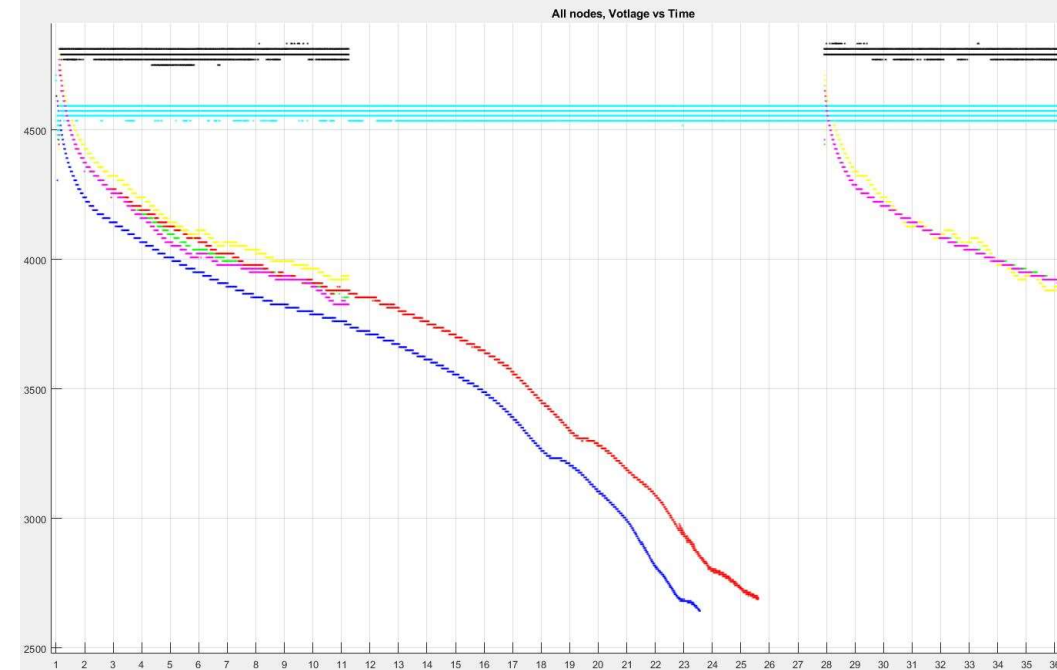
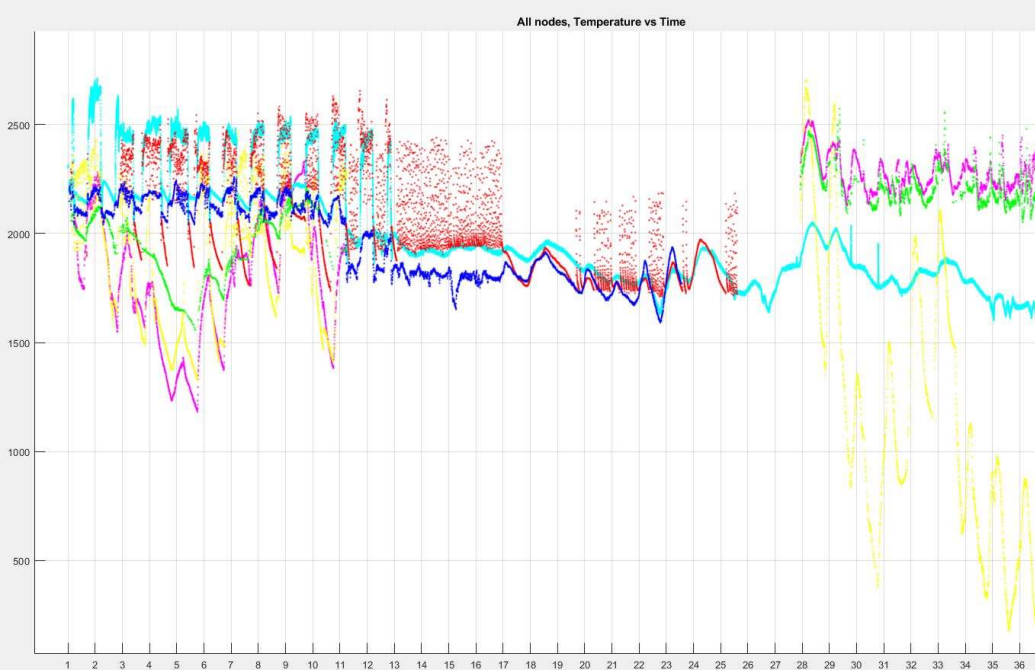
# How to Measure?

- Static vs “Dynamic” Topology
  - Dynamic Topology is excessive
- Static Topology gives greater sleep capabilities



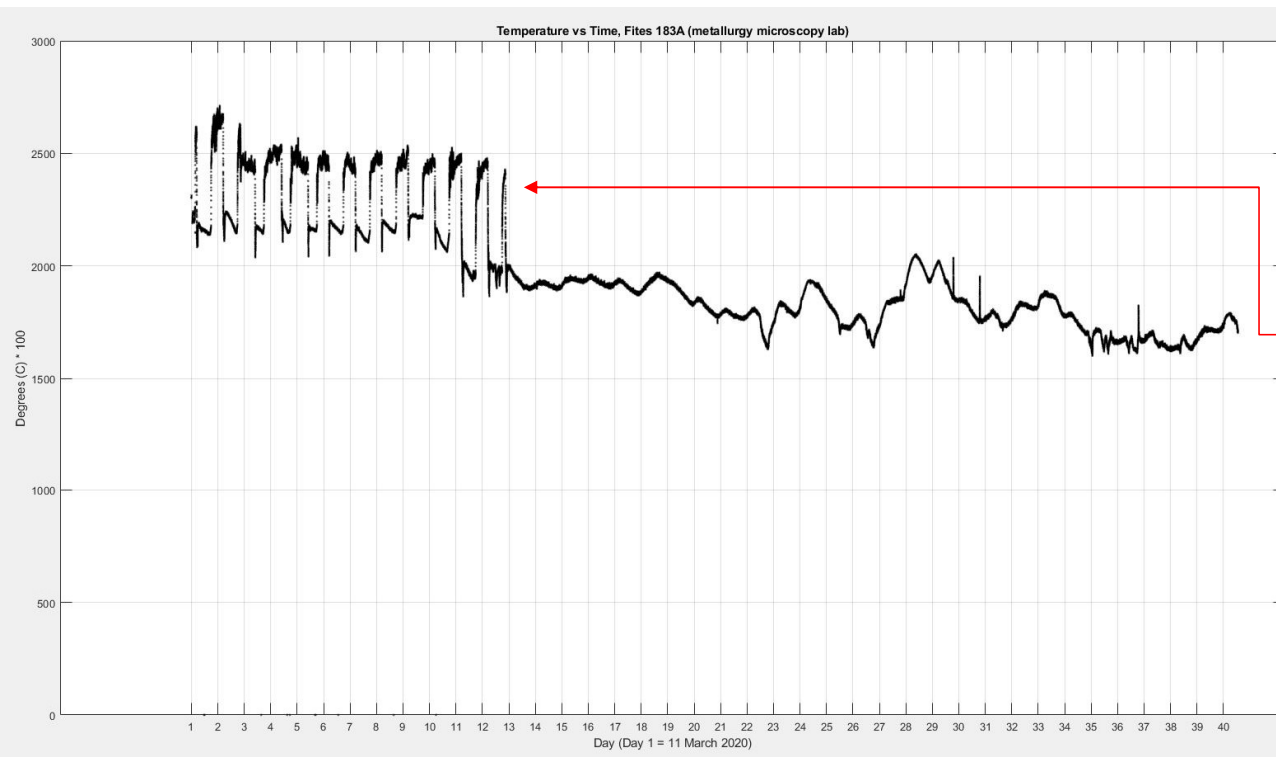
# What do we get?

- A LOT of data – over 500-thousand measurements!



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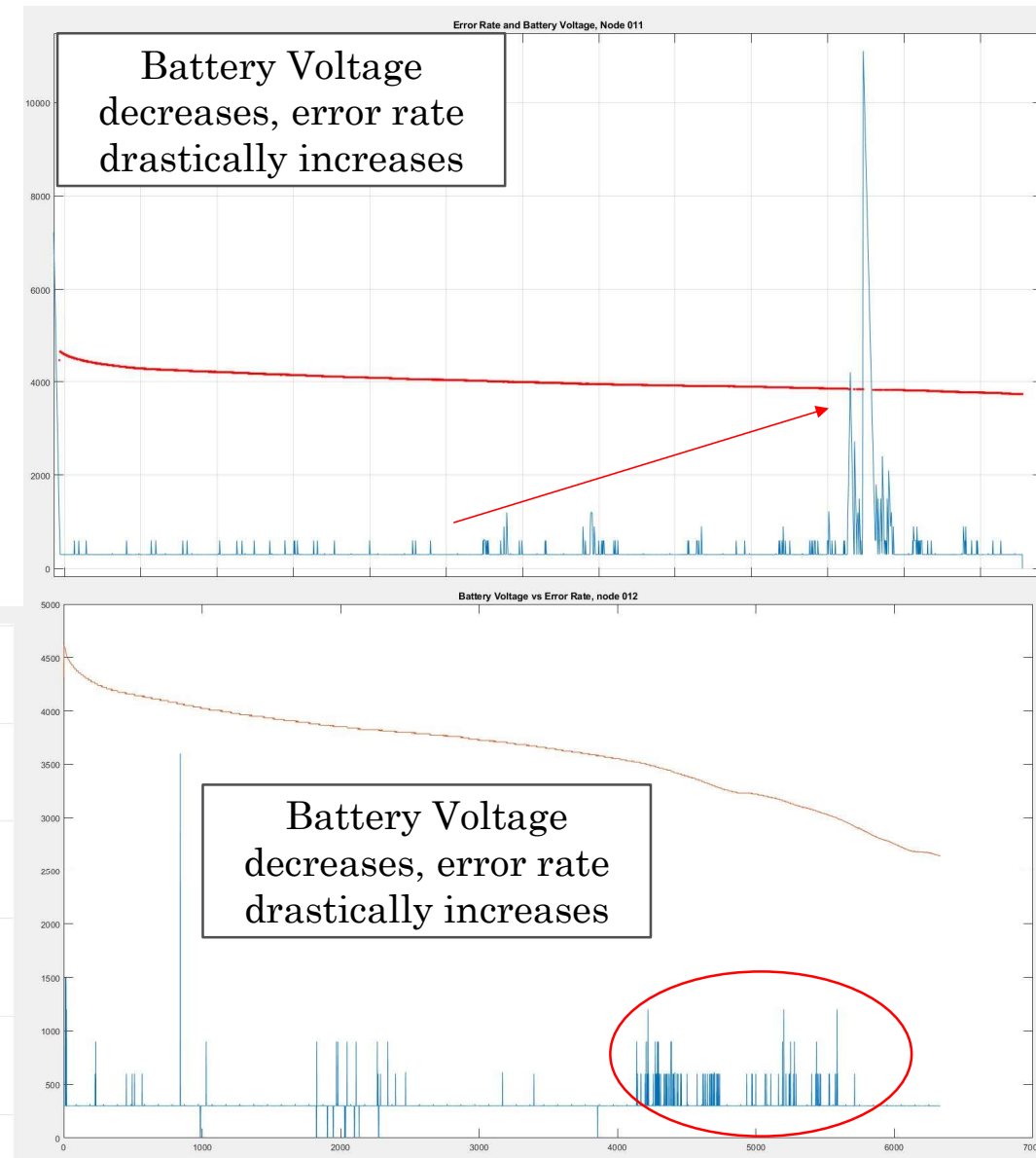
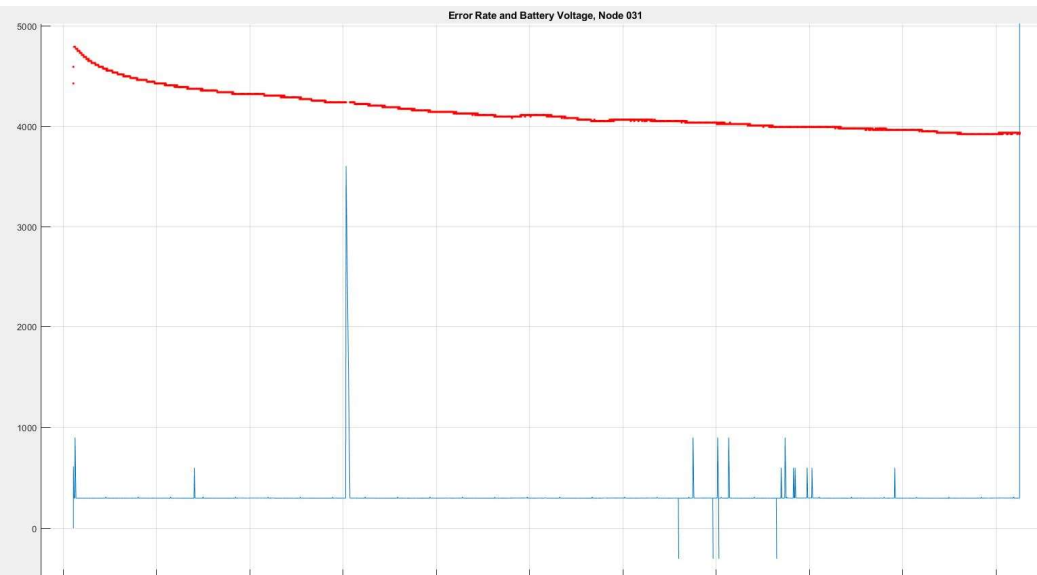
# What do we find?



- Due to online courses, unable to get on-campus to measure organ
- We can observe the effects of online courses directly
- Announcement of online courses directly coincides with 5-degree cooling in Fites

# Transmission Error Rate and Battery Voltage

- Plot shows time between transmissions
  - Programmed to be once every 5 minutes
  - As batteries lose charge, devices lose effectiveness
  - Blue spikes indicate failed messages



# Trial 1 vs Trial 2 – Battery Life

- Reducing sample rate by 80% only increases battery life by 39%
  - Indicates that idling itself is very resource-intensive
  - Optimizing sleep is key for longevity
- Trial 1: 1-minute sleep time
  - ~23,000 packets per lifetime, ~16 days
- Trial 2: 5-minute sleep time
  - 6433 packets per lifetime, ~22.3 days