Sound Sensing System with Power Over Ethernet Technology

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Motivation and Problem Statement

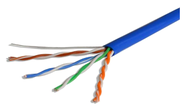
With Lehigh's rigorous academics, students are often looking for a quiet place to study around campus. Without being in a building or classroom, there is no way to know how noisy it may be. Our application allows students to remotely check classroom noise levels and accurately find a quiet place to study.

Solution

To develop a non-invasive system that can:

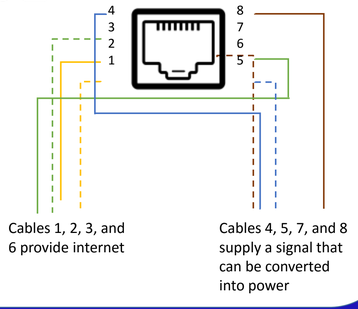
- Be powered over Ethernet for easy use
- Record data remotely over Ethernet
- Compile data into an easily accessible web application for students to use
- Be produced both efficiently and at a low cost

PoE



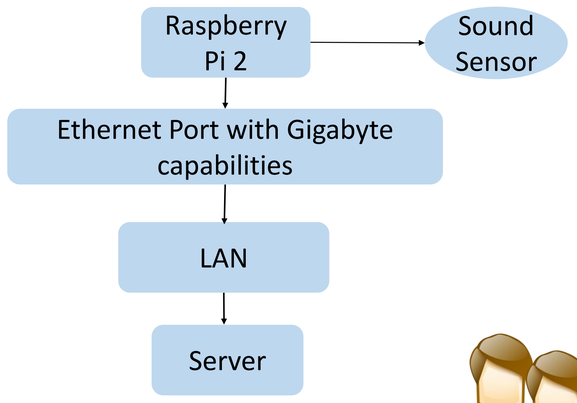
Pictured is a stripped Ethernet cable showing its 4 twisted pairs

Only two of four twisted pairs are needed to provide Ethernet, the remaining two can be used to transmit power.

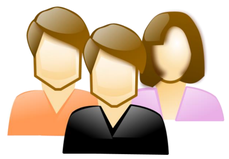


System Design

Hardware Design:



Software Design:



User can access web application anywhere

Web Application

+ Hosted using Node.js with TCP protocols (HTTP)
+ Ajax requests for file information (sound levels, etc.)
+ Data analysis of sound levels, etc.

Extracts certain file based on data analysis

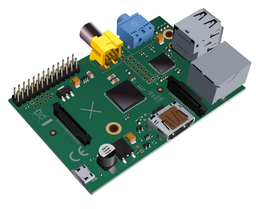
<<Processor>>
Central Networking Server

+ Receives sound levels using same UDP port
+ Sound levels collected and stored in files hourly created by Central Server

Using UDP protocols over Power over Ethernet technology

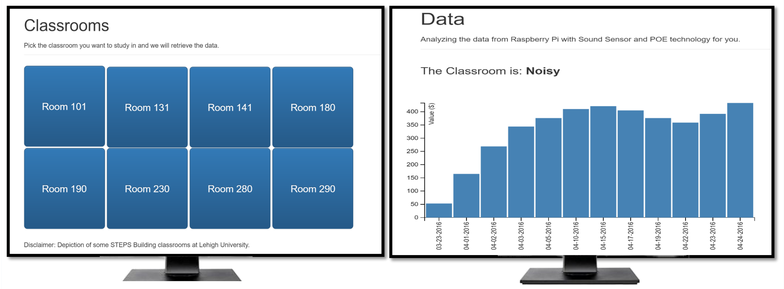
Sound Sensor Hardware Device

+ Collecting and sending sound levels
+ Using a specific UDP port
- Raspberry Pi sending data packets
- Data packets are the sound levels



Results

- Developed a web application that displays sound data in real time



Performance Test	
Accurately read sound levels in db	✓
Developed our own POE technology	✓
Compiled data in Central Network Server	✓
Designed a web application to analyze data	✓

Conclusion

Our system demonstrates the ability to easily collect and monitor sound data in various buildings throughout campus.

Future Work:

- Improve sensitivity of microphone
- Expand analytics of collected data
- Include a motion sensor

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