Lab 1: Sapphire Sounds

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Version 1

Lab 1 Draft 1

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1 Introduction

Conflicts over noise in shared housing are notoriously hard to manage, largely because they rely on subjective reports. This often leads to false claims, ongoing frustration, and unhappy tenants. At present, there is not a widely used system that can verify noise complaints in a way that is both objective and respectful of privacy.

Sapphire Sounds solves this by combining a mobile and web app with a discreet noise sensor. The sensor tracks sound intensity without recording conversations or audio. When excessive noise continues for too long, the system produces time-stamped records that property managers can use to settle disputes fairly. Residents can also view their own noise history, get instant alerts when their volume crosses set thresholds, and even earn incentives for keeping their environment quiet. By delivering transparent, unbiased data, Sapphire Sounds helps create calmer, more cooperative living spaces where disputes can be addressed fairly and efficiently.

2 Sapphire Sounds Product Description

Sapphire Sounds is designed to address one of the most common challenges in shared living environments: noise disputes. Current complaint processes depend heavily on subjective accounts, often leading to false accusations, unresolved conflicts, and strained relationships. Sapphire Sounds offers an objective, privacy-conscious solution by combining a mobile and web application with a discreet noise sensor. The sensor measures sound intensity in decibels without recording audio, ensuring resident privacy while still capturing meaningful data. When noise levels remain elevated beyond the set thresholds, the system will automatically generate time-stamped reports that property managers can use to resolve the disputes fairly. Tenants will have access to their own noise history, real-time alerts, and even rewards for maintaining a quiet

environment. By replacing personal opinions with transparent and unbiased data, Sapphire Sounds promotes cooperation, reduces conflict, and supports a more peaceful living atmosphere.

2.1 Key Product Features and Capabilities

Sapphire Sounds provides an objective and privacy-conscious way to handle noise complaints in shared living environments. Its primary function is to detect and log sustained noise disturbances without recording audio. This makes it unique compared to traditional monitoring methods that either lack objectivity or risk violating tenant privacy. The system introduces several innovative features such as time-stamped incident reports, a tenant-facing noise history dashboard, real-time alerts when sound thresholds are exceeded, and a rewards system to encourage quieter behavior. These capabilities allow tenants to self-regulate and protect themselves from false accusations, while property managers receive unbiased evidence to resolve disputes fairly and quickly. By introducing measurable and transparent data into the complaint process, Sapphire Sounds transforms a historically subjective and contentious issue into one that can be addressed with accuracy and trust.

2.2 Major Components (Hardware/Software)

Sapphire Sounds relies on a hardware setup consisting of a Raspberry Pi Zero 2 W connected to an I2C decibel sound level meter for measuring noise intensity. The Pi's built-in Wi-Fi module provides secure connectivity, allowing the device to transmit readings without ever recording or storing audio. On the software side, the architecture follows the CS 410 Major Functional Components Diagram (See Figure 1) and is designed around three core functions, monitoring and timestamping decibel levels, generating alerts and time-stamped reports when noise exceeds

thresholds, and offering dashboards for tenants and property managers to review noise history and patterns. The backend will be developed with Node.js and the web interface with React.js. The database will be managed through PostgreSQL, with hosting distributed across Firebase, Render.com, and Clever Cloud. Together, these components create a scalable, privacy-first solution that transforms subjective complaints into verifiable evidence.

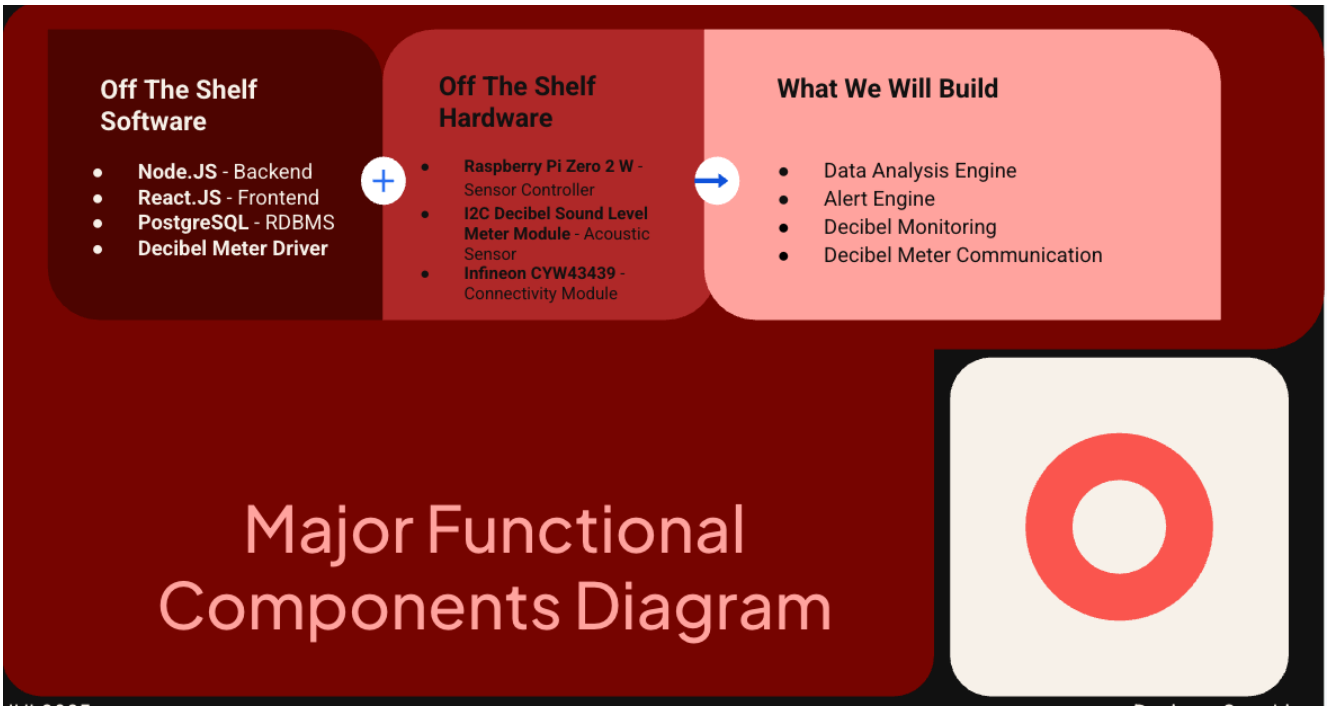

Figure 1. Major Functional Components Diagram

3 Identification of Case Study

Sapphire Sounds is primarily developed for property managers and tenants in multi-unit or shared living environments where noise complaints are common and difficult to resolve fairly. Property managers benefit from access to clear, objective records that support consistent enforcement of community standards, while tenants gain protection from false accusations and tools to self-monitor their own noise levels. Although the immediate focus is residential housing, the system could also be applied in student dormitories, co-living spaces, senior housing, or even

office buildings where noise can disrupt productivity. In the long term, Sapphire Sounds has the potential to serve any environment where maintaining a respectful acoustic atmosphere is essential.

3 Glossary

- dB (Decibel): A unit to measure the intensity of sounds.
- Noise Event: An occurrence when decibel thresholds are reached for a specific duration. Used for reporting.
- Noise Sensor: A physical device that monitors sound levels without recording audio.
- Report: A structured report generated by the system, detailing the noise event.
- Threshold: A predefined decibel level, which if exceeded, will trigger a noise event
- Tenant: A resident or occupant of a shared or multi-unit housing space using the system to manage and monitor noise activity.

4 **References**

American Public Health Association. (2021, October 25). *Noise as a public health hazard*. https://www.apha.org/policy-and-advocacy/public-health-policy-briefs/policy-database/2022/01/07/noise-as-a-public-health-hazard

Minut. (n.d.). *Minut*. http://www.minut.com/

RentEye. (n.d.). *RentEye*. http://www.renteye.com/