# Clarity: A Smart Building Monitoring Solution

Authors: Bryce Cayanan, Brianna Cyr, Madison Hill, Zachary Lancaster, Hannah MacDonald, Jaide Porter Software Engineering Sponsoring Company: TEKTELIC Communications Academic Advisor: Dr. Henry Leung

## The Motivation and Problem

TEKTELIC Communications has IoT solutions for monitoring indoor environments. TEKTELIC's BREEZE sensor can measure CO2 levels, light, temperature, humidity, and barometric pressure within a room. TEKTELIC's MEMO tablet can display specific data from the BREEZE sensors as well as custom messages. These devices (along with TEKTELIC's gateways and network server) provide a way to collect and track indoor environmental data.

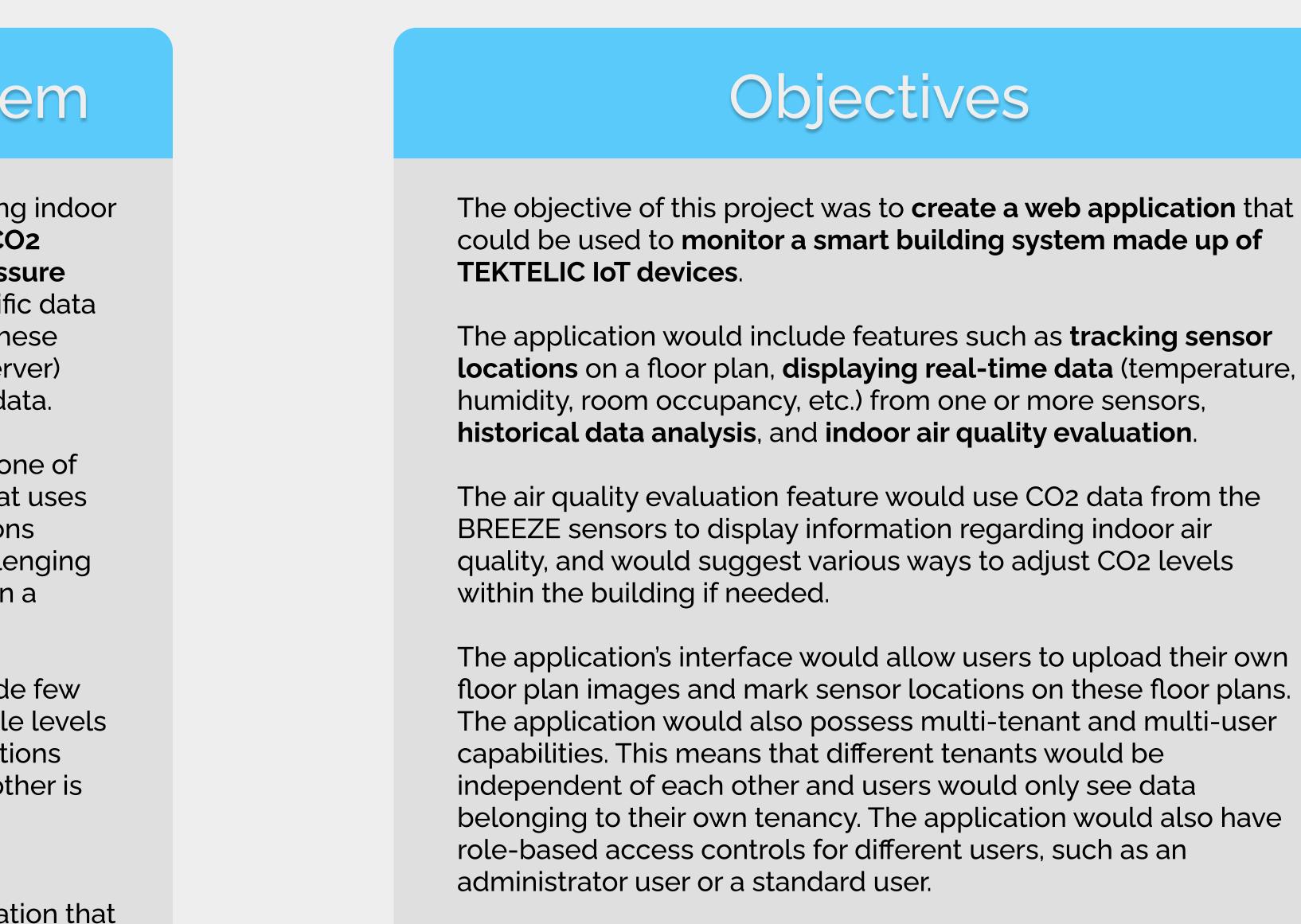
While there are applications for displaying sensor data, none of them can monitor a large-scale smart building system that uses TEKTELIC devices. Aside from scale, most existing solutions display connected devices using a list. This makes it challenging for users to locate (and differentiate) the IoT devices within a single room, on a specific floor, or in an entire building.

Additionally, many existing applications of this type provide few access controls. Therefore, an application that has multiple levels of user privileges as well as support for multiple organizations (tenancies) while keeping their data separate from each other is needed.

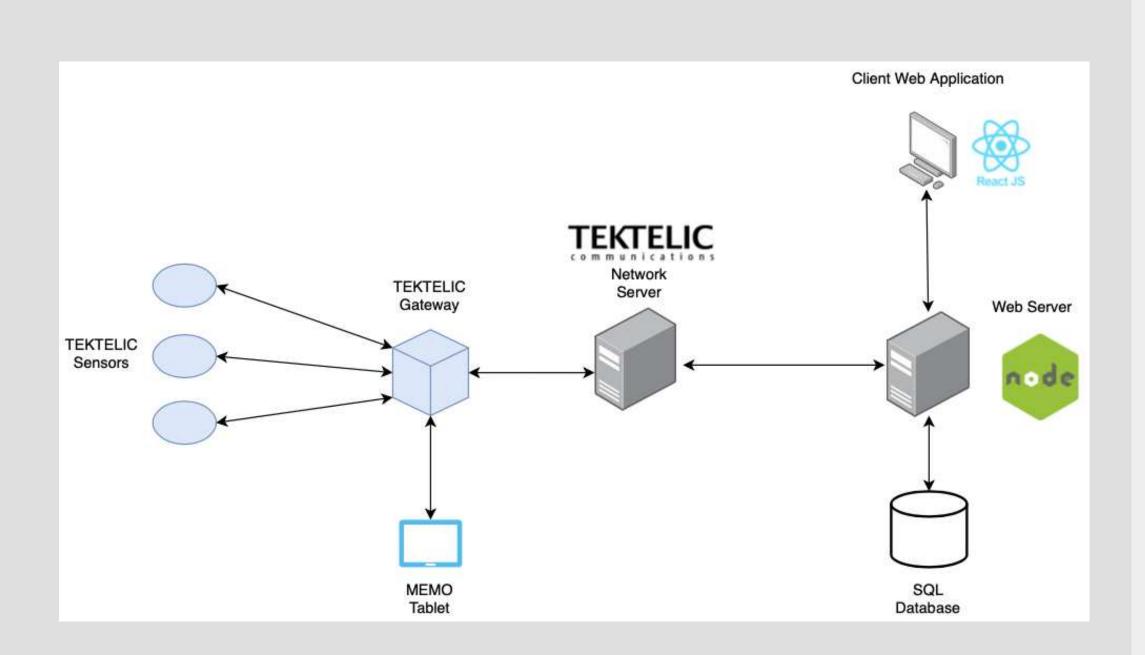
Finally, because the BREEZE sensors are mainly used for measuring indoor air quality, users should have an application that shares pertinent air quality data and suggests potential methods to adjust CO2 levels.

## • We have created a web application that can be accessed at http://clarity.tektelic-dev.com • This web application:

- Visualizes real time CO2, temperature, humidity, and room occupancy collected from specific sensors, rooms, or floors
- Visualizes CO2, temperature, humidity, and room occupancy over a specified period of time for specific sensors, rooms, or floors
- Displays warnings if dangerous CO2 levels have been detected by sensors • Allows users to view, add, edit, or remove a sensor or floor in their tenancy, depending on the users' access privileges
- Supports three different user types (super administrator, tenancy administrator, and standard user) with varying access privileges to functionalities in the application
- Allows users to view and edit their personal information (name, role, email, password, etc.), depending on their access privileges
- Summarizes sensor data throughout the entire building by generating a line plot visualization of the average data over an interval of time specified by the user
- Allows users to log into and log out of the application, and only displays data from the logged-in user's tenancy



Finally, the project would utilize existing proprietary LoRaWAN sensors, a tablet to display important datasets, LoRaWAN gateways, and the TEKTELIC Network Server - all of which have been supplied by our sponsor.





### **Backend Results**

- Created a database
- Implemented user authentication
- Created APIs for accessing and updating the application's data • Set up the application to run on an Amazon EC2 instance
- restrictions

### Fullstack Results

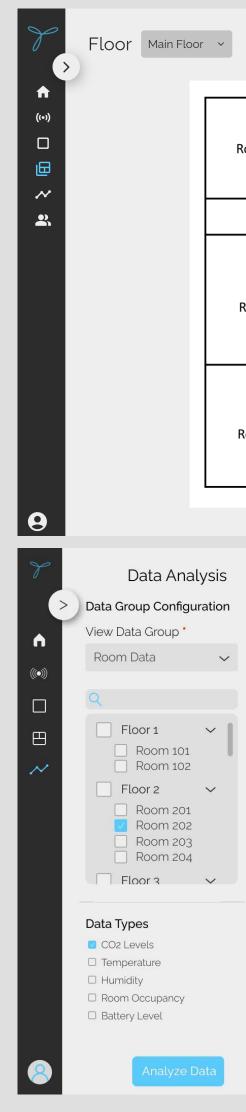
- application UI
- Configured the MEMO tablet to display the real time data of devices in the same room
- Integrated the TEKTELIC network server with the application's backend server to configure devices and fetch real time data packets from sensors

## **Frontend Results**

- prototyping tool Figma
- Implemented the UI using JavaScript, HTML, CSS, and the React framework.

## Validation of Results

- Conducted exploratory testing with mock data Conducted white box testing of individual components Determined how many of the planned features were
- implemented





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## Results

Implemented tenancy-based and role-based access

Enabled communication between the server and the

Designed the overall look and layout of the website using the

