

Connected Housing Solutions

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Grace Centers of Hope



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Project Vision

Home Automation or “the internet of things” is not a new concept. However, the benefit of an effective automation and monitoring system is something that cannot be understated. The Connected Housing Solutions system strives to combine the benefits of housing security, utility monitoring, and cost-saving analytics into one beneficial package. It is our belief that such a system would aid in alerting landlords and tenants to possible issues before a potentially larger incident occurs. This system provides the benefits of receiving live sensor updates regarding water pressure, temperature, humidity, and lighting through the convenience of a website. Additionally, landlords are able to control specific items such as lighting and temperature in hallways and public spaces when the need arises. Furthermore, sensor logs are recorded so that analytics can be later generated in hopes of identifying high-cost utilities. As a result, the Connected Housing Solutions system will allow for the automation of a housing facility by using both monitoring and control elements, focusing on building safety and energy savings.

Tools and Technologies Used

Hardware: Arduino (x3), Raspberry Pi (x2), Wireless Router, Attic Servo, Led Lights, Air Purity Sensor, Water Pressure Sensor, Infrared Motion Sensor, Break Sensor (x2).

Software: Arduino C-Script ©, ChartJS ©, Fusion 360 ©, GitHub ©, Google Drive ©, Google Hangouts ©, GroupMe ©, Microsoft Excel 2016 ©, Microsoft Project 2016 ©, MQTT Server, MySQL ©, MySQL Workbench ©, NodeRed ©, PHPmyAdmin ©, Powershell ©, Python ©, Sublime Text Editor ©, Wamp Server ©.

Project Requirements

1. As a landlord, I want a secure registration process that safely stores my personal information within a database.
2. As a landlord, I want a secure login process that grants me access to my own unique account separate from others.
3. As a landlord, I want a way to view sensor/asset information as gathered from my various properties.
4. As a landlord, I want a way to control the various utilities within the public spaces of each of my property.
5. As a landlord, I want to see generated cost-saving analytics that could help me save money in regard to long-term utility expenses.

Business Objectives

Core Values

The Connected Housing Solutions System strives to provide landlords with the tools to reduce long-term utility expenses, increase the level of housing security and identify potential hazards before a possible larger incident occurs.

Growth

The implementation of the Connected Housing Solutions system could be expanded to reach a wider market in addition to low-income housing. The cost-saving functionality could prove beneficial to manufacturing plants, larger corporations and even public stadiums and arenas in hopes of providing a convenient method of monitoring and cutting long-term energy expenses.

Productivity

1. Provide landlords with a convenient method of remotely monitoring numerous property utilities.
2. Provide landlords with the tools to remotely control their various property utilities.
3. Provide landlords with a means of sending alert notifications to the respective property tenants should there be any utility failures or health hazards.
4. Provide landlords with generated cost-saving analytics taken from the various sensor readings.
5. Provide landlords with the ability to access a log of previously recorded, in addition to live sensor information.

Security Concerns & Ethical Concerns

Hacking & Stealing Sensitive Information

Given that the system design will include the use of a MySQL database, hacking techniques such as MySQL injection and exploiting the default security parameters associated with the MySQL functionality will be addressed. The first precaution will be making the database accessible on a secured private network to limit the number of potential attackers. The second precaution is to research and implement techniques to reduce the overall risk of SQL data injection or the unauthorized manipulation of using a register function to drop database tables.

Tenant Privacy

While the system shall allow for the controlling of various building utilities such as lighting and temperature, this functionality is strictly limited to public spaces within the property. These spaces will include - but are not limited to - the building's front doorway, main hallways, front reception area, public laundry rooms, basement, attic and other maintenance or social spaces as to avoid invasion of individual tenant privacy. However, the monitoring of the various property utilities will include the monitoring of individual tenant's utilities for the purpose of generating more efficient cost-saving analytics based on reducing long-term utility costs.

Unauthorized Access

The system will require landlords to register an account with our database in order to create a verification process that will be used to access the Connected Housing Solutions System. To improve the security of this verification process, the system will also hash the password entries during both the account registration and login procedure. In addition, the use of the Connected Housing Solutions System shall be limited to the end-users that register an account and securely login to the system.

Socio-economical Impact

Housing & Health

The automation of housing utilities not only increases the convenience of the user, but is also a precautionary step taken towards improving the quality of life for both residents and landlords. The automated monitoring of housing elements such as the air quality control of a location can assist in detecting potential hazards and avoid negative impacts on both child and adult health. As a result, these systems can be implemented to increase both awareness and detection therefore leading to an overall improved quality of life.

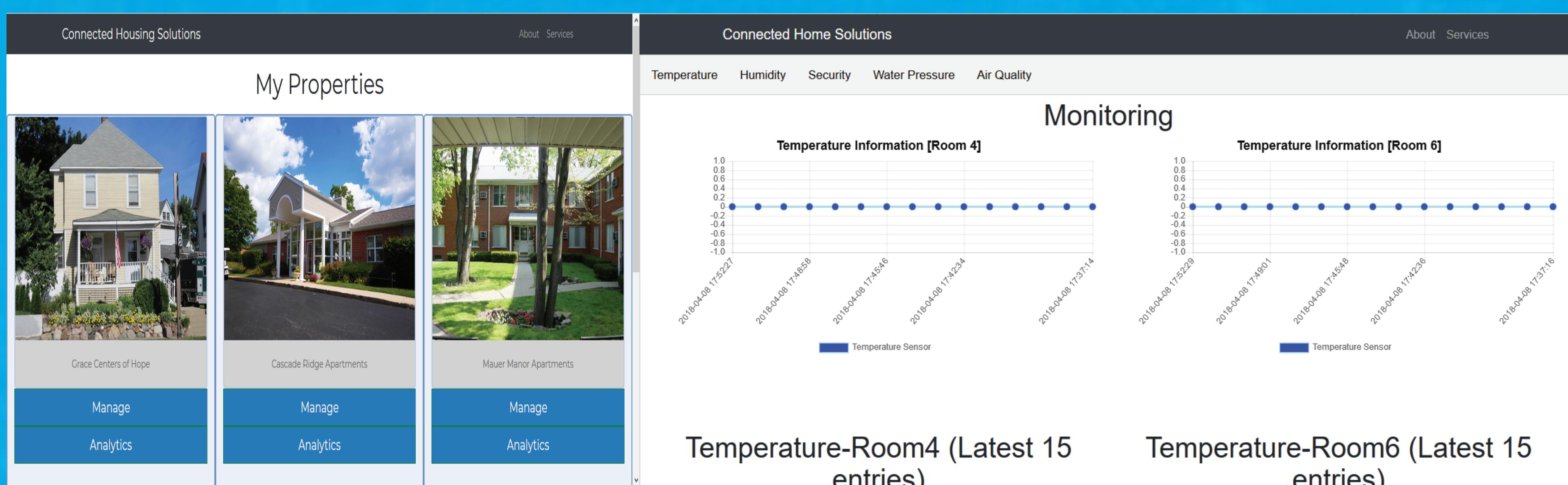
Energy & Efficiency Improvements

Energy waste leads to an increased long-term operating cost for many low-income housing facilities and can be factored into rising housing costs. These costs leave low-income families with a minimal remaining budget for other necessary expenses and limit their chances of accumulating personal savings. The automation and ability to control high-cost factors such as a property's heating can cut the costs on unnecessary or wasteful energy expenses.

Housing & Security

Safety and peace of mind are two factors that can drastically reduce stress within the personal lives of many individuals. Through the automation of security cameras and motion detectors, one can lock their doors and monitor activity with the click of a button. This greatly reduces the vulnerability to possible break-ins and other security concerns for both residences and responsible landlords.

System Screenshots



Analysis / Design / System / Deployment Diagrams

