UNIVERSITY OF LA VERNE

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SENIOR PROJECT PROPOSAL

**J2 INNOVATIONS’ AUTOMATIC RFID EMPLOYEE CLOCKING SYSTEM**

A SENIOR PROJECT SUBMITTED TO:

THE FACULTY OF

COMPUTER SCIENCE AND COMPUTER ENGINEERING

IN CANDIDANCY FOR THE DEGREE OF

BACHELORS OF SCIENCE

SOFTWARE / ENGINEERING

BY

KOPPANY HORVATH

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# Personal background

My name is Koppany Horvath, my major is Computer Science and Computer Engineering at the University of La Verne with concentrations in Software and Engineering. I originally got interested in computer science when I got my first computer at age 14 and wanted to know more after I wrote my first couple hundred programs. I have gotten to the point where most aspects of my life are based on computer science, such as my job and my hobbies. My other hobbies involve electronics, robotics, retro-computing, and watching Star Trek. My current job is as a programmer at J2 Innovations, but prior to that, I was a kitchen knife salesperson.

# Introduction

Keeping accurate records of employee work times is very important. Not only does it ensure that the employees get paid for what they worked, but it also makes sure that conflicts arising from accidental overpaying or underpaying do not occur. Accurate time records also allow for the possibility of measuring work performance when coupled with descriptions of what was done during those hours. Using this information to modify the working environment and schedules can lead to higher productivity in a company.

# Organizational overview

The target company for the senior project is J2 Innovations. J2 Innovations is a small software company that was founded by Jason Briggs in 2009 and current has about 20 people working for it. This company specializes in building automation software. The types of automation have to do with controlling HVAC systems and lighting. The software produced at J2 Innovations also records sensors scattered throughout buildings to monitor parameters such as room temperatures or whether the lights are on or off. J2 Innovations has partnerships with companies such as KMC Controls and Siemens. The company has one office in Chino, California, and one office in District 5 of Bucharest, Romania, along with a few remote employees scattered around the world. This project will be made for and deployed in the Chino office.

# Problem statement

The current system has a few problems that tend to bother the people working at J2 Innovations. The problems are listed below in descending order of severity.

1. The biggest problem that the manager complains about is that the system is a third party service that requires monthly payment which is increased for each new employee using the system, and as such it is also not flexible in terms of adding new features.
2. A problem that the employees don’t like is that with the current system employees have to manually type in their starting time and ending time which sometimes results in inaccurate information when an employee can't remember their starting time accurately or decides to report incorrect times.
3. Something that the project manager is annoyed about is that he has no idea what the general schedule is for part time employees who have very dynamic schedules, and the current system has no fast way to see what an employee’s usual schedule is.
4. Another minor problem that employees don’t like is that they are required to submit a daily email containing their work for the day along with a weekly email containing not only the information from the daily emails, but what their times were for each day that they worked. This is very redundant and a better system would allow the project manager to have a less clouded inbox so as to focus on customer emails.
5. One problem that frustrates employees sometimes is that the current system is sometimes difficult to use and does not always act the way it is expected to act. An example of this is when entering in the ending time, the system attempts to guess if the time is AM or PM and sometimes gets it wrong, leading to the employee time being too much or too little if they don’t spot this error and correct it.

# Scope of the project

The proposed project will utilize both custom made software and custom made hardware to solve the problems detailed above. Specifically, this project will result in the construction of the Radio Frequency Identification (RFID) hardware capable of recording user input events. This project will also result in the development of the software needed to record the input events from the RFID hardware and provide an interface for the users to view, edit, and describe the input events.

# Description of the current system

The current system used for J2 Innovation's employee clocking system is a third party service called Toggl. This is an online time tracking system for small businesses and can be found at [https://toggl.com](https://toggl.com/) and is available from $9 per person per month to $49 per person per month. Being web based, it is accessed through a web browser and has no associated hardware with it.

The way an employee uses the system at J2 Innovations is they are invited to join by the manager via an e-mail link. Once they sign up from the link, they then have an account on Toggl that they can use to log their hours and the work that they did.

With that account, an employee can enter their starting time at the beginning of their shift. During their shift, the employee uses the text input field to type in the various activities that they did throughout their shift. At the end of their shift, the employee enters in their ending time and submits all that information to the Toggl server.

Alternatively, due to limitations of the system, a user may record all of this information locally in a text file, and then enter in and submit that information at the end of their shift.

# Description of the Proposed System

The proposed system to replace the old system is planned to use both software and hardware solutions to make the process as simple and convenient for both management and employees.

//do something with the solution part here from the scope

The project proposed in this paper plans to solve all of these problems and also add extra features and conveniences past what is required. This project will provide facilities to make clocking in and out as painless and accurate as possible for the employees. This project will also be as extensible and open as possible to allow easy modification of the system and remove the dependence for a third party service. This project will also provide the necessary features to make management of the employees as easy as possible for the project manager.

The proposed software system is a replacement of the current web browser based system. At the lowest level, this system will consist of server level software to manage all data and provide a web interface for the users along with an API to allow integration with external software and hardware. The interface will be web based with a focus on being as minimal and intuitive as possible while also allowing access to all features provided and being mobile friendly. The interface will also allow management to easily access employee information such as hours worked and predicted schedules for the week. The interface will even have facilities to allow employees to better manage their schedules such as a feature to request days off or use extra time to leave work early.

The proposed hardware system consists of radio frequency identification nodes (RFID) to automatically record employee hours. These nodes will have to be custom designed and custom made to fit the requirements of this project. A node will be fixed to or near a door so that when an employee walks by, they would just tap their RFID badge to the node to be recorded. The node would then pass a message to the server’s API to tell it which employee was just recorded. From the first and last time that an employee was recorded, it would be simple to calculate the total hours that they worked for a day.

//add 123’s to talk about how this fixes it

# Requirements for the proposed system design

The requirements for this system are fairly short and simple. The system will not interfere with current business processes. The hardware system will be made using commercial off-the-shelf components. The software system will be made using common open source frameworks along with custom written code. The interface for this system will be both intuitive and easy to use while also being compatible with all major web clients. All software tools needed will be free to use and open source as to allow low development cost.

//physical requirements

# Implementation plan

The implementation plan is as follows:

1. All requirements will be discussed and coordinated with the project manager in charge of supervising this project.
2. Software will be iteratively developed along with hardware that will be prototyped before creating a final version.
3. All software will be tested extensively using unit tests and integration tests. All hardware will be tested to ensure that it conforms to the requirements.
4. Documentation will be written for both programmers and end users.
5. The project will be set up at the specified company and demonstrated during the final presentation.
6. All documentation and non-physical resources will be submitted for review.

# Request for support from the company if needed

Very little support from the J2 Innovations is planned to be needed. All expenses

for materials and equipment will be provided by the student. All software will be developed by the student, although some help may be requested from the higher-level programmers at J2 Innovations if required. All studying and research for this project will be done during the student’s own time in order to preserve the time of the company.

One area where support from the company J2 Innovations will be needed is in installation and testing. Once the hardware and software systems are finished, the software will have to be installed on a server and the hardware will have to be mounted near the main doors. Then the employees’ help in testing the system will be requested. All that will be expected of the employees is to use the new software system and carry RFID badges in order to interact with the hardware system.

# Development time frame and cost

Hours Spent:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 2018 | February | | | | March | | | | April | | | | May | | | | | Summary | |
| Tasks | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 5 | Ho  urs | Percent |
| Studying and specifying requirements |  | 2 | 4 | 3 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Design |  |  | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Implement |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Unit test & integrate & test |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Write user’s manual |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Write final report |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Presentation |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Hours |  | 2 | 5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 100% |

Parts Cost:

|  |  |  |  |
| --- | --- | --- | --- |
| Part | Cost | Quantity | Total |
|  |  |  |  |
| Total | | |  |

# Primary contact person include

Koppany Horvath

5514 N. Gareloch Ave, Azusa, California, 91702

(626) 428-9010

[koppany.horvath@laverne.edu](mailto:koppany.horvath@laverne.edu)

# Approvals

Name: Dr. Ahmad Abu Shanab Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Date\_\_\_\_\_\_

Name: Dr. Ray Ahmadnia Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Date\_\_\_\_\_\_\_

Name: Dr. Jozef Goetz Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Date\_\_\_\_\_\_

Name: Dr. Seta Whitby Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Date\_\_\_\_\_\_\_