**System Requirements and Design**



Attendance System

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# Nomenclature

RFID – Radio Frequency Identification

GUI – Graphical User Interface

PC – Personal Computer

SRS – Software Requirements Specifications

SDD – Software Design Documents

GPIO – General-purpose input/output

RS232 – Recommended Standard number 232

# Preface

This document is a combination of two documents which are normally separated; Software Requirements Specifications and Software Design Documents. This merger has been decided due to the relatively small size of the project, and will provide both the development team and stakeholders with a better overview.

The reader will get an overview of how the system architecture, database model, software architecture and user interface for the system will be arranged and implemented.

|  |  |  |
| --- | --- | --- |
| **Document version** | **Dated** | **Whats new?** |
| 1.0 | 17.01.2017 | Document created |
| 1.1 | 24.01.2017 | Added flowcharts and figures, minor structural changes |
|  |  |  |

# Introduction

Checkpoint will be a computer based attendance system capable of registering and verifying attendance to a wide range of event types. This could include students attending obligatory course events or workplaces holding compulsory meetings for employees. Often, such systems are implemented with attendances being manually recorded on paper. This approach can be both error prone and time consuming especially when collating data and calculating individual levels of attendance for larger events.

The application is intended to reduce the time needed to record attendance and provide a more convenient and reliable way to create a report from the data collected.

## Considerations

It is important to recognize that due to the constraints outlined in the Software Development Plan, the Checkpoint application will be developed without any significant budget over a relatively short period. Consequently, there will be aspects of the solution that would certainly fail to meet the requirements of a professional enterprise application. A major concern is the limitations of the hardware available to be used for this project. A commercial RFID based attendance system would almost certainly have the necessary assets to invest in a reading device with a display, a keypad, and the ability to run some kind of operating system capable of supporting database communication and Wi-Fi. Without these qualities it will be very difficult to provide a system which satisfies a number of problems in a convenient, user friendly way. Composed of multiple separate devices of various sizes, the Checkpoint reading device will be limited to operating almost exclusively as a stationary terminal. This lack of portability causes an issue for common situations involving locations with more than one entrance. The collection of hardware that the Checkpoint reading terminal is composed of would be highly impractical to implement in multiple locations, something that would be important to any basic attendance system that might claim to be flexible.

# System Overview

This chapter will give a brief description of the Checkpoint system.

## Introduction

## System Description

An overview of the general system structure is illustrated in *Figure 1: General system structure.* With the exception of the attendee physically attending an event, all validation and communication between the different sections of the system happens through the web application and the online database/server. A more detailed overview of the system flow can be seen in *Figure 2: Detailed System Flow*

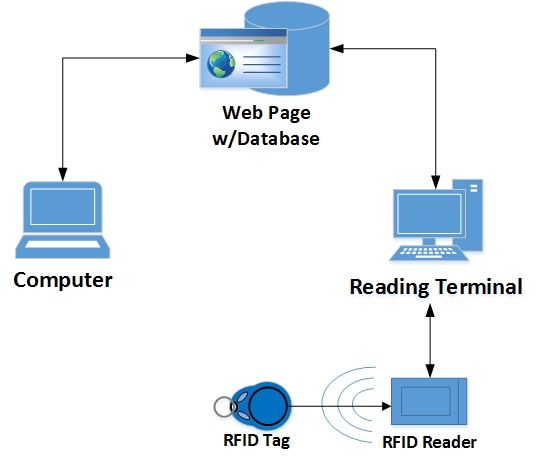


Figure 1: General system structure



Figure 2: Detailed System Flow

# Technical Requirements

The system requirements can be divided into two main groups: functional and non-functional requirements.

Checkpoint will have two main types of end user. A 'Host' that is a registered customer of the system with permissions to administer appointments and register attendees and a 'User' which is the status given to a subscriber who has been registered in the system and has received an RFID tag.  These are separate roles and they do not overlap, that is a Host is not a user with elevated privileges and a User cannot extend User functions to include those of a Host.

## Functional Requirements

These requirements are essential to the functionality of the software and will transform into use cases, which are handled in *7.1 Use Case Diagrams.*

### System

The system refers to the

* The system must be a web-based application.
* The system must support being accessed by multiple simultaneous users without disruption.
* The system must be able to run on Google Chrome and Safari web browsers.
* The system must be able to create/read/update/delete a user or host.

### User

* Each user of the system must be uniquely identified by his or her RFID tag number.
* All data entry must be validated to avoid duplicate identification fields.
* In the event that data entry validation is unsuccessful the user must be provided with the necessary feedback about this through the webpage.
* A user must log in to the system with a username and password.
* A user must be able to log out of the system.
* A user must be able to change their login details.
* A user is required to submit a username, first name, last name and email.
* A user must have the ability to edit their details whenever necessary.

### Attendee

* A user becomes an attendee when he or she is granted permission to attend an appointment by a host.
* An attendee must be able to log their attendance at an appointment with his or her RFID tag.

### Host

* A host must be able to create/read/update/delete a new appointment.
* A host must be able to add users to and remove attendees from appointments.
* A host must log in to the system through the website with a username and a password.
* A host is required to submit a username, first name, last name and email.
* A host must be able to log out of the system.
* A host must be able to have a picture on his profile.
* A host must not have the ability to edit the attendance logs.
* A host must be able to request/ order an RFID reader.
* A host must be able to generate a customizable attendance report.

### Appointment

* An appointment must be created with a name, location, date, duration and the name and email of the host.
* It must be possible to define an appointment to be a single event or a series of events.

### Reading Terminal

* The reading terminal must be composed of an RFID reader and .NET compatible PC.
* The reading terminal must be able to store registrations locally to a text file as backup.
* The reading terminal must be able to connect to the internet and communicate with the server.
* The reading terminal must display the validation status on a screen to the attendee.

## Non-Functional Requirements

These requirements are related to performance and convenience, and are equally subject to testing.

* The reading terminal should be responsive enough to process and attendance within 4 seconds.
* The system should have an uptime of 22 hours per day.
* The GUI should not require the user to have any prior technical experience in order to navigate the system.
* The database storage should be easily scalable to meet future demands of a dynamic user base.

## Graphical User Interface Specification

The GUI will be a webpage accessed through a browser and is the primary point for users and hosts to interact with the CheckPoint System. All available functions should be self-explanatory and made simple to navigate. Included is a set of first drafts for the GUI, found in *Figure 3: Draft of home page*, *Figure 4: Draft of login page* and *Figure 5: Draft of user panel.*

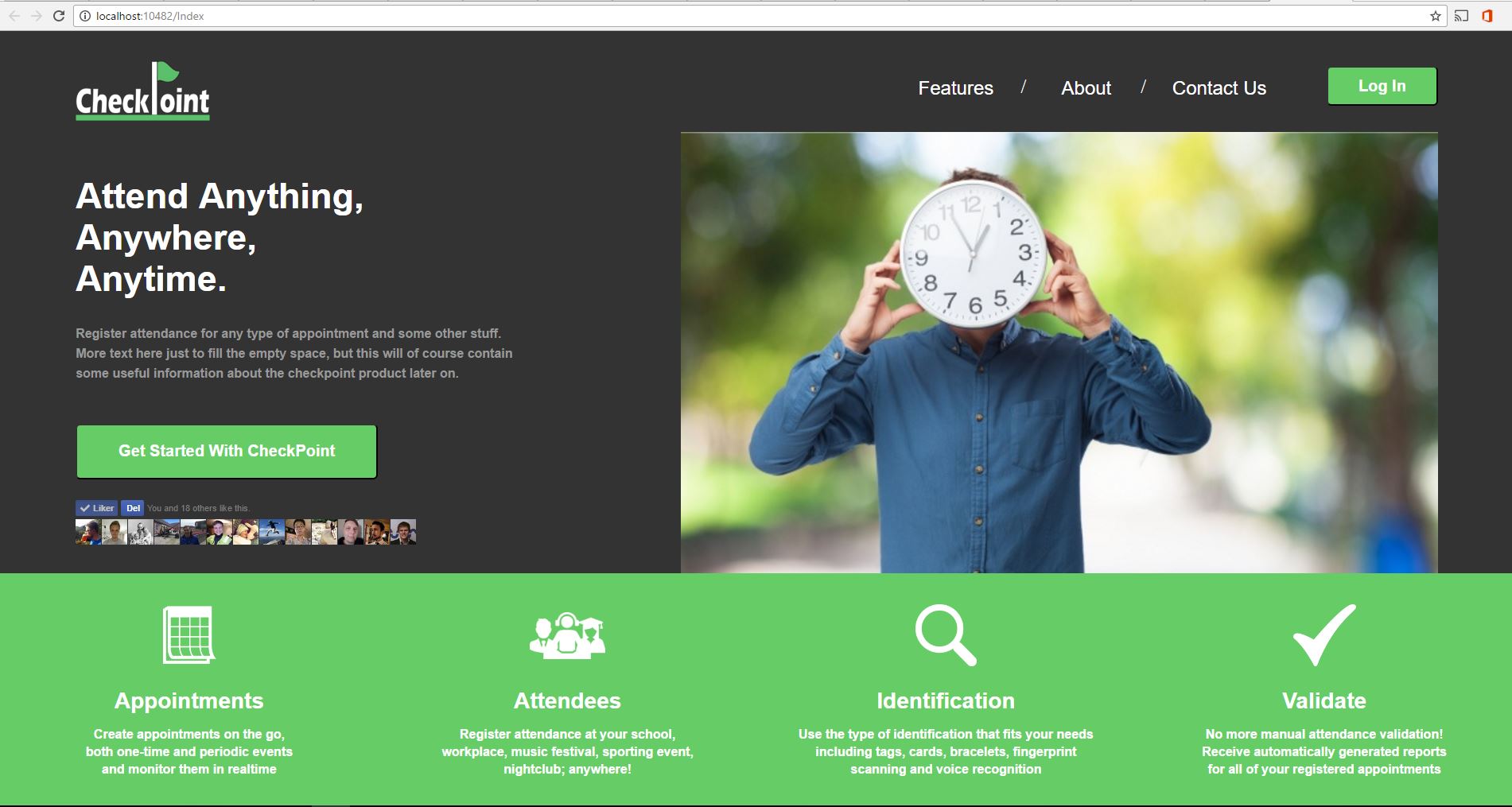


Figure 3: Draft of home page

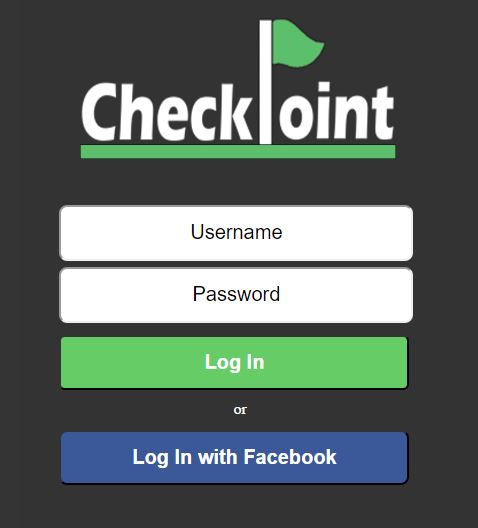


Figure 4: Draft of login page



Figure 5: Draft of user panel

## Data Communication Between Modules

The data communication flow between the different modules in the system is illustrated in *Figure 6: Communication between modules.*

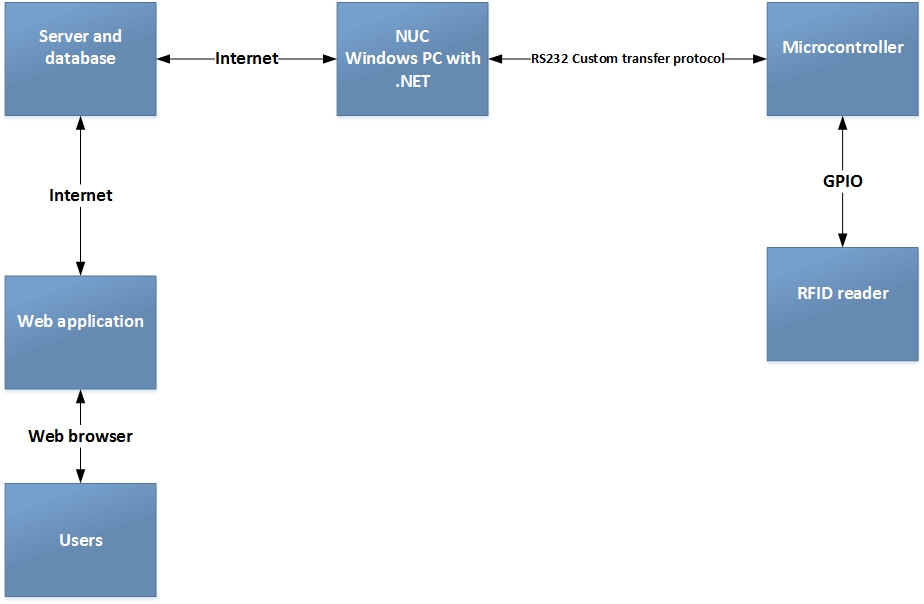


Figure : Communication between modules

# System Architecture

## Three-Tier Multi-layer Structure

### Presentation Layer

### Business Layer

### Data Access Layer

# Database

## Model and Description

# UML

## Use Case Diagrams

## Sequence Diagrams

## Class Diagrams