Project Design Report

Smart shopping cart

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18

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ABSTRACT

This study develops a Smart shopping which helps to avoid many problems in current super market system. such as queue, time delay, unknown offers and etc. This system will be basically used in Super market and other shopping centers. The proposed system has an embedded micro controller connected to RFID sensor and a keypad as an input and display as an output. Each shopping cart in the super market is connected to a server installed at the main monitoring location in the super market through a wireless network. The system will immediately show updates to customers about products. The following aspects will be addressed by the system mainly.

- Easy to use
- Low cost
- User friendly
- Speedy operation

CONTENTS

Introduction and background

Overview

Super markets already have carts why this? What's meant by "smart"?

Our system was approved to achieve mainly to goals, real time show current bill of products that he/ she purchased or put in carts another is automate billing method in cashier. (Usual procedure is check products into cart and bill). Through our system real time cashier know the bill of each cart. Reduce cashier work and crowd at cashier. Designing of system involve three key aspects Network communication between cashiers' application and shopping carts real time, securing payments information and persist them and an Embedded system in shopping carts to connect and identify the products.

Background and Motivation

Our group is developing its capabilities for providing a smart shopping cart. In part, this means wrestling with practicalities of production and identifying and testing a broad range of tools and techniques.

Today, there are many carts in super market. But they only used for carrying goods. But customers expect more than a carrying trolley.

Our concept is to create a best Smart shopping cart which will help to users and satisfy users' all expectation.

Data flow in System

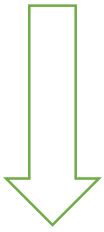
How it's work

Customer turn on shopping cart using key pad and moving it

Server knows Cart is active

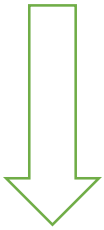
Update Cart status in Cashier

Customer pick a product and put inside cart



Cart identify product and make Request to server for more info of the product if request is accepted Response back to cart, notify connected cashiers' Desktop application update particular cart bill everywhere.

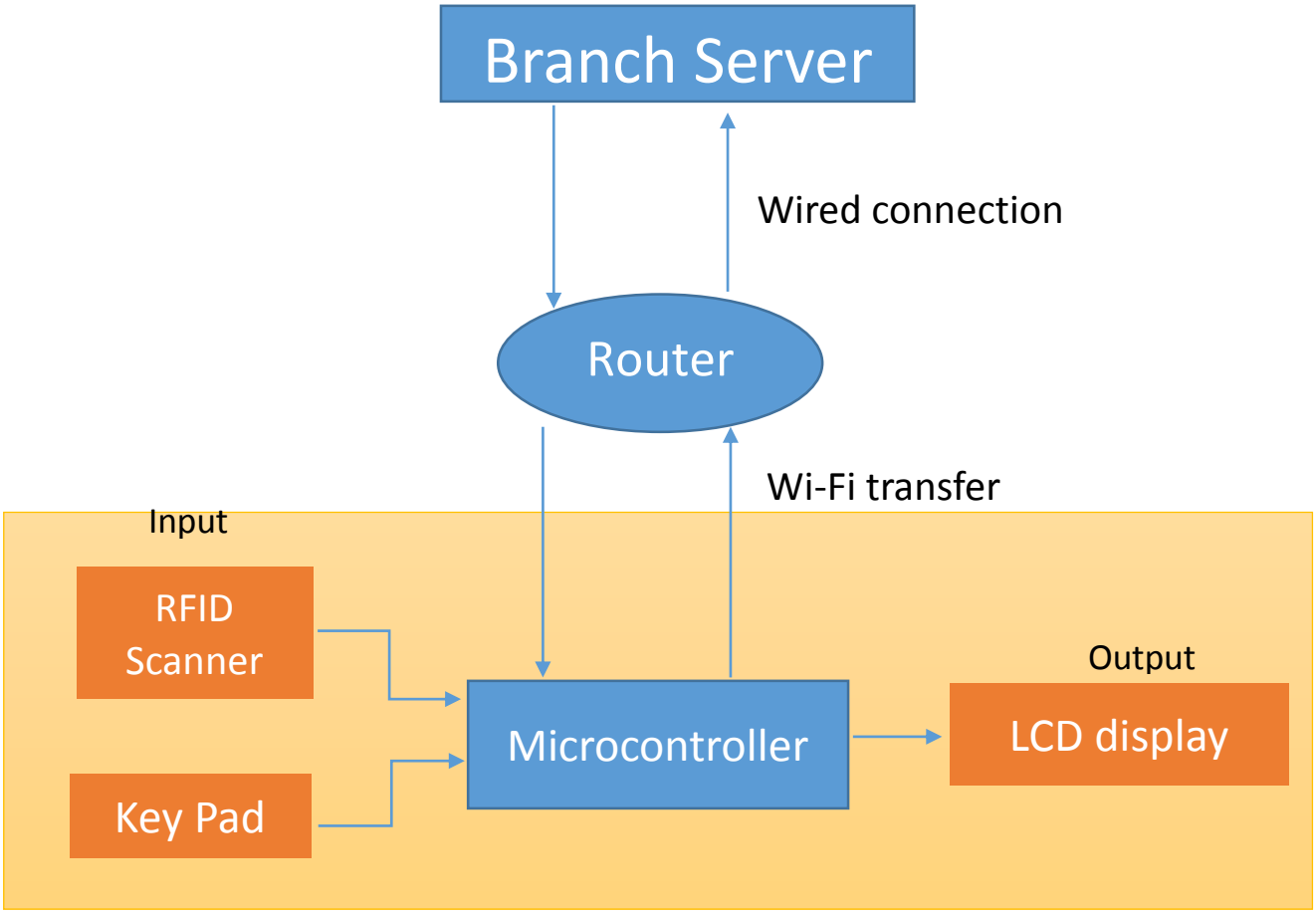
Display product info in cart for a while, then display updated bill



It will continue until customer finishes shopping.

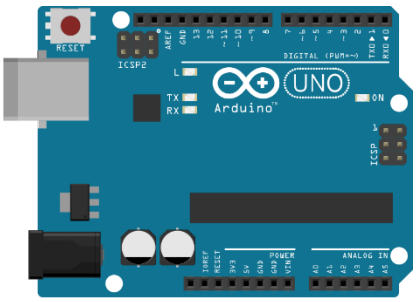
Customer finishes shopping, he can pay through one of the cashier

Architectural Design



Hardware Architecture

Arduino

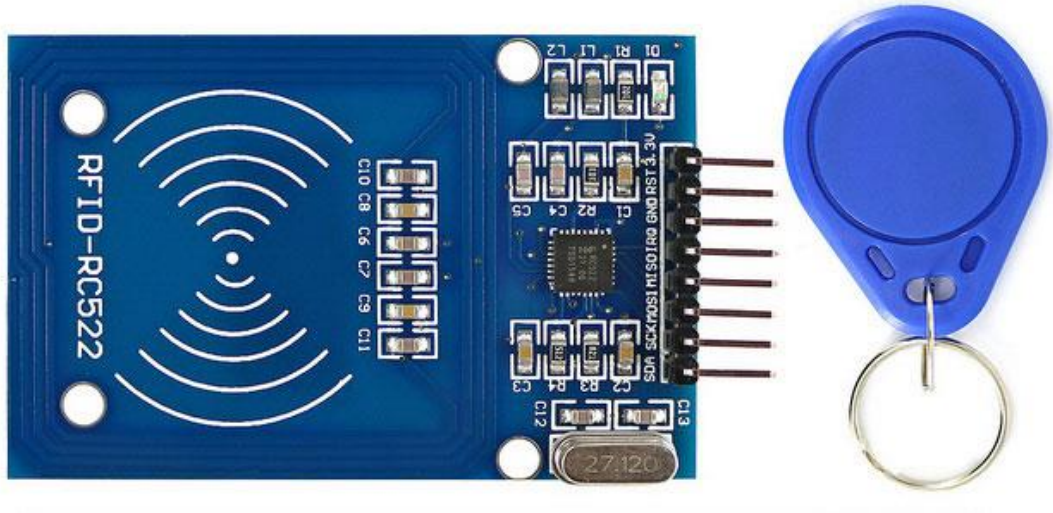


Arduino is an open source computer hardware and software company, project, and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical and digital world.

Specification

Microcontroller	ATmega328P
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limit)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
PWM Digital I/O Pins	6
Analog Input Pins	6
DC Current per I/O Pin	20 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (ATmega328P) of which 0.5 KB used by bootloader
SRAM	2 KB (ATmega328P)
EEPROM	1 KB (ATmega328P)
Clock Speed	16 MHz
LED_BUILTIN	13
Length	68.6 mm
Width	53.4 mm
Weight	25 g

RFID-RC522



MF RC522 is a highly integrated read and write card chip applied to the 13.56MHz contactless communication. Launched by the NXP Company, it is a low-voltage, low-cost, and small-sized non-contact card chip, a best choice for intelligent instrument and portable handheld devices

Specification

- MFRC522 chip based board
- Operating frequency: 13.56MHz
- Supply Voltage: 3.3V
- Current: 13-26mA
- Read Range: Approx 3cm with supplied card and fob
- SPI Interface
- Max Data Transfer Rate: 10Mbit / s
- Dimensions: 60mm × 39mm

ESP8266

The ESP8266 is a low-cost Wi-Fi microchip with full TCP/IP stack and microcontroller capability produced by Shanghai-based Chinese manufacturer, Espressif Systems.

The ESP8285 is an ESP8266 with 1 MiB of built-in flash, allowing for single-chip devices capable of connecting to Wi-Fi.

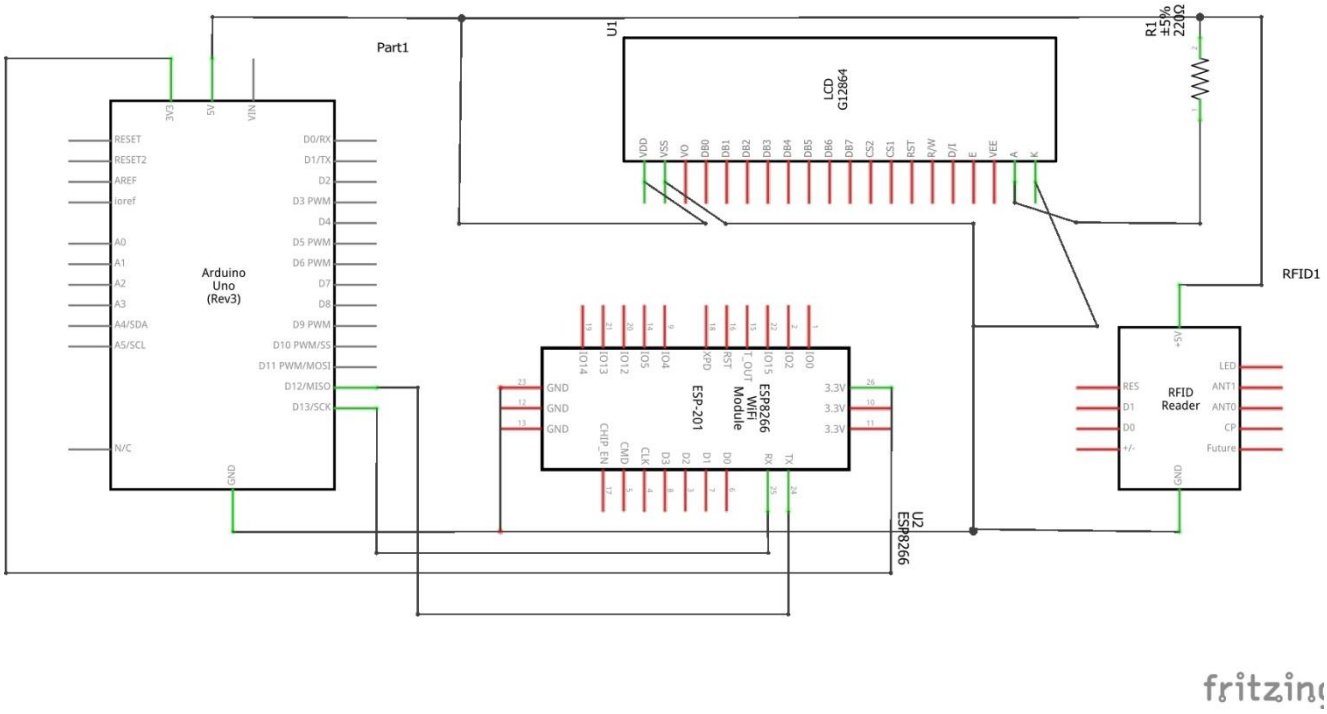
Specification

- 802.11 b / g / n wireless standards;
- STA / AP modes support;
- TCP / IP protocol stack, One socket;
- Supports standard TCP / UDP Server and Client;
- Supports serial port baud rate configuration: 1200/2400/4800/9600/19200/38400/57600/74800/115200 bps;
- Supports serial data bits: 5/6/7/8 bits;
- Supports serial parity: none;
- Supports serial stop bits: 1/2 bit;
- Pin-compatible with Arduino UNO, Mega;
- Arduino Pinout 2/3/4/5/6/7/8/9/10/11/12/13;
- ESP8266 GPIO Pinout 0/2/4/5/9/10/12/13/14/15/16 / ADC / EN / * UART TX / UART RX;
- KEY button: modes configuration;
- Dual-Ports DIP switches: switching Arduino and ESP8266;
- WiFi operation current: continuous transmission operation: ≈70mA (200mA MAX), idle mode: <200uA;
- Serial WiFi transmission rate: 110-460800bps;
- Temperature: -40℃ ~ + 125 ℃;
- Humidity: 10%-90% non-condensing;
- Weight: about 20g (0.7oz);

Others

- **Key pad**
- **Display**

Schematics and Design



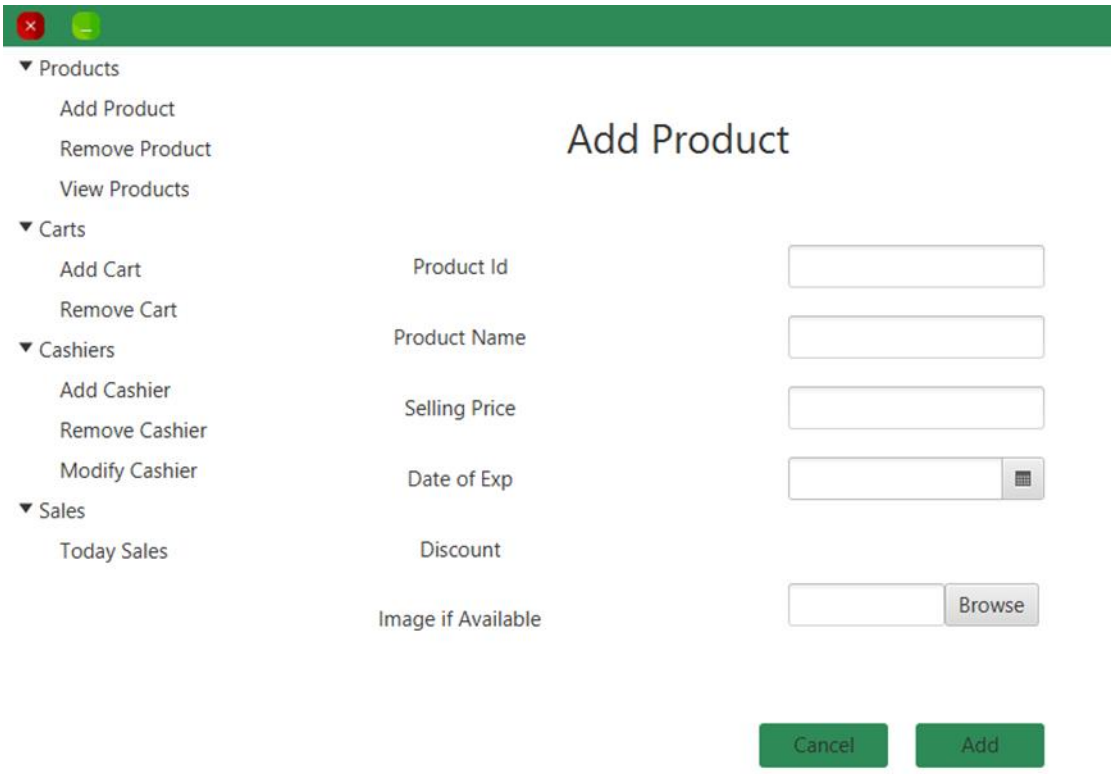
Software Architecture

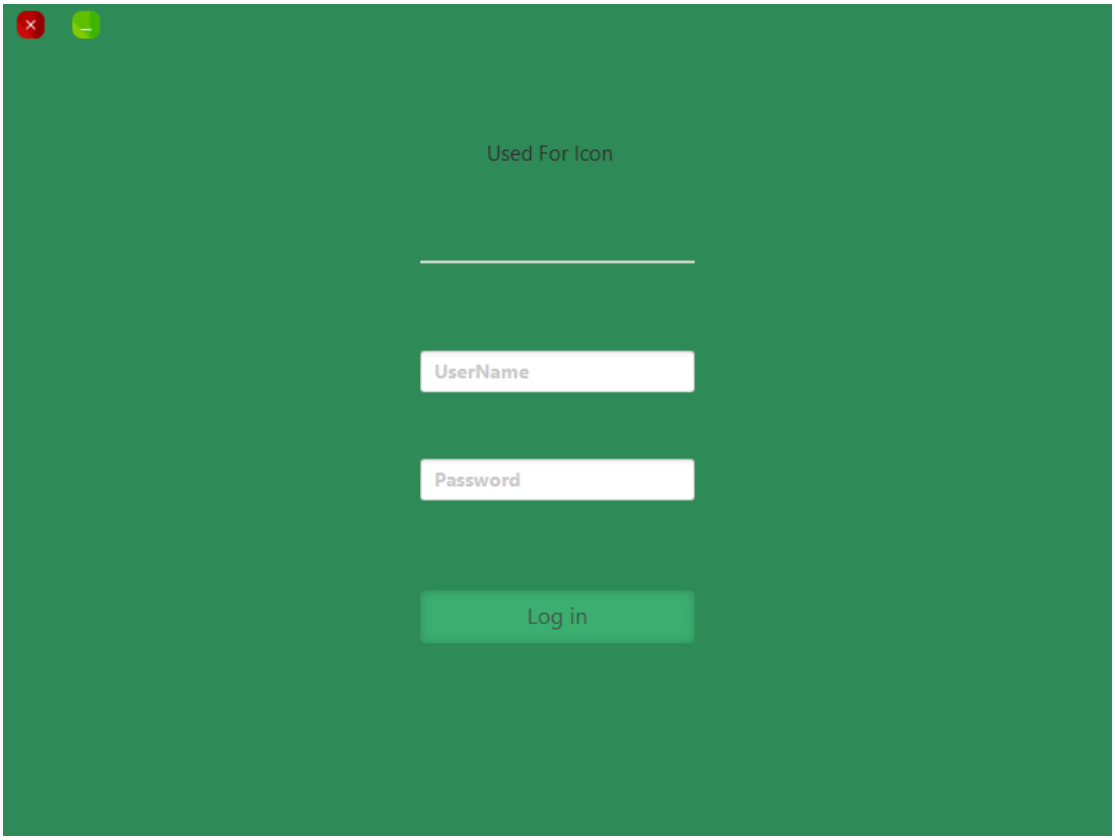
Front End

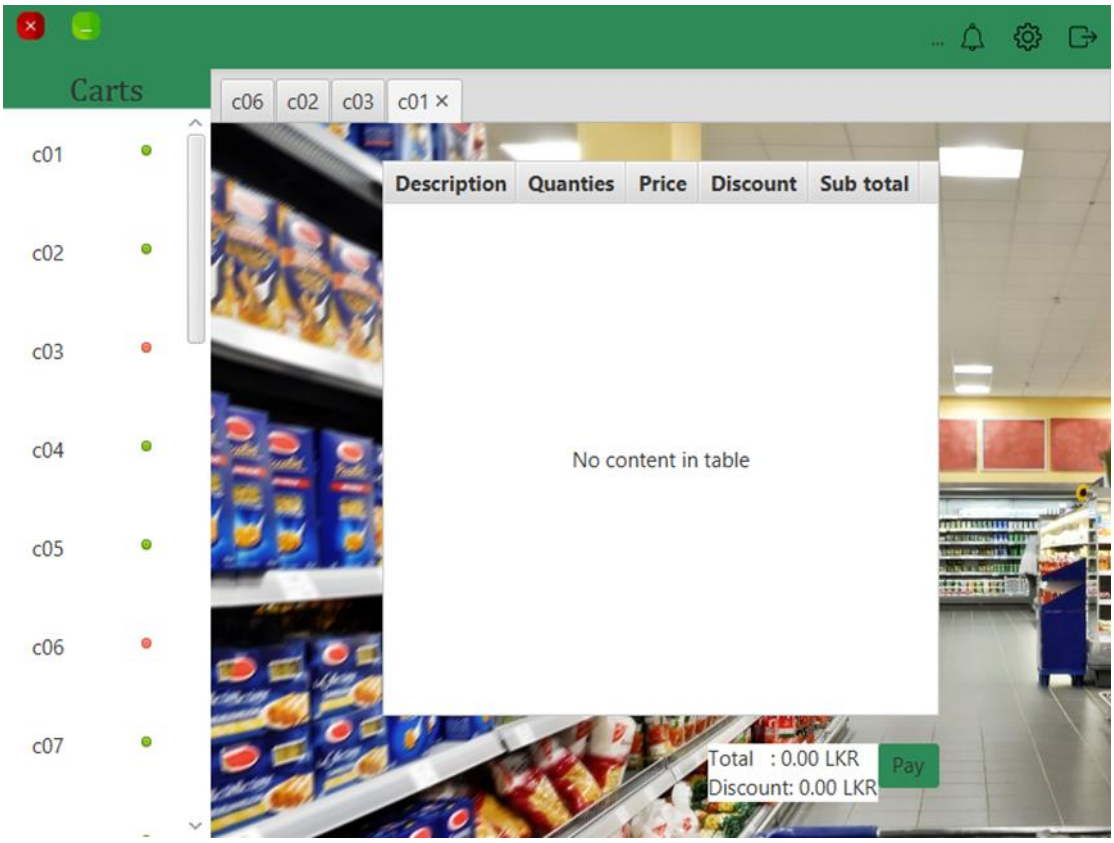
User Interfaces are implemented in JavaFx. For consuming web service, we used Apache HttpClient library. In Smart shopping cart front end is implemented in two ways. Administrative mode and Client mode. Admin panel is to control the system, such as creating new data and editing data, adding new products and etc. For client/user mode, relevant user can check the data of buying product and other related details. Front end is developing using following technologies;

Design View

Cashiers Desktop application




Used For Icon
UserName
Password
Log in


Carts
c01
c02
c03
c04
c05
c06
c07
c06
c02
c03
c01 ×
Description
Quanties
Price
Discount
Sub total
No content in table
Total : 0.00 LKR
Discount: 0.00 LKR
Pay

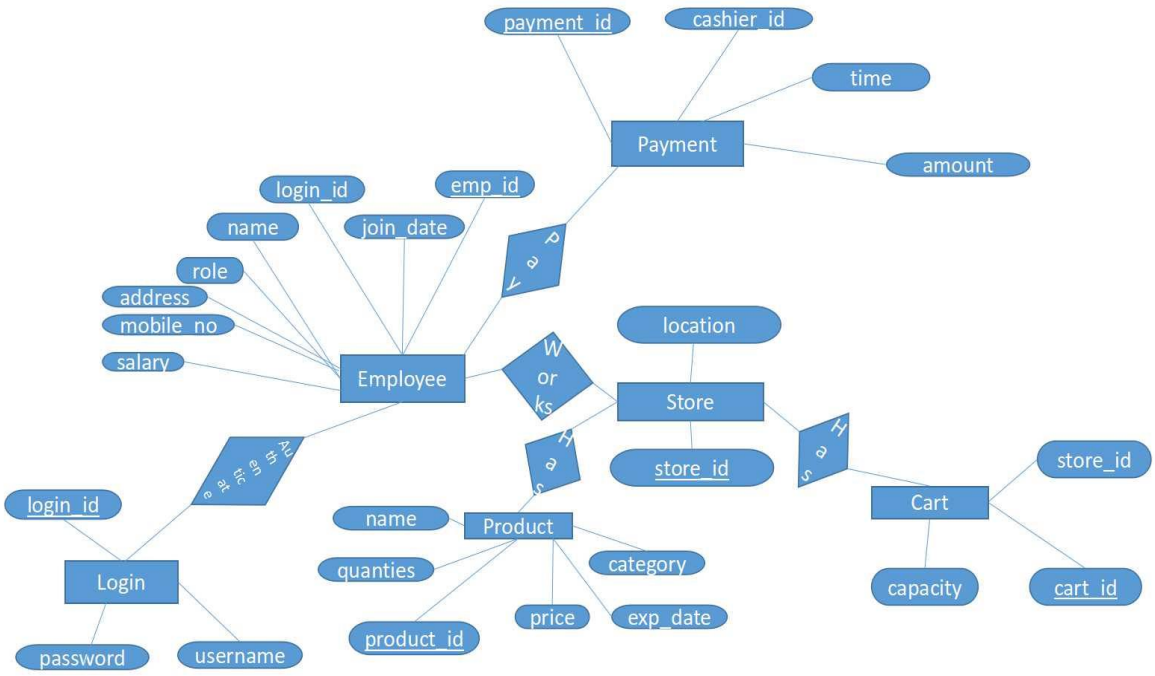
Back End

Back end is developing using following technologies;

1. Spring boot
    a. Our application is implemented using Spring boot. It is popular one in Java. Spring Boot is an "opinionated" application bootstrapping framework that makes it easy to create new RESTful services (among other types of applications). It provides many of the usual Spring facilities that can be configured easily usually without any XML.

2. MySQL database

Database ER Diagram



Security Aspects

1. Token based authentication using Jwts (Javscript web token)

   Token is created when cashier initiate communication with Server.Jwt token is passed with every api call.

2. Network communication using SSL certificate,

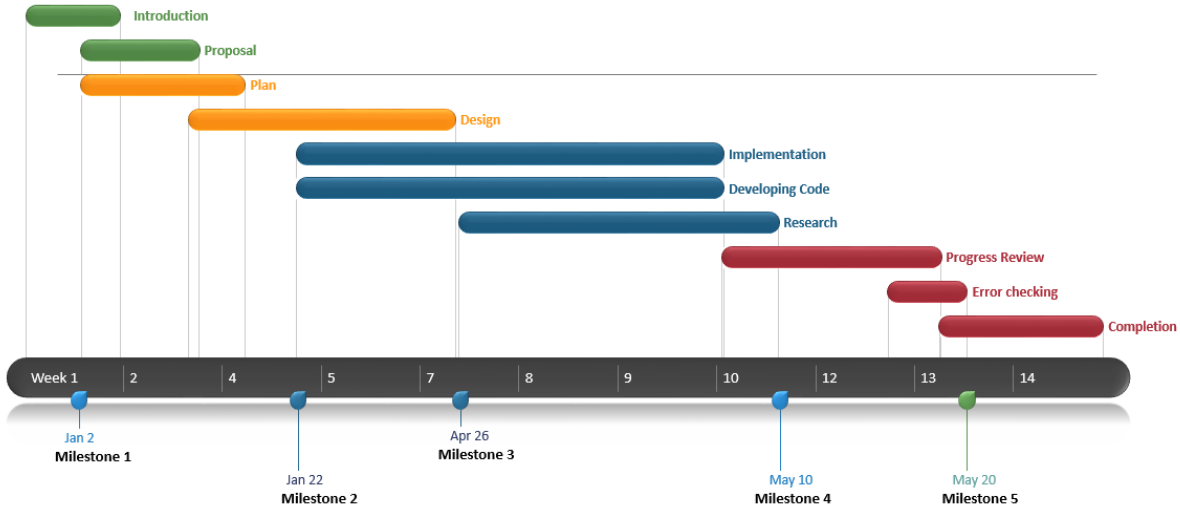
   In our case server and nodes are in limited physical area,

   Controllable area. But using this system in large scale this is not possible and it involve payment transaction so it need secure way to transmit data through network.

3. Role based accessing

   It protects only some roles have authorization to access important data and manipulate.

Project Timeline



Budget

No	Item	Quantity	Unit Price	Total
1	Arduino/uno	1	950	
2	RFID AND TAGS	1	450	
3	WI-FI Transfer	1	531	
4	Display	1	1200	
5	Key Pad	1	150	
6	Battery	1	2000	
7	Total			5281
	Others			
8	Push buttons			
9	Resistors			
10	Jumper cables			
11	Breadboard			
12	Trolley instruments			
13	Total			800
14	Grand Total			6081