Group 15

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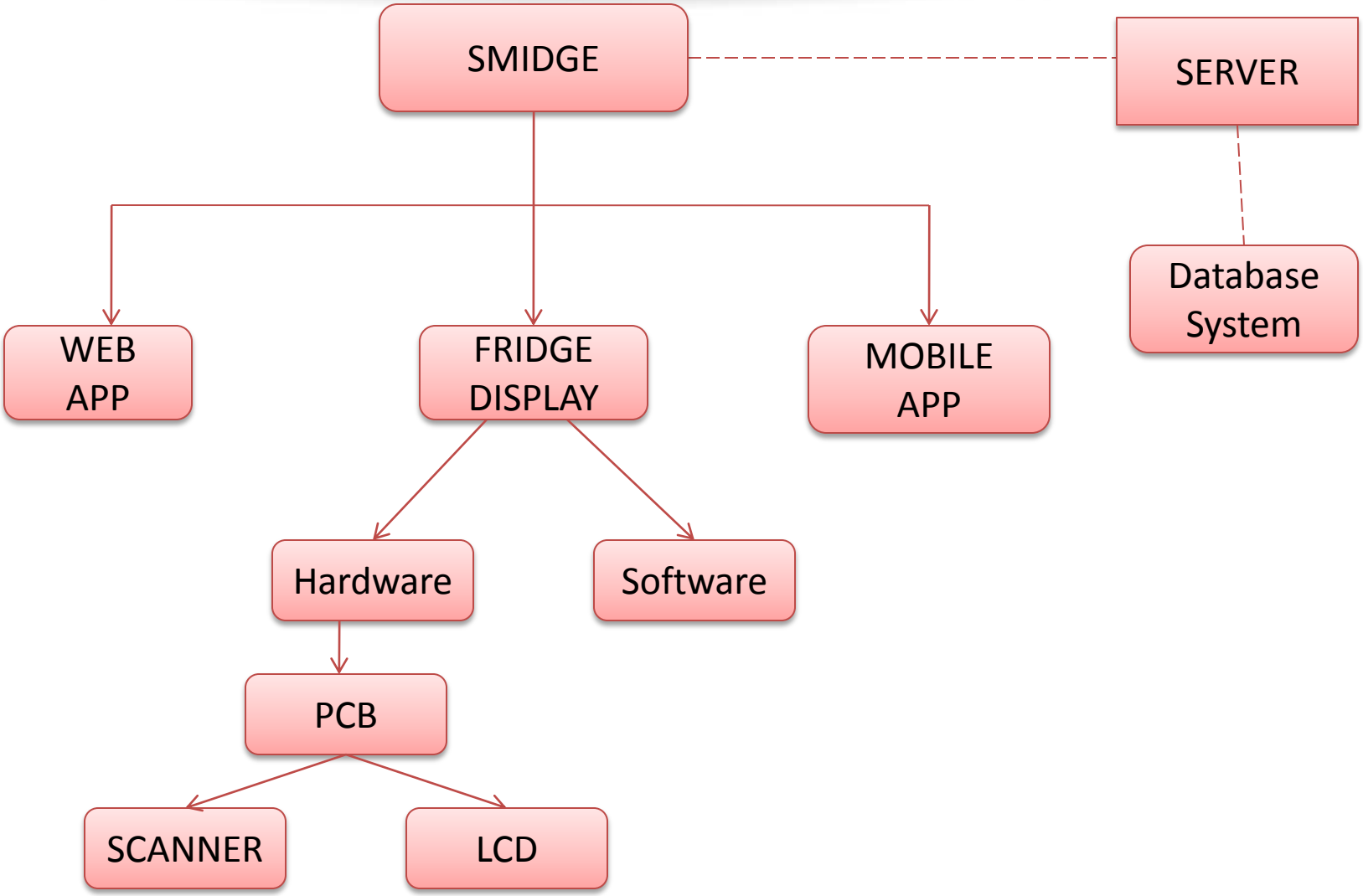
What is it?

Smidge stands for Smart Fridge System. It will offer the user the ability to store their groceries inventory in order to improve their shopping experience through automated shopping lists and recipe lookup.

Project Block Diagram



Specifications

- Processor minimum speed: 667MHz
- Pop Memory:
  - -SDRAM > 1 GB
  - -NAND > 1 GB
- - PCB board < 4 inches^2
- - 5v power source
- Able to decode:
  - 12 digits for a Type-A UPC code
  - 8 digits for a Type-E UPC code

System Requirements

- Access via a website, a phone application or the fridge system.
- The fridge client shall have wireless internet connection capabilities
- Synchronize local databases periodically with the remote server.
- The fridge client shall be able to scan a UPC code and find a matching item with an implemented API.
- Handle multiple accounts, each with its own inventory and preferences.
- Ability to view, add, modify and delete items, shopping lists and recipes.

Fridge Client
- Hardware Components -

- PCB with processor powerful enough to run Android
- Wireless Internet connection
- Touchscreen LCD
- UPC scanner
- USB hub to handle all peripherals:

  All components powered by a single connector

Board's CPU Goals

- Low power (portable size)
- ARM-based processor
- High speed GPU
- IC, POP Memory Flash/SDRAM
- Proven capability of running Android OS

  Down to three choices:

  -OMAP 4430

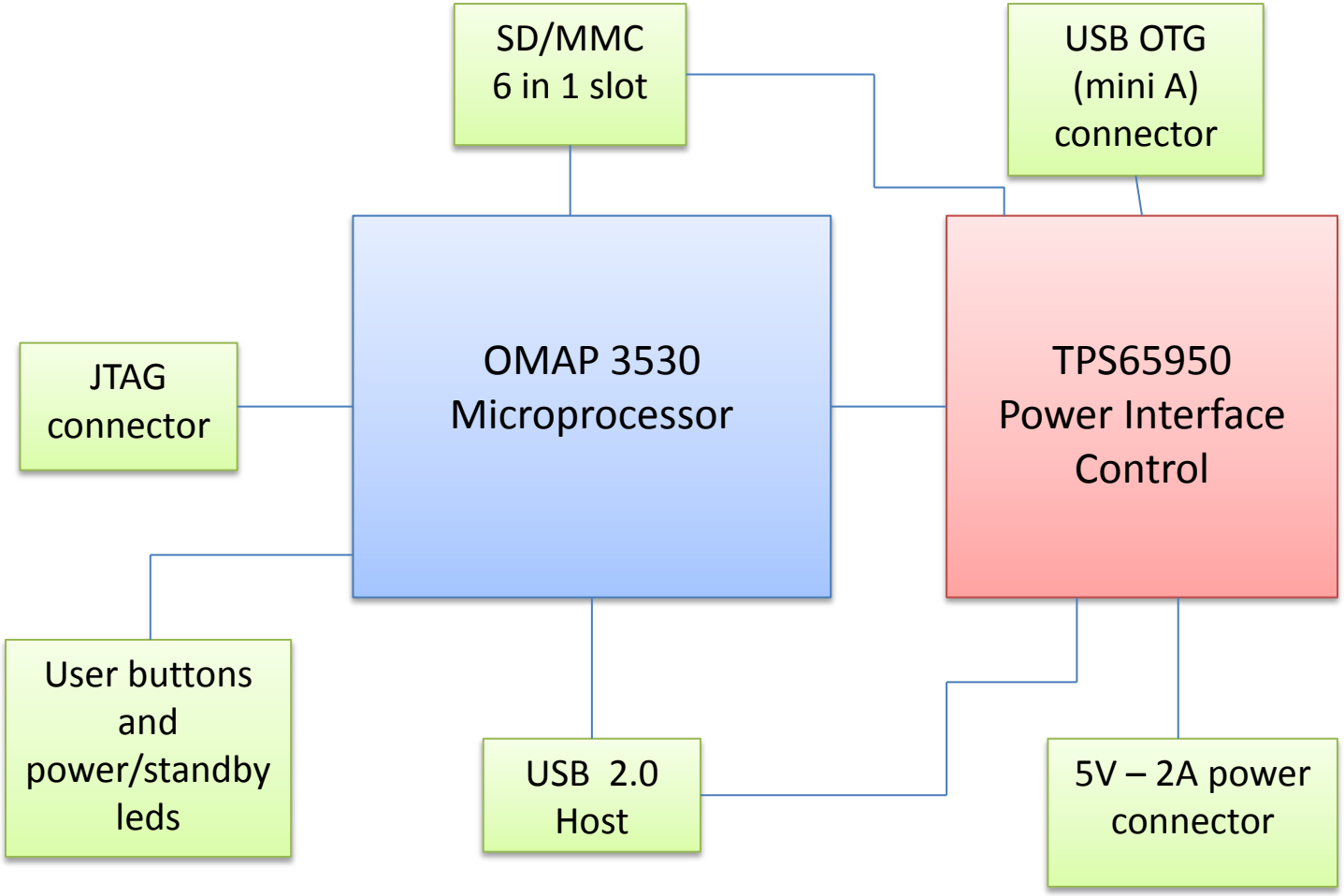
  -OMAP 3530

  - S3C6410

Microprocessors

	OMAP4430 - TI	OMAP3530 - TI	S3C6410 - Samsung
Core Processors	Dual-core ARM Cortex-A9 MPCore with SMP	ARM Cortex-A8 600MHz	ARM1176ZJF 533/VFP/SIM
GPU	Imagination Technologies' POWERVR™ SGX540 graphics core	POWERVR SGX ™ Graphics Accelerator	Hard-wired 3D GFX accelerator – 4M triangles/second
Speed	OMAP4430 operates at up to 1 GHz	Up to 720MHz	Up to 667MHz

PCB block diagram



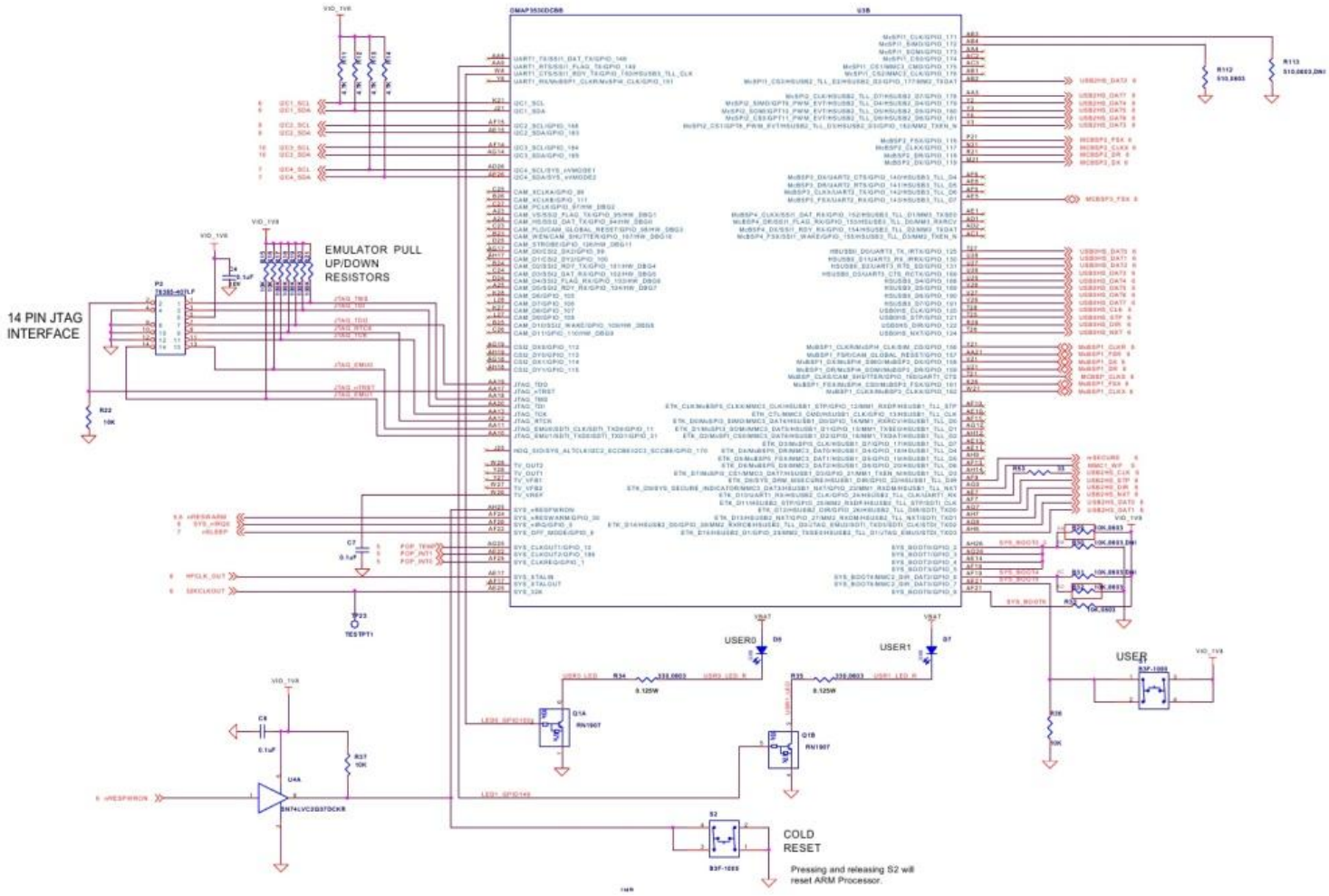
Integration of OMAP3530

- The memory chosen is a Micron POP memory which has:

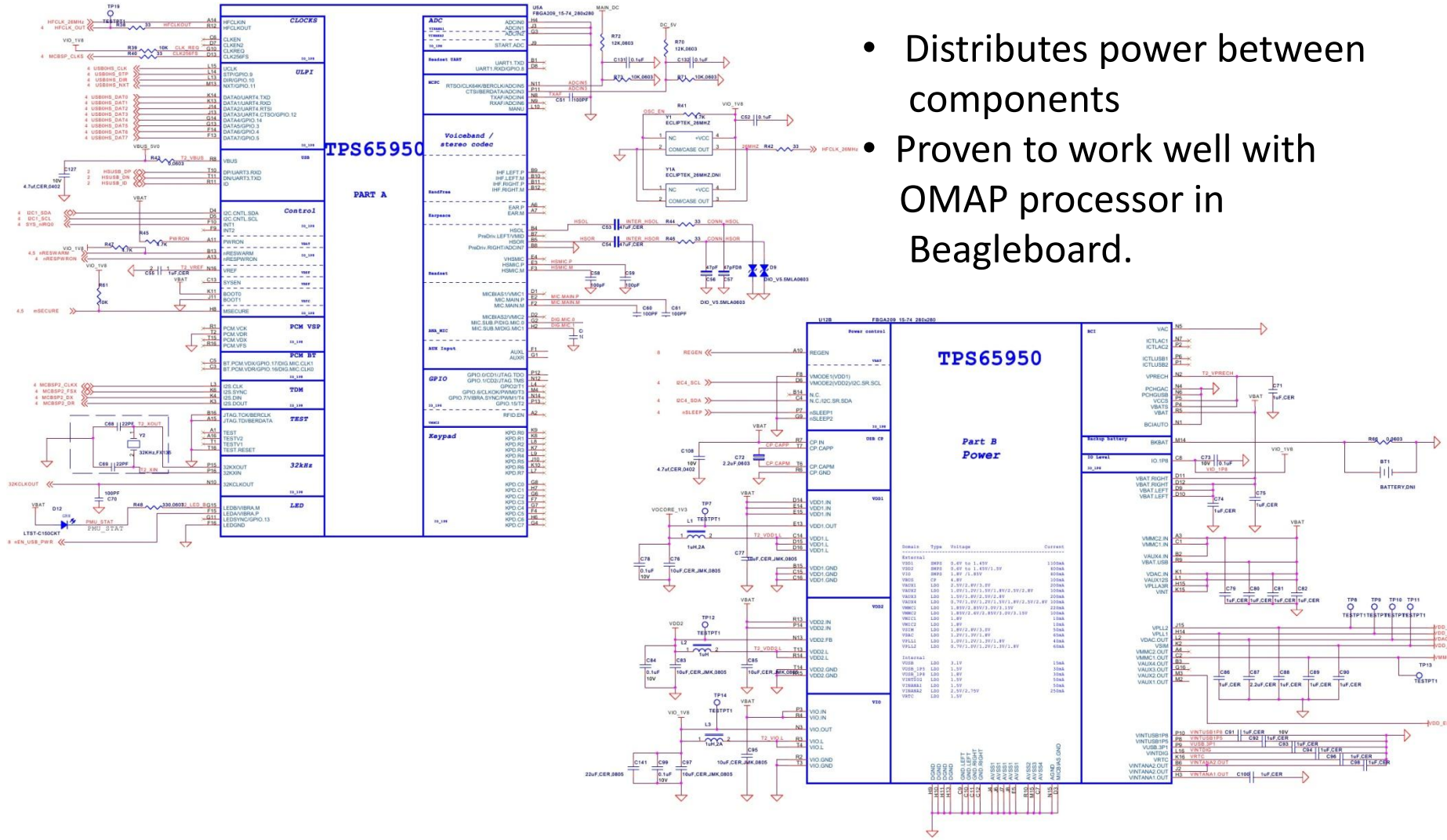
  2GB NAND x 16 (256MB) and 2GB MDDR SDRAM

  (POP is a technique where the memory, NAND and SDRAM are mounted on top of the processor.)
- Jtag connector to processor for development purposes
- Reset and User/boot button
- Four LEDs for booting and software testing.

OMAP3530 Microprocessor



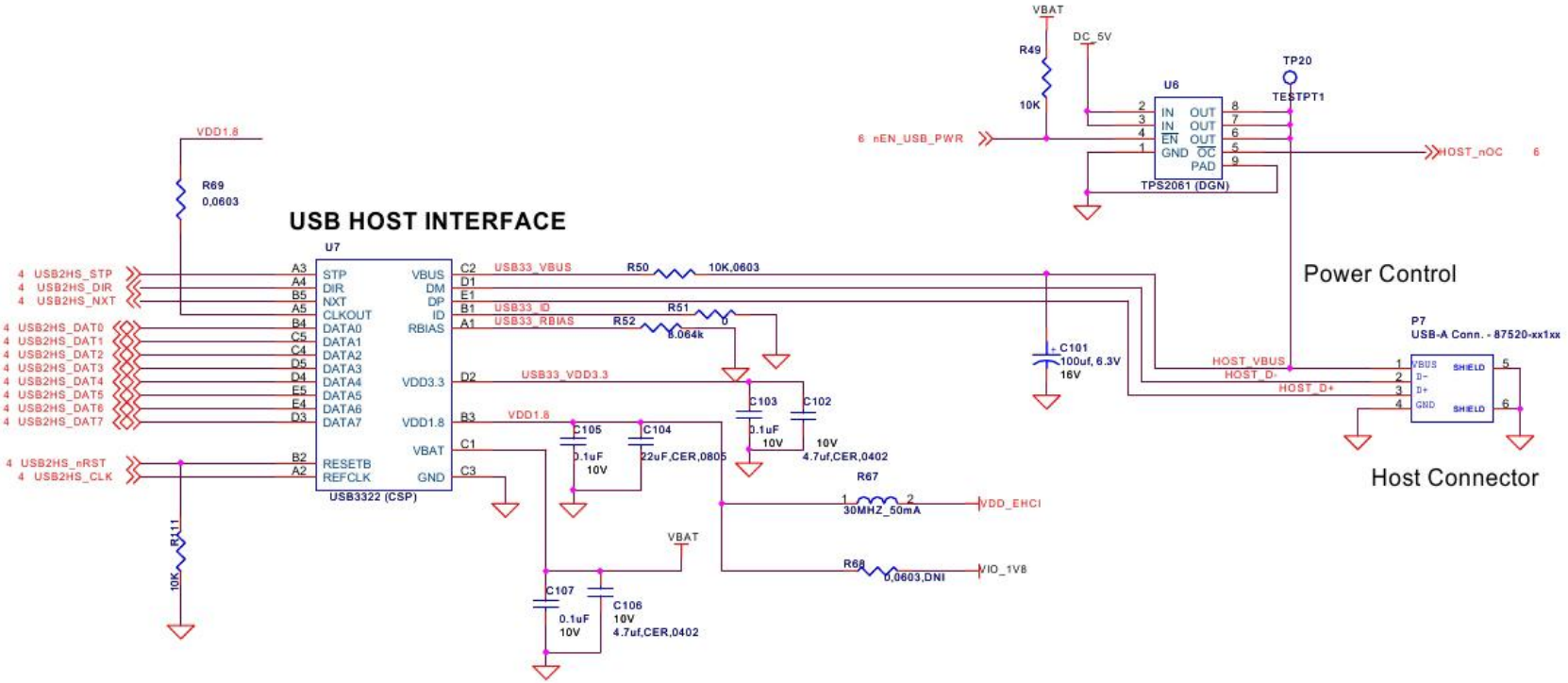
TPS65950 Power Control



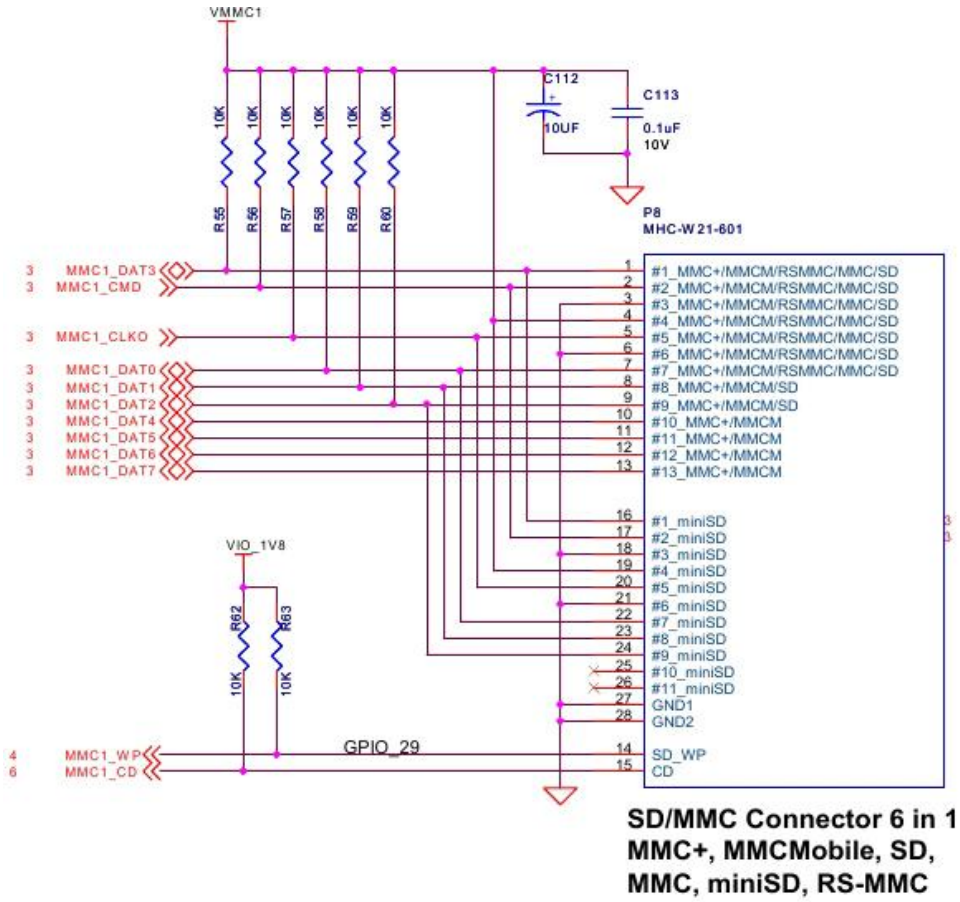
- Distributes power between components
- Proven to work well with OMAP processor in Beagleboard.

USB Host (USB3332)

USB Host will be used in conjunction with a USB hub to connect the LCD, WIFI, scanner and power the board through the OTG client.



MMC/SD Slot 6-in-1 (MHC-W21-601)



SD/MMC Connector 6 in 1
MMC+, MMCMobile, SD, MMC, miniSD, RS-MMC

- An SD/MMC 6 in 1 connector is needed to store Android's file system
- Allows for memory expansion
- It supports:

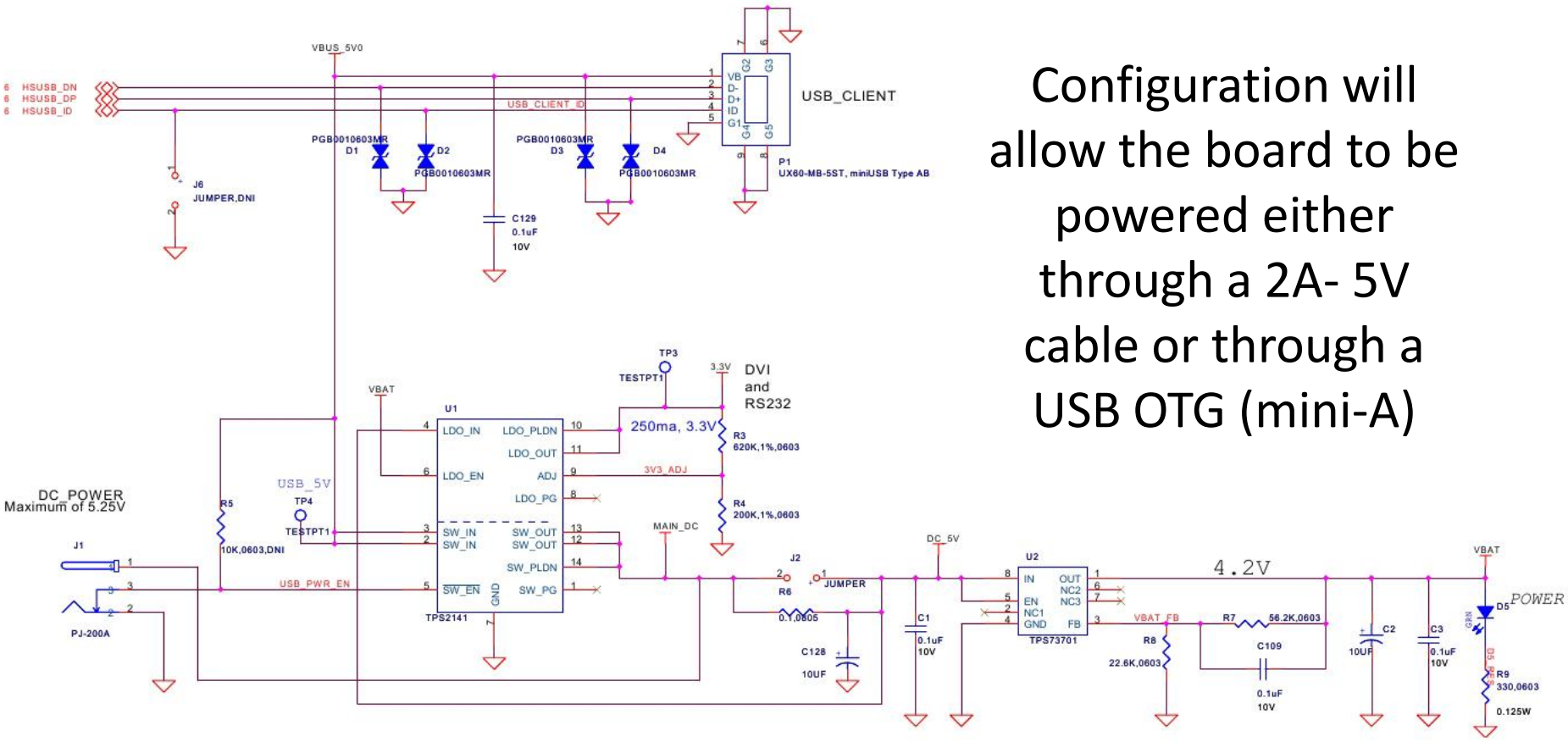
SD Memory Cards

MMC Memory Card SDIO Cards MMCMobile Cards

RS-MMC Cards

miniSD Cards

USB client and 5V power connector



Configuration will allow the board to be powered either through a 2A- 5V cable or through a USB OTG (mini-A)

PCB implementation

- The PCB will serve the fridge client
- We generated schematics in OrCad and transferred them to Allegro PCB layout in order to manufacture our own custom PCBs with the following target specifications:
  - 6 layer board
  - 3”x3.1” or smaller outside dimensions
  - Top side only component placement

Internet Connection

- Internet connection is needed to keep databases in sync.
- Wireless network connection allows for better system integration.
- Primary Concern:

  Communication to Android OS

  -Custom Drivers

Belkin Wireless G USB	TiWi-R1 Module
Usb connection	On-board module
Drivers available for Android	Custom drivers needed
Wifi only	WIFI and Bluetooth

Wifi

- Belkin Wireless G USB Network Adapter F5D7050

	Specification
Network Standards	IEEE 802.11g
Range	Up to 400ft
Security	WPA, WPA2, 64-bit/128-bit encryption
Specification interface	USB 1.0, 1.1, 2.0
Operating Voltage	5 V

TouchScreen LCD
- Imo Pivot Touch -

- USB powered
- Relatively low cost: $279
- 7” display
- Resistive touch-screen
- Resolution:

  800 x 480
- Current consumption:

  100-240 V
- Custom drivers needed to interface with Android OS

UPC Scanner
- Metrologic ScanGlove IS4225 -

- Optimum shape and size
- Barcode is read as keyboard input → No drivers required
- USB powered
- UPC and full ASCII supported
- Infrared sensor for standby mode
- LED status indicator
- Low-cost: $35

Server
-Options-

Options for our Web Server:

- Google Base
- Apache HTTP Server
- Internet Information Services
- Lighttpd
- Sun Java System Web Server

Server
-Google Base-

Google Base

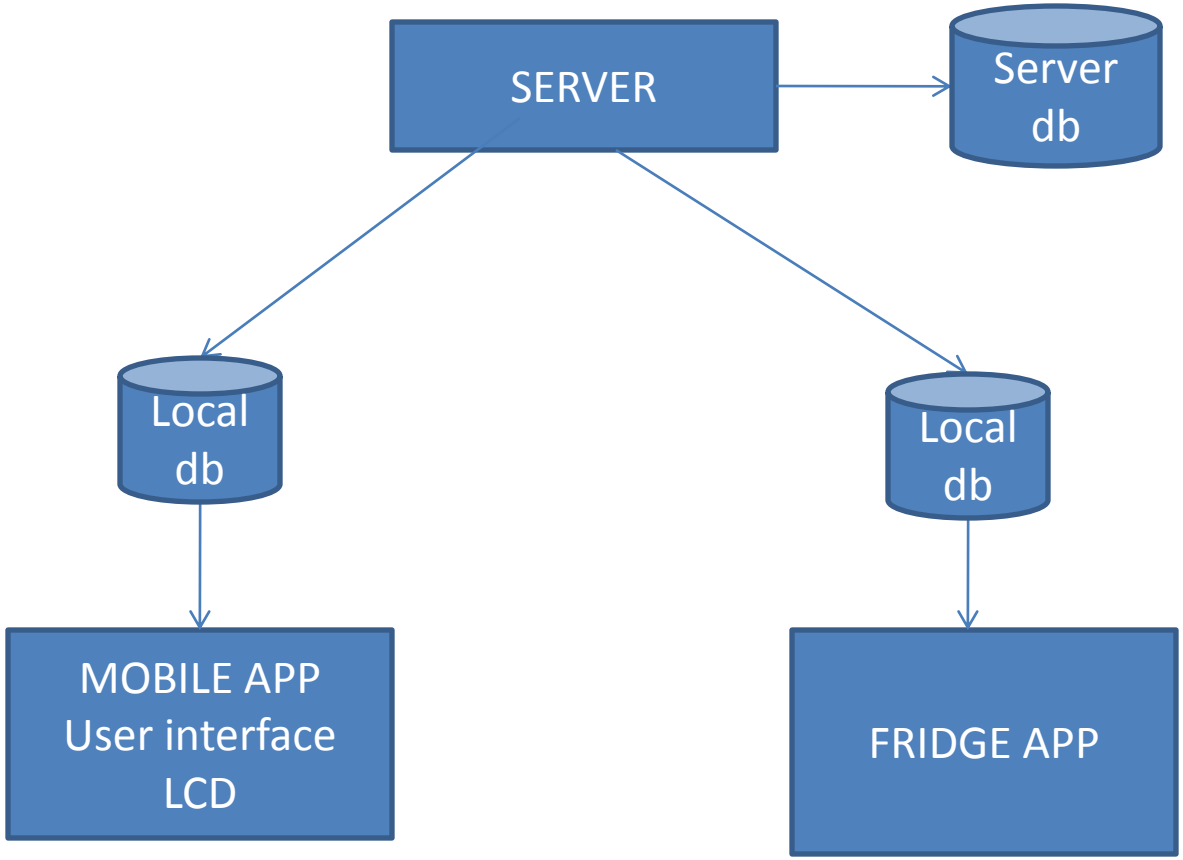
- Online database from Google
- Users can add any type of content and structure information in formats such as XML, PDF, Excel and more
- Files can be uploaded to the Google Base servers by browsing your computer or the web using various FTP methods, or by API coding

Server
-Apache-

Apache HTTP Server

- To develop and maintain an open-source HTTP server.
- For modern operating systems including UNIX and Windows NT.
- Secure, efficient and extensible server that provides HTTP services in sync with the current HTTP standards.

Server
-Structure-



Database
-Google App Engine-

Google App Engine

- Centralized Administration: administration console lets you manage all the applications on your domain.
- Reliability and support: 99% uptime service level agreement, with premium developer support available
- Secure by default: only user from Google Apps domain can access.
- Pricing that makes sense: pay only for what you use.

Database
-Google App Engine-

- Does not implement a relational database.
- Differs from a traditional relational database.
- App Engine's infrastructure takes care of all of the distribution, replication and load balancing.
- Our team feels more comfortable working with MySQL standards.

Database
-MySQL-

MySQL

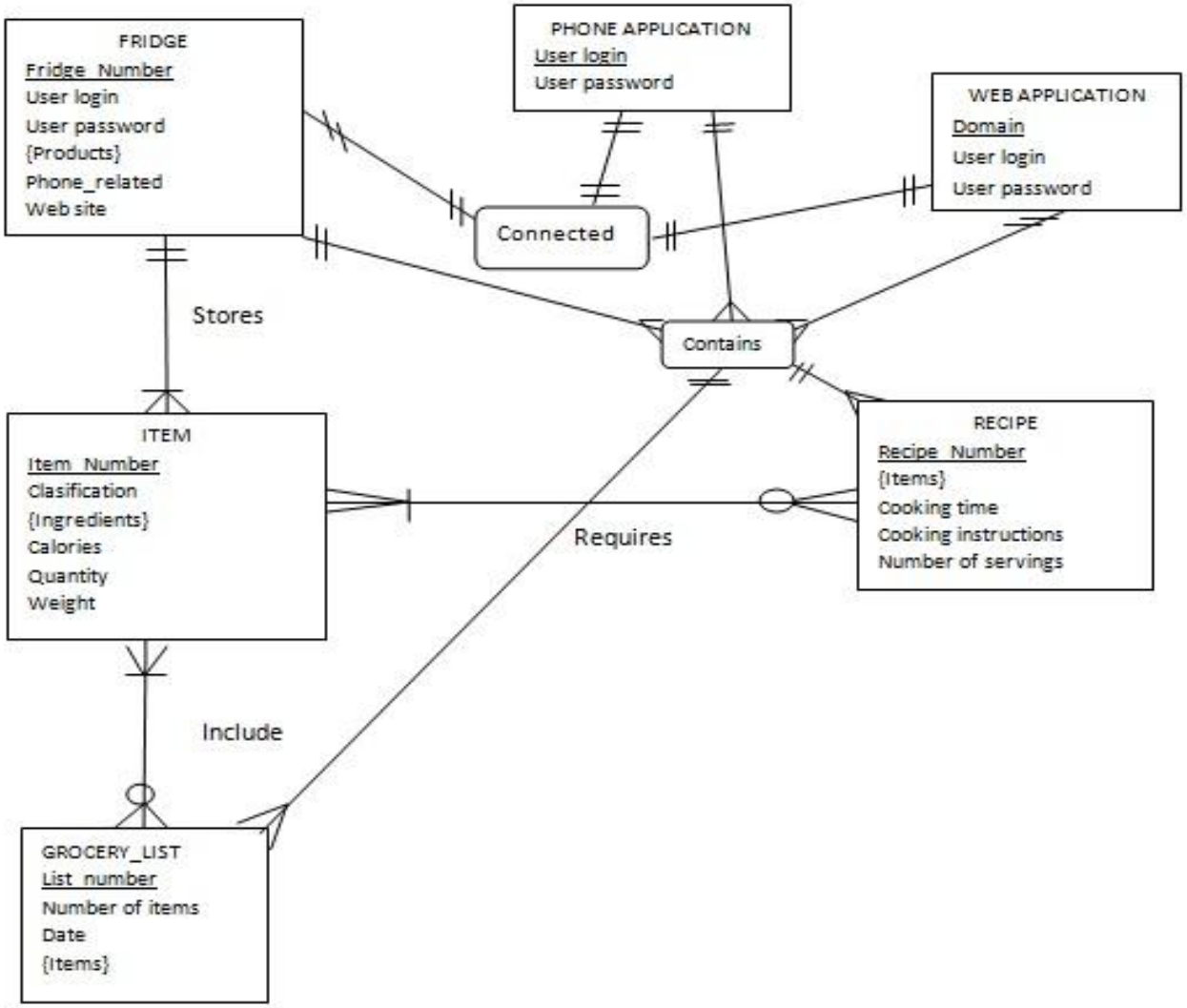
- Fast, free reliable open source relational database
- robust database with a good feature set
- Administration and security are effective
- The setup of features is not over complicated

Database
-MySQL-

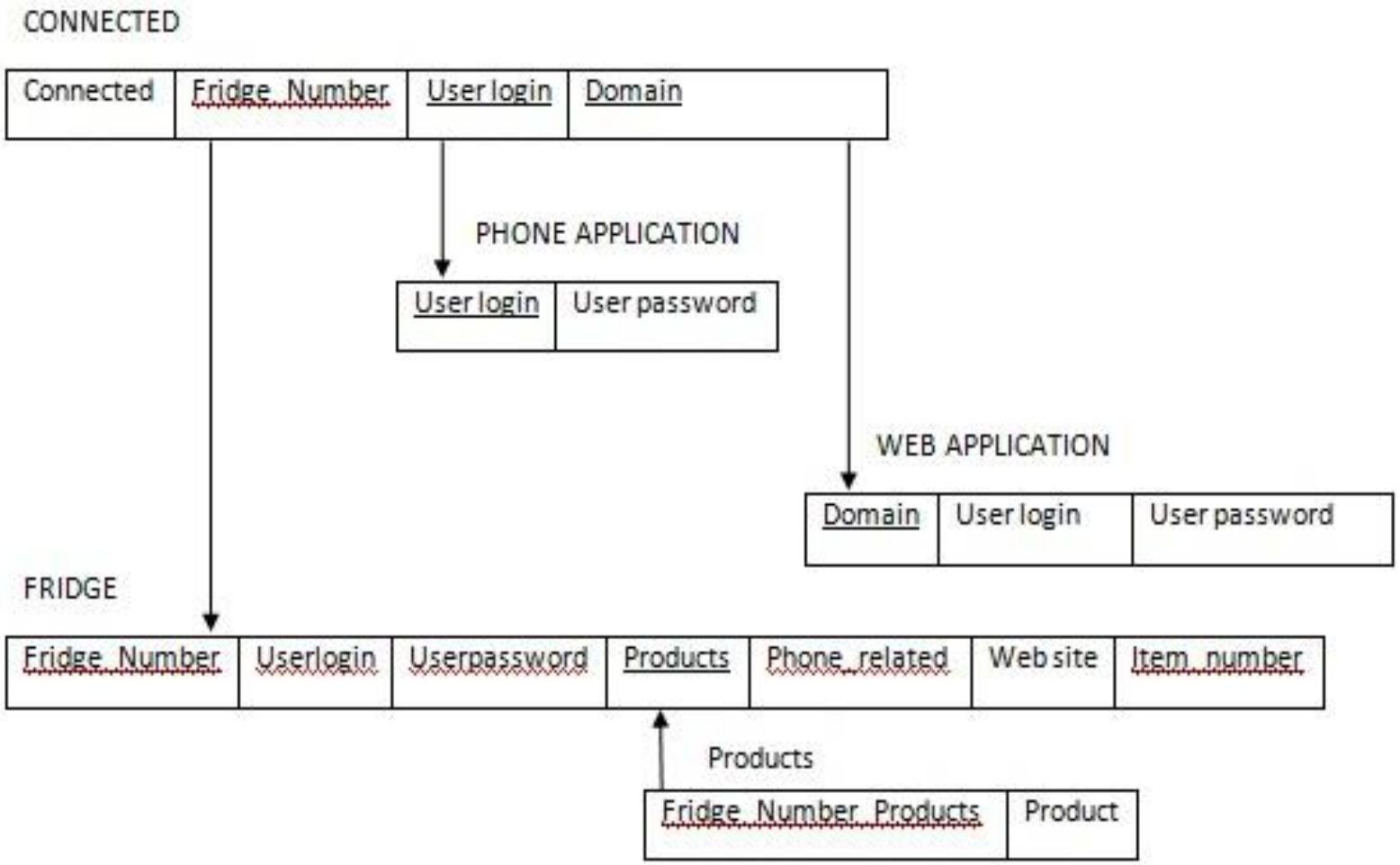
Our group decided to use MySQL software for our database based on:

- Group member's experience.
- Relational Database.
- Easier interfacing with PHP.
- More online documentation

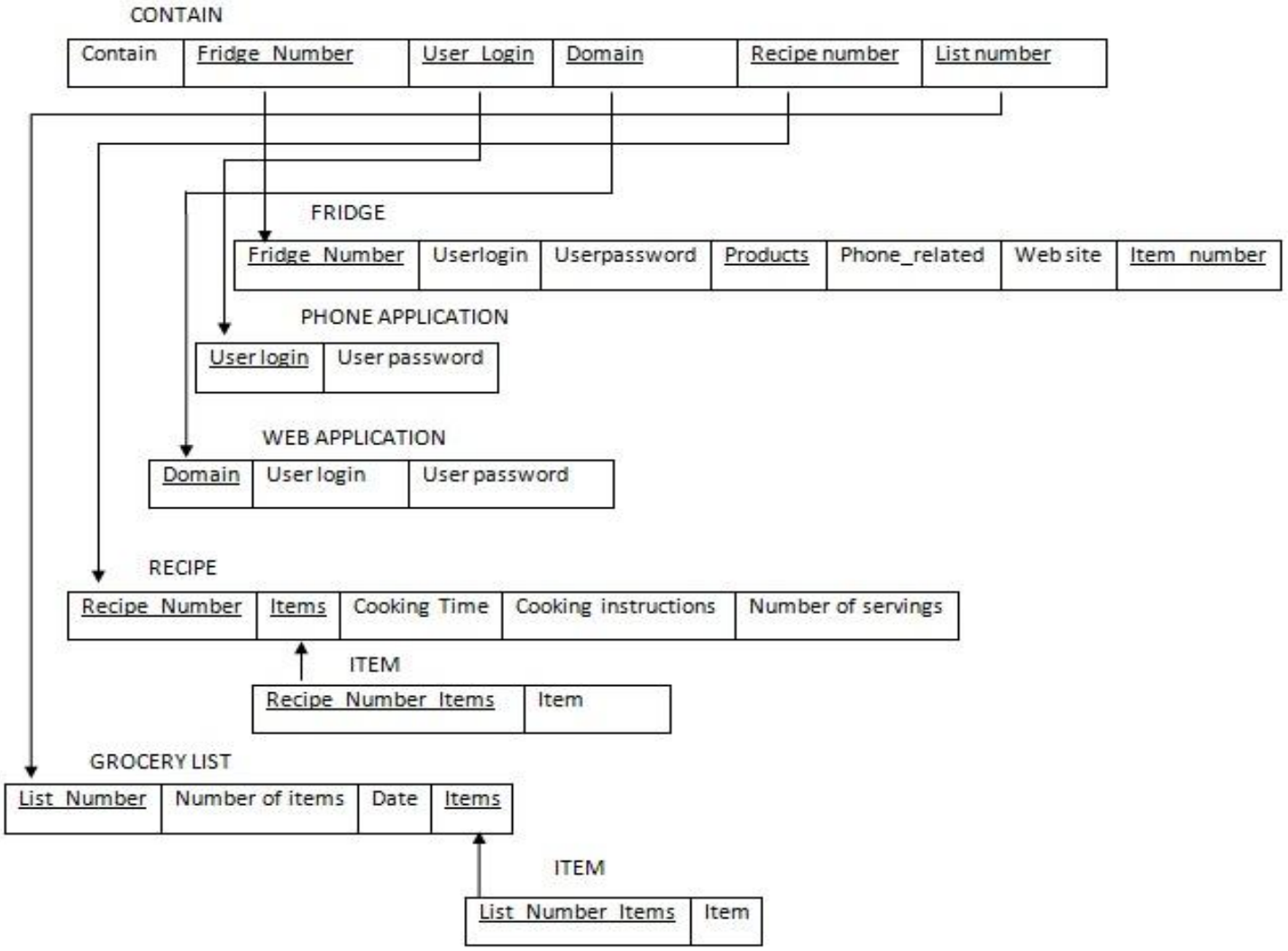
Database
-ER Diagram-



Database
-Relational Schema-



Database
-Relational Schema-



Database Android App
-Data Storage-

Android Data Storage Options:

- Shared Preferences
- Internal Storage
- External Storage
- SQLite Databases
- Network Connection

Database Android App
-SQLite-

SQLite

- SQLite is a in-process library that implements a self-contained, serverless, zero-configuration, transactional SQL database engine.

- The code for SQLite is in the public domain and free for use for any purpose, comercial or private.

- SQLite is an embedded SQL database engine.

Database Android App
-SQLite-

SQLite for Android

- Android provides full support for SQLite databases.
- Any databases you create will be accessible by name to any class in the application, but not outside the application.

Website
-Interface-

- Similar to Android apps:
  - View inventory
  - Create, modify and delete shopping lists.
  - Create, modify and delete recipes.
- Additionally:
  - Provide cooking tips and recipes from other website
  - Notification System
  - Nutritional Information

Website
-Initial design-

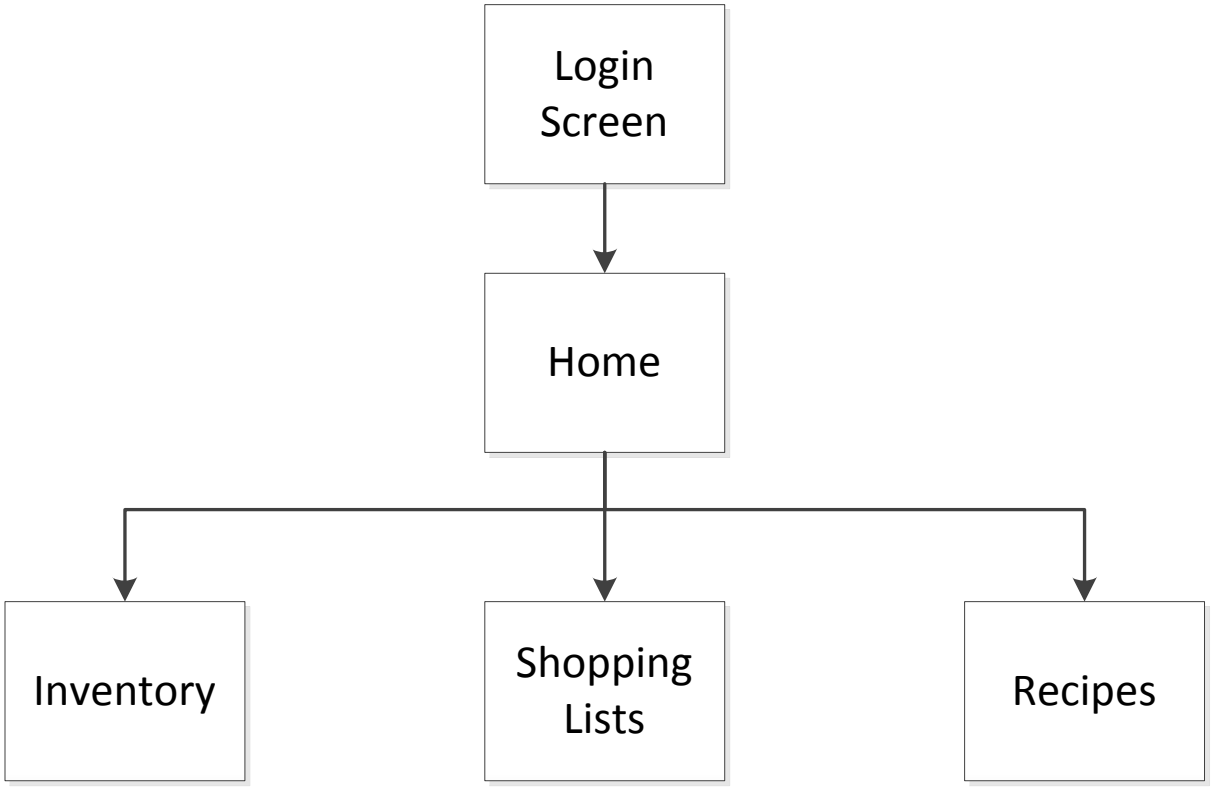
- Google Web Toolkit (GWT)
  - Development toolkit for building and optimizing complex browser-based applications.
  - Open source
  - Completely free
- Problems
  - Does not use SQL standards

Website
-PHP-

- Embed dynamic text into static text.
- Very useful for integrating web pages with databases.
- Resembles JavaScript, Java, and Perl, common ancestor, C language.

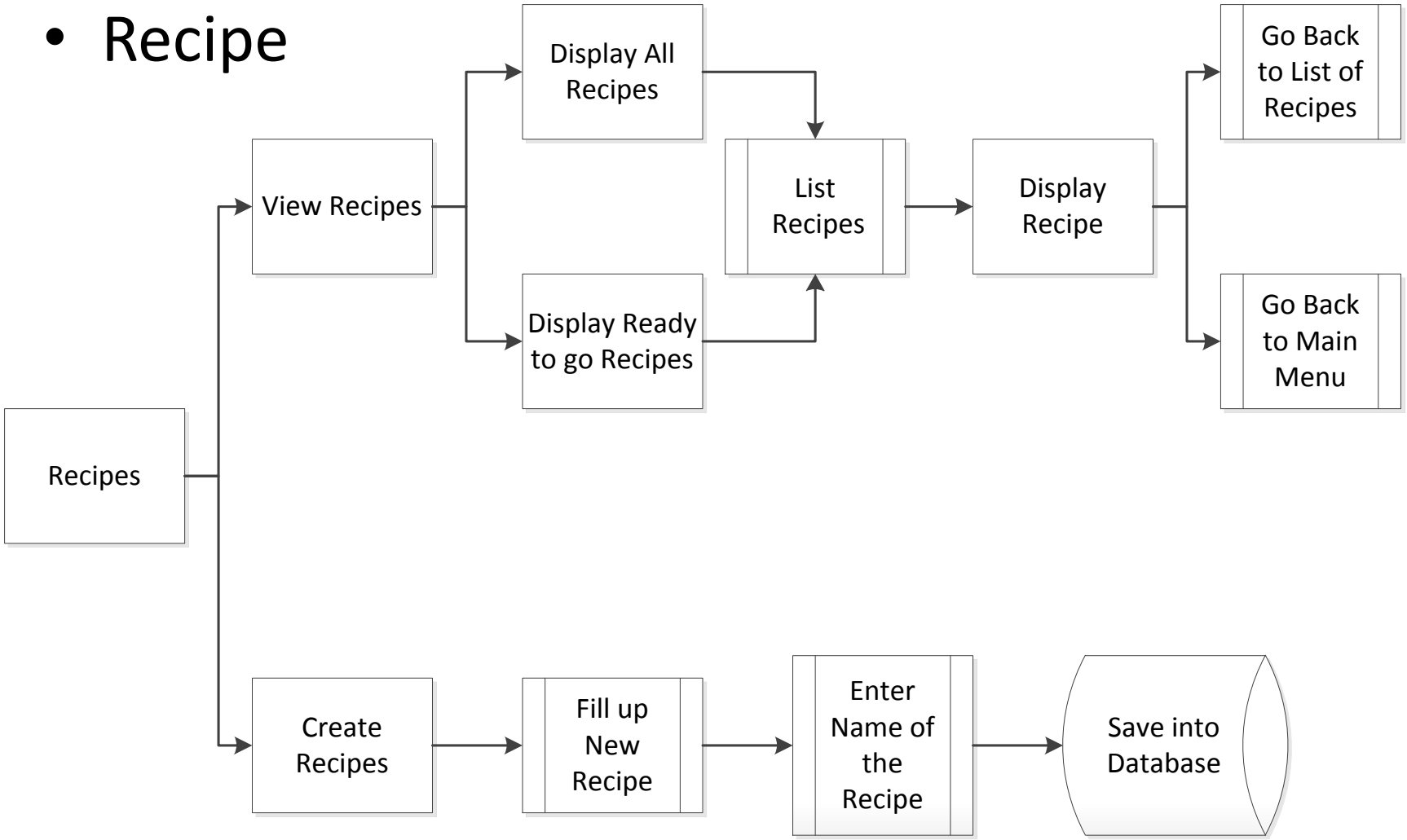
Website
-Block Diagram-

- Home

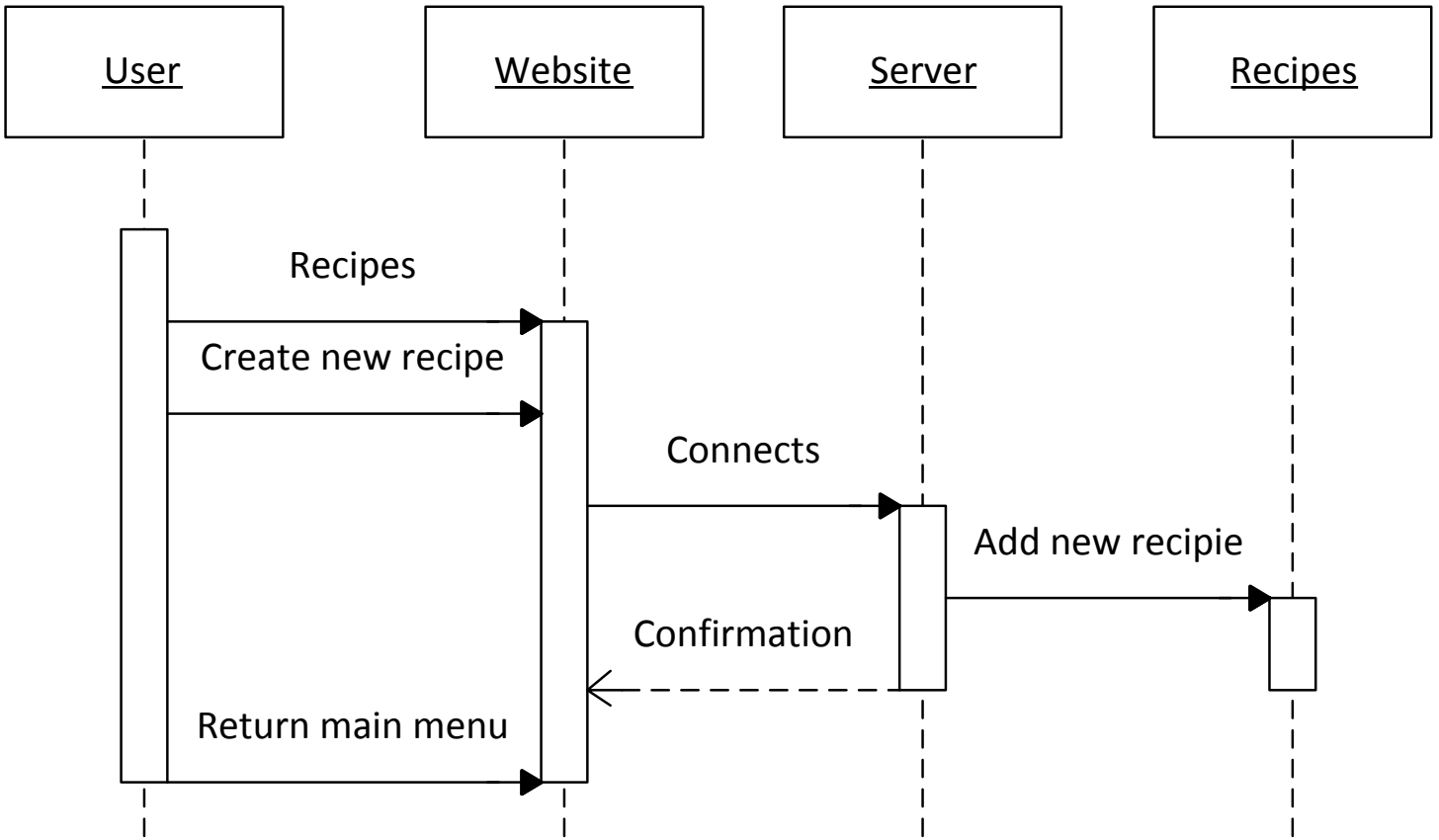


Website
-Block Diagram-

- Recipe



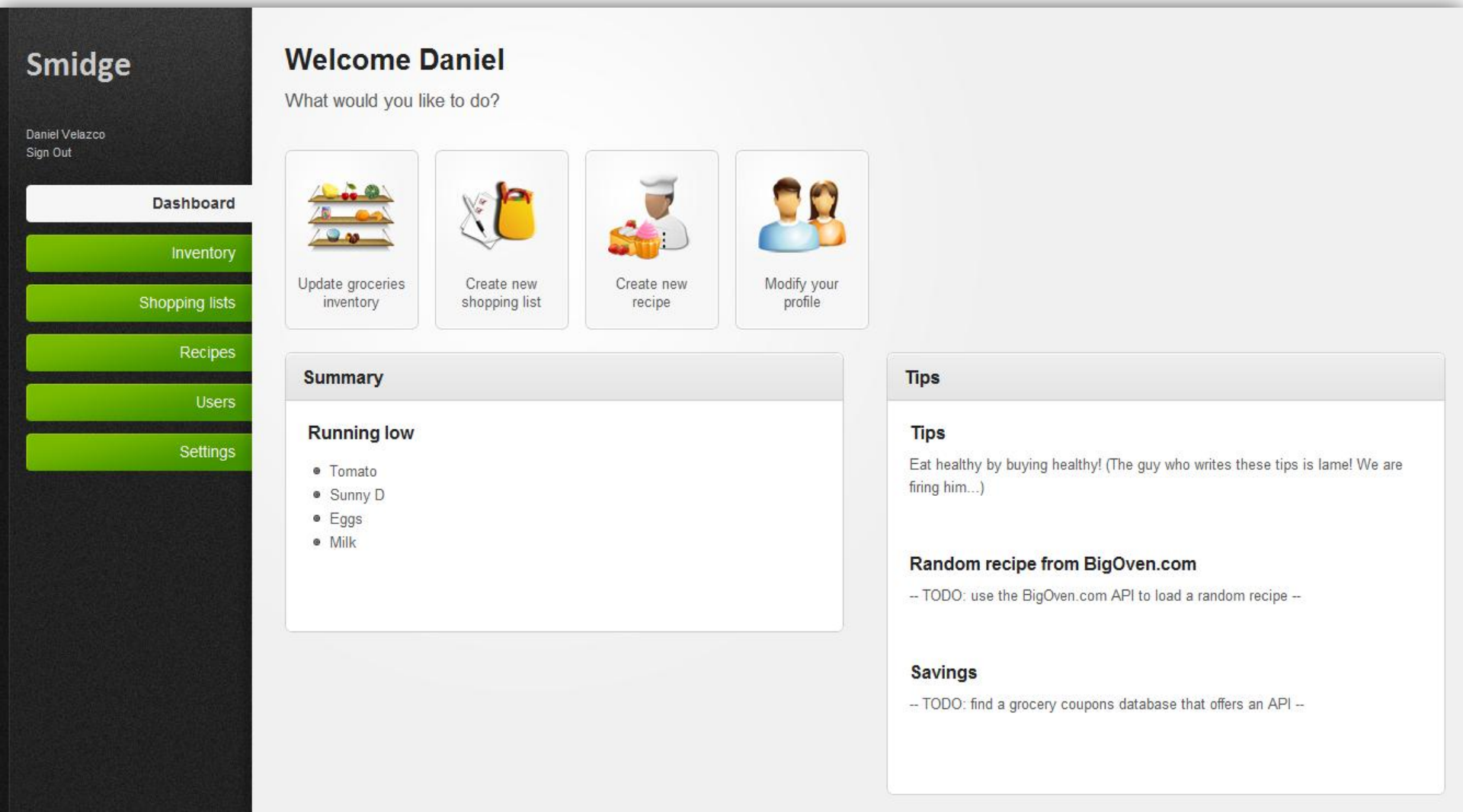
Website
-Sequence Diagram-



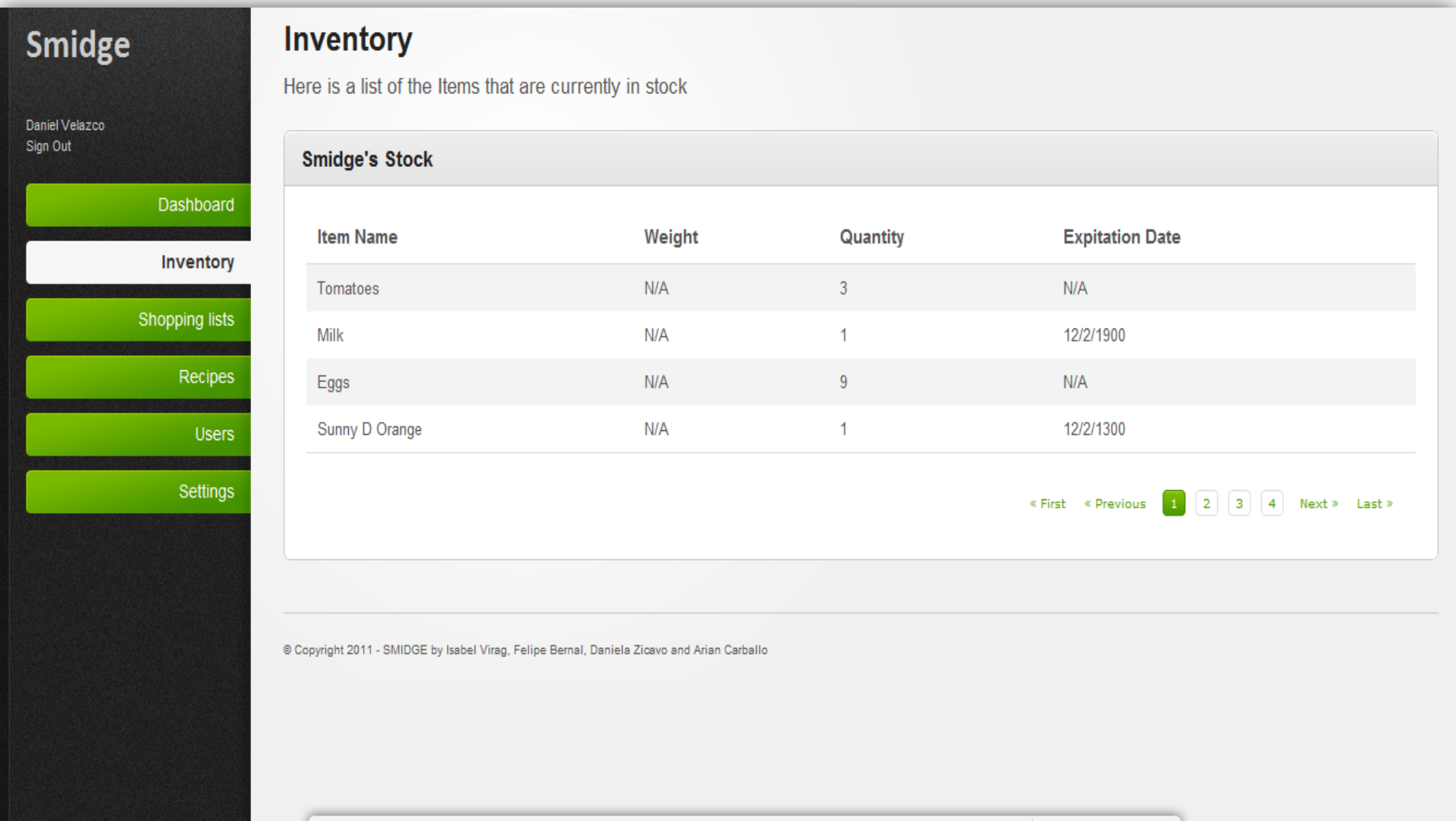
Website
-Screen Shots-

- Multiple user accounts
- Users can create an account through the fridge client
- Each account contains its inventory and preferences

Website
-Screen Shots-



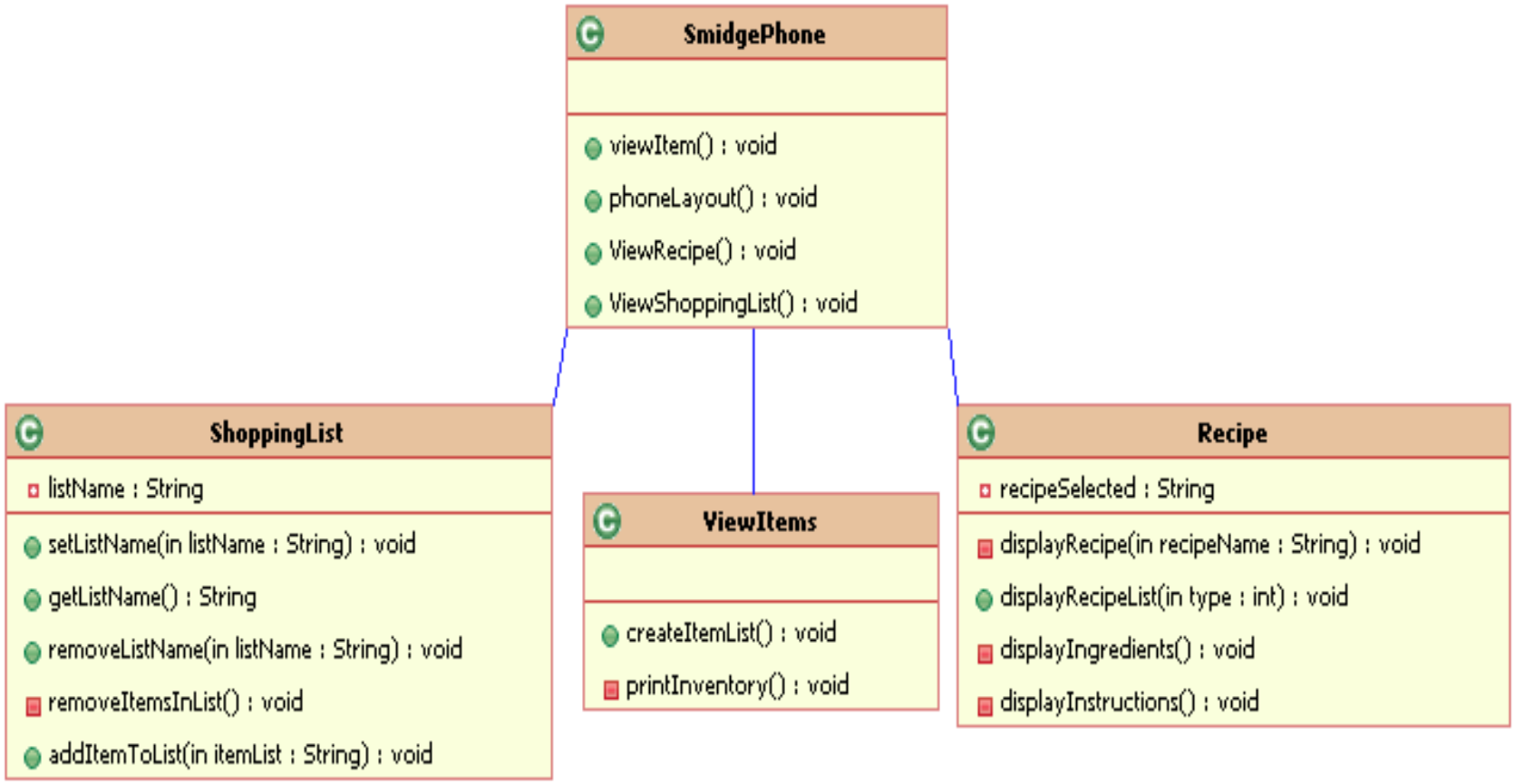
Website
-Screen Shots-



Mobile App
-Goals-

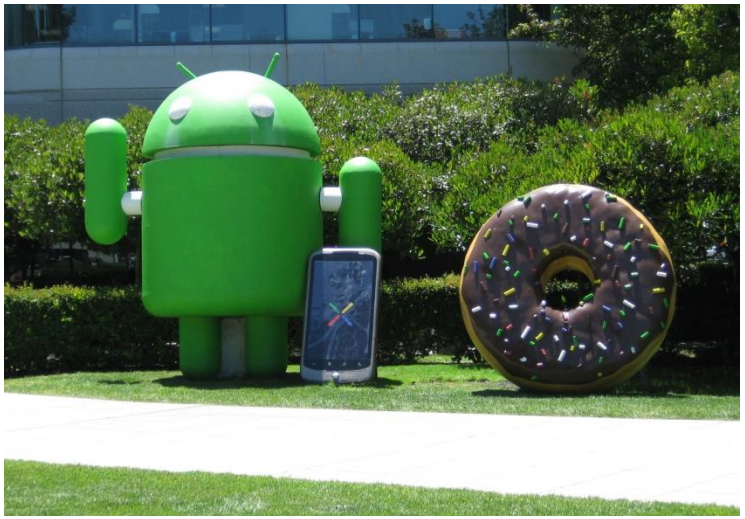
- Access the inventory at any time, any place.
- Access, create, and modify shopping lists while at the grocery store
- View recipe
- Alert notifications:
  - Items about to expire
  - Items about to run out

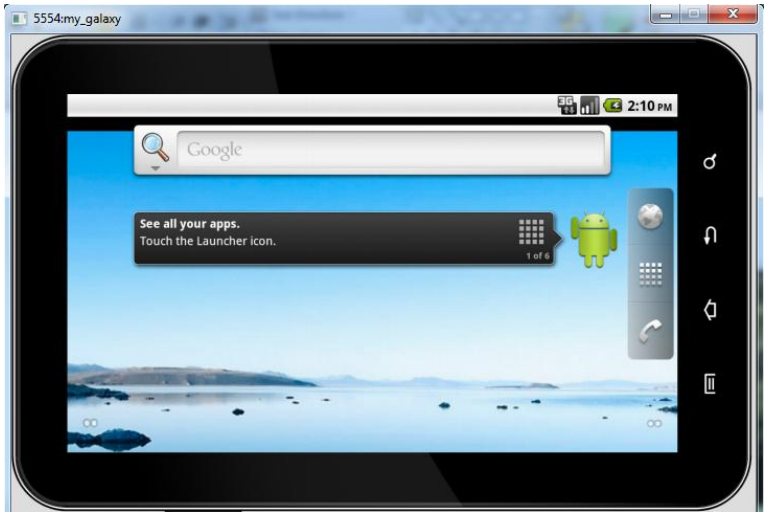
Mobile App
-Class Diagram-



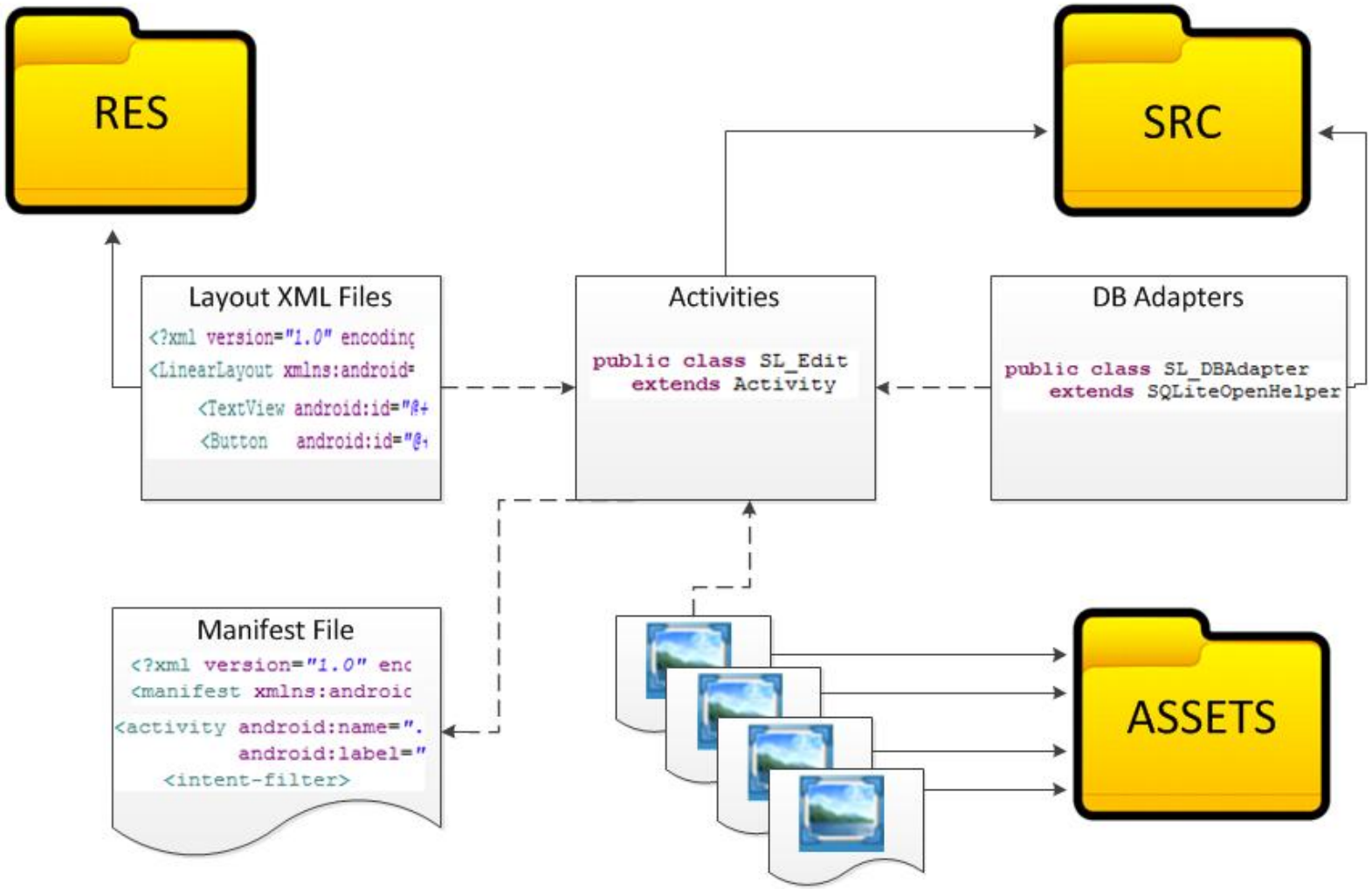
Development Environment

- Eclipse IDE v.3.6 with ADT plugin
- SDK Platform Android 2.2
- Emulators:
  - Avd vs. Galaxy Tab

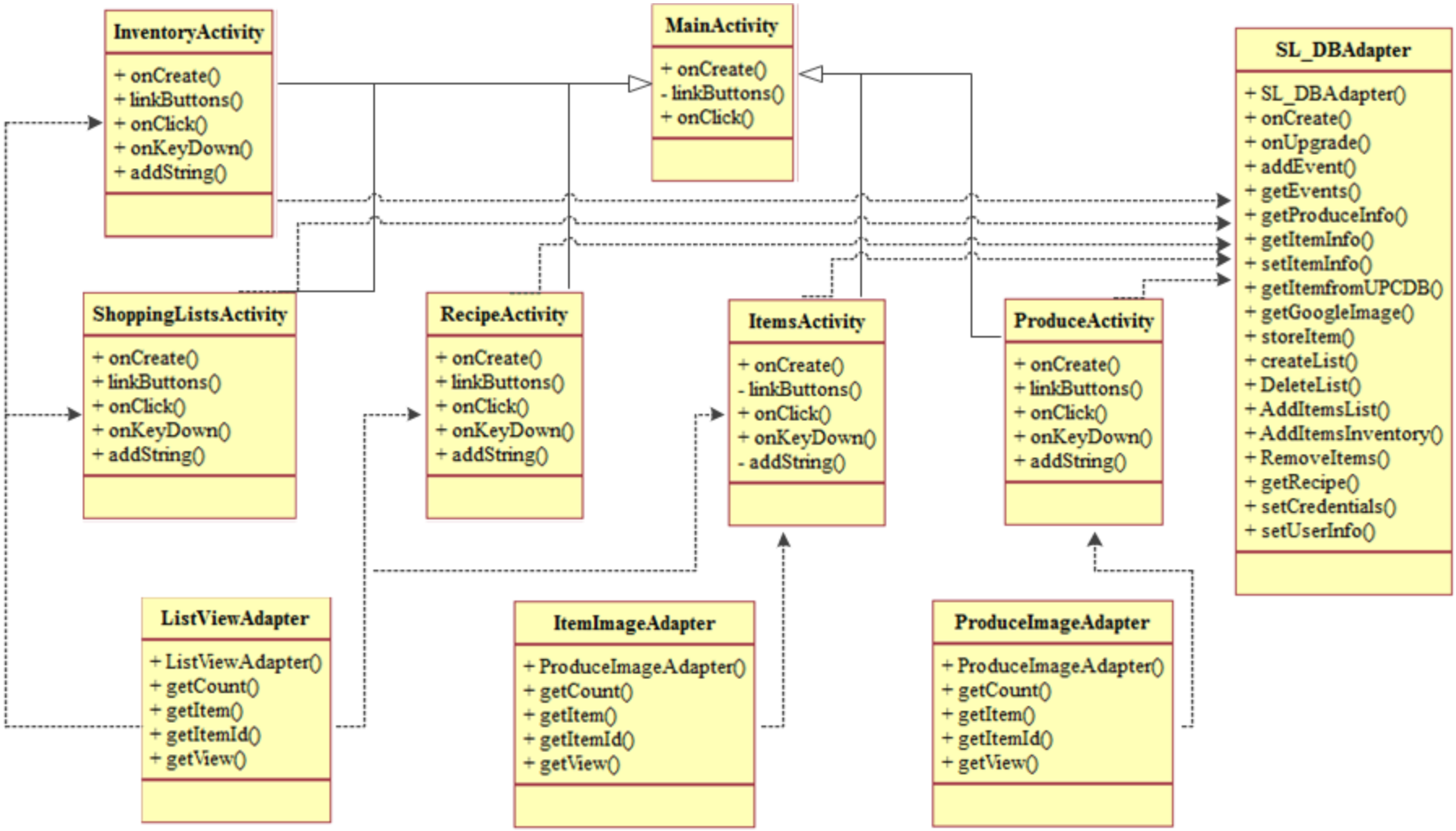




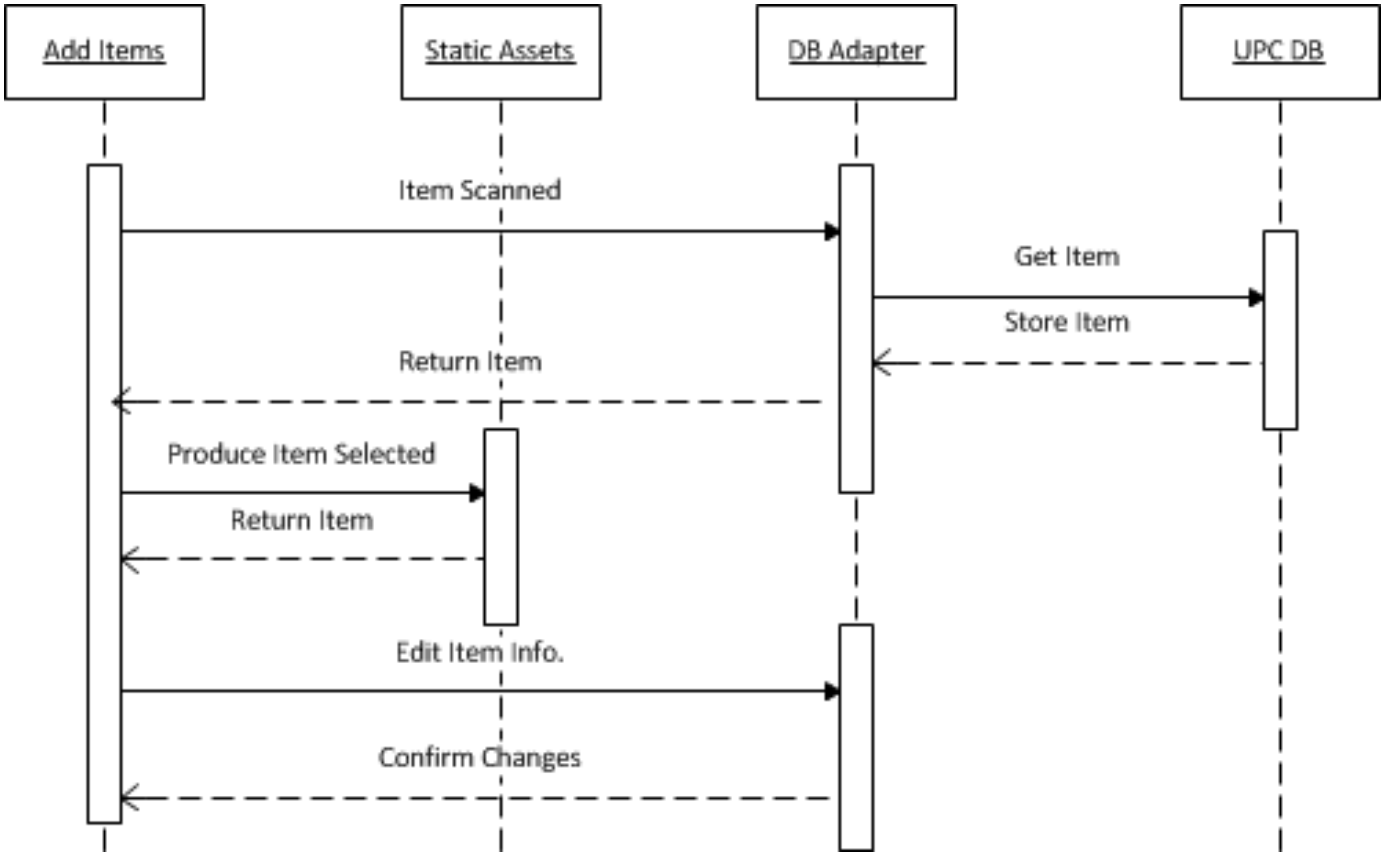
Android framework



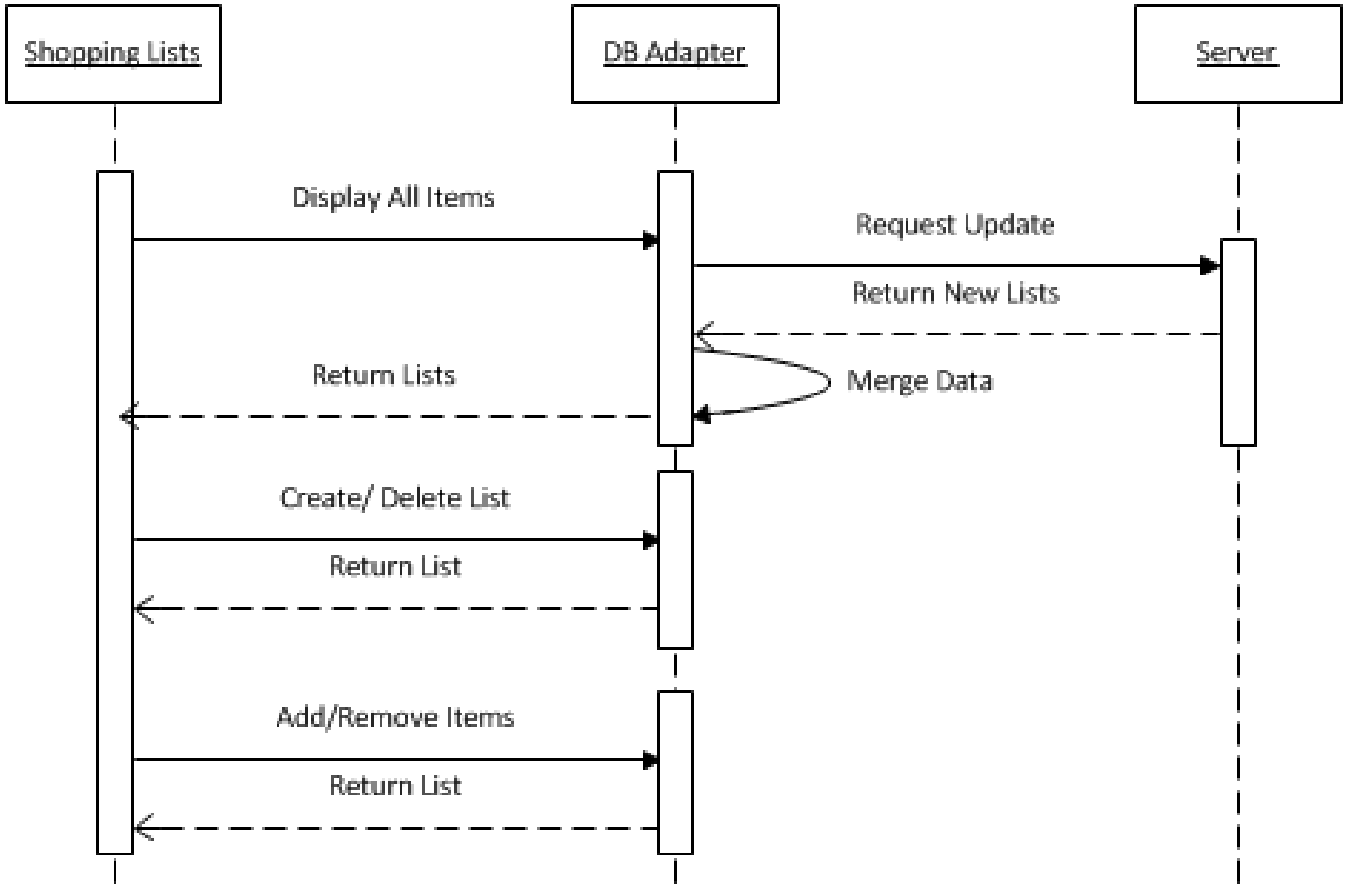
Class Diagram



Add Items Sequence Diagram



Shopping List Sequence Diagram



Main Page

Add Items

- Scan Items
- Edit: Weight, Exp. Date, Amt. Left
- Delete Items
- Go to Produce

Produce Items

- Search by PLU Code
- Select from list
- Images Retrieved with UNIX script
- List Implemented using Hash map

Other Pages

Shopping List

- Create List
- Delete List
- Add Items
- Remove Items

Inventory

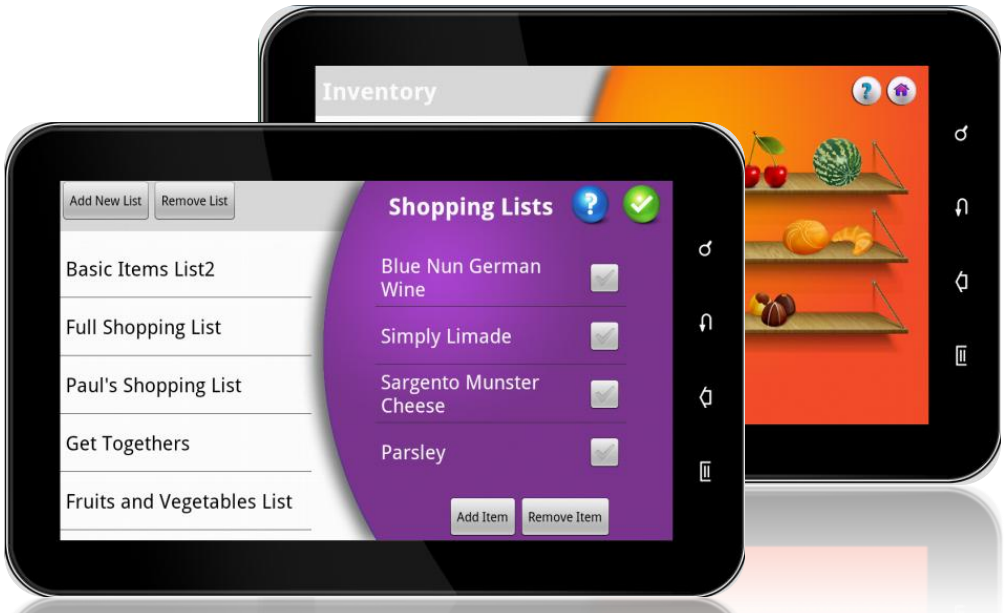
- Display Items
- Remove Items
- Edit Exp. Date
- Edit Amt. Left

Recipes

- List Recipes
- Display Recipe
- Add Items to shopping list

Settings

- Set username
- Set password
- Enter email



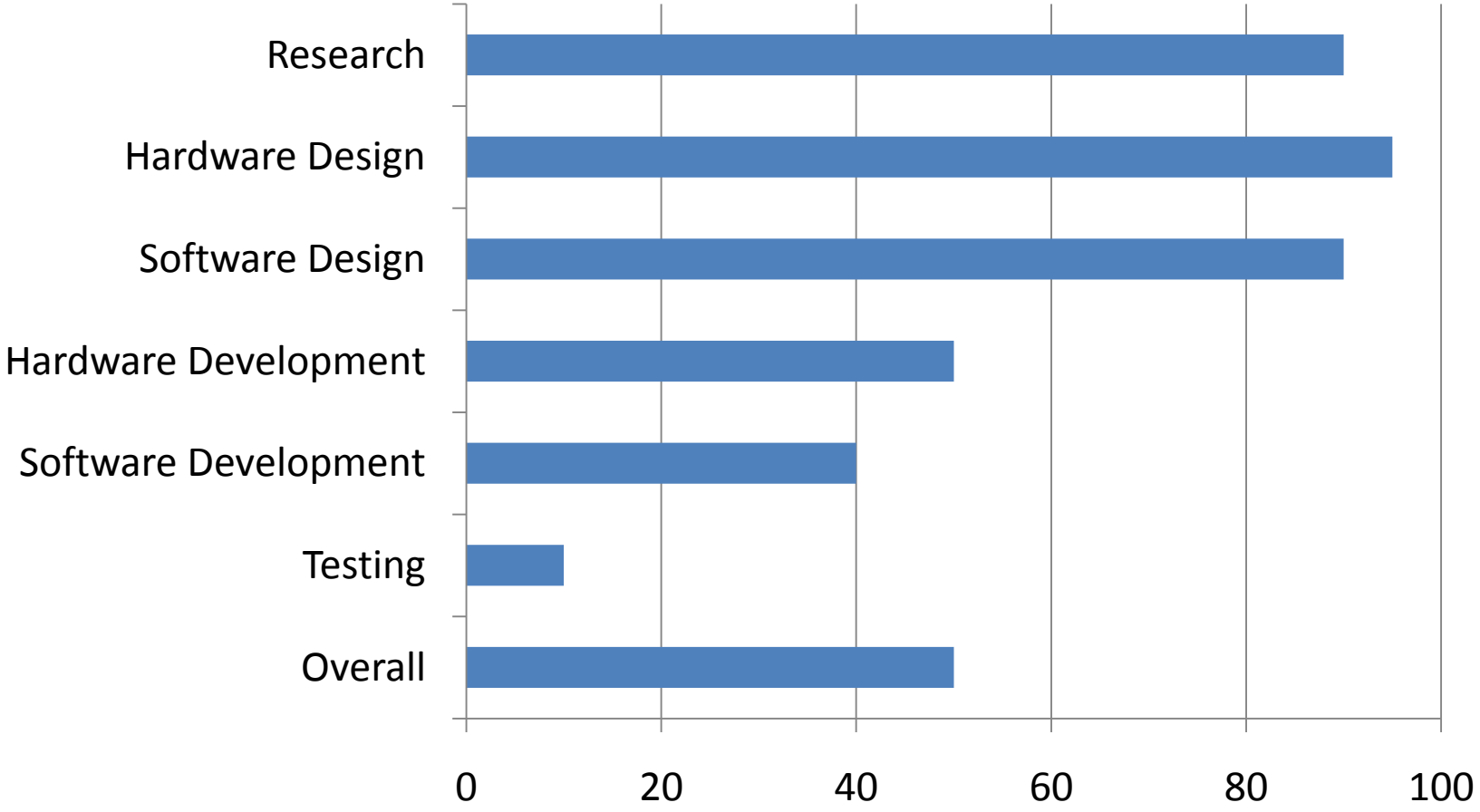
Difficulties

- Google App Engine
- UPC Database API
- Algorithm for user input items to match the database
- Exception handling for unrecognized UPC codes

Budget

PART	DEVELOPMENT
LCD	$180
Scanner	$35
USB wifi module	$24
Development board	$140
PCB	---
OMAP 3530	free
TPS 65950	free
PCB Parts other	---
Web hosting	free
Total	**$379**
Projected total	$1100

Progress


Research
Hardware Design
Software Design
Hardware Development
Software Development
Testing
Overall
0
20
40
60
80
100